

ABSTRACT

Title of Dissertation: PRODUCTION AND ENVIRONMENTAL
INFLUENCES ON SOYBEAN ISOFLAVONE
TYPE AND CONCENTRATION

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Doctor of Philosophy, 2005

Dissertation Directed By: Professor, Charles Mulchi
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Environmental Sciences

Environmental conditions can have major impacts on the production of soybean [*Glycine max* (L.) Merr.] metabolites. In two studies, isoflavone type and concentration of soybean seed tissue was evaluated. Study one evaluated the effects of treatments with lactofen; weed control (WC) and white-mold suppression (WM) rates and timings of 217 g ai ha⁻¹ applied at the V1 stage and 122 g ai ha⁻¹ applied at the V5-R1 stages, respectively. Leaf tissue isoflavone concentration for post-lactofen treated leaf tissue was 26% higher for total soybean treated with WC than WM. Yield was unaffected by lactofen treatments, but double crop (DC) averages were ~16% higher than full season (FS). The highest concentrations of seed isoflavones for DC and FS were malonyldaidzin and malonylgenistin. The damage

caused to the leaf tissue by lactofen applications did not result in a change in the seed isoflavone concentrations, individually or quantified as total isoflavone. While the Lactofen treatments did not show an effect on isoflavone type and concentration with respect to application timing for the seed tissue, the consistency of the relative isoflavone concentrations for seed are important for cultivar selection. The second study focused on cultivar differences and interaction with elevated tropospheric ozone concentrations. Four cultivars were grown in the field in open-top chambers and fumigated with either carbon filtered (CF) or ozone (O₃) enriched air. The two β-glucosides, daidzin and genistin, and their Malonyl forms, plus one aglycone, genistein were present at detectable levels. The levels of the isoflavones daidzin, malonyldaidzin, malonylgenistin, and genistein were reduced for the seeds produced in O₃, 25, 19, 15, and 11%, respectively. Genistin levels were not significantly different, but the data did trend toward lower concentrations for the O₃ AQT. Genistein was the only aglycone detected. Williams 82 ranked consistently higher in levels of isoflavones, in some cases regardless of the AQT, than the other cultivars. Cultivar selection is important for the

production of high isoflavone soybeans near urban centers. The affects of production and environmental influences on soybean seed isoflavone type and concentration are variable and should be evaluated independently. Total isoflavone concentration is the best measure of overall cultivar isoflavone production.

PRODUCTION AND ENVIRONMENTAL INFLUENCES ON SOYBEAN
ISOFLAVONE TYPE AND CONCENTRATION

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University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2005

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Dedication

To God for the love of his only son, and for all of the opportunities and gifts that he has given me in my life.

To my wife Carol Jo Osiecki Phillips and my son Camden Edward Osiecki Phillips. Thank you for all of your hard work, time, patience, and love. Without you in my life, I could never have accomplished this work. Your love and devotion both inspire and humble me. May God bless you and keep you.

Acknowledgements

I would like to acknowledge Dr. Scott Glenn and Dr. William Kenworthy for all of their support throughout a major portion of my college education. Their tireless efforts to guide me through my education while allowing me the opportunities to succeed and fail on my own could never be repaid. Thankfully, guidance from Dr. Glenn and Dr. Kenworthy always included moral direction.

To Rosanna Louie, I will be ever grateful for her hard work, time, assistance, and cheering. Rosanna's tireless efforts and words of encouragement made this journey much more enjoyable.

To Dr. Charles Mulchi for his wisdom and good humor during some difficult tasks in the heat of the summer.

To Dr. Monica Giusti for her help and encouragement in the lab and from afar.

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Chapter 1: Introduction

1.1 Overview

People have utilized Soybean [*Glycine max* (L.) Merr.] seeds in many ways. Recently, products made from soybean seed, and its constituents, are being studied in agronomic, food science, and human health research all over the world. One of the most prolific areas of ongoing research focuses on soybean seed isoflavones.

Isoflavones are secondary plant metabolites that act as phytoalexins and are often referred to as phytoestrogens. These compounds are found in many plant families but none as much as the LEGUMINOSAE family. Previous research projects have concentrated in areas such as; environmental influences on soybean isoflavone production, searching for isoflavone-rich plant sources, and the absorption, metabolism, and functions of isoflavones in the human diet, as well as the development of human nutrition supplements. The impetus behind a large portion of the research is predominantly the potential for monetary gain placed upon isoflavones by the food, nutraceutical, and pharmaceutical industries. Much of the resources in the human health fields are focused on the safety and efficacy of isoflavones. The nutraceutical, and to a much lesser extent the

pharmaceutical, industries have marketed these compounds as being key to fighting diseases such as various cancers and osteoporoses or use in hormone replacement therapies for postmenopausal women. Many of the putative benefits made for isoflavones in human health have limited or no clinical research to support the purported findings. To this end, the relationship of isoflavones to human health is an ever-expanding field.

Much of the focus of the agronomic research has been limited to the amount of isoflavones produced by soybeans and the types that are produced. The primary focus of past and current research has been on isoflavone variability among cultivars, as well as the comparative response of these soybean cultivars to environmental stresses (Panizz and Bordingnon 2000). One area of potential for the alteration of isoflavone concentrations and types in soybean seed may be tied to the physiologic responses of specific cultivars to various production methodologies and crop protection chemicals and/or procedures. In many cases research conducted on soybean isoflavones has been conducted primarily within disciplines. Future research should take a multidisciplinary approach.

The objectives of the following research were to: 1. Evaluate differential cultivar responses from leaf damage, and subsequent leaf isoflavone production, resulting from applications of the herbicide lactofen and its relationship on the type and concentration of seed isoflavones. 2. Evaluate differential soybean cultivar seed responses to elevated ozone concentrations thru the analysis of isoflavone type and concentration.

1.2 Dissertation Sections

1.2.1 Chapter 2

This chapter contains a review of the research literature covering the areas of isoflavone production, soybean isoflavone genetics and physiology, as well as human health metabolism and absorption of isoflavones.

1.2.2 Chapter 3

This chapter presents the results of research conducted to evaluate the effects of the herbicide lactofen on soybean seed isoflavones. Lactofen was applied according to labeled rates and timings, as either an herbicide or as a suppressant of white mold.

1.2.3 Chapter 4

This chapter presents the results of the research conducted to evaluate the effects of chronic exposure to moderately elevated tropospheric O₃ on soybean seed isoflavones.

1.2.4 Chapter 5

This chapter presents the findings of this research as well as the contributions that this research has made to the overall body of research.

1.2.5 Appendices

In the appendices of this dissertation there are completed SAS¹ programs as well as their results, labeled "SAS Output". The programs that are included are written in macro format. The primary file is the first to be run in SAS and is used to invoke all macros and import the data set from the database Microsoft Access 2000².

¹ SAS ver 8.01, Copyrite © 1999-2000 by SAS Institute Inc., Cary, North Carolina, USA.

² Copyright© 1992-1999 Microsoft Corporation, One Microsoft Way, Redmond, Washington 98052-6399 U.S.A.

Chapter 2: Literature Review

2.1 Isoflavones

2.1.1 Introduction

There are more than 100 isoflavones and isoflavone glucosides known (Wong, 1975). These compounds are secondary plant metabolites that are produced as phytoalexins. Isoflavones are produced predominantly in plants of the LEGUMINOSAE family, such as soybean [*Glycine max* (L.) Merr.], and also in a few non-leguminous plants including the important agronomic crop sugarbeet (*Beta vulgaris*) (Jung et al., 2000). Still, other plants produce significant concentrations of isoflavones. An extract of the inedible fruit of the Osage Orange tree (*Maclura pomifera*) was found to be a significant source of the isoflavones osajin and pomiferin, containing 25.7 and 36.2%, respectively (Tsao et al., 2003). There is current research to suggest that both osajin and pomiferin may be a repellent to insects (Peterson et al. 2002).

In soybean plants, isoflavones are found primarily in the seed, but under environmental stresses they can be extracted from various parts of the plant including the leaf tissue. Three soybean cultivars, Emiliana, Elvir, and Kure were analyzed

for phenolic compounds over a three-month period. With the exception of pods, all parts of the plants were found to contain isoflavones (Romani et al., 2003). However, the researchers explained that the levels and locations of flavonols within the plant gave the indication that the plants were under ultraviolet light stress. The conclusion was that this stress might have been the cause of elevated levels of isoflavones; in some cases concentrations were ten-fold the averages represented in the literature. Isoflavones have also been reported in the roots and root exudates of soybean plants without stress induction (Kosslak et al., 1987).

Isoflavones are produced as the basic molecular structure known as the aglycone. The aglycone molecule is the basic building block from which two of these molecule isoflavone conjugates are made. The aglycone can have a glucose molecule attached at the number seven carbon thus resulting in the second molecule, the β -glucoside. The addition of a malonyl group to the 6'' carbon of the β -glucoside results in the formation of the malonyl conjugate (Figure 1.). The water-soluble β -glucosides are found in greatest abundance as compared to the aglycone (Wollenweber and Dietz, 1981).

Announced and described in 1980 the "new" isoflavone extracted from soybean was determined to be the 6''-O-

acetylgenistin conjugate (Ohta et al., 1980). Later it was found that this was not a new isoflavone, but a by-product of an extraction procedure that used high temperatures.

There are more than 100 isoflavones known, but only nine soybean isoflavones are thought to be of primary economic interest (Figure 1.). These isoflavones are comprised of three aglycons and three β -glucosides. Daidzein, genistein, and glycitein are the aglycones and daidzin, genistin, and glycitin are the β -glucosides. The rest of the nine forms have the malonyl prefix attached to their respective β -glucoside name: malonyldaidzin, malonylgenistin, and malonylglycitin.

2.1.2 Production

The biochemical production of isoflavones begins in the phenylalanine pathway, when triggered by specific conditions within the plant a portion of the pathway is shifted toward the production of isoflavones (Figure 2). Further down the pathway isoflavones can become precursors for other secondary metabolites. Daidzein was found to be the precursor to another phytoestrogen, coumestrol, in alfalfa (*Medicago sativa*). When soybean leaves were damaged using CuCl_2 and UV treatments the level of coumestrol was not affected (Dewick and Martin, 1979). However, this study has produced insight into the enzyme system

to which the plants quickly shift the biochemical pathway for isoflavone production. The system elucidated by Cosio et al (1985) included the enzymes chalcone synthase, phenylalanine ammonia-lyase, and UDP-glucose:isoflavone 7-O-glucosyl transferase. This enzymatic activity leading to the production of isoflavones will be detailed in the following section.

2.2 Soybeans and Isoflavones

2.2.1 Leaf Tissue

Mature soybean leaf tissue contains no isoflavones but does contain the flavonol kaempferol-3-glucoside (K3G) (Cosio et al., 1985). Following damage to leaf tissue, cells will produce isoflavones as a means of chemical defense. This production is localized and is a shift in leaf physiology and biochemistry. While the concentration of the flavonol K3G does not change as a result of the leaf damage, isoflavones begin to develop in varying types and concentrations. Isoflavones found in the mature leaf tissue of soybean plants occur only in response to damage. Chemical, disease, insect, or mechanical damage can cause the trigger for this phytoalexin response. The localization of these reactions in the leaf tissue has been studied in a few soybean cultivars. Mature soybean leaves of the cultivar Harosoy63 contain kaempferol-3-glucosides with no other flavonoids found at detectable levels (Cosio et al., 1985). In the same study, soybean leaves that were treated with 100 mg/L of the herbicide acifluorfen³ plus 0.01 % (v:v) Triton x-100⁴ (Octylphenol ethoxylate) surfactant were found to contain

³ BASF AG, Carl-Bosch-Strasse 64, 67117 Limburgerhof, Germany

⁴ The Dow Chemical Company, 2030 Dow Center, Midland, Michigan 48674 USA

isoflavone aglycons and β -glucosides. In a separate study, the primary isoflavones induced in soybean leaf tissue by the herbicide lactofen⁵ (ethyl *O*-[5-(2-chloro- α,α,α -trifluoro-*p*-tolylloxy)-2-nitrobenzoyl]-DL-lactate), were formononetin aglycones, as well as the isoflavones diadzein and malonylgénistin (Landini et al., 2003).

Acifluorfen and lactofen are the common names of two members of the diphenylether or nitrodiphenylether, herbicide family with the trade names of Blazer and Cobra, respectively (Vencill et al., 2002). This family of herbicides is used for postemergence broadleaf weed control in soybean fields. These chemicals are not readily translocated in soybean. The mode of action of these herbicides is the inhibition of protoporphyrinogen oxidase. This inhibition begins a cascading effect where by the inhibition of this enzyme further inhibits the production of chlorophyll via the lack of oxidation of protoporphyrinogen IX to protoporphyrin IX. A subsequent buildup of protoporphyrin IX in the thylakoid lumen leads to a spill over into the chloroplast stroma where it absorbs energy from sunlight, which in turn moves the outer-most electron into a third higher valence shell. This energy is then transferred to ground-state oxygen where it forms singlet oxygen that

⁵ Valent USA Corp. P.O. Box 8025, 1333 N. California Blvd. Suite 600, Walnut Creek California 94596-8025

interacts with the plasmalemma resulting in lipid peroxidation. The result of the application of acifluorfen to soybean plants is not death but necrotic lesions on the contacted leaves (Vencill, 2002). Lactofen is the uniquely label for the prevention of white mold in soybean. White mold is caused by the fungal pathogen *Sclerotinia sclerotiorum* in soybeans. Lactofen prevents white mold via the induction of isoflavones in soybean leaf tissue that inhibit *Sclerotinia sclerotiorum* (Nelson et al., 2002).

After treatment with acifluorfen, Cosio et al (1985) evaluated enzyme induction through the accumulation and subsequent identification of chalcone synthase (24% of leaf activity), phenylalanine ammonia-lyase (12%), and UDP-glucose:isoflavone 7-O-glucosyl transferase (20%). This accumulation of enzymes was validated by an earlier study by Cosio and McClure (1984) where untreated soybean leaflets 2.5 to 3 cm long were found to have no detectable levels of phenylalanine ammonialyase activity. In addition to elucidating the enzymes in the leaf tissue, the study by Cosio et al. (1985) included a time sequence of leaf enzyme and isoflavone production. Within the first 24 to 30 hours, post spray application (PSA) of acifluorfen to the soybean plants, there were significant increases in the phenylalanine and chalcone

synthase concentrations. After 48 h PSA isoflavone aglycons and pterocarpan increased, then after 72 h PSA UDP-glucose:isoflavone 7-O-glucosyl transferase also increased. After 96 h PSA, and following the availability of the UDP-glucose:isoflavone 7-O-glucosyl transferase enzyme, isoflavone aglycons were present.

Isoflavone β -glucoside production and storage were found to be within the mesophyll cells (Cosio et al. 1985). These researchers theorize that the β -glucosides were detoxification products accumulated within the vacuoles of mesophyll cells. Isoflavone β -glucoside synthesis and accumulation were found to be within the cytosol of the mesophyll cells. Isoflavone aglycons and pterocarpan accumulated in the epidermis and intercellular spaces of the mesophyll cells. Pterocarpan and aglycons were detected only in the tissue adjacent to the necrotic tissue, which resulted from the Acifluorfen treatment.

From these two influential research findings it is probable that: 1. The aglycons and pterocarpan are the important constituents in the reaction to leaf tissue damage, as they were most available in the location where the damage occurred, 2. An explanation of the lack of phenylalanine ammonialyase activity in the leaf tissue is that the flavonol intermediates may be translocated to leaf tissue where they are later used in the

synthesis of secondary phenolic compounds. With respect to the later of the two findings, the evidence for this finding was the accumulation of the enzyme 4-coumarate:CoA ligase, which is an enzyme that occurs between the phenylpropanoid pathway and the flavonoid pathway. It is this enzyme that is needed to begin the production of the isoflavone phytoalexins. Further evidence is the concomitant accumulation of chalcone-flavanone isomerase, the primary enzyme required for the production of the aglycone isoflavone daidzein.

In 2003, Landini et al. found that the primary isoflavones induced by an application of lactofen were daidzein, formononetin aglycones, and malonylgenistin. The location of these induced phytoalexins were proximal the area of damage by the herbicide, thus confirming the findings of Cosio et al. (1985). Further findings from this research were that there was no movement of the isoflavones from the immediate area of damage. In this research, it was also observed that the treatment of soybean leaf tissue by several of the diphenyl ether herbicides induced a mechanism in the plant to respond to infection by *Phytophthora sojae*. This mechanism results in the soybean tissue accumulating glyceollin, which is a pterocarpan phytoalexin. This response is induced by chemical signals from the pathogen that are designed to induce the host cells into

producing glucan (Ebel et al., 1984; Ebel and A. Mithofer, 1998). A key to the successful use of lactofen over other diphenylether herbicides is that it is only one of a few of the diphenyl ethers to induce soybean leaf tissue into the production of isoflavones without a chemical signal from a pathogen (Landini et al., 2003). These researchers explain that the mode of action of the diphenyl ether herbicides, such as lactofen, result in oxygen radicals that "mimic some aspects of hypersensitive cell death" (Landini et al., 2003).

In addition to fungal pathogens, it is thought that damage caused by insects is also another stimulant by which isoflavone production is induced. While there has been no research working directly with soybean plants, there have been efforts to evaluate the role of isoflavones in insect feeding on crops such as subterranean clover (*Trifolium subterraneum* L.). According to Beck and Knox (1971), red clover (*Trifolium pratense* L.) was found to contain formononetin, biochanin, as well as both of their β -glucosides. The major concentration of formononetin and biochanin were in the form of malonate esters. Wang et al. (1999) also extracted isoflavones from subterranean clover. Using a methanol extraction procedure, they determined the type and concentration of the total leaf tissue (TLT) and surface leaf tissue (SLT) isoflavones. These researchers found that the

primary isoflavone in the TLT extract was genistein. The next highest concentration was biochanin A, which was only one-third of the concentration of the genistein. The concentration of the TLT isoflavones was found to be a poor predictor of the level of mite resistance. However, in the TST the concentration of biochanin A was more than three times the concentration of genistein. The level of 7-O-glucoside biochanin-A in the leaf surface was the best predictor of mite resistance (r^2 0.84), while the concentrations of the total biochanin A plus genistein were almost as good (r^2 0.78). The major problem with the analysis of this research is the comparison of the use of r^2 for the evaluation of prediction. A simple analysis comparing the collected data to the predicted data would have provided evidence of the quality of the models discussed. Perhaps a better analysis of the data would have been to use genistein as a covariate, since they seem to believe that the total biochanin A plus the genistein was a better predictor. In this study, the nonglucosylated forms of the isoflavones were found to be active deterrents of mite feeding at concentrations ten times lower than their glucosylated forms.

The ability of plant leaf tissue to produce isoflavones is a key to their protection from damage that could reduce overall plant health as well as yield. The converse to this is that the

production of isoflavones requires plant products and the shifting of biochemical constituents and pathways. Thus the question yet to be evaluated involves the cost of leaf isoflavone production. Specifically, what is the cost to stored isoflavones in the seed? Are enzymes and precursors used for seed isoflavone production translocated to be used in leaf isoflavone production?

2.2.2 Root and Rhizosphere

Distribution of the isoflavones daidzein, daidzin, and the malonyated forms of daidzin and genistin were determined for seven-day-old seedlings of cultivars Williams 79 and Williams 82 (Graham, 1991). The concentrations were the same for the two thus the data were combined. Grown under lighted conditions the root had the highest concentration of daidzin and daidzein with the root tip having more than three times the concentration of daidzein than the remaining portion of the plant. The daidzin concentration in the root tip was about the same as that of the rest of the combined tissue.

Grown in dark conditions, the soybean root tip contained about the same concentration of daidzein as the remainder of the plant tissue while the cotyledons contained the same relative concentration of daidzin as the combination of all other tissue. There was a relative reduction in root isoflavones and an

increase in the cotyledon isoflavones. As for the malonyl forms, the root tip and the cotyledon had the same concentration, which was well over double that of the other tissue combined; Malonyldaidzin was high for the two, but highest in the cotyledons. Overall however, the concentrations of the isoflavones in the tissue grown in the dark was about one third that of the tissue from the light.

What role the light plays in the increased production of isoflavones was not determined, however it is clear that the lack of light causes an increase in the isoflavone concentration in the cotyledons and a decrease in the roots. The majority of the malonyldaidzin and malonylgenistin were found in the root tip and the cotyledons (Graham 1991).

Exudate at the root tip was found to have a high in aglycone daidzein concentration (Graham, 1991). The research was repeated and the findings were that the majority of the root exudate was malonyldaidzin. This lead to the belief that the exudate from the root tip was the of the malonyl form. The speculation was that there were β -glucosidases in the exudate resulting in the aglycone (Graham, 1991).

In 1987 it was reported that soybean roots exude the aglycon isoflavones coumestrol, daidzein, and genistein, and that these exudates stimulate *Bradyrhizobium japonicum* USDA123

to begin transcription of the gene responsible for nodulation, nod gene (Kosslak et al., 1987). Many studies have demonstrated that members of the tribe Phaseolleeae share a common trait of using the same isoflavone chemical triggers for transcription of the nod gene regardless of their particular species of symbiont (Dakora, 2000).

The aglycone isoflavones, daidzein and genistein were found to be the primary nod gene inducing chemicals in root exudates of soybean (Loh and Stacey, 2003; Leibovitch et al., 2001; Kosslak, 1987). The nod gene induction is a result of activation of the NodD regulator by the presence of daidzein and genistein (Loh and Stacey, 2003). In fact, Leibovitch et al. (2001) found that an increase in exposure of *B. japonicum* to these isoflavones plus a subsequent increase in daidzein and genistein in the rhizosphere of the soybean plants, improved nitrogen fixation and seed yield 7%. In addition, root genistein and daidzein concentrations were elevated in soybean plants inoculated with rhizobium compared to the same cultivars, which were not inoculated (Zhang et al., 2000).

Three species of rhizobium were found to metabolize the induction compounds, isoflavones, with the metabolites found in the cells of the bacteria. Two of the metabolites found, umbelliferone and phenylacetic acid, sequestered in the cells

were proven to reduce the expression of the nod gene by 36% (Rao and Cooper 1995). The three rhizobia studied were *Bradyrhizobium japonicum* USDA 110spc4, *Rhizobium fredii* HH103, and *Rhizobium* sp. NGR234. Once the rhizobium has infected the root system the isoflavones are presumably no longer important to the system; thus the effort to reduce the isoflavone production by the bacteria (Rao and Cooper, 1995).

Medicarpin concentrations in the roots of *Medicago truncatula* increase during the early phase of mycorrhizal colonization (Harrison and Dixon, 1993). As a sign of the increase in flavonoids, Harrison and Dixon (1993) found that there was an increase in the concentrations of the enzymes phenylalanine ammonia-lyase (PAL) and chalcone synthase (CHS). The levels of isoflavone reductase (IFR) did not increase, but decreased for those cultivars colonized by mycorrhizae when compared to the control isolines that were negative for colonization. In addition, coumestrol was found in the colonized roots but not in the control isolines.

Volpin et al. 1995 later demonstrated that in the early stages of mycorrhizal colonization of alfalfa (*Medicago sativa*) there is a response by the plant to produce mRNA that codes for an increase in defensive secondary metabolites. Between the 14th and 18th day of colonization of roots by mycorrhizae, the levels

of mRNA coding for PAL doubled, and for chalcone isomerase (CHI) increased six fold over the isoline control levels. Immediately after the 18th day, the levels of mRNA decreased rapidly as if there was some recognition by the plant of the symbiotic nature of the colonization. Levels of formononetin and formononetin plus medicarpin glucosides were also found to increase then rapidly decrease in the colonized roots. These findings complement those of earlier researchers and yet take the research a step further. Perhaps the bacterial dissolution of the isoflavone compounds is a short-term mechanism to allow for the early stages of infection, then there is some type of "feedback mechanism" that the plant utilizes to reduce the defensive isoflavone compounds. Together the two major pieces of research conclude that there is some important interaction during the early infection by rhizobia in leguminous plants. However, in a continuing effort to elucidate the details of the role of flavonoids and isoflavonoids in the symbiosis of alfalfa and *Rhizobium meliloti*, McKhann et al. (1997) evaluated the expression of the CHS, IFR and CHI genes. CHS mRNA was located in the root hairs and epidermis of the root but almost none in nodule-forming tissue. IFR and CHI mRNA were not found to increase as a result of inoculation. The overall findings demonstrated that there was no difference found for gene

expression in the comparison of the nod forming and no-nod forming alfalfa. These findings then controvert that of the earlier observations of researchers. It is perhaps important to remember that there may be some molecular recognition between the plant and its symbiont that may also control the genetic machinery. While there was an increase in isoflavones when soybean roots were infected with *Phytophthora megasperma* (Graham et al., 1990), there is no response from *Rhizobium meliloti*.

In another area of this crossover of root zone ecology and root physiology research, there is the possible role of flavonoides and isoflavones in nematode resistance. Root-lesion nematode (*Pratylenchus penetrans*) resistant (RST) and susceptible (SUS) alfalfa plants were evaluated for root flavanoid and isoflavone type and content (Baldrige et al., 1998). Prior to nematode infection, the concentrations of root phenylpropanoid pathway mRNA for RST cultivars were 1.3 to 1.8 times that of the SUS.

Post nematode infection found the mRNA levels for the RST plants began to slowly decline while the concentration in the SUS root tissue increased for a short period prior to its decline. Analyses of total isoflavone concentrations were the same for the RST and SUS cultivars; however the types and ratios of isoflavones varied between the RST and the SUS. The most

important of these differences was the finding that the phytoalexin medicarpin was found to be in the highest concentrations in the RST plant roots. Key to this discovery was also the fact that medicarpin was found to be a motility inhibitor of this species of nematodes *in vitro*. Given that these phytoalexins have an effect on nematodes; it would seem that the gradual "loss of resistance" by nematode-resistant cultivars is an elementary case of selection.

2.2.3 Seed Tissue

The primary source of marketable isoflavones is the seed, or grain, of the soybean plant. Currently on the market there are diet supplements that are marketed as containing isoflavones derived directly from soybean seed. The demand for nutraceuticals, as these types of supplements are called, has begun to be an important area for soybean marketing. This marketing for the industry is becoming very important as a value-added source for soybean growers and processors. Current research on soybean-derived nutraceuticals has focused on two major areas, genotypic variation and environmental interactions with the production of nutraceuticals.

The role of isoflavones in the tissue of soybean, or any other species of plant, is first as a protectant to the

developing seed and seedling. Within 24 h of seed imbibition, exudate increases in isoflavone concentrations; the largest fraction of these isoflavones has been found to be malonyldaidzin and genistin (Graham, 1991). In harvested seed, there are four predominant isoflavones, daidzin, genistin, malonyldaidzin, and malonylgenistin (Tsukamoto et al., 1995). Since the early 1970's there have been announcements of new isoflavones isolated from soybean seeds. Glycitein was announced as a newly elucidated isoflavone aglycone in 1973 by Naim et al. Later in 2003, Thoruwa et al. announced an *in vitro* synthesis of glycitein. In 1980, Ohta et al. announced and described a "new" isoflavone extracted from soybean as 6"-O-acetyl genistin. However in 1981, Murphy found that acetylated forms of isoflavone glucosides are most likely the result of β -glucosides exposed to heat during the processing of seed. The two aforementioned β -glucosides and the two malonyl forms of the isoflavones are well accepted to be the most prevalent, while the acetyl forms are considered a non-issue (Murphy, 1981).

Recent research has demonstrated that the combined genistein and daidzein derivatives accumulated in seeds range from 4.49 to 12.61 g kg⁻¹ for a mix of different cultivars analyzed (Romani et al., 2003). The distribution of the recovered isoflavones from soybean seed have been found to be

80-90% in the cotyledons and 10-20% recovered from the hypocotyls, by weight (Tsukamoto et al., 1995). Isoflavone species extracted from whole seed in the same study were daidzin, genistin, malonylgenistin, and malonyldaidzin, while from the hypocotyls alone they were daidzin, genistin, glycitin, malonylgenistin, malonyldaidzin, and malonylglycitin (Figure 1.). Eldridge and Kwolck (1983) also found "trace" amounts of isoflavones in the seed coat. However, this amount of isoflavones is so small that it is regarded as insignificant.

Several studies have been published that attempted to explain the highly variable nature of isoflavones found in soybean cultivars (Duke et al., 2003; Hoeck et al., 2000; Wang et al., 2000; Tsukamoto et al., 1995; Wang and Murphy, 1994a; Graham, 1991). Initially the variability had been thought to be simply cultivar differences, most likely unintended selection of breeding lines. Early research began to focus on the role that environmental influences have on the content and concentration of isoflavones in soybean seed. Tsukamoto et al. (1995) found that the seed from soybean plants harvested from environments of high relative temperatures consistently contained higher concentration of isoflavones than the seed from plants that were harvested from areas of relatively lower season-long temperatures. This characteristic was found to be true for all

seven cultivars tested in this study. This agreed with studies of Hoeck et al. (2000) where they found that the isoflavone concentrations were significantly different between environments. In addition, in this study the within environment isoflavone levels at the genotypic level were found to be different. In the Tsukamoto et al. (1995) study, all isoflavones extracted from the seed of cultivars grown in the cool temperature environments were lower in concentration when compared to the warm weather grown seed. This shift in isoflavone concentrations at high temperatures was found to be isolated to the cotyledons. When a comparison was made between growth chamber-grown soybean plants and field-grown plants, a lower overall isoflavone concentration was found for seed harvested from the growth chamber plants. Suppositional findings were related to macro- and microorganism damage. Indeed this finding would be consistent with the theory of tissue-damage induction for isoflavones. In an effort to expand on the role of environmental variability, Hoeck et al. (2000) evaluated six soybean genotypes at eight locations to determine what effect genotype by environment interactions may have on isoflavone concentration and production. The data were analyzed with year and environment (location) as fixed effects and as a result, when the year effect was determined to be significant,

the data were separated and analyzed by year using F tests to determine significance. The isoflavone concentrations were significantly different between environments. Within each environment, isoflavone concentrations for genotypes were also determined to be different. Differences in mean genotype by environment interactions remained consistent for all six genotypes across the eight locations. Due to the similarity in the responses of the total and individual isoflavone concentrations, these authors contend that the results support the hypothesis that isoflavone concentration is a quantitative trait.

In another study, a total of 210 cultivars of soybeans, made up of 41, 96, and 73 cultivars of maturity groups 0, I, II, respectively, were grown in one location then evaluated for seed isoflavone concentration and types (Wang et al., 2000). Differences in isoflavones did not follow any trends based on maturity groups. In fact, maturity group differences were mixed, total isoflavones for group 0 were lower than for group II, but group I concentrations were not different from either. Genistein concentrations were higher for group 0 and I compared to group II, but daidzein was higher for group I than for groups 0 and II. In addition, findings in this study revealed that

disease resistance was not linked to isoflavone type or concentration, but hilum color was linked.

Hilum color was not different for total isoflavone concentration; however seeds with a green hilum had higher concentrations of genistin when compared to black or brown hilum seeds. Daidzein was higher in yellow hilum seeds versus black, and the black hilum seeds had the lowest genistein overall. Given the research in the area of soybean seed isoflavones, it seems that if there is a qualitative trait for isoflavone type and concentrations, it may be hilum color.

While it was not the intention of this research or the data presented herein, it may be an indication of a much broader point; there is a lack of genetic diversity among modern soybean cultivars. There is a broad spectrum of cultivars used in current breeding programs and thus those that are sold to farmers. However, given data such as that from the studies discussed herein, it is easy to deduce that the cultivated soybeans of today are inbred to an extent that current progeny are descendants of only a small number of progenitors. Current annual soybean cultivars descend from the two species *Glycine max* and *Glycine soja*. These two species are so readily crossed sexually that Hymowitz (2004) has referred to these two species as "effectively constituting a single species". Perhaps armed

with this knowledge, researchers interested in the search for regulating isoflavone type and concentration in soybean seed may choose to begin their search at the beginning of the soybean lineage. It is clear that there remains much research to be conducted into isoflavone types and concentrations among soybean cultivar seeds, and the effects that cause a change in expression.

2.2.4 Isoflavone Genetics

The basic body of research into the genetics of isoflavone production in plants was begun first by enzyme isolation, then the bioengineering of plants to produce isoflavones. This first step began with the isolation of the enzyme responsible for the *in vivo* production of isoflavones in legumes. The focus of a study by Jung et al (2000) announced the finding of the soybean isoflavone synthase (IFS) gene (Genbank accession number AF195798). There were two genes IFS1 and IFS2 found in soybean that were determined to be 96.7% identical. However, the total conversion and the speed at which conversion takes place is more than double for IFS1. The existence of two IFS genes was also found in nonlegume sugarbeet (*Beta vulgaris*). These genes were found to be >95% similar to the IFS genes in soybeans (GenBank accession numbers AF195816).

Later in 2000, Yu et al. followed up with research focused on the genetic transformation of plants that do not produce isoflavones. This was accomplished by the transformation of *Arabidopsis*, tobacco (*Nicotiana tabacum*), and Maize Black Mexican Sweet (BMS) (*Zea mays*) plants. Transgenic *Arabidopsis* produced the IFS enzyme that utilized the *in vitro* naringenin substrate to produce genistein in hydrolyzed leaf and stem tissue. In subsequent research, plants belonging to these transgenic lines were found to accumulate genistein in leaf tissue that had been damaged by UV-B.

Transgenic tobacco (*Nicotiana tabacum* cv SR1) did not produce genistein unless there was damage to the leaf tissue, such as with UV-B light. These plants were found to produce the IFS enzyme, however there was little of the substrate naringenin due to use of its precursor in the anthocyanin pathway. The damage to the leaf tissue, however caused a shift in the use of the phenylpropanoid pathway from anthocyanins to isoflavones.

Transgenic BMS cells were used as the monocot model for the isoflavone production study. Of the 25 cell lines that were found by PCR to contain the IFS gene, none produced detectable levels of genistein. A chimeric transcription factor (CRC) was used to activate gene expression for anthocyanins in cells thus producing the substrate naringenin and subsequently genistein.

The levels of genistein were increased through stimulation by UV-B light, proving that the IFS was able to compete in the transformed monocot cell lines just as in the dicot plants.

The arabidopsis, tobacco, and BMS plants contained isoflavones in the form of genistin, while the tobacco plants contained malonyl-genistin in red flowers. Daidzein synthesis follows much the same biochemical route: the IFS gene is involved in triggering the production of the enzyme isoflavone synthase, along with chalcone reductase (CHR), the substrate liquiritigenin is produced. This process continues and results in the production of daidzein.

Transformed BMS containing the IFS, CRC, and CHR genes resulted in the production of daidzein as determined by co-chromatography using high-pressure liquid chromatography (HPLC) and gas chromatography mass spectrometry (GC-MS). This conversion is much faster than that of the naringnin to genistein. It was determined from this research that the missing part of the biochemical machinery of non-leguminous plant species is due to a lack of the production of the substrate. Jung et al. (2000) determined that the lack of genistin in the leaves of transformed tobacco is due to the lack of naringnin and not the competition for this substrate (Figure 2.). The basis of their determination was that there was a high

level of IFS detected in the leaves of the tobacco plants. In the BMS cells the need of the CRC was not a result of the lack of the substrate but the over abundance of a conjugated substrate. The foundation of the research in this paper is to be able to incorporate the production of isoflavones into more popular food crops, such as wheat, to give humans the opportunity to utilize these compounds for their health benefits.

Through metabolic engineering, a decrease in the level of genistein along with a complete blockage of the anthocyanin pathway caused an increase in the production of daidzein in two independent transformed soybean lines (Yu et al., 2003). The increase in daidzein was reported to be above four fold that of "wild-type seed". It was noted that in the two transformed lines the progeny seed exhibited differences in seed morphology. The seed coat in the transformed lines was in one case wrinkled while in the other soybean line there was a pronounced dark stripe on the seed. The researchers noted that there was a strong correlation between the transformed seed exhibiting the wrinkled seed coat with increased daidzein. There was also a strong correlation between the transformed striped seed with reduced genistein levels. The conclusion was that the phenotypic variability was related to the change in isoflavone

concentrations. This finding supports the results of Wang et al (2000) who found hilum color to be closely correlated to isoflavone type and concentrations.

2.3 Human Health

The natural progression from a discussion of agronomic crops such as soybean would be to the products that are made from the seeds of these plants. Isoflavone rich foods, nutraceuticals, and pharmaceuticals have become important for their human benefits. In fact, the type and concentrations of isoflavones in end use products can be altered by the manner in which they are processed and prepared.

It is beyond the scope of this literature review to delve into the entire body of human health research with respect to isoflavones. However, it is important to understand the potential and the scope of how the production of isoflavones from soybean seed may someday impact human health. For this reason the following discussion will highlight a few of the major achievements in the current body of research.

2.3.1 Processing

The isoflavone composition of many commercial foods is varied based upon the type of soy products used in the making of these foods, as well as the process by which they are made (Wang and Murphy, 1994b). As with almost all chemical reactions, the amount of heat added to a system can result in changes and conjugated products. This includes the changes in soy foods

during the cooking process (Toda et al., 2000). In the cases of the production of toasting soy flour, decarboxylation of 6''-O-malonyl- β -glucoside resulted in the conjugation to 6''-O-acetyl- β -glucoside caused by excessive heat. Baking and frying also caused the conversion of malonyl forms of isoflavones to β -glucosides (Coward et al., 1998).

While excessive heat can result in changes to isoflavones in food products, there are also other processing steps that have been found to alter isoflavones as well. Low-fat soy products and soymilk were found to be low in all isoflavones (Coward et al., 1998). However, isoflavone aglycon concentrations are increased when soybeans are presoaked in water as part of the processing for soymilk. The results of this increase in aglycons are the increase in a perceived acerbic and "beany" flavor. Preheating of soybeans decreased the malonyl forms of isoflavones via their conversion to β -glucosides, however no increases in the concentration of aglycons were observed. This was not perceived to impart the negative taste of soymilk made with the presoaked soybeans (Carrao-Panizzi et al., 1999).

While the processing of soybean seeds has an impact on the type of isoflavones present, as consumers it is only the choice of what we take in that can be controlled. It is for this

reason that much research has focused upon the intake of different isoflavones, their absorption and ultimately the role they have in human health.

2.3.2 Human Studies

Diet and nutraceutical intake are two areas of isoflavone exposure in adults and children that are unique enough to be considered separately and then together. The unintended ingestion of foods and food products that are either directly made from, or indirectly contain isoflavones can be important with respect to human health. The addition of the intentional consumption of federally unregulated nutraceutical products for their anti-carcinogenic or hormonal effects may increase the overall considerations for human health.

Consumption of isoflavones resulting from food intake can be an issue in whole and processed foods. As previously stated, the type of isoflavones found in processed soy products can vary based upon how they are processed. Nutraceutical use by humans has increased as marketing has become more multifaceted and people become more informed and proactive with respect to their health (Kurtzweil, 1999). According to the Federal Food and Drug Administration (FDA) from the period of 1990 to 1996 the growth of the dietary supplement sales have almost doubled from

\$3.3 billion to \$6.5 billion dollars (Kurtzweil, 1999).

Pharmaceutical research has branched into the "natural" health care market by the inclusion of "plant-based phytochemicals" into premixed treatments as well as a few stand-alone products. One of the most famous of these products is Tamoxifen Citrate⁶. Together the source of daily intake of isoflavones from the American diet has yet to become a major focus of health-care research. This may perhaps be due to the lack of available data sets for epidemiological researchers, the lack of concern or the lack of clinical knowledge in the subject area.

Research has been undertaken to evaluate the type of isoflavones absorbed via human digestion of soy products. This type of research can be used in an effort to understand the significance of isoflavones in the human diet, but it can also be exploited for the monetary value of those products sold without standardized testing.

Park et al. (2003) focused on extracting and transforming isoflavones via a method that will result in the conversion of β -glucosides to aglycones because their hypothesis was that aglycone isoflavones have greater biological activity than β -glucosides. This process resulted in the commercial yield of aglycone isoflavones from soybean seeds to be higher than that

⁶ ZENECA Pharmaceuticals, Wilmington, Delaware 19850-5437

of their initial concentration. There is no mutually agreed upon standard of human absorption of isoflavones. However, the majority of the research has demonstrated that the isoflavone aglycones are readily absorbed and that β -glucosides are hydrolyzed in the large intestine via gut micro flora prior to absorption.

Wilkinson et al. (1999) evaluated the absorption and metabolism of isoflavones ingested by humans. Ingested isoflavones were found in the blood plasma within 30 min of intake, thus the implication was that the absorption must be in the small intestine. It is currently accepted that once in the small intestine, daidzein diffusion is passive via the enterocyte. This diffusion of daidzein into the enterocyte is via "Active Sugar Transport Mechanisms". Hydrolysis may occur in the mucosal brush border membrane forming daidzein that then diffuses as stated above. This study used *in vitro* rat gut as the model to test isoflavone absorption. It is thought that isoflavone β -glucosides are hydrolyzed in the large intestine via gut micro flora. This study indicated that there is no difference between aglycone or glucoside absorption, a finding that is very controversial and not widely accepted. However, in a study by Izumi et al (2000) in humans, soy isoflavone aglycones were absorbed at a faster rate and a higher percentage

than their glucosides. Aglycone concentration in blood plasma was at its maximum at two h, while for the glucosides it was twice as long. When test subjects ingested the same concentration of daidzein as genistein, the blood plasma always had a higher concentration of genistein. The end result is that for perceived health reasons, food products high in isoflavone aglycones may be the ideal form. These forms may be fermented soy protein and fermented soy protein extracts. In fact in 1996 Fukutake et al. quantified the concentration of genistein and genistin in soybean and soybean products. Their findings were that the aglycon genistein is higher in fermented soybean and fermented products of soybean.

Researchers investigated the variability of intestinal metabolism of the aglycone daidzein among individual people (Rafii et al 2003). Using gut micro flora from ten individuals, it was found that those whom had changed their diets to a soy-rich diet also changed their ability to metabolize daidzein. This study supported other research, which demonstrated that a change in diet could also affect gut micro flora in such a manner as to alter the resulting metabolites.

In 2003, Setchell et al. conducted research into the pharmacokinetics of the differential absorption of aglycone isoflavone types. In this study, the concentration of genistein

in blood serum was highest at 7.4 hr while daidzein concentration was highest at 5.5 hr after ingestion. Pharmacokinetics of genistein and daidzein were studied and found that genistein was more bioavailable than daidzein. In the dose response portion of the research the nonlinearity of the bioavailability of genistein and daidzein lead the researchers to the conclusion that the intake of these two isoflavones is saturable. This finding suggests that isoflavone supplements may have limited value and that a change in diet could offer the maximum pharmacological benefit that can be gained from isoflavone ingestion.

In a 2000 statement for healthcare professionals, the American Heart Association (AHA) recommended, "...the consumption of soy protein containing isoflavones..." for the population in general, but specifically for those with elevated total and LDL cholesterol (Krauss et al., 2001). This statement came just short of an acknowledgment that there is a cholesterol-lowering activity resulting from the consumption of soy protein that is due to the isoflavone content. On the other side of this debate, is the fact that while the growth parameters of infants fed soy-based formula were no different than that of breast fed babies, the American Academy of Pediatrics (AAP) has found inconsistencies in the evidence regarding soy-based formula for

preterm infants (Zung et al 2001). Due to the inconsistent findings in the literature, the AAP has stated that it does not recommend soy-based infant formulas for preterm infants <1,800 g. This paper by Zung et al. (2001) stated that it was the isoflavone content of soy-based formula that resulted in reduced cholesterol and lipoprotein levels. The literature does confirm that isoflavones are found in the maternal blood, cord plasma, and amniotic fluid thus proving their passage from mother to prepartum infant. In studies using rodent models, there have been several findings that demonstrated prepartum and postpartum exposure to genistein resulting in female offspring experiencing early puberty, reduced ovary and uterus size, and a reduction in estradiol and progesterone. In the Journal of Clinical Nutrition, Setchell et al. (1998) reported on the exposure of infants to phytoestrogens from soy-based infant formula. In this study, they found that infants are exposed to isoflavone levels in soy-based infant formula at levels four times the concentration of that found in human breast milk.

Franke et al. (1998) found that human breast milk contained absorbed isoflavones in forms of glucuronide or sulfate conjugates, which were thought to increase their absorption and perhaps mobility. The metabolites of isoflavones, such as equol, were present in urine samples but not in the breast milk.

Human research subjects fed 20g of soybeans had blood plasma levels of genistein that were more than twice the concentration of daidzein. The level of genistein in urine was less than that of daidzein. Franke et al. (1998) attributed this to the higher polarity of the daidzein. Infants fed a diet high in soy-based formula had higher levels of malonyl and acetyl forms of isoflavones in their urine. This was speculated to be due to the lack of gut micro flora required to carry out β -glucosidic cleavage. Clearly there are mixed messages and a lack of information regarding infant intake of isoflavones. This is perhaps the conundrum that brought the AAP to their decision.

2.3.3 Human Indications

There are three areas in which isoflavones are thought to play an active role in human health. The first of the three areas are as antioxidants to prevent and/or aid in the treatment of some cancers. Second is the ability isoflavones have in the role of increased bone density and hormone replacement therapy (HRT) for postmenopausal women. In the third area there has been some limited success at evaluating isoflavones for their antidipsotropic properties.

There has been research conducted to evaluate the theory relating isoflavone antioxidative potential to the cellular

level. Both Fleury et al. (1992) and then Yang et al. (2001) evaluated isoflavones for their antioxidative potentials. In addition to this body of work, much has been published on the role that isoflavones can play in HRT. The third area is the antidipsotropic property, which is believed to have the potential to inhibit serotonin and dopamine metabolism (Keung and Vallee, 1998). These properties have been studied with the motivation to assist in the long-term treatment of dipsomania. Current animal studies have resulted in some promising findings.

Yang et al. (2001) estimated the antioxidant activities (AA) of flavonoids from their oxidation potentials. This study was designed to develop a methodology for the estimation for the AA of several types of flavonoids. Estimation of the lipid peroxidation (LPO) inhibition of flavonoids was established. An inhibitory concentration of 50% (IC_{50}) was determined for each of the flavonoids in the study. The relationship of an IC_{50} to the LPO of the compound was that, the lower the IC_{50} the less of the compound that it takes to inhibit LPO. Compounds lacking the 2-3 double bond and the 3-hydroxyl group resulted in the electron delocalization of the molecule, thus a decrease in the LPO and an increase in the IC_{50} . To further characterize the LPO, the comparisons of the IC_{50} , $E_{1/2}/V$ (a measure of the oxidation and electron transfer on the first wave of oxidation occurring) and

the log octanol/water partition coefficient (O/WPC) resulted in elucidating the AA of many compounds. As it turned out, there was a strong relationship between the $E_{1/2}/V$ and the structure of the flavonoid molecule. Thus the molecular structure plus the other two measured parameters were important in the determination of the AA of flavonols, flavones, flavanones, isoflavones, flavans, and flavanonols. In this study, the flavonoid with the highest AA was the flavonol quercetin (3,5,7,3',4'-pentahydroxyflavone). The 2-3 double bond and the 3-hydroxyl group resulted in a low $IC_{50}/\mu M$ of 8.5 and a 1.15 O/WPC. The O/WPC was found to be a value that when too high or too low the lipophilicity will not allow for the correct interaction with a cellular lipid bilayer, thus resulting in a higher IC_{50} (Yang et al., 2001; Terao et al., 1994). The findings of Yang et al. (2001) provided the same conclusions as Terao et al. (1994) with respect to the AA nature of quercetin. Comparing the values of the two isoflavones included in the study with the values for quercetin demonstrated the lack of AA of these chemicals. The two isoflavones included in this study were daidzein and daidzin. There was an IC_{50} of $>100/\mu M$ and $>100/\mu M$ plus a 2.69 and 0.85 O/WPC for the aglycon daidzein (7,4'-dihydroxyisoflavone) and the β -glucoside daidzin (4'-hydroxyisoflavone-7--glucoside), respectively. This

demonstrated a clear lack of AA properties for these chemicals. Lacking the 2-3 double bond and having the O/WPC at either extreme resulted in a very high IC₅₀ for each of the two isoflavones.

As with many potential finds in pharmacognosy there are often high hopes. In the early stages of research, the potential indications for the drug tamoxifen were numerous. In fact, tamoxifen became very important for those women who have had breast cancers that are dependant upon estrogen, or those who have the potential for these types of cancers (Anonymous, 1998; Alberts and Garcia. 1995). While this turns out to be a small part of the population, to these women the early hopes did bear fruit. However, there were many for whom this research excluded them from treatment as contraindicated. In the potential role as antioxidants, isoflavones are currently being marked in the nutraceutical industry for a wide range of treatments.

The aglycone genistein has been evaluated as an inhibitor of tumor cell growth resulting from its estrogen agonistic activities *in vitro* (Zava and Duwe, 1997). Acting as an estrogen antagonist, genistein had properties like tamoxifen, which aid in the reduction of cellular growth in cancer cells that require estrogen to proliferate. While tamoxifen and

genistein each have a different mode of action, both are considered antiestrogenic compounds. The encouraging information to come out of this research is that the concentrations of genistein required to have this effect is at levels that are consistent with acceptable *in vivo* concentrations.

A study conducted by Miltyk et al. (2003) focused on the genistein potential for prostate cancer treatment. The major problem facing this is that past findings state that genistein causes damage to genetic material of human cells *in vitro* (Miltyk et al., 2003; Record et al., 1995; Yamashita et al., 1990). The research by Miltyk et al. (2003) and Jarred et al. (2003) demonstrated that there was no genotoxic effect when genistein was administered at 300 mg d⁻¹ for 28 d, then 600 mg d⁻¹ for an additional 56 d. The study by Davies et al. (1998) was based upon the findings of Gallaher et al (1996) that isolated soy proteins that were proven to be cancer preventatives. However, these same anticarcinogenic compounds were said to perhaps cause colon cancer if stored for greater than two years. It was found that the rate of genistein breakdown over time was inversely related to the browning, Maillard reaction, of the stored isolated soy protein. While no further cause and effect relationship was investigated, it seems to indicate that the

degradation of genistein was related to the carcinogenicity of the stored isolated soy protein.

When evaluating the effects that increased isoflavones can have on women, it is important to put into perspective the concentrations and intake reported in the literature. The average daily intake of genistein for the Japanese population is 1.5 to 4.1 mg person⁻¹, and 6.3 to 8.3 mg person⁻¹ for genistin (Fukutake et al., 1996). In evaluating the biological effects of a diet of soy protein rich in isoflavones on the menstrual cycle of premenopausal women, the daily intake of just 0.7 mg kg⁻¹ is enough to have a hormonal effect on the menstrual cycle of premenopausal women (Cassidy et al., 1994).

Ishida et al. (1998) found that genistin and daidzin prevented the effects of bone loss in ovariectomized rats. Suh et al. (2003) found that when genistein and daidzein were added to cultures of osteoblastic cells in the presence of tumor necrosis factor- α , the addition of the isoflavones resulted in the reduction of apoptosis when compared to cultures without the isoflavones. Isoflavones blocked the production of interleukin-6 (IL-6) and prostaglandin E2 (PGE2). The findings of this study show isoflavones to be important in bone remodeling as a result of increased osteoblastic cells. The beneficial effect on bone density is one area that isoflavone research has

demonstrated promise (Piersen, 2003). This is a welcomed addition to postmenopausal women facing a potential future of suffering from the effects of osteoporosis.

The enhancement of the binding of estrogen α (ER α) and estrogen β (ER β) to the estrogen response element (ERE) as a result of the addition of several estrogen stimulants were evaluated by Kostelac et al. (2003). The binding of the two ERs to the ERE was evaluated in the presence of 17 β -estradiol, coumestrol, daidzein, genistein, and the metabolite of daidzein, equol. The response was concentration dependant and for ER α there was a two hundred-fold increase in the EC₅₀ of daidzein over genistein; while for ER β the increase was only slightly greater than 11%. This demonstrated that binding affinity was increased for ER β by the presence of the two phytoestrogens. In the same study, the metabolites of daidzein and equol were more active for ER α at an EC₅₀ of 85-fold lower then that required for daidzein, but for ER β the two were roughly the same. When compared with 17 β -estradiol; daidzein, genistein and equol required 10,000, 500, and 117 times higher concentration to reach an EC₅₀, respectively, for ER α , while for ER β the concentrations were 35, 3, and 40 times higher. This study demonstrates the variability in the affinities that

phytoestrogens, like isoflavones, have on biological effects that are activated by estrogen induction.

Another use for isoflavones was studied based upon the use of a daidzin containing plant extract in Chinese medicine for the treatment of alcoholism. A group of researchers began to evaluate the effect of daidzin on the dipsomania activity, or alcoholism, using hamster models (Keung et al., 1996). They found that a methanol extract of the plant *Radix puerariae* (RP) increased the "uptake" of daidzin by golden hamsters and thus had a synergistic effect. The daidzin in the extract resulted in a ten-fold increase over doses of pure daidzin. A dose of 150 and 230 mg/kg of RP extract reduced ethanol uptake in hamsters by approximately 50%. This research provides a clearer picture of the importance of daidzin as an antidipsotropic, and that some constituent in the plant extract acts in synergy to aid daidzin absorption. Keung and Vallee (1998) followed the original research and again used rodent models to evaluate the effect of pure daidzin on alcohol intake inhibition. In this study, the researchers found that *in vitro* daidzin inhibited the hamster mitochondrial enzymes required to metabolize dopamine and serotonin. *In vivo* studies with hamsters resulted in a statistical correlation between the concentration of daidzin and the level of ethanol suppression. All of the treated rodents in

the study responded with a positive correlation between daidzin concentration and ethanol intake suppression.

2.4 Summation

Secondary plant metabolites such as isoflavones have found their way into the diet of humans either indirectly or directly. The indirect method of intake via the consumption of food and food products has been ongoing for centuries. However, the intentional consumption of nutraceutical and herbal supplements, along with a choice to add new food products containing isoflavones into a daily diet, is a relatively new phenomenon in the west. Regardless of the mode of consumption of isoflavones, interest sparked in this area has led to the research that has found that soybean seed, and products from soybean seed, are the best extractable and dietary sources of isoflavones.

Given the almost universal acceptance of soybean as a primary source of isoflavones, it should now be the focus of researchers to understand how the production and physiology of the soybean crop function together. It will be this information that will result in the physiological manipulation and/or breeding that will ultimately benefit farmers in marketing their soybean crops based upon isoflavone content.

Attempts to date to manipulate the production of soybean isoflavones have focused on isolated parts of the plant rather than the whole. Herbicide applications to leaf tissue have

induced isoflavones in that tissue, and in fact this induction has been found to be important in the role of plant disease prevention. Research has also revealed the importance of the role that the production of the three isoflavones coumestrol, daidzein, and genistein each play in the relationship between legumes and atmospheric nitrogen fixing soil bacteria. Adding to this body of research was the isolation and manipulation of the IFS genes and the substrates that are required to support isoflavone production. Finally, the research focusing on the type and concentration of isoflavones in the seed produced by soybean plants has expanded on the two fronts of environmental variability and selection of cultivars.

The entire body of research evaluating the relationship of isoflavones and soybean seeds has yet to be linked to physiological changes in other portions of the plant. Cultivar selection has been in the area of research that has not been widely undertaken. Research focusing on cultivar as well as maturity group variability has demonstrated that among cultivars there are consistent differences in isoflavones. Also, however, these studies have identified the variability within cultivars. It is this within cultivar variability in isoflavones that is not clearly understood, but is assumed to be inherent to environmental effects.

Research on the changes in isoflavones in one part of a plant, such as mature leaves, and the effects these changes have on seed isoflavones is useful for understanding the plants' reaction to environmental effects, and could provide a clearer explanation for the plant-to-plant variation observed under field conditions.

2.5 Figures

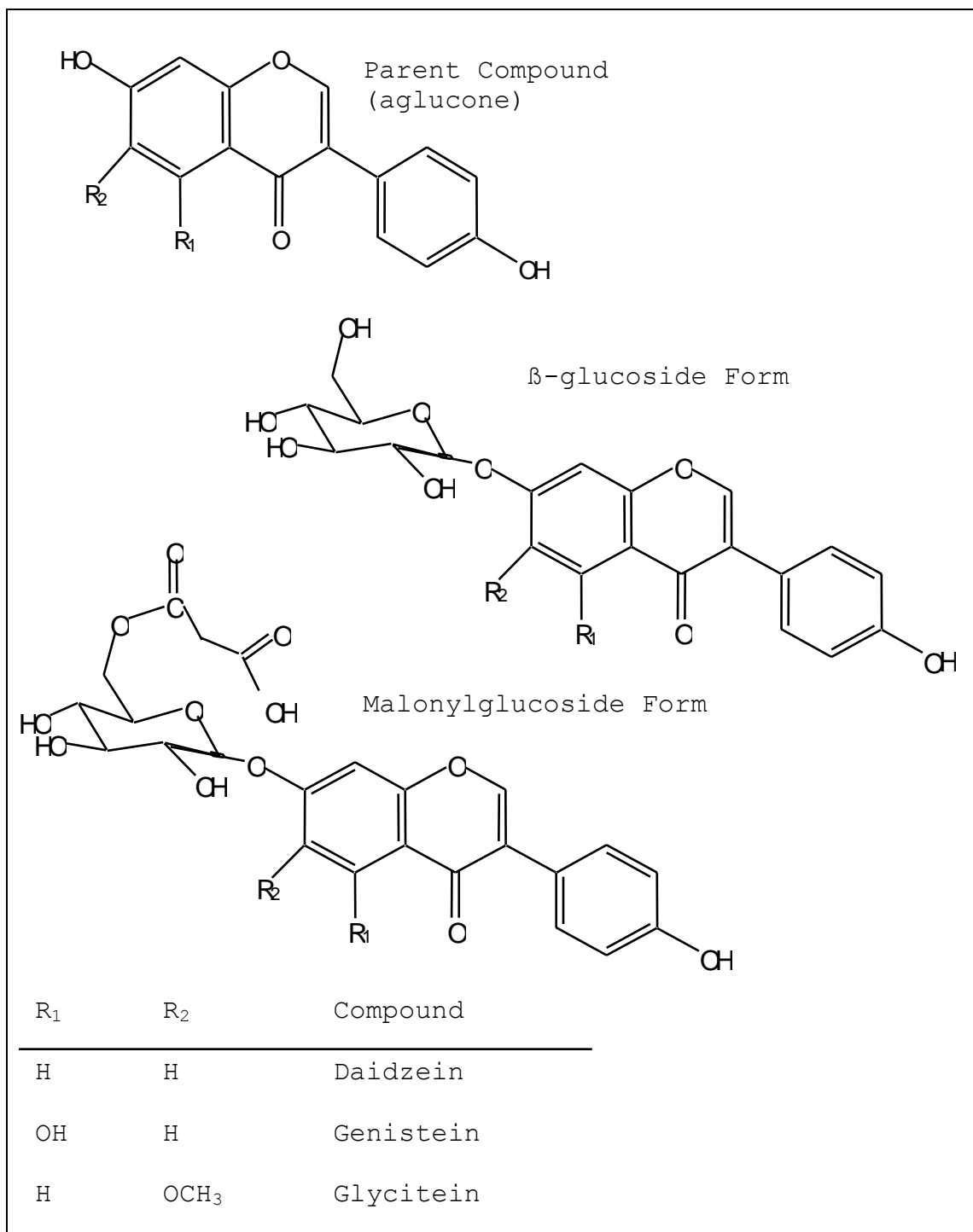


Figure 2.1. Structures of the nine primary economically important isoflavones found in soybean seeds.

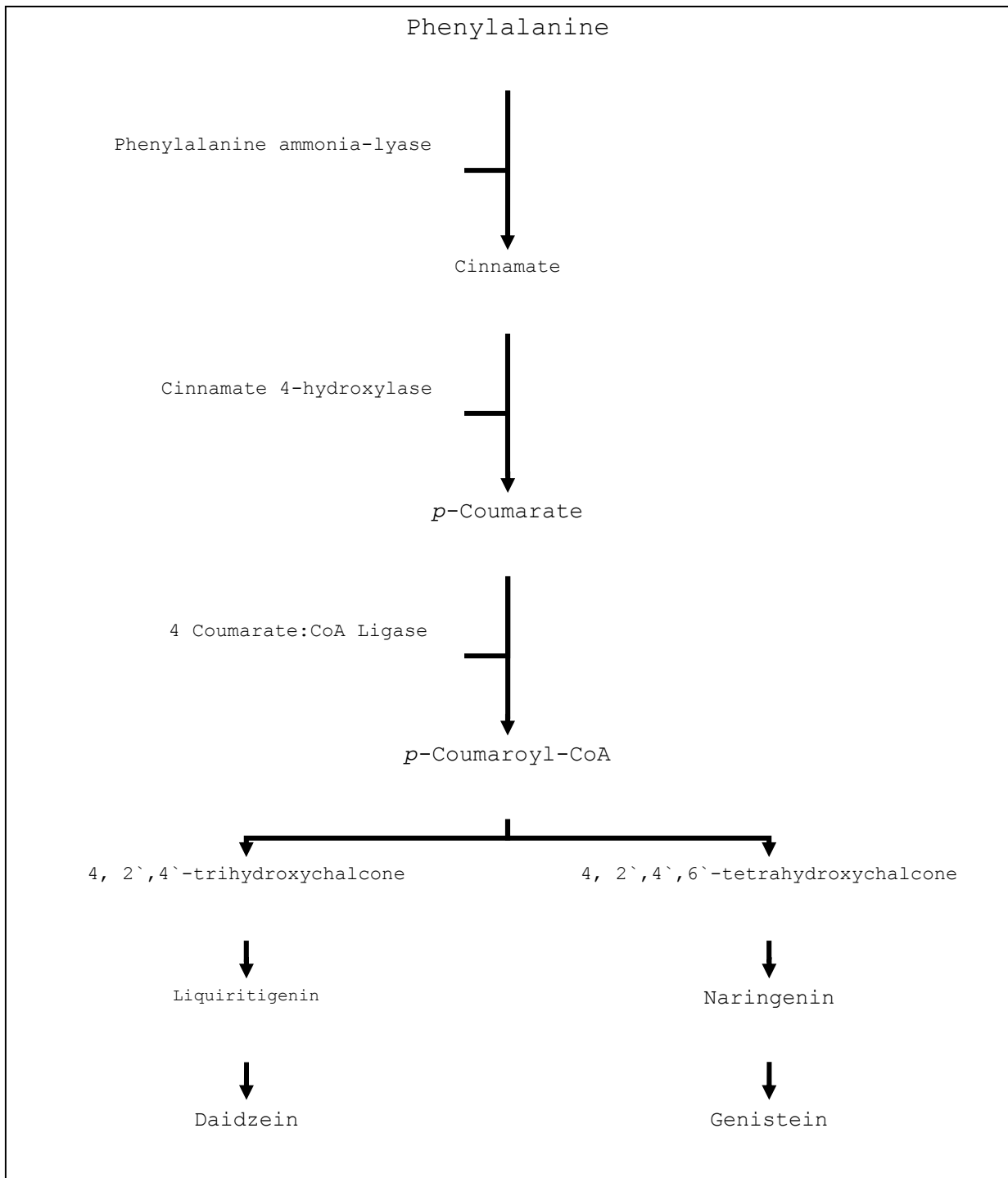


Figure 2.2. Phenylalanine pathway responsible for the production of all isoflavones found in the soybean seeds.

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Chapter 3: Soybean [*Glycine max* (L.) Merr.] Leaf And Seed Isoflavone Response To Lactofen Applications

3.1 Abstract

Environmental conditions can have major impacts on the production of soybean [*Glycine max* (L.) Merr.] metabolites. In this study, isoflavone type and concentration of both soybean leaf and seed tissue were evaluated under double-crop (DC) and full-season (FS) field conditions following treatment with lactofen. Lactofen was applied at weed control (WC) and white-mold suppression (WM) rates and timings of 219 g ai ha⁻¹ applied at the V-1 stage and 122 g ai ha⁻¹ applied at the V-5 to R-1 stages, respectively. Grain yield was obtained from the two center rows of each plot to be used for yield and laboratory analysis. Leaf tissue was obtained from plants prior to spray application. Isoflavone concentration for post-lactofen treated leaf tissue was 26% higher for total soybean treated with WC than WM. Leaf tissue concentrations of genistin were significantly higher for WC at 3.1 mg 100g seed⁻¹ than WM at 1.5 mg 100g seed⁻¹. Genistin had no response to the lactofen treatments in the FS cropping system. Yield was unaffected by

lactofen treatments in FS or DC. The DC yields averaged ~16% higher than FS. Cropping systems had no effect on average soybean seed weight. Lactofen treatment did not have an effect on soybean seed isoflavone concentrations, however, cropping systems and cultivars did. Total isoflavone concentration for DC seed was one-third higher than FS. The highest concentrations of seed isoflavones for DC and FS were malonyldaidzin and malonylgenistin. Total isoflavones within each cropping system were not different but daidzin, genistin, malonyldaidzin, malonylgenistin and genistein were, and within cropping system for cultivars, relative seed isoflavones remained consistent. The damage caused to the leaf tissue by lactofen applications did not result in a change in the seed isoflavone concentrations, individually or when quantified as total isoflavone.

3.2 Introduction

Environmental conditions can have a major impact on the production of soybean [*Glycine max* (L.) Merr.] plant metabolites during the growing season, and thus on the composition of the harvested seed. Terrestrial and edaphic environmental factors that lead to plant stress have been shown to modify the type and concentration of soybean isoflavones found in seed. (Eldridge and Kwolek, 1983; Wang and Murphy, 1994; Tsukamoto et al., 1995; Hoeck et al. 2000; Wang et al., 2000).

Eldridge and Kwolek (1983) evaluated four soybean cultivars at one location and determined that the differences in the three aglycones, daidzein, genistein, and glycitein, and β -glucosides, daidzin, genistin, and glycitin, were significant. As part of the same study, two additional cultivars were evaluated over four years at the same location. As with the first set of cultivars, there were large differences in isoflavones across different cultivars as well as differences from year to year for each cultivar type. Although not pointed out in the research, the relative concentrations of total and individual isoflavones across years were consistent with one another. In another study, Wang and Murphy (1994) evaluated six soybean cultivars grown in eight locations over two growing seasons for the

effects of interactions between environment and genotypes on the type and concentration of isoflavones. The harvested grain was analyzed for nine of the twelve known soybean isoflavones. While their findings demonstrated significant differences in the total and individual isoflavones, the relative amounts remained consistent within the cultivars across years.

The studies evaluating soybean isoflavone changes have focused on the results of many plant stresses that are often encompassed in the broad term of environment. Included within environmental stresses are many production practices that may influence the macro- and/or microenvironment. Production practices such as tillage, fertility, and residual fertility, as well as crop protection inputs all play a role in shaping, or influencing, the environment of a crop ecosystem. Some of these practices and inputs can have measurable effects.

The effects of the diphenylether herbicides, acifluorfen⁷ (5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoic acid) and lactofen⁸ (ethyl *O*-[5-(2-chloro- α,α,α -trifluoro-*p*-tolylloxy)-2-nitrobenzoyl]-DL-lactate), on isoflavone induction in soybean leaf tissue have been studied (Landini et al., 2003; Hoagland, 1989; Cosio et al., 1985). In a study by Cosio et al. (1985), soybean leaves that were treated with 100 mg L⁻¹ acifluorfen were

⁷ BASF AG. Carl-Bosch-Strasse 64, 67117 Limburgerhof, Germany

⁸ Valent USA Corp. P.O. Box 8025, 1333 N. California Blvd. Suite 600, Walnut Creek California 94596-8025

found to contain isoflavone aglycons and β -glucosides. In a separate study, the primary isoflavones induced in soybean leaf tissue by lactofen were daidzein and daidzin, malonylgenistin, along with the aglycone flavonoid formononetin (Landini et al., 2003).

The objectives of this research were to evaluate isoflavone type and concentration in both soybean leaf and seed tissue under field conditions following treatment with the herbicide lactofen. Foliar lactofen treatments were applied at two labeled rates and timings to evaluate their effect on isoflavone type and concentration in soybean leaf and seed tissue. The relative relationships between leaf and seed tissue isoflavone types and concentrations were determined.

3.3 Materials and Methods

Field studies were established in 2002 and 2003 at the University of Maryland Wye Research and Education Center (WREC) and the Lower Eastern Shore Research and Education Center, Poplar Hill Facility (LESREC) in Queenstown and Quantico Maryland, respectively. Full-season and double-crop soybeans fields were planted at each location in each year. All field studies at WREC were treated with preemergence application of 1,120 g ai ha⁻¹ metolachlor and sulfentrazone 198 g ai ha⁻¹ plus 33 g ai ha⁻¹ chlorimuron-ethyl. Double-crop soybean fields at WREC also received an application of glyphosate at 630 g ae ha⁻¹. Full-season field studies at LESREC were treated with the preemergence applications of 1,700 g ai ha⁻¹ metolachlor, 185 g ai ha⁻¹ linuron and 119 g ai ha⁻¹ sulfentrazone plus 20 g ai ha⁻¹ chlorimuron-ethyl. Double-crop soybean fields at LESREC were treated with 630 g ae ha⁻¹ glyphosate, 1,120 g ai ha⁻¹ metolachlor, and 316 g ai ha⁻¹ sulfentrazone plus 53 g ai ha⁻¹ chlorimuron-ethyl.

Full-season soybean seeds were planted on 23 May and 29 May 2002, and 27 June and 30 June 2003 at a density of 6.5 seeds per 30-cm of row spaced 60 cm apart. The full-season plots were planted in a split-plot arrangement with subplots of four, 6-m

rows. Double-crop soybean seeds were planted following a barley (*Hordeum vulgare* L.) harvest on 19 June and 25 June 2002, and 10 July and 18 July 2003 at a density of 6.5 seeds per 30-cm of row spaced 40 cm on center and 3.5 seeds per 30-cm of row spaced 20cm on center at WREC and LESREC, respectively. The plots for double-crop soybeans were planted in a split-plot arrangement with subplots of seven, 7.5-m rows at WREC and five, 6-m rows at LESREC. Each whole plots contained one of the cultivars Bass, Corsica, Jack, or Williams 82. The herbicide treatments were randomly assigned to the subplots and were either a control, WC lactofen application or WM lactofen application. The WC rate and timing for lactofen was 219 g ha⁻¹ applied at the V-1 stage of the soybean crop and the WM rate and timing for lactofen was 122 g ha⁻¹ applied at the V-5 to R-1 stages of the soybean crop growth. The two center rows of each plot were harvested for yield and laboratory analysis.

3.3.1 Leaf Extraction

Isoflavones were extracted from soybean leaves harvested prior to lactofen applications then 48 h post spray application (PSA). The 48 h PSA was chosen based on the work of Cosio et al. (1985) that demonstrated that the concentrations of aglycone isoflavones reach their maximum in the leaf tissue at this

point. After 96 h the maximum conversion of the aglycones to glucosides would prevent detection of the aglycones (Cosio et al., 1985). Leaf isoflavone extraction was achieved using a modification of a method that was developed for soybean seed extraction (Figallo et al., 2003; Lin and Giusti, 2003). Two whole leaves from two randomly selected plants within each plot were ground to a fine powder in liquid nitrogen using a mortar and pestle. A 2.5-g sample of the flour was transferred to a 50-ml Erlenmeyer flask. A 20-ml aliquot of 80% (v:v) methanol and a 50- μ l internal standard of 20 mM flavone were added to the flask. A Teflon stirrer bar was added to the solution then placed on a stirrer plate at medium speed for 2 h. After 2 h the supernatant was separated from the flour by vacuum separation through number one Whatmann⁹ filter paper in an Erlenmeyer vacuum apparatus under 500 mm of mercury.

The supernatant was transferred from the Erlenmeyer flask to two 10-ml plastic centrifuge tubes and placed into a water bath at 40C under a constant flow of dry nitrogen until the volume reached approximately 6 ml. The samples were then centrifuged in a Beckman J2-21 at 33 g at 5 C for 10 minutes. The supernatant was then removed and transferred to 5-cm³

⁹ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 1001-070

syringes with Tru Loc tips¹⁰ fitted with 17-mm polypropylene syringe filters¹¹. The syringes and filters were then flushed with 1.5 ml of 16% (v:v) acetonitrile. Filtered samples and acetonitrile wash were collected and the final volume was adjusted to 5 ml using the 16% (v:v) acetonitrile. The samples were then placed into a freezer at -20 C until analyzed for isoflavones.

3.3.2 Seed Extraction

Isoflavones were extracted from soybean seeds harvested in September. Total seed weight was determined for each plot. Seed size was determined on a 100-seed sample from each plot. Approximately 5 g of soybean seed was obtained from each plot and was analyzed for oil and protein using infrared analysis via an Infratec model 1255 Feed and Food Analyzer¹². An additional 5-g sample of seeds was obtained and ground to a fine flour using a Braun Type 4041 Model KSM2 coffee grinder¹³. The grinder was pulsed for 3 sec over a 30-sec period. This flour was then used for isoflavone extraction.

Isoflavone extraction was achieved using the method outlined by Figallo et al. (2003) and Lin and Giusti (2003). A

¹⁰ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 14-823-35

¹¹ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part DDP04T17NB

¹² FOSS North America, Eden Prairie, MN 55344, USA

¹³ BRAUN, 1 Gillette Park, Boston, MA 02127-1096

2-g sample of the soybean seed flour was transferred to a 25-ml Erlenmeyer flask. A 10-ml aliquot of 80% (v:v) methanol and a 50- μ l internal standard of 20 mmol flavone were added to the flask. A Teflon stirrer bar was added to the solution then placed on a stirrer plate at medium speed for 2 h. After 2 h, the supernatant was separated from the flour by vacuum separation through number one Whatmann¹⁴ filter paper in an Erlenmeyer vacuum apparatus under 500 mm of mercury.

A slight modification was made to the procedure of Figallo et al. (2003) for concentrating the samples. A steady stream of dry nitrogen gas replaced the rotary evaporator. The supernatant was transferred from the Erlenmeyer flask to a 10-ml plastic centrifuge tube and placed into a water bath at 40 C under a constant flow of dry nitrogen until the volume reached approximately 3ml. The samples were then transferred to 3-cm³ syringes with Tru Loc tips¹⁵ fitted with 17-mm polypropylene syringe filters¹⁶. The syringes and filters were then flushed with 1.5 ml of 16% (v:v) acetonitrile. Filtered samples and acetonitrile wash were collected and the final volume was adjusted to 5 ml using the 16% (v:v) acetonitrile. The samples

¹⁴ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 1001-070

¹⁵ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 14-823-35

¹⁶ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part DDP04T17NB

were then placed into a freezer at -20 C until analyzed for isoflavones.

Identification and quantification of isoflavones occurred through high performance liquid chromatography (HPLC). Separation of isoflavones was on a C18 column with a linear gradient of acidified water (Solvent A: 0.1% acetic acid and 5% acetonitrile in water) and acidified acetonitrile (Solvent B was 0.1% acetic acid in acetonitrile). The flow rate of 1 ml min⁻¹ and the gradient started at 10% and increasing to 14% B over 10 min, then increased to 20% over 2 min, was maintained at 20% over 8 min, continued to increase to 70% over 10 min, maintained at 70% for 3 min, and returned to 10% at the end of the 34 min run time (lin and Giusti 2005). The injection volume was 50 µl. A Waters¹⁷ HPLC equipped with a Delta 600 pump, model 996 Photodiode Array Detector and 717plus Autosampler was used. Elution was monitored at 254 nm with spectral data collected from 200-450 nm. Identification and quantification of isoflavones was achieved by comparing spectral data and retention times to standard references. Calibration curves were developed from pure standards of isoflavone aglycones and glucosides. Standards for the malonyl forms of the glucosides were not chromatographed due their instability; rather, molar

¹⁷ Waters Inc. 34 Maple Street, Milford, MA. 01757 USA

equivalents were calculated using the β -glucosides peaks (Figure 1).

3.3.3 Statistical Analysis

Statistical analysis was conducted as a split plot design with four randomized blocks. The whole plots contained one of the cultivars Bass, Corsica, Jack, or Williams 82. The herbicide treatments were randomly assigned to the subplots and were a control, WC lactofen application or WM lactofen application. In the analysis, blocks, years, and their interaction terms were treated as random effects in a mixed models analysis using SAS 8.1¹⁸. Residuals were examined to determine if the analysis of variance assumptions were adequately met. In all cases, normality of residuals and homogeneity of variances were assumed. The Tukey-Kramer method was used for means comparisons at a 5% significance level.

¹⁸ SAS/STAT, version 8.1, SAS Institute Inc., Cary North Carolina

3.4 Results and Discussion

3.4.1 Soybean Leaf Isoflavones

Total isoflavone concentrations for untreated leaf tissue were highest for Williams 82 and Jack. Bass and Corsica were the cultivars with the two lowest isoflavone concentrations, however, Jack was not significantly different from Bass and Corsica (Table 3.1). Of the isoflavones detected in all untreated leaf samples, Williams 82 was highest for three of the four isoflavones: genistin, malonylgenistin, and genistein. The fourth isoflavone malonylglycitin was detected at very low levels and was highly variable among experimental units and as such resulted in no significant differences between cultivars.

Total isoflavone concentrations for post-lactofen treated leaf tissue was 26% higher for soybeans treated with WC applications than WM (Table 3.2). The three isoflavones genistin, malonylgenistin and genistein were found at higher concentrations for the WC treated soybeans. Leaf tissue concentrations of genistin for the WC lactofen treatments applied to DC soybeans were significantly higher at 3.1 mg 100 g seed⁻¹ than WM at 1.5 mg 100 g seed⁻¹. Genistin concentrations for these same treatments applied to FS soybeans were found not to be different with levels of 1.9 and 1.3 mg 100g seed⁻¹ for the

WC and WM treatments, respectively. The isoflavones daidzin, malonyldaidzin, and malonylglycitin were not different when compared between the two lactofen treatments. The three isoflavones, daidzin, malonyldaidzin, and malonylglycitin that did not show an increase were also the same isoflavones that were either at, or below, the level of detection in untreated leaf tissue (Table 3.1).

In addition to the relationship between the un-treated and post-lactofen treatment leaf tissue for the three isoflavones, daidzin, malonyldaidzin, and malonylglycitin, there was a strong relationship between isoflavone concentrations and cultivar type (Table 3.1). However, following either of the lactofen treatments, there was no relationship between isoflavone concentration and cultivar type (Table 3.3).

Overall, the isoflavones that displayed a significant post-lactofen application effect were higher for the WC treatment over the WM treatment. The one exception to this was the isoflavone genistin, which had no response to the lactofen treatments in the FS cropping system. It would be expected that a WC rate, which was over two times that used for the WM treatment, would result in higher levels of isoflavones.

As isoflavone production in leaf tissue is an acute response to physical damage, the propagation of isoflavone

species would begin with aglycone production, followed by the conjugate species. In fact, genistin is the aglycone substrate from which the β -glucoside and malonylgenistin are produced, thus the level of the leaf tissue aglycone is directly related to the turnover dictated by the stimulation of the enzyme system. The ratio of total detected malonylgenistin plus genistein to the total aglycone genistin (MGG:G) for the untreated leaf was approximately 2.8:1, and the MGG:G ratio for lactofen treated leaf tissue was 4.5:1. There was no daidzin aglycone or malonyl form detected in the untreated leaf tissue. The ratio of the detected malonyldaidzin to the aglycone daidzin (MD:D) for the combined WC and WM lactofen-tissue treatments was 11.2:1.

The stimulus of leaf damage results in the production, or increased production of isoflavone aglycones, with a concomitant quick conversion of those aglycone isoflavones to their conjugate β -glucoside and malonyl forms. As discussed in Cosio et al. (1985), there is a temporal component to the different leaf tissue aglycone. From this information it can be deduced that at the 48h harvest time, both treatments of lactofen had induced aglycone isoflavone production. Further proof of this induction is the level of enzyme activity, demonstrated by the ratio of aglycones to their converted conjugate species.

3.4.2 Soybean Seed Constituents

Soybean yield was unaffected by lactofen treatments in FS or DC plantings (Table 3.4). The DC soybean yields averaged approximately 16% higher than the FS crop. This unexpected higher DC yield was driven by consistently lower yields in FS soybean at the LESREC location. DC soybean yields may have been higher since they were planted into no-tillage fields following barley. The DC no-tillage cropping systems may have allowed for increased moisture availability. While the yield difference among cropping systems did not translate to a difference in average soybean seed weight, Jack displayed an 11% decrease in weight of the full-season versus the double-crop seed (Table 3.5). This single full-season seed weight was the lowest seed weight of all cultivar weights regardless of the cropping system.

Lactofen applications did not significantly affect seed oil and protein concentrations (Table 3.6 and 3.7). The significance in the cultivar main effect for percent oil established that the four cultivars had differences of <5% between the highest and lowest concentration (Table 3.7). Tsukamoto et al. (1995) reported that soybeans seeds produced under high seasonal temperatures displayed a concomitant decrease in total fatty acid concentration and isoflavone

concentration. In this study there were no differences in total percent oil when treatments were compared across cultivars with the controls. The cultivar main effect indicated that the protein variability was also low. Corsica and Williams 82 contained the highest protein concentrations of the cultivars tested (Table 3.7).

3.4.3 Soybean Seed Isoflavones

Soybean seed tissue isoflavone concentrations from untreated, WC treated, and WM treated plants were not found to be different. Significant isoflavone differences were found among cropping systems and cultivars.

Individual seed tissue isoflavones from DC soybeans were consistently higher than in tissue from the FS soybean seeds. Total isoflavone concentration for DC soybean seed ($100 \text{ mg } 100\text{g}^{-1}$) was one-third higher than that of the FS seed tissue ($62.56 \text{ mg } 100\text{g}^{-1}$) (Table 3.8). The isoflavone concentrations followed the pattern of higher yields for the DC soybeans than the FS soybeans. The highest concentrations of seed tissue isoflavones for both DC and FS were the malonyl forms of daidzin and genistin (Table 3.8).

Cultivar differences in total seed tissue isoflavone concentrations were highest for Williams 82, with no difference

among the other three cultivars (Table 3.9). Also, the relative isoflavone concentrations for Bass, Corsica, Jack, and Williams 82 were similar over all five of the detected isoflavones. Seed isoflavone concentrations for Williams 82 were consistently among the highest of the cultivars for all isoflavones detected.

The total isoflavones within each cropping system were not different (Table 3.10). However, within cropping system, the relative concentrations of seed isoflavones at the cultivar level remained consistent. This consistency in the seed tissue isoflavones may be key to understanding the reactions of soybeans cultivars to different environments. If relative isoflavone concentrations respond consistently over varying environmental influences, quantitatively, the genetics should be based upon cultivar response and not individual isoflavone response. When Wang and Murphy (1994) evaluated seeds from six soybean cultivars over different environments, they demonstrated that regardless of environmental influences, consistency in isoflavone concentrations remained related to individual cultivars. Within this current study the importance of cultivar selection for isoflavone is clear. The consistent relative concentrations of isoflavones and the consistently high concentrations of isoflavones found over both cropping systems in the seeds of the single cultivar Williams 82, demonstrate

cultivar importance. Total seed isoflavone concentration is thus the best measure for cultivar selection.

3.5 Conclusions

The results of this study demonstrate that at 48h post-lactofen treatment, there is enough daidzin and genistin in the leaf tissue that the conversion to the β -glucoside and malonyl forms are well under way. If the production of aglycone forms in the leaf tissue were to have an impact on the subsequent production in the seed, both treatments could have demonstrated this proclivity. In fact, from the seed-tissue isoflavone data it is clear that the damage caused to the leaf tissue did not translate to a change in the seed-tissue isoflavone concentrations; neither individually or quantified as total isoflavone concentration.

Future applied research should focus on establishing the isoflavone production capability of cultivars. A more basic approach to soybean isoflavone production needs to be focused on the production and storage enzymology and genetics. A better understanding of the functioning and controls of these systems could lead to the ability of farmers to produce for potential high isoflavone markets in the future.

3.6 References

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3.6 Tables and Figures

3.6.1 Tables

Table 3.1. Soybean untreated leaf tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), and two cropping systems (full-season and double-crop).

Isoflavones	Cultivar			
	Bass	Corsica	Jack	Williams 82
	mg 100g ⁻¹			
Daidzin	nd	nd	nd	nd
Genistin	1.76ab	1.58b	1.73ab	2.05a
Glycitin	nd	nd	nd	nd
Malonyldaidzin	nd	nd	nd	nd
Malonylgenistin	3.90b	3.87b	4.70ab	5.61a
Malonylglycitin	0.07	0.07	0.15	0.31
Genistein	0.12ab	0.06b	0.12ab	0.20a
Total	5.86b	5.58b	6.72ab	8.19a

Isoflavone means across cultivars followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

nd=no detection of that isoflavone for the cultivar.

Table 3.2. Soybean post-lactofen treated (48 h) leaf tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), two cropping systems (full-season and double-crop), and four cultivars (Bass, Corsica, Jack, and Williams 82), for soybean plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Isoflavones	Weed Control	White Mold
	(WC)	Supression (WM)
	mg 100g ⁻¹	
Daidzin	0.09	0.02
Genistin	2.22a	1.70b
Glycitin	nd	nd
Malonyldaidzin	3.44	2.79
Malonylgenistin	10.20a	6.88b
Malonylglycitin	1.23	1.47
Genistein	0.31a	0.07b
Total	17.20a	12.70b

Treatment means within isoflavone and total isoflavones followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 3.3. Soybean post-lactofen treated (48 h) leaf tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), and two cropping systems (full-season and double-crop), for soybean plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Isoflavones	Cultivar			
	Bass	Corsica	Jack	Williams 82
	mg 100g ⁻¹			
Daidzin	0	0	0.18	0.06
Genistin	2.12	1.90	1.68	2.14
Glycitin	nd	nd	nd	nd
Malonyldaidzin	4.29	3.54	1.90	2.72
Malonylgenistin	8.87	8.39	7.99	8.86
Malonylglycitin	1.34	1.17	1.57	1.32
Genistein	0.23	0.15	0.18	0.19
Total	16.53	14.97	13.25	15.05

Isoflavone means across cultivars followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

nd=no detection of the specific isoflavone for the cultivar.

Table 3.4. Soybean yields in full-season and double-crop cropping system averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), for soybeans plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Cultivar	Full-season Yields				Double-crop Yields			
	WC	WM	Control	Mean	WC	WM	Control	Mean
	kg ha ⁻¹				kg ha ⁻¹			
Bass	1,901	1,787	1,806	1,831	2,185	2,049	2,642	2,292
Corsica	1,866	1,988	1,974	1,943	2,335	2,551	2,469	2,452
Jack	1,808	1,868	1,831	1,836	2,064	2,160	2,244	2,156
Williams 82	2,268	2,080	1,916	2,088	2,081	2,397	2,264	2,247
Mean	1,961	1,931	1,882	1,925b	2,166	2,289	2,405	2,287a

Cropping system main effect was tested in the anova, and means for cropping system are significantly different (0.05).

Table 3.5. Soybean seed weight in full-season and double-crop cropping system averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), for soybeans plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Cultivar	Full-season Seed Weight				Double-crop Seed Weight				Cultivar*
	WC	WM	Control	Mean*	WC	WM	Control	Mean*	
_____g 100 Seed ⁻¹ _____					_____g 100 Seed ⁻¹ _____				
Bass	11.8	12.2	12.1	12.0bc	14.3	14.3	14.9	14.5ab	13.3b
Corsica	12.9	13.1	13.6	13.2ab	15.2	15.9	16.3	15.8a	14.5a
Jack	11.9	11.8	11.3	11.7c	12.6	13.2	13.6	13.1b	12.4b
Williams 82	14.3	14.1	14.3	14.2a	15.0	14.9	15.2	15.0a	14.6a
Mean	12.7	12.8	12.8	12.8	14.3	14.6	15.0	14.6	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 3.6. Soybean seed oil concentration in full-season and double-crop plantings averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), for soybeans plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Cultivar	Full-season Oil				Double-crop Oil				Cultivar*
	WC	WM	Control	Mean*	WC	WM	Control	Mean*	
	%				%				%
Bass	21.1	21.1	20.9	21.0a	20.1	20.2	20.2	20.2ab	20.6a
Corsica	20.4	20.6	20.3	20.4b	19.6	19.5	19.7	19.6b	20.0b
Jack	20.3	20.6	19.8	20.2b	20.4	19.9	20.3	20.2a	20.2ab
Williams 82	20.6	20.7	20.5	20.6ab	20.1	19.9	19.7	19.9ab	20.2ab
Mean	20.6	20.7	20.4		20.0	19.9	20.0		

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 3.7. Soybean seed protein concentration in full-season and double-crop cropping system averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), for soybeans plants treated with lactofen at 217 g active ingredient (ai) ha⁻¹ for weed control (WC), 122 g ai ha⁻¹ for white mold suppression (WM).

Cultivars	Full-season Protein				Double-crop Protein				Cultivar*
	WC	WM	Control	Mean*	WC	WM	Control	Mean*	
	%				%				%
Bass	41.0	41.2	41.3	41.2b	40.8	40.7	41.0	40.8b	41.0b
Corsica	42.0	41.7	42.3	42.0a	41.8	42.0	41.8	41.8a	41.9a
Jack	41.5	41.3	42.2	41.7ab	40.0	40.1	40.0	40.0c	40.9b
Williams 82	42.0	41.9	42.6	42.2a	40.9	40.9	40.9	40.9b	41.6a
Mean	41.6	41.5	42.1	41.7	40.9	40.9	40.9	40.9	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 3.8. Seed tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), four cultivars (Bass, Corsica, Jack, and Williams 82), two lactofen treatments (217 g active ingredient [ai] ha⁻¹ for weed control [WC] and 122 g ai ha⁻¹ for white mold suppression [WM]), and a untreated control.

Isoflavones	Double Crop	Full Season
	mg 100g ⁻¹	
Daidzin	5.40a	3.26b
Genistin	13.75a	7.18b
Glycitin	nd	nd
Malonyldaidzin	20.27a	12.52b
Malonylgenistin	60.06a	39.51b
Malonylglycitin	nd	nd
Genistein	0.57a	0.01a
Total	100.0a	62.56b

Treatment means within isoflavone and total isoflavones followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 3.9. Soybean seed tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), two cropping systems (full-season and double-crop), two lactofen treatments (217 g active ingredient [ai] ha⁻¹ for weed control [WC] and 122 g ai ha⁻¹ for white mold suppression [WM]), and a untreated control.

Isoflavones	Cultivar			
	Bass	Corsica	Jack	Williams 82
	mg 100g ⁻¹			
Daidzin	4.10b	4.71ab	3.10c	5.40a
Genistin	10.13ab	10.43ab	8.87b	12.43a
Glycitin	nd	nd	nd	nd
Malonyldaidzin	14.19bc	17.70ab	11.41c	22.26a
Malonylgenistin	47.37b	46.30b	44.39b	61.07a
Malonylglycitin	nd	nd	nd	nd
Genistein	0.24b	0.25ab	0.32ab	0.36a
Total	76.05b	79.49b	68.16b	101.49a

Isoflavone means and total isoflavones across cultivars followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

nd=no detection of that isoflavone for the cultivar.

Table 3.10. Soybean seed tissue isoflavone concentration averaged over two growing seasons (2002 and 2003), two locations (Quantico and Queenstown, Maryland), two lactofen treatments (217 g active ingredient [ai] ha⁻¹ for weed control [WC] and 122 g ai ha⁻¹ for white mold suppression [WM]), and a untreated control.

Isoflavones	Full Season				Double Crop			
	Cultivar				Cultivar			
	Bass	Corsica	Jack	Williams 82	Bass	Corsica	Jack	Williams 82
	mg 100g ⁻¹				mg 100g ⁻¹			
Daidzin	2.66bc	3.70ab	3.39c	4.28a	5.54a	5.72a	3.82bc	6.51a
Genistin	6.49ab	7.41ab	5.46b	9.37a	13.77ab	13.45ab	12.29b	15.49a
Glycitin	nd	nd	nd	nd	nd	nd	nd	nd
Malonyldaidzin	9.46	14.44	7.91	18.26	18.93	20.97	14.91	26.25
Malonylgenistin	35.78b	38.43b	31.82b	52.02a	58.96ab	54.18b	56.98b	70.12a
Malonylglycitin	Nd	nd	nd	nd	nd	nd	nd	nd
Genistein	0.01a	0a	0a	0.03a	0.46b	0.50b	0.63ab	0.69a
Total	54.4	64.2	47.7	84.0	97.7	94.8	88.6	119.0

Means across isoflavones type and within cropping systems (Full Season and Double Crop) followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

nd=no detection of that isoflavone for the cultivar.

3.6.2 Figures

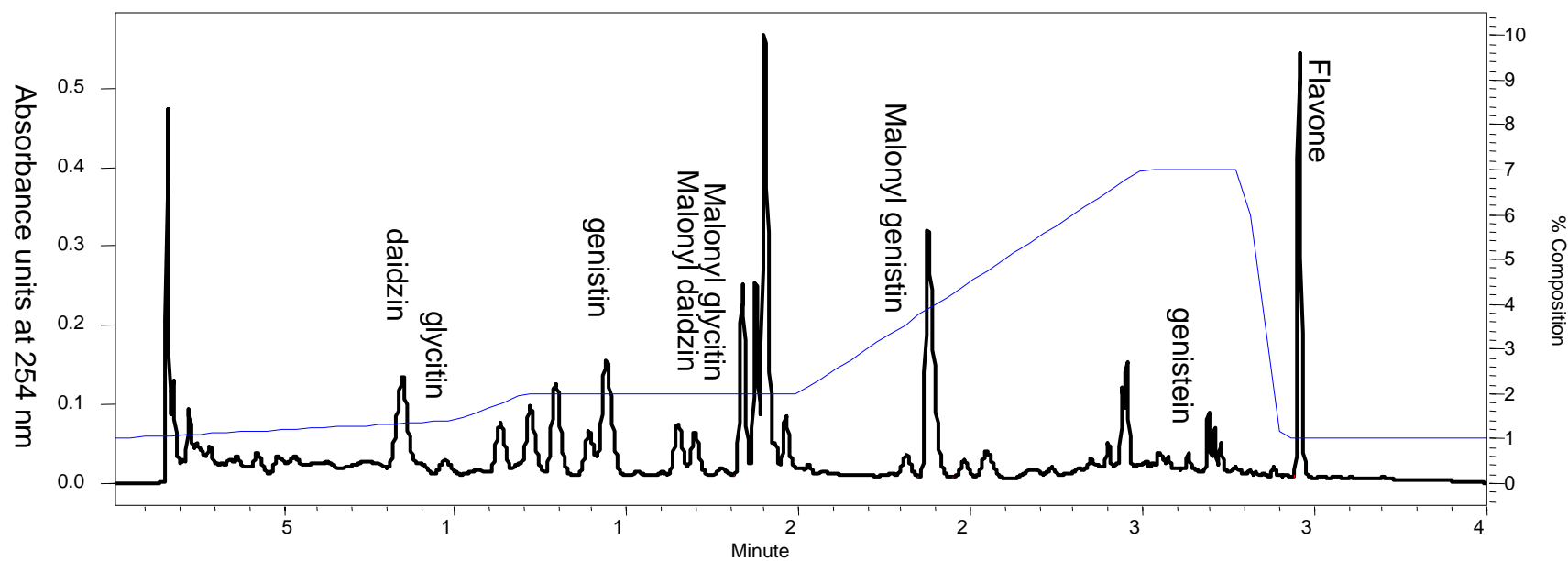


Figure 3.1. Chromatogram of the isoflavones extracted from soybean leaf tissue 48 hours after treatment with the white mold suppression application (WS) of lactofen at 122 g active ingredient (ai) ha⁻¹ for weed control.

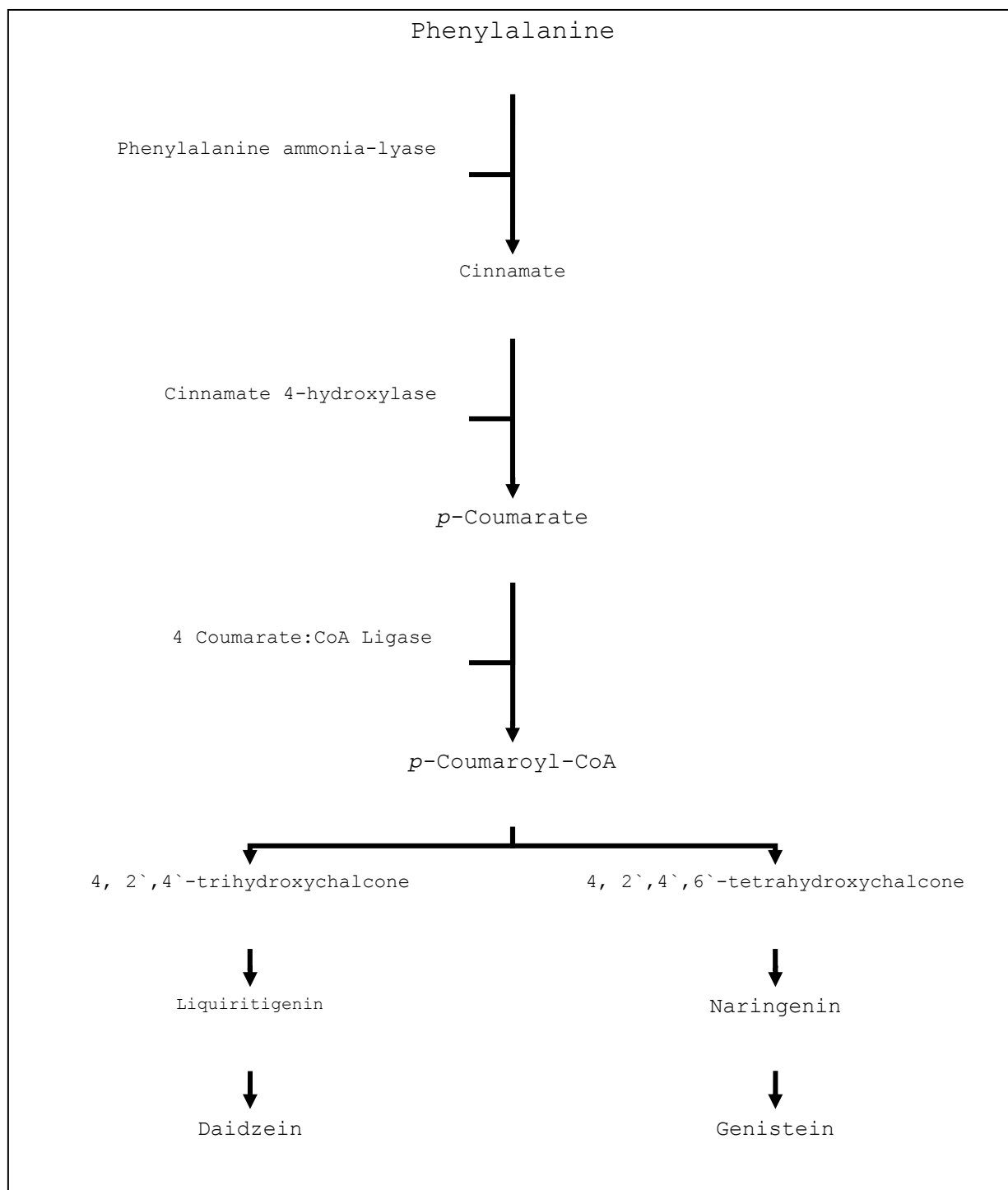


Figure 3.2. Phenylalnine pathway responsible for the production of all isoflavones found in the soybean seeds.

Chapter 4: Ozone Air Pollution Effects on the Concentration of Isoflavones in Soybean [*Glycine max* (L.) Merr.] Seeds

4.1 Abstract

Production of isoflavones is highly variable between plants, and environmental conditions are known to increase this variability. This study focused on cultivar differences in four predominant isoflavones in soybean [*Glycine max* (L.) Merr.] seeds: daidzin, genistin, malonyldaidzin, and malonylgenistin and the interaction with elevated tropospheric ozone concentrations. Four cultivars (Bass, Corsica, Jack, and Williams 82) were grown in the field in open-top chambers and fumigated with either carbon filtered (CF) or ozone (O₃) enriched air, 1.4 parts per billion above ambient (ppb) air. Average seasonal O₃ levels were 57.1 ppb and 31.4 ppb for O₃ and CF treatments, respectively. Soybean seed yields and average seed weight were reduced by 22% and 14%, respectively. However, the O₃ air quality treatments (AQT) had little effect on seed oil and protein concentrations. The two β -glucosides, daidzin and genistin, as well as their malonyl forms plus the only aglycone, genistein were present at detectable levels. The levels of

daidzin, malonyldaidzin, malonylgenistin and genistein were reduced for seeds from plants grown in O₃ by 25, 19, 15, and 11%, respectively compared to CF air. Although genistin levels were not significantly different, the data did trend toward lower concentrations for the plants receiving the elevated O₃ AQT. Other aglycone isoflavones were below the level of detection. Williams 82 ranked consistently higher than the other cultivars in levels of isoflavones regardless of the AQT and Jack exhibited the lowest concentration of isoflavones, except for genistein.

4.2 Introduction

Environmental conditions can have major impacts on the production of plant metabolites during the growing season, and thus may alter the composition of the harvested seed. Air pollution has become a very important consideration in the quality of agronomic-crop end products. In fact, the role of air pollutants and their effects on crop plants is an important research topic in plant sciences and has been reviewed (Hoeck et al., 2000; Heck et al., 1988; Mulchi et al., 1995). Ozone (O_3) is the primary air pollutant found to cause damage to crop plants and worldwide results in losses that are believed to be in excess of a billion dollars annually.

The background ambient level of O_3 common in the troposphere is approximately 25 parts per billion (ppb= $ng\ g^{-1}$) averaged over a 7-h mean (0900 to 1700 h EDT). However, in some regions of the United States, ambient O_3 levels above 100 ppb are not uncommon during the mid-day of summer months. Tropospheric O_3 is primarily produced by photochemical reactions among emissions from the burning of fossil fuels. Moderate to high levels of exposure to O_3 are phytotoxic to plants and result in reduced chlorophyll concentration and other traits including crop yields (Chernikova et al., 2000; Mulchi et al., 1988). An additional

area of interest in O₃ air pollution is its impact on secondary plant metabolites such as isoflavones. Isoflavones extracted from the seeds of soybeans are very important in nutraceuticals and pharmaceuticals (Anonymous, 2000). These phytoestrogen compounds are currently sought for their possible health benefits of preventing some cancers and for hormone replacement therapy (Anonymous, 2000). There is also concern about the effects of these estrogen-like compounds in soy foods on the development of infants and children. Currently there is no FDA standards or requirements to monitor the concentrations of isoflavone compounds in foodstuffs or infant formulas. This remains true even in light of toxicological evidence that small disruptions in the human endocrine system can lead to health and developmental abnormalities.

Yu et al. (2000) illustrated that exposure to ultraviolet-B light increased the level of β -glucoside isoflavones of genetically transformed tobacco (*Nicotiana tabacum*) and Arabidopsis leaves. Wang et al. (1999) evaluated the concentration of the β -glucosides in subterranean clover (*Trifolium subterraneum*). They found that Reddlegged Earth Mite-resistant clover had higher levels of β -glucoside isoflavones. The levels of these forms of isoflavones, specifically daidzin and genistin, found in damaged tissue as

well as insect-resistant tissues would lend support to the assertion that these metabolites were simply being routed to the strongest sink tissue. The isoflavones daidzin and genistin are highly water-soluble β -glucosides and are known to be among the most predominant in soybean seed tissue (Tsukamoto et al., 1995; Wollenweber and Dietz, 1981).

If in the future, contracts are available to farmers to produce soybean seeds for isoflavones, knowledge of how environmental factors will impact isoflavone production will be vital. If environmental conditions such as O₃ air pollution have major impacts on the production, mobility, and storage of soybean seed isoflavones, additional research is needed in order to gain a more basic understanding of such impacts. This study investigated the effect of elevated tropospheric ozone on the concentration of 12 isoflavones in the seeds of the soybean cultivars Bass, Corsica, Jack, and Williams 82. In this research the focus was on the effects of O₃ on soybean isoflavone concentrations.

4.3 Materials and Methods

4.3.1 Field

The field design of this experiment included six open-top chambers with a diameter of three meters (OTC) (Figure 4.1).

When treatments began, three of the OTC were continuously fumigated with carbon-filtered air (CF) and the remaining three OTC with ambient air plus enough O₃ to increase the ambient air O₃ concentration by 7 parts per billion (ppb).

Ozone treatments followed those described by Chernikova et al. 2000. The O₃ treatments were a mix of ambient air and artificially produced O₃, which was generated from passing O₂ through a Griffin¹⁹ O₃ generator. The O₃ was injected into the airstream of blowers where it was mixed prior to entering the distribution ring of the chamber. Treatments were applied beginning on 13 June of 2002 for 7 h day⁻¹ (1000 - 1700 h) for five days a week, over an eight-week duration (Figure 4.2). Ozone chamber air quality was sampled at canopy level hourly using a Dasibi model 1008, UV Photometric O₃ analyzer as described by Mulchi et al. (1992, 1995).

Seeds were planted in 3-cm diameter pots in the greenhouse in April for transplanting in early May. As illustrated in figure 4.3, each chamber was partitioned into six rows 1.8 m in length with rows spaced 40 cm apart. The two end rows in each chamber served as border rows. The rows were divided into three replicates 0.6 m in length with four plots per replicate. The plots within each replicate were randomly assigned to the four

¹⁹ Griffin Technics Corp., Lodi, New Jersey

cultivars prior to transplanting. Transplants at the V1-V2 stage were taken to the field and planted in the OTC in three 0.6-m length rows replicate with plants spaced 10 cm apart, or six plants per plot row. Each OTC contained three replicated plots for each of the four cultivars. Three chambers were equipped with charcoal filters (CF) and three were purged continuously with ambient air.

After two weeks of growth, O₃ treatment began. The O₃ levels were monitored through an automated sampling system (Chernikova et al., 2000). Supplemental O₃ was supplied to the three ambient air chambers from 0900 to 1600 h, EDT, five days week⁻¹. The activated charcoal lowered O₃ levels approximately 50% of ambient (Figure 4.1). All OTC were irrigated by hand immediately after planting and then every day for the first three days. Supplemental irrigation was made to all OTC when rainfall was insufficient for optimal plant growth. The O₃ treatments were terminated when canopy leaves were at advanced senescence.

Seed harvest yields and weights were obtained from the plants, which were hand-harvested in late September. Total seed weight was determined for each plot. Seed size (100 g⁻¹ seed) was determined on a 100-seed sample from each plot.

4.3.2 Laboratory

Grain quality was obtained from approximately 5 g of soybean seed from each replicated cultivar and was analyzed for oil and protein contents using infrared analysis via an Infratec model 1255 Feed and Food Analyzer. An additional 5-g sample of seeds was obtained and ground into a fine flour using a Braun Type 4041 Model KSM2 coffee grinder. The grinder was pulsed for 3 sec over a 30-sec period. This flour was then used for isoflavone extraction.

Isoflavone extraction was achieved using the method outlined by Lin and Giusti (2005) and Figallo et al (2003). A 2-g sample of the soybean seed flour was transferred to a 25-ml Erlenmeyer flask. A 10-ml aliquot of 80% (v:v) methanol and a 50- μ l internal standard of 20 mmol flavone were added to the flask. A Teflon stirrer bar was added to the solution then placed on a stirrer plate at medium speed for 2 h. After 2 h, the supernatant was separated from the flour by vacuum separation through number one Whatmann²⁰ filter paper in an Erlenmeyer vacuum apparatus under 500 mm of mercury.

A slight modification was made to the procedure of Figallo et al. (2003) for concentrating the samples. A steady stream of dry nitrogen gas replaced the rotary evaporator. The

²⁰ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 1001-070

supernatant was transferred from the Erlenmeyer flask to a 10-ml plastic centrifuge tube and placed into a water bath at 40C under a constant flow of dry nitrogen until the volume reached approximately 3ml. The samples were then transferred to 3-cm³ syringes with Tru Loc tips²¹ fitted with 17-mm syringe polypropylene filters²². The syringes and filters were then flushed with 1.5ml of 16% (v:v) acetonitrile. Filtered samples and acetonitrile wash were collected and the final volume was adjusted to 5ml using the 16% (v:v) acetonitrile. The samples were then placed into a freezer at -20 C until analyzed for isoflavones.

Identification and quantification of the isoflavones occurred through high performance liquid chromatography (HPLC) using a Waters²³ HPLC with a model 996 Photodiode Array Detector, model 600 Controller, 717plus Autosampler and Delta 600 pump. Identification and quantification of isoflavones occurred through high performance liquid chromatography (HPLC). Separation of isoflavones was on a C18 column with a linear gradient of acidified water (Solvent A: 0.1% acetic acid and 5% acetonitrile in water) and acidified acetonitrile (Solvent B was 0.1% acetic acid in acetonitrile). The flow rate of 1 ml min⁻¹

²¹ Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part 14-823-35

²² Fisher Scientific, Research, 2000 Park Lane Drive, Pittsburgh, PA 15275, Part DDP04T17NB

²³ Waters Inc. 34 Maple Street, Milford, MA. 01757 USA

and the gradient started at 10% and increasing to 14% B over 10 min, then increased to 20% over 2 min, was maintained at 20% over 8 min, continued to increase to 70% over 10 min, maintained at 70% for 3 min, and returned to 10% at the end of the 34 min run time (Lin and Giusti 2005). The injection volume was 50 μ l. A Waters²⁴ HPLC with a Delta 600 pump, model 996 Photodiode Array Detector and 717plus Autosampler was used. Elution was monitored at 254 nm with spectral data collected from 200–450 nm. Identification and quantification of isoflavones was achieved by comparing spectral data and retention times to standard references. Calibration curves were developed from pure standards of isoflavone aglycones and glucosides. Standards for the malonyl forms of the glucosides were not chromatographed due to their instability; rather, molar equivalents were calculated using the β -glucosides peaks (Figure 1).

4.3.4 Statistical Analysis

Statistical analysis was conducted as a completely randomized design with three chambers per treatment. Within each chamber there were three replicated blocks, each of which contained four soybean cultivars Bass, Corsica, Jack, or

²⁴ Waters Inc. 34 Maple Street, Milford, MA. 01757 USA

Williams 82. The treatments were either Ambient air plus ozone (O_3) or carbon filtered air (CF). A mixed models analysis using SAS 8.1²⁵ was used. Chambers were treated as replicates and the plots within each block were treated as samples in the final analysis. Chamber and the associated interactions were designating as random variables. Residuals were examined to determine if the analysis of variance assumptions were adequately met. In all cases, normality of residuals and homogeneity of variances were assumed. The Tukey-Kramer method was used for means comparisons at a 5% significance level.

²⁵ SAS/STAT, version 8.1, SAS Institute Inc., Cary North Carolina

4.4 Results and Discussion

Through daily monitoring, the average O₃ enrichment for the ambient air plus O₃ treatment was 1.4 ppb (Figure 4.2.). This change from the target of 7 ppb was the result of high seasonal ambient ozone levels and that O₃ injection was only 5 days week⁻¹, which resulted in a lower seasonal average of O₃ concentration in the treatment chambers. Average seasonal ambient O₃ level was 55.7 ppb, while O₃ and CF treatment levels were 57.1 ppb and 31.4 ppb, respectively.

Even with the modest increase in O₃ levels, average soybean seed yields were significantly reduced by 22% for plants grown in elevated O₃ AQT (90.8 g m⁻²) when compared to those grown in CF AQT (117.0 g m⁻²) (Table 4.1.). It has been well documented that moderate levels of O₃ exposure are phytotoxic to soybean plants and result in reduced crop yields (Chernikova et al., 2000; Mulchi et al., 1988).

In addition, individual seed weights from plants grown in elevated O₃ AQT had average weights (12.4 g g m⁻²) that were 14% less than those from the CF AQT (14.4 g m⁻²). All cultivars reacted similarly to the AQT. There was no significant cultivar effect, or cultivar by treatment interaction observed for seed yield or individual seed weight. The cultivars Corsica and

Williams 82 had the highest average seed weight regardless of the AQT to which they were exposed. Visual comparisons of leaf tissues between the two AQT confirmed damage from O₃ as characteristic signs of necrotic spotting on the adaxial portions of leaves. This is consistent with reported symptoms of O₃ exposure (Mulchi et al., 1995).

Likewise, the AQT did not have a significant effect on seed oil concentration (Table 4.2). However, seed oil concentrations were significantly different between cultivars. Bass and Williams 82 had the highest oil concentrations. Differences in oil concentrations were not consistent between cultivars with respect to AQT. This treatment by cultivar interaction was due to a change in ranking of the cultivars for oil concentration at each AQT. The cultivar's genotype had more influence on oil concentration than the AQT (Table 4.2).

The AQT did not have a significant effect on the seed protein concentrations (Table 4.2). Although there were significant differences between cultivars for their protein concentrations, there was no significant cultivar by treatment interaction. Averaged over all cultivars, protein concentrations were not significantly different for the comparison of the O₃ AQT and the CF AQT. Overall, the exposure to elevated O₃ had little effect on soybean seed oil and protein

concentrations. The magnitude of the oil and protein changes were consistent with other studies (Mulchi et al., 1988)

Together, the reduced yield and seed weight plus the lack of effect of O₃ on oil and protein concentrations suggest that the soybean plants in the O₃-AQT were stressed, but the overall treatment effects were not severe enough to cause considerable leaf loss and necrosis.

The average levels of daidzin for soybean cultivar grown in O₃ (3.2 mg 100 g⁻¹) were 25% lower than for plants grown in CF AQT (4.2 mg 100 g⁻¹) (Table 4.3). Cultivar Williams 82 had the highest concentration of daidzin (5.1 mg 100 g⁻¹) regardless of AQT. Concentrations of the other glucoside, genistin, were not different with respect to ozone treatments; however, there were clear trends for lower concentrations with O₃-AQT as compared to the CF AQT. Cultivar differences for daidzin and genistin responded similarly. Cultivar Williams 82 was likewise found to be in the group with the highest levels of genistin (12.5 mg 100 g⁻¹). The isoflavone β-glucosides daidzin and genistin extracted from the seeds of plants grown under the two AQT did follow the same trends as found for some environmental stress such as elevated temperature, but opposite of those found for others such as ultraviolet light. (Yu et al., 2000; Tsukamoto et al., 1995)

The malonyl forms of isoflavones responded in much the same way as the β -glucosides (Table 4.4). Malonyldaidzin and malonylgenistin were both at lower concentrations in seeds from plants grown in the elevated O₃ AQT compared to the CF AQT. The average concentration of malonyldaidzin was 19% lower in the soybean seed from the O₃ AQT, while the malonylgenistin average concentration was 15% lower for the same AQT. Williams 82 exhibited the highest concentration for both of these malonyl forms of isoflavones.

Aglycone concentrations were below the level of detection with the exception of genistein. Since aglycones are produced then stored in cell vacuoles as glucosyl and malonyl forms, the rapid conversion of aglycones, *in vivo*, to β -glucoside and malonyl forms often results in low or undetectable concentrations of these forms of isoflavones (Yu et al., 2000). In this study, the average genistein concentration was reduced in seed produced from soybean plants grown in the O₃ AQT (0.42 mg 100 g⁻¹) by 11% compared to seeds from plants exposed to the CF AQT (0.50 mg 100 g⁻¹).

Cultivar differences were significant for genistein with Williams 82 having a higher concentration (0.57 mg 100 g⁻¹) than other cultivars. Because of the interdependency of the isoflavone types (aglycone \rightarrow β -glucoside \rightarrow malonyl), an

observed change in one form of isoflavone due to an affect of O₃ may be the result of an affect on another isoflavone type.

Speculation as to the causal factors lowering the isoflavone concentrations in soybean seeds in response to O₃ exposure, across the four cultivars, would probably be best focused on a shift in the biochemical requirements of leaf tissue and/or a reduction of photosynthate. The enzyme changes in functioning leaf tissue have been proven to favor the production of isoflavones over other essential biochemicals such as anthocyanins (Cosio et al., 1985). In addition, the phytotoxic nature of O₃ has been proven to result in a reduction of crop leaf canopy, leaf area, and thus lowering the capacity of the plant to produce the required amount of photosynthate (Chernokova et al., 2000; Mulchi et al., 1992). Together changes in biochemical and photosynthetic leaf functions may have reduced overall plant production below some threshold. As a result, the overall plant biochemistry shifted resources that would have been used for increased seed production, toward repair. This resulted in a less healthy plant that is unable to both produce seed and repair damaged tissue.

4.5 Conclusions

Overall, the O₃ AQT lowered the isoflavone concentrations in the soybean seeds. Rankings of cultivar means within isoflavone types demonstrated that Williams 82 consistently produced higher levels of isoflavones compared to other cultivars, Jack exhibited the lowest levels except for genistein.

These research findings are supported by the work of Hoeck et al. (2000). In their study, cultivar variability had a greater significance than environmental factors on isoflavone concentration. While environmental influences did result in changes in isoflavone concentrations, there remained consistency among the cultivars within the environments. The four cultivars used in this study were of two maturity groups (MG). Bass, Jack, and Williams 82 are MG III and Corsica is an early MG IV cultivar. With the exception of the β -glucoside genistin, Bass and Williams 82 were consistently different from one another with respect to isoflavone concentrations. Just as with the findings of Wang et al. (2000), this study did not demonstrate a relationship between isoflavone production and maturity group since Williams 82 and Jack, both are MG III, exhibited one higher and lower levels of isoflavones, in general.

While only four cultivars were evaluated for the impacts of O₃ AQT on isoflavones in this study, the concentrations of

isoflavones were found to be significantly lower among cultivars when exposed to O₃ levels of >55 ppb. Previous research has demonstrated an increase in soybean seed isoflavones as a result of environmental stresses such as temperature. The four cultivars used in this study failed to show a similar stress response to O₃ air pollution as had been reported in the literature for temperature. The elevated air pollution resulted in a reduction in yield, which was the result of an overall reduction in physiological productivity. This lower productivity most probably resulted in the lower isoflavone concentrations observed. It would seem at this level of O₃, the response of soybean plants was to redirect resources, thus increasing the compensation point for O₃ injury, thereby lowering the overall productivity. Considering that this is the first study to examine the impact of elevated O₃ air pollution on soybean isoflavones levels in seed, follow up studies would appear to be warranted. Additional studies should be conducted to quantify and corroborate these results with elevated tropospheric O₃, and perhaps adding other environmental stresses such as drought.

4.6 References

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4.5 Tables and Figures

4.5.1 Tables

Table 4.1. Soybean yield and weight per 100 seeds for cultivars grown in open-top field chambers fumigated with either carbon-filtered or ozone-enriched air at Beltsville, MD, in 2001.

Cultivar	Total Seed Yield			Weight 100 Seed ⁻¹		
	Filtered	Ozone	Mean*	Filtered	Ozone	Mean*
	g m ⁻²			g		
Bass	106.1	89.5	97.8a	13.6	11.7	12.7a
Corsica	139.3	92.8	116.0a	16.8	14.4	15.6a
Jack	86.7	84.4	85.6a	11.5	9.3	10.4a
Williams 82	135.8	96.7	116.3a	15.6	14.1	14.8a
Mean**	117.0a	90.8b		14.4a	12.4a	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

**Column means within total seed yield or weight 100 seed⁻¹ followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 4.2. Soybean seed oil and protein concentrations for cultivars grown in open-top field chambers fumigated with either carbon-filtered or ozone-enriched air at Beltsville, MD, in 2001.

Cultivar	Seed Oil			Seed Protein		
	Filtered	Ozone	Mean*	Filtered	Ozone	Mean*
	%			%		
Bass	22.6	23.0	22.8a	39.8	39.4	39.6 a
Corsica	21.3	21.8	21.6b	42.3	41.4	41.9 b
Jack	21.8	20.2	21.0b	40.0	42.2	41.1bc
Williams 82	22.6	22.6	22.6a	40.1	40.0	40.1ac
Mean	22.1	21.9		40.5	40.8	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 4.3. Soybean seed glucoside isoflavones daidzin and genistin concentrations for cultivars grown in open-top field chambers fumigated with carbon-filtered and ozone-enriched air at Beltsville, MD, in 2001.

Cultivar	Daidzin			Genistin		
	Filtered	Ozone	Mean*	Filtered	Ozone	Mean*
	mg 100g ⁻¹			mg 100g ⁻¹		
Bass	3.4	2.7	3.1a	10.2	8.2	9.2ab
Corsica	4.5	3.5	4.0b	9.6	7.7	8.7b
Jack	3.2	2.1	2.6a	9.5	5.5	7.5b
Williams 82	5.6	4.7	5.1c	13.6	11.4	12.5a
Mean**	4.2a	3.2b		10.7a	8.2a	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

**Column means within individual isoflavone and followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

Table 4.4. Soybean seed malonyl and aglycone isoflavone concentrations in soybean cultivars grown in open-top field chambers fumigated with carbon-filtered or ozone-enriched air at Beltsville, MD, in 2001 and 2002.

Cultivar	Malonyl						Aglycone		
	Daidzin			Genistin			Genistein		
	Filtered	Ozone	Mean*	Filtered	Ozone	Mean*	Filtered	Ozone	Mean*
	mg 100g ⁻¹			mg 100g ⁻¹			mg 100g ⁻¹		
Bass	12.7	8.4	10.5ab	51.1	37.3	44.2a	0.34	0.34	0.37a
Corsica	15.5	11.3	13.4a	47.3	37.2	42.3a	0.39	0.32	0.36a
Jack	10.0	5.8	7.90b	44.1	25.9	35.0a	0.62	0.51	0.51ab
Williams 82	20.2	18.1	19.1c	61.7	58.8	60.3b	0.58	0.57	0.57b
Mean**	14.5a	10.9b		51.1a	39.8b		0.50a	0.42b	

*Within column means followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

**Column means within individual isoflavone type followed by the same letter are not significantly different according to Tukey-Kramer (0.05).

4.5.2 Figures

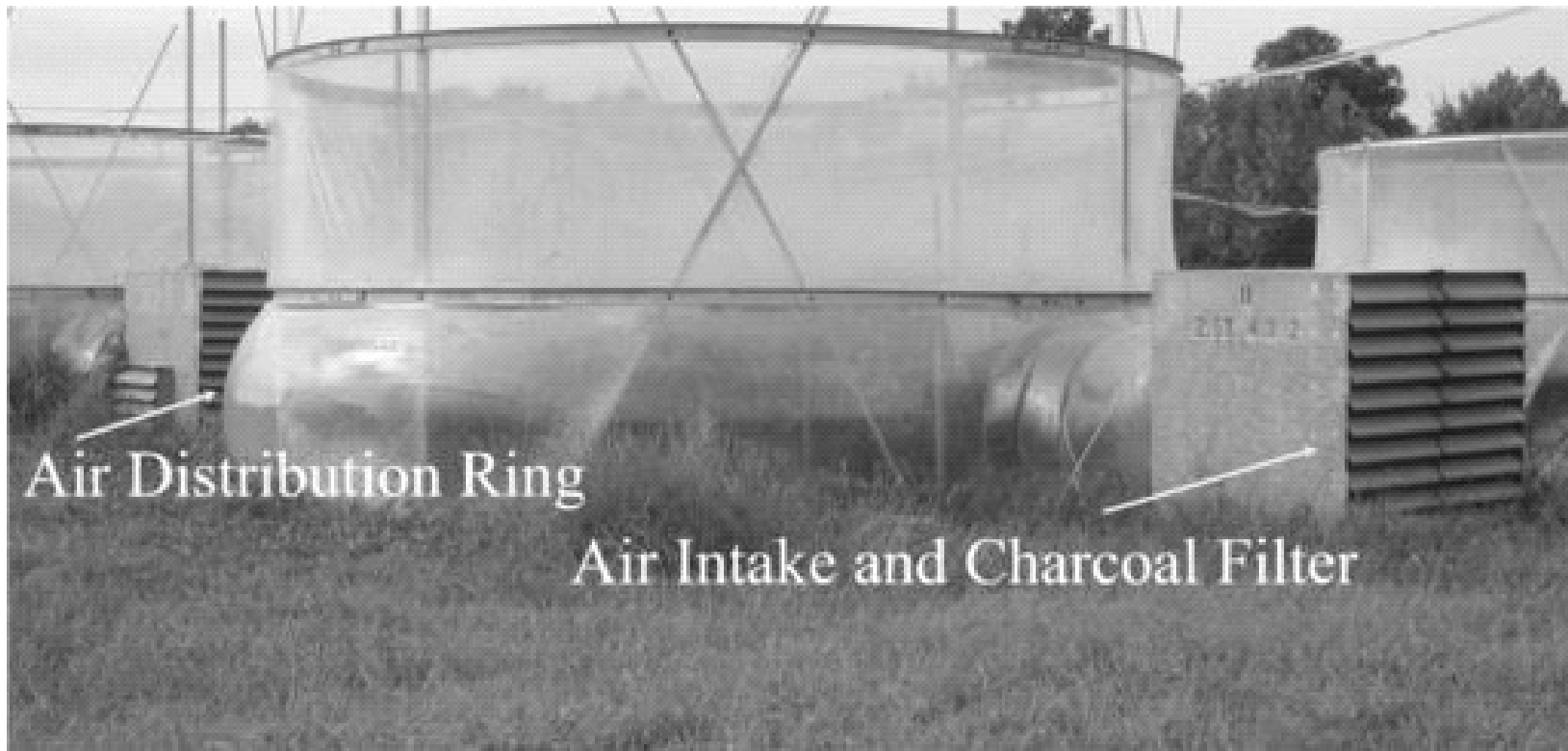


Figure 4.1. Three meter Open-Top Chamber (OTC) fitted with an air intake containing a charcoal filter system.

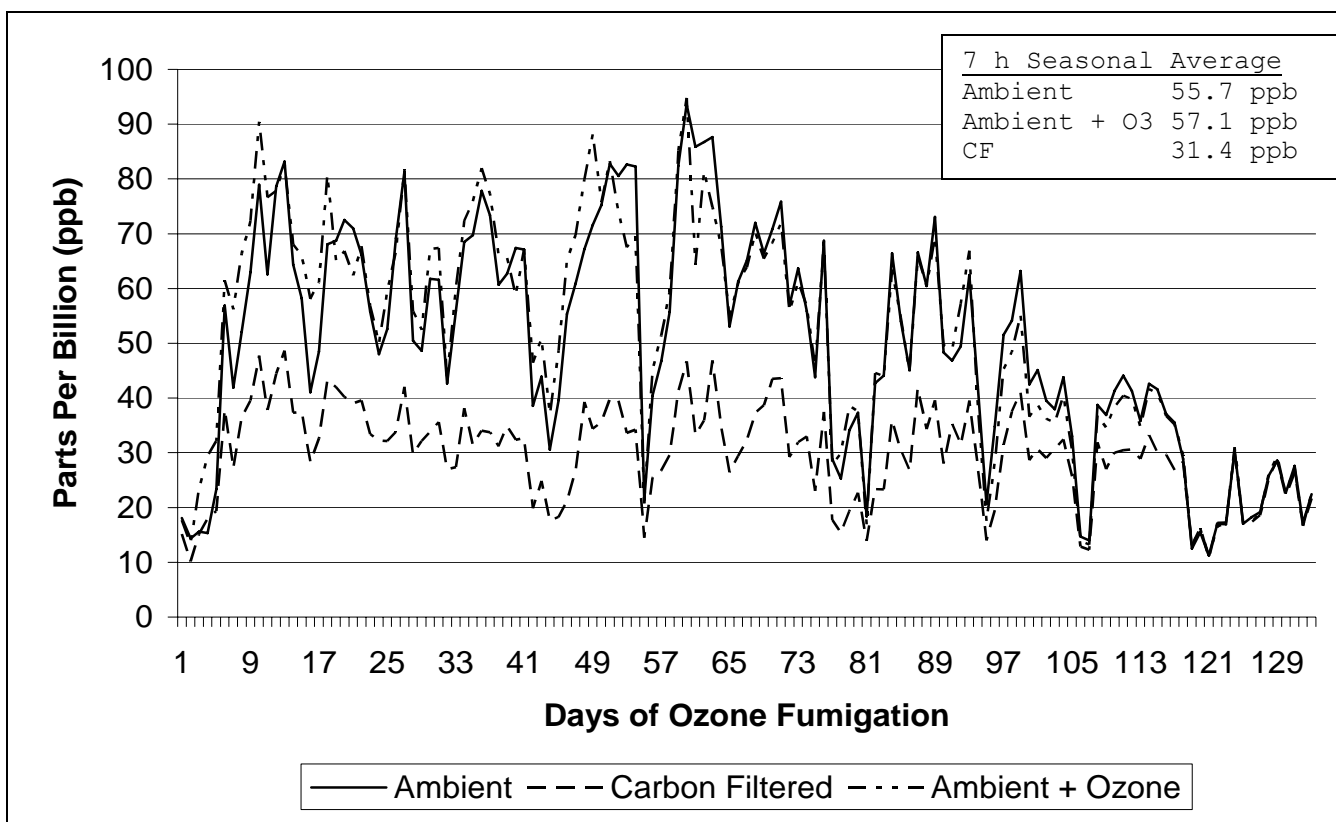


Figure 4.2. Average daily 7 h (0900 - 1600 h EDT) ozone concentration for in-field Open-Top Chambers (OTC) averaged across chamber replications.

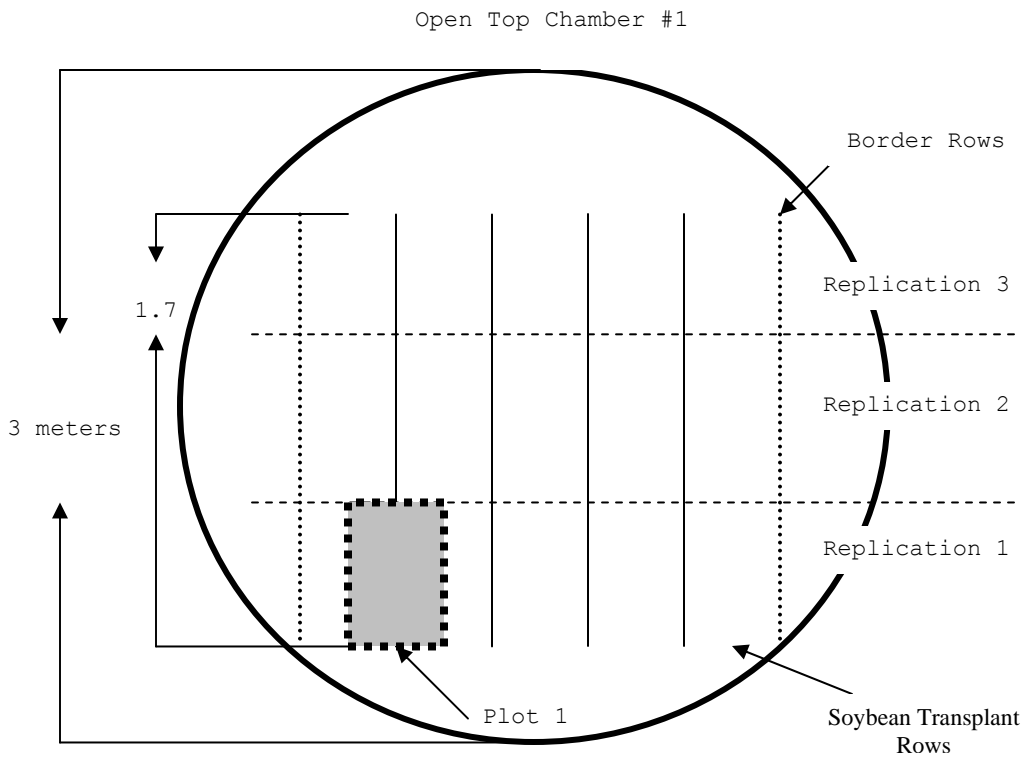


Figure 4.3. View from above an open-top chamber of a soybean plot with transplants arranged in three replications (Plot 1=Ozone Treatment + Replication 1 + Cultivar Bass).

Chapter 5: Dissertation Conclusions

Agronomic research focus has been limited to the amount of isoflavones produced by soybeans and the types that are produced. The primary focus of past and current research has been on isoflavone type and concentration with respect to the comparative response of cultivars to specific environmental stresses. The primary focus of this research was on the potential for the alteration of soybean seed isoflavone concentrations and types, in specific cultivars, to herbicide as well as ozone damage.

The findings of this research have added to the overall body of the research literature by demonstrating that: 1. Lactofen treatments did not show an effect from herbicide induced leaf injury on the isoflavone type and/or concentration in the seed tissue, 2. Cultivar selection is important for the production of high isoflavone soybeans near urban centers where air pollution is of concern. Perhaps the single most important result of this research is the determination that the effects of production and environmental influences on soybean seed isoflavone type and concentration are variable and should be evaluated independently. The dogmatic philosophy that stress will increase isoflavone concentration, and somehow alter the type of detectable isoflavone species must be rethought in light

of this research. The findings of this research support the notion that total soybean plant seed isoflavone concentration is the best measure for cultivar selection.

The role of future research may best be focused on the physiological affects of three specific treatment effects. The first broad focused area would be to evaluate various cropping systems, chemical protectants, and air pollutants in combination with temperature and moisture stress. This effort could aid in focusing breeding on cultivars better suited to these extremes. In addition, it would also be of practical benefit to evaluate soybean cultivars from extreme maturity groups such as 0 and 12 to elucidate any potential temporal effects with respect to repair and isoflavone specific enzyme production. The third area of research would focus specifically on the isoflavone production and storage. A more basic approach to soybean isoflavone production needs to be focused on the production and storage enzymology and genetics. A better understanding of the functioning and controls of these systems would could lead to the ability of farmers to select high isoflavone markets.

Appendices

Statistical Analysis

SAS Programming

Chapter 3: SAS Programming for Statistical Analysis of Soybean
[*Glycine max* (L.) Merr] Seed And Leaf Isoflavone Response To
Lactofen Applications

Isoflavone Analysis - Lactofen Study

```

=====
Data HPLC;
options ls=96 ps=33 pageno=1;
title1 "Bill Phillips, II";

%include 'E:\PhD Program\Biometrics\Chapter 3\Isoflavone Analysis Post
Defense\Analysis.sas';
%include 'E:\PhD Program\Biometrics\Chapter 3\Isoflavone Analysis Post
Defense\pdmix800.mac';

Proc Import Out=NewHPLC
            Replace
            datafile="E:\PhD Program\Biometrics\Chapter 3\Isoflavone
Analysis Post Defense\NewHPLCData.xls";
            Quit;

/*=====
Macro contains the Mixed analysis*/
%Analysis
/*=====*/
Proc Print Data=NewHPLC (Obs=26);
Quit;

/* =====This
is a macro to calculate the concentration of Isoflavones from the area under
the curve. Due to differences in dilutions between the leaf tissue(20 ml)
and the seed (10 ml) there are two sets.*/
/*Calculations Area -> mg/L Malonyl use a ratio of mol wt [~malonyl]*(Malonyl
mol wt/Glucoside mol wt)
=====*/

%MACRO ConsCalc;
Data HPLC;

```

```

Set HPLC;

Data HPLC;
Set HPLC;
  If Daidzin > 1 Then Daidzin=(((3.55E-6*Daidzin)+6.79)/5);
  Else If Daidzin < 1 Then Daidzin=0;

  If Malonyl_Daidzin > 1 Then Malonyl_Daidzin=(((3.55E-
6*Malonyl_Daidzin)+6.79)*1.20666)/5);
  Else If Malonyl_Daidzin < 1 Then Malonyl_Daidzin=0;

  If Genistin > 1 Then Genistin=(((6.9E-6*Genistin)+3.19)/5);
  Else If Genistin < 1 Then Genistin=0;

  If Malonyl_Genistin > 1 Then Malonyl_Genistin=(((6.9E-
6*Malonyl_Genistin)+3.19)*1.19901)/5);
  Else If Malonyl_Genistin < 1 Then Malonyl_Genistin=0;

  If Glycitin > 1 Then Glycitin=(((3.04E-6*Glycitin)-0.55)/5);
  Else If Glycitin < 1 Then Glycitin=0;

  If Malonyl_Glycitin > 1 Then Malonyl_Glycitin=(((3.04E-
6*Malonyl_Glycitin)-0.55)*1.19276)/5);
  Else If Malonyl_Glycitin < 1 Then Malonyl_Glycitin=0;

  If Genistein > 1 Then Genistein=(((4.78E-6*Genistein)-0.03)/5);
  Else If Genistein < 1 Then Genistein=0;

Run;
*=====
Leaf extract was diluted double that of the seed.
*=====;

Proc Sort Data=HPLC;
  By Sample_Type;
  Quit;

Data NewHPLC;
Set HPLC;
  If Sample_Type=LeafPre Then Daidzin=(Daidzin/2);
  If Sample_Type=LeafPre Then Malonyl_Daidzin=(Malonyl_Daidzin/2);
  If Sample_Type=LeafPre Then Genistin=(Genistin/2);
  If Sample_Type=LeafPre Then Malonyl_Genistin=(Malonyl_Genistin/2);
  If Sample_Type=LeafPre Then Glycitin=(Glycitin/2);
  If Sample_Type=LeafPre Then Malonyl_Glycitin=(Malonyl_Glycitin/2);
  If Sample_Type=LeafPre Then Genistein=(Genistein/2);
  If Sample_Type=LeafPost Then Daidzin=(Daidzin/2);
  If Sample_Type=LeafPost Then Malonyl_Daidzin=(Malonyl_Daidzin/2);
  If Sample_Type=LeafPost Then Genistin=(Genistin/2);
  If Sample_Type=LeafPost Then Malonyl_Genistin=(Malonyl_Genistin/2);
  If Sample_Type=LeafPost Then Glycitin=(Glycitin/2);
  If Sample_Type=LeafPost Then Malonyl_Glycitin=(Malonyl_Glycitin/2);
  If Sample_Type=LeafPost Then Genistein=(Genistein/2);

```

```
Keep Farm Year Field_Type Block Sample_Type Timing Cultivar Plot
      Daidzin Genistin Glycitin Malonyl_Daidzin Malonyl_Genistin
Malonyl_Glycitin Genistein;
```

```
Proc Export data=NewHPLC Replace
      outfile="E:\PhD Program\Biometrics\Chapter 3\Output\NewHPLC.xls";
      Quit;
```

```
%MEND ConsCalc;
```

```
%MACRO Analysis;
```

```
/*
```

```
=====
OVERALL ANALYSIS for Main Effects and Interactions
=====
```

```
Dependant Variable (mg/Kg) = mgPerKg
-----
```

```
2 Years = Year
```

```
2 Locations = Farm
```

```
2 Cropping Systems at each farm (DC and FS)= Field_Type
```

```
3 Blocks within each field (12 plots - Each block has
                                     2 treatments and one
```

```
control/cultivar) = Block
```

```
4 Cultivars (Bass, Corsica, Jack, Williams82) = Cultivar
```

```
2 Herbicide Application Timings on Each Cultivar = Timing
```

```
2 Samples Harvested (Leaf and Seed) = Sample_Type
```

```
7 Isoflavone Types (1-7) = Isoflavone
=====
```

```
/******
```

```
Daidzin
```

```
*****/
```

```
Proc Sort Data=NewHPLC;
```

```
By Sample_Type;
```

```
Quit;
```

```
Proc Mixed Data=NewHPLC;
```

```
By Sample_Type;
```

```
Class Year Farm Field_Type Block Cultivar Timing;
```

```
Model      Daidzin=Farm
```

```
            Field_Type
```

```
            Field_Type*Farm
```

```
            Cultivar
```

```
            Cultivar*Field_Type
```

```
            Timing
```

```
            Timing*Field_Type
```

```
            Timing*Cultivar
```

```
            Timing*Field_Type*Cultivar
```

```
            / outp=residsD; /*ddfm=kr*/
```

```
Random      Year Year*Farm
```

```
            Field_Type*Year*Farm
```

```
            Block(Year Farm Field_Type)
```

```

Block*Year*Farm*Cultivar
Block*Year*Farm*Cultivar*Timing
Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
   Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Field_Type*Cultivar/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmd;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmd, slice=Field_Type);
%pdmix800(diffs, lsmd, slice=Cultivar);
Quit;

Proc Univariate data=residsD PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=residsD Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsD.xls";
  Quit;
Proc Export data=lsmd Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansD.xls";
  Quit;
/*+++++*/

/*****
MalonylDaidzin
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model      Malonyl_Daidzin=Farm
           Field_Type
           Field_Type*Farm
           Cultivar
           Cultivar*Field_Type
           Timing
           Timing*Field_Type
           Timing*Cultivar
           Timing*Field_Type*Cultivar
           / outp=residsMD;/*ddfm=kr*/

Random    Year Year*Farm
          Field_Type*Year*Farm
          Block(Year Farm Field_Type)
          Block*Year*Farm*Cultivar
          Block*Year*Farm*Cultivar*Timing

```



```

        Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
   Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Field_Type*Cultivar/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmd;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmd, slice=Field_Type);
%pdmix800(diffs, lsmd, slice=Cultivar);
Quit;

Proc Univariate data=residsMD PLOT NORMAL;
  By Sample_Type
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=residsMD Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsMD.xls";
  Quit;
Proc Export data=lsmd Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansMD.xls";
  Quit;
/*+++++*/

/*****
Genistin
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model      Genistin=Farm
           Field_Type
           Field_Type*Farm
           Cultivar
           Cultivar*Field_Type
           Timing
           Timing*Field_Type
           Timing*Cultivar
           Timing*Field_Type*Cultivar
           / outp=residsG;/*ddfm=kr*/

Random     Year Year*Farm
           Field_Type*Year*Farm
           Block(Year Farm Field_Type)
           Block*Year*Farm*Cultivar
           Block*Year*Farm*Cultivar*Timing
           Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr

```

```

Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Field_Type*Timing/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmG;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmG, slice=Field_Type);
%pdmix800(diffs, lsmG, slice=Cultivar);
%pdmix800(diffs, lsmG, slice=Timing);
Quit;

Proc Univariate data=residsG PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=resids Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsG.xls";
  Quit;
Proc Export data=lsmG Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansG.xls";
  Quit;
/*+++++*/

/*****
MalonylGenistin
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model          Malonyl_Genistin=Farm
                Field_Type
                Field_Type*Farm
                Cultivar
                Cultivar*Field_Type
                Timing
                Timing*Field_Type
                Timing*Cultivar
                Timing*Field_Type*Cultivar
                / outp=residsMG; /*ddfm=kr*/

Random         Year Year*Farm
                Field_Type*Year*Farm
                Block(Year Farm Field_Type)
                Block*Year*Farm*Cultivar
                Block*Year*Farm*Cultivar*Timing
                Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
  Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

```

```

lsmeans Field_Type Cultivar Field_Type*Cultivar Timing / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmMG;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmMG, slice=Field_Type);
%pdmix800(diffs, lsmMG, slice=Cultivar);
%pdmix800(diffs, lsmMG, slice=Timing);
Quit;

Proc Univariate data=residsMG PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=residsMG Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsMG.xls";
  Quit;
Proc Export data=lsmMG Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansMG.xls";
  Quit;

/*+++++*/
/*****
Glycitin
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model      Glycitin=Farm
           Field_Type
           Field_Type*Farm
           Cultivar
           Cultivar*Field_Type
           Timing
           Timing*Field_Type
           Timing*Cultivar
           Timing*Field_Type*Cultivar
           / outp=residsGL; /*ddfm=kr*/

Random    Year Year*Farm
          Field_Type*Year*Farm
          Block(Year Farm Field_Type)
          Block*Year*Farm*Cultivar
          Block*Year*Farm*Cultivar*Timing
          Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
  Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

```

```

lsmeans Cultivar*Timing / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmGL;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmGL, slice=Cultivar);
%pdmix800(diffs, lsmGL, slice=Timing);
Quit;

Proc Univariate data=residsGL PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=residsGL Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsGL.xls";
  Quit;
Proc Export data=lsmGL Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansGL.xls";
  Quit;

/*+++++*/

/*****
MalonylGlycitin
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model      Malonyl_Glycitin=Farm
           Field_Type
           Field_Type*Farm
           Cultivar
           Cultivar*Field_Type
           Timing
           Timing*Field_Type
           Timing*Cultivar
           Timing*Field_Type*Cultivar
           / outp=residsML;/*ddfm=kr*/

Random     Year Year*Farm
           Field_Type*Year*Farm
           Block(Year Farm Field_Type)
           Block*Year*Farm*Cultivar
           Block*Year*Farm*Cultivar*Timing
           Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
  Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;

lsmeans Field_Type Cultivar Field_Type*Cultivar Farm*Field_Type*Block /
ADJUST=TUKEY pdiff;

```

```

ods listing exclude lsmeans;
ods output lsmeans=lsmML;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Field_Type);
%pdmix800(diffs, lsm, slice=Cultivar);
%pdmix800(diffs, lsm, slice=Timing);
%pdmix800(diffs, lsm, slice=Sample_Type);
%pdmix800(diffs, lsm, slice=Isoflavone);*/
Quit;

Proc Univariate data=residsML PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=resids Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsML.xls";
  Quit;
Proc Export data=lsmML Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansML.xls";
  Quit;

/*+++++*/

/*****
Genistein
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model          Genistein=Farm
                Field_Type
                Field_Type*Farm
                Cultivar
                Cultivar*Field_Type
                Timing
                Timing*Field_Type
                Timing*Cultivar
                Timing*Field_Type*Cultivar
                / outp=residsGE; /*ddfm=kr*/

Random          Year Year*Farm
                Field_Type*Year*Farm
                Block(Year Farm Field_Type)
                Block*Year*Farm*Cultivar
                Block*Year*Farm*Cultivar*Timing
                Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
  Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

```

```

lsmeans Timing Cultivar Field_Type*Cultivar Farm*Field_Type / ADJUST=TUKEY
pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmeGE;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmeGE, slice=Field_Type);
%pdmix800(diffs, lsmeGE, slice=Cultivar);
%pdmix800(diffs, lsmeGE, slice=Timing);
Quit;

Proc Univariate data=residsGE PLOT NORMAL;
  By Sample_Type;
  var resid;
  Histogram/Normal;
  quit;

Proc Export data=resids Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsGE.xls";
  Quit;
Proc Export data=lsmeGE Replace
  outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansGE.xls";
  Quit;

/*+++++*/
/*****
Total
*****/

Proc Mixed Data=NewHPLC;
By Sample_Type;
Class Year Farm Field_Type Block Cultivar Timing;
Model      Total_Iso=Farm
           Field_Type
           Field_Type*Farm
           Cultivar
           Cultivar*Field_Type
           Timing
           Timing*Field_Type
           Timing*Cultivar
           Timing*Field_Type*Cultivar
           / outp=residsT; /*ddfm=kr*/

Random    Year Year*Farm
          Field_Type*Year*Farm
          Block(Year Farm Field_Type)
          Block*Year*Farm*Cultivar
          Block*Year*Farm*Cultivar*Timing
          Block*Year*Farm*Field_Type*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
  Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

```

```
lsmeans Timing Cultivar Field_Type/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmT;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Field_Type);
%pdmix800(diffs, lsm, slice=Cultivar);
%pdmix800(diffs, lsm, slice=Timing);
Quit;
/**/
Proc Univariate data=residsT PLOT NORMAL;
    By Sample_Type;
    var resid;
    Histogram/Normal;
    quit;

Proc Export data=residsT Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsT.xls";
    Quit;
Proc Export data=lsmT Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansT.xls";
    Quit;

%MEND;
```

Yield, Seed Weight, Protein and Oil Analysis - Lactofen Study

```

Data Seed;
options ls=96 ps=33 pageno=1;
title1 "Bill Phillips, II";

%include 'E:\PhD Program\Biometrics\Chapter 3\SeedTotalWt.sas';
%include 'E:\PhD Program\Biometrics\Chapter 3\SeedHndWt.sas';
%include 'E:\PhD Program\Biometrics\Chapter 3\SeedProNOil.sas';
%include 'E:\PhD Program\Biometrics\Chapter 3\pdmix800.mac';

proc import
    file='E:\PhD Program\Biometrics\Chapter 3\Poplar Hill and Wye Seed Data
28 April 2005.xls'
    out=Seed
    dbms=excel2000
    replace;
sheet=Sheet3;
getnames=yes;
quit;

Proc Print Data=Seed /*(Obs=50)*/*;
Quit;

/*=====
This is a macro to */
%SeedTotalWt
/*=====*/
%SeedProNOil
/*=====*/
%SeedHndWt
/*=====*/
;

%MACRO SeedTotalWt;

/*=====*/
Title2'Seed Total Weight';
/*=====
2 Years = Year
2 Locations = Farm
2 Cropping Systems at each farm (DC and FS)= Field_Type
3 Replications
4 Cultivars (Bass, Corsica, Jack, Williams82) = Cultivar
2 Herbicide Application Timings on Each Cultivar = Timing
=====*/
Proc Mixed Data=Seed;
Class Year Farm Field_Type Cultivar Timing Rep;
/*TotlWgt HndSedWt Protein Oil;*/
Model          Yield=Farm
                Field_Type

```



```

                Field_Type*Farm
                Cultivar
                Cultivar*Field_Type
                Timing
                Timing*Field_Type
                Timing*Cultivar
                Timing*Field_Type*Cultivar
                / outp=residseed ddfm=sat;
Random          Year Year*Farm
                Field_Type*Year*Farm
                Rep(Year Farm Field_Type)
                Rep*Year*Farm*Cultivar
                Rep*Year*Farm*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
   Subject=Rep*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Farm Farm*Field_Type Field_Type / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Farm);
%pdmix800(diffs, lsm, slice=Field_Type);
Quit;

Proc Univariate data=residseed PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;
Proc Export data=residseed Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsSeed.xls";
    Quit;
Proc Export data=lsm Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansSeed.xls";
    Quit;

/*+++++*/
%MEND;

%MACRO SeedHndWt;

Title2 'Seed Hundred Weight';
Proc Mixed Data=Seed;
Class Year Farm Field_Type Cultivar Timing Rep;
/*TotlWgt HndSedWt Protein Oil;*/
Model          HndSedWt=Farm
                Field_Type
                Field_Type*Farm
                Cultivar

```

```

                Cultivar*Field_Type
                Timing
                Timing*Field_Type
                Timing*Cultivar
                Timing*Field_Type*Cultivar
                / outp=residseed2; /*ddfm=kr;*/
Random      Year Year*Farm
            Field_Type*Year*Farm
            Rep(Year Farm Field_Type)
            Rep*Year*Farm*Cultivar
            Rep*Year*Farm*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
   Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Timing Field_Type*Timing Field_Type*Cultivar
Timing*Field_Type*Cultivar
        / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm2;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm2, slice=Field_Type);
%pdmix800(diffs, lsm2, slice=Cultivar);
%pdmix800(diffs, lsm2, slice=Timing);
Quit;

Proc Univariate data=residseed2 PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;
Proc Export data=residseed2 Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsSeed2.xls";
    Quit;
Proc Export data=lsm2 Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansSeed2.xls";
    Quit;

/*+++++
+++++*/
%MEND;

%Macro SeedProNOil;

Title2 'Seed Protein';

Proc Mixed Data=Seed;
Class Year Farm Field_Type Cultivar Timing Rep;
/*TotlWgt HndSedWt Protein Oil;*/
Model      Protein=Farm
           Field_Type
           Field_Type*Farm

```

```

Cultivar
Cultivar*Field_Type
Timing
Timing*Field_Type
Timing*Cultivar
Timing*Field_Type*Cultivar
/ outp=residsP; /*ddfm=kr;*/
Random Year Year*Farm
Field_Type*Year*Farm
Rep(Year Farm Field_Type)
Rep*Year*Farm*Cultivar
Rep*Year*Farm*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Timing Field_Type*Timing / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsmP;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsmP, slice=Field_Type);
%pdmix800(diffs, lsmP, slice=Cultivar);
%pdmix800(diffs, lsmP, slice=Timing);
Quit;

Proc Univariate data=residsP PLOT NORMAL;
var resid;
Histogram/Normal;
quit;
Proc Export data=residsP Replace
outfile="E:\PhD Program\Biometrics\Chapter 3\Output\ResidsP.xls";
Quit;
Proc Export data=lsmP Replace
outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeansP.xls";
Quit;

/*=====
=====*/

Title2 'Seed Oil';

Proc Mixed Data=Seed;
Class Year Farm Field_Type Cultivar Timing Rep;
/*TotlWgt HndSedWt Protein Oil;*/
Model Oil=Farm
Field_Type
Field_Type*Farm
Cultivar
Cultivar*Field_Type
Timing
Timing*Field_Type
Timing*Cultivar

```

```

                                Timing*Field_Type*Cultivar
                                / outp=resids0; /*ddfm=kr;*/
Random      Year Year*Farm
            Field_Type*Year*Farm
            Rep(Year Farm Field_Type)
            Rep*Year*Farm*Cultivar
            Rep*Year*Farm*Cultivar*Timing;

/*Repeated Isoflavone / Type=un r rcorr
   Subject=Block*Year*Farm*Field_Type*Cultivar*Timing;*/

lsmeans Field_Type Cultivar Timing Field_Type*Timing / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm0;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
*%pdmix800(diffs, lsm0, slice=Field_Type);
*%pdmix800(diffs, lsm0, slice=Cultivar);
*%pdmix800(diffs, lsm0, slice=Timing);
Quit;

Proc Univariate data=resids0 PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;
Proc Export data=resids0 Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\Resids0.xls";
    Quit;
Proc Export data=lsm0 Replace
    outfile="E:\PhD Program\Biometrics\Chapter 3\Output\LSMeans0.xls";
    Quit;
%MEND;

```

Chapter 4: SAS Programming for Statistical Analysis of Ozone Effects on the Concentration of Seed Isoflavones in Soybean [*Glycine max* (L.) Merr.] Seeds

Isoflavone Analysis - Ozone Study

```

/*=====This is a
macro to calculate the concentration of Isoflavones from the area under the
curve. Due to differences in dilutions between the leaf tissue(20 ml) and
the seed (10 ml) there are two sets.*/
/*Calculations Area -> mg/L Malonyl use a ratio of mol wt [~malonyl]*(Malonyl
mol wt/Glucoside mol wt)
=====*/

%MACRO ISOConsCalc;
Data Ozone1;
Set Ozone1;

/*
Data Ozone debug;
Set Ozone1;
    If Daidzin > 1 Then Daidzin=(((3.55E-6*Daidzin)+6.79)/5);
        Else If Daidzin < 1 Then Daidzin=0;

    If M_Daidzin > 1 Then M_Daidzin=(((3.55E-
6*M_Daidzin)+6.79)*1.20666)/5);
        Else If M_Daidzin < 1 Then M_Daidzin=0;

    If Genistin > 1 Then Genistin=(((6.9E-6*Genistin)+3.19)/5);
        Else If Genistin < 1 Then Genistin=0;

    If M_Genistin > 1 Then M_Genistin=(((6.9E-
6*M_Genistin)+3.19)*1.19901)/5);
        Else If M_Genistin < 1 Then M_Genistin=0;

    If Genistein > 1 Then Genistein=log(((4.78E-6*Genistein)-0.03)/5);
        Else If Genistein < 1 Then Genistein=0;
Run;
Proc Export data=Ozone Replace
    outfile="E:\PhD Program\Biometrics\Ozone\Ozone.xls";
Quit;

/*+++++
+++++*/
Data OzoneISO1;
Set OzoneISO1;

Data OzoneISO;
Set OzoneISO1;
    If Daidzin > 1 Then Daidzin=(((3.55E-6*Daidzin)+6.79)/5);
        Else If Daidzin < 1 Then Daidzin=0;

```

```

      If M_Daidzin > 1 Then M_Daidzin=(((3.55E-
6*M_Daidzin)+6.79)*1.20666)/5);
      Else If M_Daidzin < 1 Then M_Daidzin=0;

      If Genistin > 1 Then Genistin=(((6.9E-6*Genistin)+3.19)/5);
      Else If Genistin < 1 Then Genistin=0;

      If M_Genistin > 1 Then M_Genistin=(((6.9E-
6*M_Genistin)+3.19)*1.19901)/5);
      Else If M_Genistin < 1 Then M_Genistin=0;

      If Genistein > 1 Then Genistein=(((4.78E-6*Genistein)-
0.03)/5)*(((4.78E-6*Genistein)-0.03)/5));
      Else If Genistein < 1 Then Genistein=0;

Run;
Proc Export data=OzoneISO Replace
  outfile="E:\PhD Program\Biometrics\Ozone\OzoneISO.xls";
  Quit;

%MEND ISOConsCalc;

%MACRO OzoneAnalysis;

*=====
*=====
*=====;
*****Note Chamber=Replication*****;
Title1 "Genistin";
Proc Mixed Data=OzoneISO;
Class Chamber Cultivar Treatmnt;
Model Genistin=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=Ginresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;
Proc Univariate data=Ginresids PLOT NORMAL;
  var resid;
  Histogram/Normal;
  quit;

Title1 "MalGenistin";
Proc Mixed Data=OzoneISO;
Class Chamber Cultivar Treatmnt;
Model M_Genistin=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr
outp=MGinresids;
Random Chamber;

```

```

lsmeans Treatmnt Cultivar Cultivar*Treatmnt / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;
Proc Univariate data=MGINresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

*=====;
*=====;
*=====;
*=====;
*****Note Chamber=Replication*****;
Title1 "Daidzin";
Proc Mixed Data=OzoneISO;
Class Chamber Cultivar Treatmnt;
Model Daidzin=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=Dinresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;
Proc Univariate data=Dinresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

Title1 "MalDaidzin";
Proc Mixed Data=OzoneISO;
Class Chamber Cultivar Treatmnt;
Model M_Daidzin=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=MDinresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;
Proc Univariate data=MDinresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

```

```
*=====;
*=====;
*=====;
*****Note Chamber=Replication*****;
Title1 "Genistein";
Proc Mixed Data=OzoneISO;
Class Chamber Cultivar Treatmnt;
Model Genistein=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr
outp=Geneinresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt / ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;
Proc Univariate data=Geneinresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

*/*=====;
*=====;

%MEND OzoneAnalysis;
```


Yield, Seed Weight, Protein and Oil Analysis - Ozone Study

```

*=====;
Title1 "Weight/Hundrd/Seed";
Proc Mixed Data=Ozone1;
Class Chamber Cultivar Treatmnt;
Model WtHundrd=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=WtHunresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;

Proc Univariate data=WtHunresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

Title1 "Yield";
Proc Mixed Data=Ozone1;
Class Chamber Cultivar Treatmnt;
Model Wtg=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=Yldresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar);
Quit;

Proc Univariate data=Yldresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;

Title1 "Oil";
Proc Mixed Data=Ozone1;
Class Chamber Cultivar Treatmnt;
Model Oil=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=Oilresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;

```

```
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar*Treatmnt);
Quit;
Proc Univariate data=Oilresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;
*****Note Chamber=Replication*****;

Title1 "Protein";
Proc Mixed Data=Ozone1;
Class Chamber Cultivar Treatmnt;
Model Protein=Cultivar Treatmnt Cultivar*Treatmnt/ ddfm=kr outp=Proresids;
Random Chamber;
lsmeans Treatmnt Cultivar Cultivar*Treatmnt/ ADJUST=TUKEY pdiff;
ods listing exclude lsmeans;
ods output lsmeans=lsm;
ods listing exclude diffs;
ods output diffs=diffs;
Quit;
%pdmix800(diffs, lsm, slice=Treatmnt);
%pdmix800(diffs, lsm, slice=Cultivar*Treatmnt);
Quit;
Proc Univariate data=Proresids PLOT NORMAL;
    var resid;
    Histogram/Normal;
    quit;
*****Note Chamber=Replication*****;
```

SAS Results

Chapter 3: SAS Output for Statistical Analysis of Soybean
 [*Glycine max* (L.) Merr] Seed And Leaf Isoflavone Response To
 Lactofen Applications

Seed and Leaf Isoflavone Analysis - Lactofen Study

Daidzin Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	184.16631177	
1	2	153.55454458	18.33844279
2	1	139.04376030	0.14050833

3	3	125.60418772	.
4	3	121.00633877	0.00536667
5	3	120.94172349	0.00370710
6	2	120.55138043	0.01067350
7	5	120.53362403	.
8	1	120.50890025	0.00000892
9	1	120.50827420	0.00000002

----- Sample_Type=LeafPost -----

The Mixed Procedure

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
10	1	120.50827284	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.000488
Year*Farm	0
Year*Farm*Field_Type	0
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	1.86E-20
Yea*Far*Blo*Cul*Timi	0.03874
Ye*Fa*Fi*Blo*Cul*Tim	0.09057
Residual	0.01827

Fit Statistics

-2 Res Log Likelihood	120.5
AIC (smaller is better)	128.5
AICC (smaller is better)	128.8
BIC (smaller is better)	123.3

Type 3 Tests of Fixed Effects

Effect	Num	Den	F Value	Pr > F
	DF	DF		
Farm	1	1	1.30	0.4578
Field_Type	1	2	0.94	0.4347
Farm*Field_Type	1	2	1.20	0.3884
Cultivar	3	26	1.29	0.2979
Field_Type*Cultivar	3	26	0.66	0.5858
Timing	1	26	0.70	0.4119
Field_Type*Timing	1	26	0.13	0.7215
Cultivar*Timing	3	26	2.01	0.1379
Field_*Cultiv*Timing	3	26	1.26	0.3081

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	0	1.797693135E308	

WARNING: Stopped because of infinite likelihood.

----- Sample_Type=LeafPre -----

The Mixed Procedure

Covariance Parameter Values
At Last Iteration

Cov Parm	Estimate
Year	0
Year*Farm	0
Year*Farm*Field_Type	0
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0

Residual 0

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1002.19658576	
1	2	891.37705683	0.01388133
2	1	887.87553204	0.00332836
3	1	887.08723434	0.00038001
4	1	887.00086665	0.00002914
5	1	886.99434552	0.00000099
6	1	886.99413956	0.00000000

----- Sample_Type=Seed -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.8254
Year*Farm	0
Year*Farm*Field_Type	0
Bloc(Year*Farm*Fiel)	0.06018
Year*Farm*Bloc*Culti	0.6042
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	1.0045

Fit Statistics

-2 Res Log Likelihood	887.0
AIC (smaller is better)	895.0
AICC (smaller is better)	895.1
BIC (smaller is better)	889.8

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.02	0.9070
Field_Type	1	2	189.91	0.0052
Farm*Field_Type	1	2	9.05	0.0950
Cultivar	3	33	14.70	<.0001
Field_Type*Cultivar	3	117	6.46	0.0004
Timing	2	88	0.82	0.4419
Field_Type*Timing	2	117	0.02	0.9765
Cultivar*Timing	6	88	0.62	0.7100
Field_*Cultiv*Timing	6	117	0.16	0.9874

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=0.30055 maxSD=0.30055 -----

Obs Sample_Type

- 1 LeafPost
- 2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			0.08929	0.05215	2	1.71	0.2290	A
2	FS			0.02158	0.05961	2	0.36	0.7520	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.3069 maxSD=0.31352 -----

Obs Sample_Type

- 3 LeafPost
- 4 LeafPost
- 5 LeafPost
- 6 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
-----	------------	----------	--------	----------	----------------	----	---------	---------	---------

3	Bass	-0.00841	0.08013	26	-0.10	0.9172	A
4	Corsica	-0.00783	0.08139	26	-0.10	0.9241	A
5	Jack	0.1785	0.07912	26	2.26	0.0327	A
6	Williams82	0.05948	0.08450	26	0.70	0.4877	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.16556 maxSD=0.16556 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	0.08902	0.06608	26	1.35	0.1896	A
8			Late	0.02185	0.05207	26	0.42	0.6782	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.42769 maxSD=0.48026 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost
12 LeafPost
13 LeafPost
14 LeafPost
15 LeafPost
16 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC	Bass		-0.01879	0.09698	26	-0.19	0.8479	A
10	DC	Corsica		-0.01732	0.1014	26	-0.17	0.8657	A
11	DC	Jack		0.2761	0.09272	26	2.98	0.0062	A
12	DC	Williams82		0.1172	0.09586	26	1.22	0.2326	A
13	FS	Bass		0.001959	0.1111	26	0.02	0.9861	A
14	FS	Corsica		0.001661	0.1120	26	0.01	0.9883	A
15	FS	Jack		0.08088	0.1104	26	0.73	0.4702	A
16	FS	Williams82		0.001812	0.1228	26	0.01	0.9883	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=0.6676 maxSD=0.6676 -----

Obs Sample_Type

17 Seed
18 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			5.3978	0.6613	2	8.16	0.0147	A
18	FS			3.2596	0.6613	2	4.93	0.0388	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.97084 maxSD=0.97233 -----

Obs Sample_Type

19 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		4.0999	0.6923	33	5.92	<.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.97084 maxSD=0.97233 -----
(continued)

Obs Sample_Type

20 Seed

21 Seed

22 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
20		Corsica		4.7126	0.6925	33	6.81	<.0001	AB
21		Jack		3.1035	0.6925	33	4.48	<.0001	C
22		Williams82		5.3989	0.6929	33	7.79	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.34573 maxSD=0.34654 -----

Obs Sample_Type

23 Seed

24 Seed

25 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23			Control	4.3855	0.6620	88	6.62	<.0001	A
24			Early	4.3797	0.6620	88	6.62	<.0001	A
25			Late	4.2210	0.6621	88	6.37	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.09763 maxSD=1.10463 -----

Obs Sample_Type

26 Seed

27 Seed

28 Seed

29 Seed

30 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
26	DC	Bass		5.5373	0.7035	117	7.87	<.0001	A
27	DC	Corsica		5.7236	0.7042	117	8.13	<.0001	A
28	DC	Jack		3.8156	0.7042	117	5.42	<.0001	B

29	DC	Williams82		6.5148	0.7060	117	9.23	<.0001	A
30	FS	Bass		2.6624	0.7044	117	3.78	0.0002	BC

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.09763 maxSD=1.10463 -----
(continued)

Obs Sample_Type

31 Seed
32 Seed
33 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31	FS	Corsica		3.7016	0.7042	117	5.26	<.0001	AB
32	FS	Jack		2.3913	0.7042	117	3.40	0.0009	C
33	FS	Williams82		4.2830	0.7042	117	6.08	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=0.30055 maxSD=0.30055 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			0.08929	0.05215	2	1.71	0.2290	A
2	FS			0.02158	0.05961	2	0.36	0.7520	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.3069 maxSD=0.31352 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		-0.00841	0.08013	26	-0.10	0.9172	A
4		Corsica		-0.00783	0.08139	26	-0.10	0.9241	A
5		Jack		0.1785	0.07912	26	2.26	0.0327	A
6		Williams82		0.05948	0.08450	26	0.70	0.4877	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.16556 maxSD=0.16556 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	0.08902	0.06608	26	1.35	0.1896	A
8			Late	0.02185	0.05207	26	0.42	0.6782	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.33656 maxSD=0.35139 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost
12 LeafPost
13 LeafPost
14 LeafPost
15 LeafPost
16 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC	Bass		-0.01879	0.09698	26	-0.19	0.8479	A
10	FS	Bass		0.001959	0.1111	26	0.02	0.9861	A
11	DC	Corsica		-0.01732	0.1014	26	-0.17	0.8657	A
12	FS	Corsica		0.001661	0.1120	26	0.01	0.9883	A
13	DC	Jack		0.2761	0.09272	26	2.98	0.0062	A
14	FS	Jack		0.08088	0.1104	26	0.73	0.4702	A
15	DC	Williams82		0.1172	0.09586	26	1.22	0.2326	A
16	FS	Williams82		0.001812	0.1228	26	0.01	0.9883	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=0.6676 maxSD=0.6676 -----

Obs Sample_Type

17 Seed
18 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			5.3978	0.6613	2	8.16	0.0147	A
18	FS			3.2596	0.6613	2	4.93	0.0388	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.97084 maxSD=0.97233 -----

Obs Sample_Type

19 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		4.0999	0.6923	33	5.92	<.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.97084 maxSD=0.97233 -----

(continued)

Obs Sample_Type

20 Seed
21 Seed
22 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
20		Corsica		4.7126	0.6925	33	6.81	<.0001	AB
21		Jack		3.1035	0.6925	33	4.48	<.0001	C
22		Williams82		5.3989	0.6929	33	7.79	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.34573 maxSD=0.34654 -----

Obs Sample_Type

23 Seed
24 Seed
25 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23			Control	4.3855	0.6620	88	6.62	<.0001	A
24			Early	4.3797	0.6620	88	6.62	<.0001	A
25			Late	4.2210	0.6621	88	6.37	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.61099 maxSD=0.62025 -----

Obs Sample_Type

26 Seed
27 Seed
28 Seed
29 Seed
30 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
26	DC	Bass		5.5373	0.7035	117	7.87	<.0001	A
27	FS	Bass		2.6624	0.7044	117	3.78	0.0002	B
28	DC	Corsica		5.7236	0.7042	117	8.13	<.0001	A
29	FS	Corsica		3.7016	0.7042	117	5.26	<.0001	B
30	DC	Jack		3.8156	0.7042	117	5.42	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.61099 maxSD=0.62025 -----
(continued)

Obs Sample_Type

31 Seed
32 Seed
33 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31	FS	Jack		2.3913	0.7042	117	3.40	0.0009	B
32	DC	Williams82		6.5148	0.7060	117	9.23	<.0001	A
33	FS	Williams82		4.2830	0.7042	117	6.08	<.0001	B

Genistin Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	438.05513306	
1	4	407.67612777	0.11383027
2	2	406.55449341	.
3	3	405.54607559	0.00010354
4	1	405.53790031	0.00000289
5	1	405.53768090	0.00000000

Convergence criteria met.

----- Sample_Type=LeafPost -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.02639
Year*Farm	0
Year*Farm*Field_Type	0.4930
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	1.3E-18
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	0.7446

Fit Statistics

-2 Res Log Likelihood	405.5
AIC (smaller is better)	411.5
AICC (smaller is better)	411.7
BIC (smaller is better)	407.6

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	1.44	0.4425
Field_Type	1	2	1.58	0.3352
Farm*Field_Type	1	2	0.64	0.5070
Cultivar	3	26	2.00	0.1389
Field_Type*Cultivar	3	26	0.96	0.4260
Timing	1	26	9.14	0.0056
Field_Type*Timing	1	26	39.03	<.0001
Cultivar*Timing	3	26	0.16	0.9245
Field_*Cultiv*Timing	3	26	0.21	0.8876

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	558.66072540	
1	3	505.32066316	0.03250902
2	3	502.12251581	.
3	2	502.04965139	0.00018033
4	1	502.04224255	0.00000398
5	1	502.04208961	0.00000000

Convergence criteria met.

----- Sample_Type=LeafPre -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.2102
Year*Farm	0.008384
Year*Farm*Field_Type	0.09030
Bloc(Year*Farm*Fiel)	0.009615
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	0.05253
Ye*Fa*Fi*Blo*Cul*Tim	0.03043
Residual	0.3233

Fit Statistics

-2 Res Log Likelihood	502.0
AIC (smaller is better)	516.0
AICC (smaller is better)	516.5
BIC (smaller is better)	506.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.23	0.7154
Field_Type	1	2	7.93	0.1064
Farm*Field_Type	1	2	0.01	0.9192
Cultivar	3	33	3.95	0.0164
Field_Type*Cultivar	3	36	0.73	0.5429
Timing	1	36	0.48	0.4917
Field_Type*Timing	1	36	3.90	0.0559

Cultivar*Timing	3	36	2.60	0.0669
Field_*Cultiv*Timing	3	36	1.65	0.1953

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1553.48688370	
1	2	1404.07347642	0.00337155
2	1	1402.19450685	0.00063956
3	1	1401.85710114	0.00005110
4	1	1401.83204816	0.00000060
5	1	1401.83177080	0.00000000

Convergence criteria met.

----- Sample_Type=Seed -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	9.9110
Year*Farm	0
Year*Farm*Field_Type	0.8394
Bloc(Year*Farm*Fiel)	0.8026
Year*Farm*Bloc*Culti	3.6654
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	7.0941

Fit Statistics

-2 Res Log Likelihood	1401.8
AIC (smaller is better)	1411.8
AICC (smaller is better)	1412.1
BIC (smaller is better)	1405.3

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.12	0.7838
Field_Type	1	2	66.04	0.0148
Farm*Field_Type	1	2	3.60	0.1980
Cultivar	3	33	5.32	0.0042
Field_Type*Cultivar	3	117	0.88	0.4545
Timing	2	88	1.32	0.2733
Field_Type*Timing	2	117	0.09	0.9164
Cultivar*Timing	6	88	0.89	0.5040
Field_*Cultiv*Timing	6	117	0.22	0.9680

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=2.31723 maxSD=2.31723 -----

Obs Sample_Type

- 1 LeafPost
- 2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			2.2982	0.4024	2	5.71	0.0293	A
2	FS			1.6205	0.3932	2	4.12	0.0541	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.61418 maxSD=0.63605 -----

Obs Sample_Type

- 3 LeafPost
- 4 LeafPost
- 5 LeafPost
- 6 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
-----	------------	----------	--------	----------	----------------	----	---------	---------	---------

3	Bass	2.1199	0.3212	26	6.60	<.0001	A
4	Corsica	1.9020	0.3240	26	5.87	<.0001	A
5	Jack	1.6769	0.3193	26	5.25	<.0001	A
6	Williams82	2.1387	0.3289	26	6.50	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.35296 maxSD=0.35296 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	2.2189	0.3122	26	7.11	<.0001	A
8			Late	1.6999	0.2979	26	5.71	<.0001	B

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=0.5956 maxSD=0.6935 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost
12 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC		Early	3.0944	0.4061	26	7.62	<.0001	A
10	DC		Late	1.5021	0.4230	26	3.55	0.0015	B
11	FS		Early	1.3434	0.4455	26	3.02	0.0057	A
12	FS		Late	1.8976	0.3869	26	4.90	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.92172 maxSD=1.07507 -----

Obs Sample_Type

13 LeafPost
14 LeafPost
15 LeafPost
16 LeafPost
17 LeafPost
18 LeafPost
19 LeafPost
20 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
13	DC	Bass		2.5709	0.4333	26	5.93	<.0001	A
14	DC	Corsica		2.3941	0.4410	26	5.43	<.0001	A
15	DC	Jack		1.8736	0.4374	26	4.28	0.0002	A
16	DC	Williams82		2.3543	0.4391	26	5.36	<.0001	A
17	FS	Bass		1.6690	0.4455	26	3.75	0.0009	A
18	FS	Corsica		1.4098	0.4459	26	3.16	0.0040	A
19	FS	Jack		1.4802	0.4359	26	3.40	0.0022	A

20 FS Williams82 1.9231 0.4620 26 4.16 0.0003 A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.02591 maxSD=1.02591 -----

Obs Sample_Type

21 LeafPre
22 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	DC			2.1204	0.3711	2	5.71	0.0293	A
22	FS			1.4490	0.3674	2	3.94	0.0587	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.37744 maxSD=0.38064 -----

Obs Sample_Type

23 LeafPre
24 LeafPre
25 LeafPre
26 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23		Bass		1.7690	0.3602	33	4.91	<.0001	AB
24		Corsica		1.5848	0.3595	33	4.41	0.0001	B
25		Jack		1.7331	0.3596	33	4.82	<.0001	AB
26		Williams82		2.0520	0.3598	33	5.70	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.21554 maxSD=0.21554 -----

Obs Sample_Type

27 LeafPre
28 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
27			Early	1.7478	0.3514	36	4.97	<.0001	A
28			Late	1.8217	0.3556	36	5.12	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=0.34729 maxSD=0.3969 -----

Obs Sample_Type

29 LeafPre
30 LeafPre
31 LeafPre
32 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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29	DC	Early	1.9882	0.3705	36	5.37	<.0001	A
30	DC	Late	2.2526	0.3890	36	5.79	<.0001	A
31	FS	Early	1.5074	0.3740	36	4.03	0.0003	A
32	FS	Late	1.3907	0.3709	36	3.75	0.0006	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.52827 maxSD=0.59636 -----

Obs Sample_Type

33 LeafPre
34 LeafPre
35 LeafPre
36 LeafPre
37 LeafPre
38 LeafPre
39 LeafPre
40 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC	Bass		2.1908	0.3933	36	5.57	<.0001	A
34	DC	Corsica		1.8617	0.3895	36	4.78	<.0001	A
35	DC	Jack		2.1054	0.3909	36	5.39	<.0001	A
36	DC	Williams82		2.3240	0.3920	36	5.93	<.0001	A
37	FS	Bass		1.3472	0.3807	36	3.54	0.0011	A
38	FS	Corsica		1.3080	0.3817	36	3.43	0.0015	A
39	FS	Jack		1.3608	0.3808	36	3.57	0.0010	A
40	FS	Williams82		1.7801	0.3808	36	4.68	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.4759 maxSD=3.4759 -----

Obs Sample_Type

41 Seed
42 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
41	DC			13.7494	2.3148	2	5.94	0.0272	A
42	FS			7.1846	2.3147	2	3.10	0.0900	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=2.43373 maxSD=2.43791 -----

Obs Sample_Type

43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
43		Bass		10.1314	2.3445	33	4.32	0.0001	AB
44		Corsica		10.4292	2.3447	33	4.45	<.0001	AB

45	Jack	8.8774	2.3447	33	3.79	0.0006	B
46	Williams82	12.4300	2.3457	33	5.30	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.91882 maxSD=0.92095 -----

Obs Sample_Type

47 Seed
48 Seed
49 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	10.5707	2.2901	88	4.62	<.0001	A
48			Early	10.7151	2.2900	88	4.68	<.0001	A
49			Late	10.1151	2.2903	88	4.42	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=1.42059 maxSD=1.42836 -----

Obs Sample_Type

50 Seed
51 Seed
52 Seed
53 Seed
54 Seed
55 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
50	DC		Control	13.8757	2.3359	117	5.94	<.0001	A
51	DC		Early	13.9082	2.3357	117	5.95	<.0001	A
52	DC		Late	13.4643	2.3369	117	5.76	<.0001	A
53	FS		Control	7.2658	2.3361	117	3.11	0.0023	A
54	FS		Early	7.5220	2.3359	117	3.22	0.0017	A
55	FS		Late	6.7659	2.3359	117	2.90	0.0045	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=2.78201 maxSD=2.80164 -----

Obs Sample_Type

56 Seed
57 Seed
58 Seed
59 Seed
60 Seed
61 Seed
62 Seed
63 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
56	DC	Bass		13.7658	2.3932	117	5.75	<.0001	AB
57	DC	Corsica		13.4494	2.3947	117	5.62	<.0001	AB
58	DC	Jack		12.2933	2.3947	117	5.13	<.0001	B

59	DC	Williams82		15.4890	2.3984	117	6.46	<.0001	A
60	FS	Bass		6.4970	2.3951	117	2.71	0.0077	AB
61	FS	Corsica		7.4089	2.3947	117	3.09	0.0025	AB
62	FS	Jack		5.4614	2.3947	117	2.28	0.0244	B
63	FS	Williams82		9.3709	2.3947	117	3.91	0.0002	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=2.31723 maxSD=2.31723 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			2.2982	0.4024	2	5.71	0.0293	A
2	FS			1.6205	0.3932	2	4.12	0.0541	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.61418 maxSD=0.63605 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		2.1199	0.3212	26	6.60	<.0001	A
4		Corsica		1.9020	0.3240	26	5.87	<.0001	A
5		Jack		1.6769	0.3193	26	5.25	<.0001	A
6		Williams82		2.1387	0.3289	26	6.50	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.35296 maxSD=0.35296 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	2.2189	0.3122	26	7.11	<.0001	A
8			Late	1.6999	0.2979	26	5.71	<.0001	B

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=1.25221 maxSD=1.62483 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost

12 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC		Early	3.0944	0.4061	26	7.62	<.0001	A
10	DC		Late	1.5021	0.4230	26	3.55	0.0015	B
11	FS		Early	1.3434	0.4455	26	3.02	0.0057	B
12	FS		Late	1.8976	0.3869	26	4.90	<.0001	AB

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.50171 maxSD=1.5311 -----

Obs Sample_Type

13 LeafPost
 14 LeafPost
 15 LeafPost
 16 LeafPost
 17 LeafPost
 18 LeafPost
 19 LeafPost
 20 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
13	DC	Bass		2.5709	0.4333	26	5.93	<.0001	A
14	FS	Bass		1.6690	0.4455	26	3.75	0.0009	A
15	DC	Corsica		2.3941	0.4410	26	5.43	<.0001	A
16	FS	Corsica		1.4098	0.4459	26	3.16	0.0040	A
17	DC	Jack		1.8736	0.4374	26	4.28	0.0002	A
18	FS	Jack		1.4802	0.4359	26	3.40	0.0022	A
19	DC	Williams82		2.3543	0.4391	26	5.36	<.0001	A
20	FS	Williams82		1.9231	0.4620	26	4.16	0.0003	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.02591 maxSD=1.02591 -----

Obs Sample_Type

21 LeafPre
 22 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	DC			2.1204	0.3711	2	5.71	0.0293	A
22	FS			1.4490	0.3674	2	3.94	0.0587	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.37744 maxSD=0.38064 -----

Obs Sample_Type

23 LeafPre
 24 LeafPre
 25 LeafPre
 26 LeafPre

Field_ Type	Standard Error	Pr > t	Let Grp
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Obs	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
23		Bass		1.7690	0.3602	33	4.91	<.0001	AB
24		Corsica		1.5848	0.3595	33	4.41	0.0001	B
25		Jack		1.7331	0.3596	33	4.82	<.0001	AB
26		Williams82		2.0520	0.3598	33	5.70	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.21554 maxSD=0.21554 -----

Obs Sample_Type

27 LeafPre
28 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
27			Early	1.7478	0.3514	36	4.97	<.0001	A
28			Late	1.8217	0.3556	36	5.12	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=0.5922 maxSD=0.74205 -----

Obs Sample_Type

29 LeafPre
30 LeafPre
31 LeafPre
32 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
29	DC		Early	1.9882	0.3705	36	5.37	<.0001	AB
30	DC		Late	2.2526	0.3890	36	5.79	<.0001	A
31	FS		Early	1.5074	0.3740	36	4.03	0.0003	B
32	FS		Late	1.3907	0.3709	36	3.75	0.0006	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.68708 maxSD=0.69313 -----

Obs Sample_Type

33 LeafPre
34 LeafPre
35 LeafPre
36 LeafPre
37 LeafPre
38 LeafPre
39 LeafPre
40 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC	Bass		2.1908	0.3933	36	5.57	<.0001	A
34	FS	Bass		1.3472	0.3807	36	3.54	0.0011	A
35	DC	Corsica		1.8617	0.3895	36	4.78	<.0001	A
36	FS	Corsica		1.3080	0.3817	36	3.43	0.0015	A
37	DC	Jack		2.1054	0.3909	36	5.39	<.0001	A

38	FS	Jack		1.3608	0.3808	36	3.57	0.0010	A
39	DC	Williams82		2.3240	0.3920	36	5.93	<.0001	A
40	FS	Williams82		1.7801	0.3808	36	4.68	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.4759 maxSD=3.4759 -----

Obs Sample_Type

41 Seed
42 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
41	DC			13.7494	2.3148	2	5.94	0.0272	A
42	FS			7.1846	2.3147	2	3.10	0.0900	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=2.43373 maxSD=2.43791 -----

Obs Sample_Type

43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
43		Bass		10.1314	2.3445	33	4.32	0.0001	AB
44		Corsica		10.4292	2.3447	33	4.45	<.0001	AB
45		Jack		8.8774	2.3447	33	3.79	0.0006	B
46		Williams82		12.4300	2.3457	33	5.30	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.91882 maxSD=0.92095 -----

Obs Sample_Type

47 Seed
48 Seed
49 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	10.5707	2.2901	88	4.62	<.0001	A
48			Early	10.7151	2.2900	88	4.68	<.0001	A
49			Late	10.1151	2.2903	88	4.42	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=2.23518 maxSD=2.67885 -----

Obs Sample_Type

50 Seed
51 Seed
52 Seed

53 Seed
54 Seed
55 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
50	DC		Control	13.8757	2.3359	117	5.94	<.0001	A
51	DC		Early	13.9082	2.3357	117	5.95	<.0001	A
52	DC		Late	13.4643	2.3369	117	5.76	<.0001	A
53	FS		Control	7.2658	2.3361	117	3.11	0.0023	B
54	FS		Early	7.5220	2.3359	117	3.22	0.0017	B
55	FS		Late	6.7659	2.3359	117	2.90	0.0045	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=2.31448 maxSD=2.33196 -----

Obs Sample_Type

56 Seed
57 Seed
58 Seed
59 Seed
60 Seed
61 Seed
62 Seed
63 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
56	DC	Bass		13.7658	2.3932	117	5.75	<.0001	A
57	FS	Bass		6.4970	2.3951	117	2.71	0.0077	B
58	DC	Corsica		13.4494	2.3947	117	5.62	<.0001	A
59	FS	Corsica		7.4089	2.3947	117	3.09	0.0025	B
60	DC	Jack		12.2933	2.3947	117	5.13	<.0001	A
61	FS	Jack		5.4614	2.3947	117	2.28	0.0244	B
62	DC	Williams82		15.4890	2.3984	117	6.46	<.0001	A
63	FS	Williams82		9.3709	2.3947	117	3.91	0.0002	B

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=2.31723 maxSD=2.31723 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			2.2982	0.4024	2	5.71	0.0293	A
2	FS			1.6205	0.3932	2	4.12	0.0541	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.61418 maxSD=0.63605 -----

Obs Sample_Type

3 LeafPost
4 LeafPost

```

5 LeafPost
6 LeafPost

Field_
Obs Type Cultivar Timing Estimate Standard Error DF t Value Pr > |t| Let Grp

3 Bass 2.1199 0.3212 26 6.60 <.0001 A
4 Corsica 1.9020 0.3240 26 5.87 <.0001 A
5 Jack 1.6769 0.3193 26 5.25 <.0001 A
6 Williams82 2.1387 0.3289 26 6.50 <.0001 A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.35296 maxSD=0.35296 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Field_
Obs Type Cultivar Timing Estimate Standard Error DF t Value Pr > |t| Let Grp

7 Early 2.2189 0.3122 26 7.11 <.0001 A
8 Late 1.6999 0.2979 26 5.71 <.0001 B

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=1.4042 maxSD=1.44216 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost
12 LeafPost

Field_
Obs Type Cultivar Timing Estimate Standard Error DF t Value Pr > |t| Let Grp

9 DC Early 3.0944 0.4061 26 7.62 <.0001 A
10 FS Early 1.3434 0.4455 26 3.02 0.0057 B
11 DC Late 1.5021 0.4230 26 3.55 0.0015 A
12 FS Late 1.8976 0.3869 26 4.90 <.0001 A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.57967 maxSD=2.03147 -----

Obs Sample_Type

13 LeafPost
14 LeafPost
15 LeafPost
16 LeafPost
17 LeafPost
18 LeafPost
19 LeafPost
20 LeafPost

Field_
Obs Type Cultivar Timing Estimate Standard Error DF t Value Pr > |t| Let Grp

13 DC Bass 2.5709 0.4333 26 5.93 <.0001 A

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14	DC	Corsica		2.3941	0.4410	26	5.43	<.0001	A
15	DC	Jack		1.8736	0.4374	26	4.28	0.0002	A
16	DC	Williams82		2.3543	0.4391	26	5.36	<.0001	A
17	FS	Bass		1.6690	0.4455	26	3.75	0.0009	A
18	FS	Corsica		1.4098	0.4459	26	3.16	0.0040	A
19	FS	Jack		1.4802	0.4359	26	3.40	0.0022	A
20	FS	Williams82		1.9231	0.4620	26	4.16	0.0003	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.02591 maxSD=1.02591 -----

Obs Sample_Type

21 LeafPre
22 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	DC			2.1204	0.3711	2	5.71	0.0293	A
22	FS			1.4490	0.3674	2	3.94	0.0587	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.37744 maxSD=0.38064 -----

Obs Sample_Type

23 LeafPre
24 LeafPre
25 LeafPre
26 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23		Bass		1.7690	0.3602	33	4.91	<.0001	AB
24		Corsica		1.5848	0.3595	33	4.41	0.0001	B
25		Jack		1.7331	0.3596	33	4.82	<.0001	AB
26		Williams82		2.0520	0.3598	33	5.70	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.21554 maxSD=0.21554 -----

Obs Sample_Type

27 LeafPre
28 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
27			Early	1.7478	0.3514	36	4.97	<.0001	A
28			Late	1.8217	0.3556	36	5.12	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=0.62806 maxSD=0.65628 -----

Obs Sample_Type

29 LeafPre

30 LeafPre
31 LeafPre
32 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
29	DC		Early	1.9882	0.3705	36	5.37	<.0001	A
30	FS		Early	1.5074	0.3740	36	4.03	0.0003	A
31	DC		Late	2.2526	0.3890	36	5.79	<.0001	A
32	FS		Late	1.3907	0.3709	36	3.75	0.0006	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.7814 maxSD=0.94169 -----

Obs Sample_Type

33 LeafPre
34 LeafPre
35 LeafPre
36 LeafPre
37 LeafPre
38 LeafPre
39 LeafPre
40 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC	Bass		2.1908	0.3933	36	5.57	<.0001	AB
34	DC	Corsica		1.8617	0.3895	36	4.78	<.0001	AB
35	DC	Jack		2.1054	0.3909	36	5.39	<.0001	AB
36	DC	Williams82		2.3240	0.3920	36	5.93	<.0001	A
37	FS	Bass		1.3472	0.3807	36	3.54	0.0011	B
38	FS	Corsica		1.3080	0.3817	36	3.43	0.0015	B
39	FS	Jack		1.3608	0.3808	36	3.57	0.0010	B
40	FS	Williams82		1.7801	0.3808	36	4.68	<.0001	AB

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.4759 maxSD=3.4759 -----

Obs Sample_Type

41 Seed
42 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
41	DC			13.7494	2.3148	2	5.94	0.0272	A
42	FS			7.1846	2.3147	2	3.10	0.0900	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=2.43373 maxSD=2.43791 -----

Obs Sample_Type

43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
43		Bass		10.1314	2.3445	33	4.32	0.0001	AB
44		Corsica		10.4292	2.3447	33	4.45	<.0001	AB
45		Jack		8.8774	2.3447	33	3.79	0.0006	B
46		Williams82		12.4300	2.3457	33	5.30	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.91882 maxSD=0.92095 -----

Obs Sample_Type

47 Seed
48 Seed
49 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	10.5707	2.2901	88	4.62	<.0001	A
48			Early	10.7151	2.2900	88	4.68	<.0001	A
49			Late	10.1151	2.2903	88	4.42	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=2.18954 maxSD=2.19353 -----

Obs Sample_Type

50 Seed
51 Seed
52 Seed
53 Seed
54 Seed
55 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
50	DC		Control	13.8757	2.3359	117	5.94	<.0001	A
51	FS		Control	7.2658	2.3361	117	3.11	0.0023	B
52	DC		Early	13.9082	2.3357	117	5.95	<.0001	A
53	FS		Early	7.5220	2.3359	117	3.22	0.0017	B
54	DC		Late	13.4643	2.3369	117	5.76	<.0001	A
55	FS		Late	6.7659	2.3359	117	2.90	0.0045	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.41098 maxSD=3.87671 -----

Obs Sample_Type

56 Seed
57 Seed
58 Seed
59 Seed
60 Seed
61 Seed
62 Seed
63 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
56	DC	Bass		13.7658	2.3932	117	5.75	<.0001	AB
57	DC	Corsica		13.4494	2.3947	117	5.62	<.0001	AB
58	DC	Jack		12.2933	2.3947	117	5.13	<.0001	BC
59	DC	Williams82		15.4890	2.3984	117	6.46	<.0001	A
60	FS	Bass		6.4970	2.3951	117	2.71	0.0077	DE
61	FS	Corsica		7.4089	2.3947	117	3.09	0.0025	DE
62	FS	Jack		5.4614	2.3947	117	2.28	0.0244	E
63	FS	Williams82		9.3709	2.3947	117	3.91	0.0002	CD

Glycitin Analysis

None Detected

Malonyldaidzin Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	878.64062305	
1	4	875.96300897	0.00045704
2	2	875.87784915	0.00000116
3	1	875.87750240	0.00000000

Convergence criteria met.

----- Sample_Type=LeafPost -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	1.3251

Year*Farm	0
Year*Farm*Field_Type	0.7049
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	6.07E-17
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	22.4430

Fit Statistics

-2 Res Log Likelihood	875.9
AIC (smaller is better)	881.9
AICC (smaller is better)	882.1
BIC (smaller is better)	878.0

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	4.76	0.2737
Field_Type	1	2	1.96	0.2966
Farm*Field_Type	1	2	1.99	0.2938
Cultivar	3	26	1.53	0.2312
Field_Type*Cultivar	3	26	0.24	0.8700
Timing	1	26	0.52	0.4785
Field_Type*Timing	1	26	0.38	0.5427
Cultivar*Timing	3	26	0.03	0.9926
Field_*Cultiv*Timing	3	26	0.18	0.9064

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51

Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	0	1.797693135E308	

WARNING: Stopped because of infinite likelihood.

----- Sample_Type=LeafPre -----

The Mixed Procedure

Covariance Parameter Values
At Last Iteration

Cov Parm	Estimate
Year	0
Year*Farm	0
Year*Farm*Field_Type	0
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	0

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1940.65428871	
1	4	1614.09609805	0.02870862
2	1	1592.87277343	0.01500097
3	1	1582.17505068	0.00627375
4	1	1577.87044104	0.00178570
5	1	1576.70626385	0.00027521
6	1	1576.53424442	0.00002810
7	1	1576.51688404	0.00000169
8	1	1576.51591161	0.00000001
9	1	1576.51590559	0.00000000

----- Sample_Type=Seed -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	82.5832
Year*Farm	4.0961
Year*Farm*Field_Type	3.28E-18
Bloc(Year*Farm*Fiel)	0.6119
Year*Farm*Bloc*Culti	14.8691
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	12.6825

Fit Statistics

-2 Res Log Likelihood	1576.5
AIC (smaller is better)	1586.5
AICC (smaller is better)	1586.8
BIC (smaller is better)	1580.0

Type 3 Tests of Fixed Effects

Effect	Num	Den	F Value	Pr > F
	DF	DF		

Farm	1	1	0.27	0.6926
Field_Type	1	2	214.94	0.0046
Farm*Field_Type	1	2	10.41	0.0841
Cultivar	3	33	15.45	<.0001
Field_Type*Cultivar	3	117	2.42	0.0696
Timing	2	88	1.74	0.1815
Field_Type*Timing	2	117	0.48	0.6194
Cultivar*Timing	6	88	1.39	0.2273
Field_*Cultiv*Timing	6	117	0.32	0.9259

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=4.86519 maxSD=4.86519 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			2.3233	1.1285	2	2.06	0.1757	A
2	FS			3.9057	1.1684	2	3.34	0.0790	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.36574 maxSD=3.48945 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		4.2986	1.2402	26	3.47	0.0018	A
4		Corsica		3.5424	1.2605	26	2.81	0.0093	A
5		Jack		1.8961	1.2128	26	1.56	0.1301	A
6		Williams82		2.7209	1.2884	26	2.11	0.0445	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.86562 maxSD=1.86562 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	3.4408	1.1597	26	2.97	0.0064	A
8			Late	2.7882	1.0326	26	2.70	0.0120	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=5.05044 maxSD=5.87722 -----

Obs Sample_Type

9 LeafPost
 10 LeafPost
 11 LeafPost
 12 LeafPost
 13 LeafPost
 14 LeafPost
 15 LeafPost
 16 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC	Bass		3.7571	1.4614	26	2.57	0.0162	A
10	DC	Corsica		2.7964	1.5157	26	1.84	0.0765	A
11	DC	Jack		0.5202	1.4447	26	0.36	0.7217	A
12	DC	Williams82		2.2197	1.4616	26	1.52	0.1409	A
13	FS	Bass		4.8401	1.6365	26	2.96	0.0065	A
14	FS	Corsica		4.2885	1.6416	26	2.61	0.0147	A
15	FS	Jack		3.2719	1.5583	26	2.10	0.0456	A
16	FS	Williams82		3.2222	1.7698	26	1.82	0.0802	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=2.27442 maxSD=2.27442 -----

Obs Sample_Type

17 Seed
 18 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			20.2659	6.5395	2	3.10	0.0903	A
18	FS			12.5160	6.5395	2	1.91	0.1957	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=4.55313 maxSD=4.5572 -----

Obs Sample_Type

19 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		14.1947	6.6147	33	2.15	0.0393	BC

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=4.55313 maxSD=4.5572 -----
 (continued)

Obs Sample_Type

20 Seed
 21 Seed
 22 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
-----	-------------	----------	--------	----------	----------------	----	---------	---------	---------

20	Corsica	17.7017	6.6149	33	2.68	0.0115	AB
21	Jack	11.4096	6.6149	33	1.72	0.0939	C
22	Williams82	22.2578	6.6155	33	3.36	0.0020	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.22871 maxSD=1.23163 -----

Obs Sample_Type

- 23 Seed
- 24 Seed
- 25 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23			Control	16.4564	6.5409	88	2.52	0.0137	A
24			Early	16.8359	6.5409	88	2.57	0.0117	A
25			Late	15.8806	6.5410	88	2.43	0.0172	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=4.94762 maxSD=4.96782 -----

Obs Sample_Type

- 26 Seed
- 27 Seed
- 28 Seed
- 29 Seed
- 30 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
26	DC	Bass		18.9319	6.6291	117	2.86	0.0051	BC
27	DC	Corsica		20.9658	6.6301	117	3.16	0.0020	AB
28	DC	Jack		14.9129	6.6301	117	2.25	0.0264	C
29	DC	Williams82		26.2530	6.6325	117	3.96	0.0001	A
30	FS	Bass		9.4576	6.6303	117	1.43	0.1564	BC

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=4.94762 maxSD=4.96782 -----
(continued)

Obs Sample_Type

- 31 Seed
- 32 Seed
- 33 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31	FS	Corsica		14.4375	6.6301	117	2.18	0.0314	AB
32	FS	Jack		7.9064	6.6301	117	1.19	0.2355	C
33	FS	Williams82		18.2626	6.6301	117	2.75	0.0068	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=4.86519 maxSD=4.86519 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			2.3233	1.1285	2	2.06	0.1757	A
2	FS			3.9057	1.1684	2	3.34	0.0790	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.36574 maxSD=3.48945 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		4.2986	1.2402	26	3.47	0.0018	A
4		Corsica		3.5424	1.2605	26	2.81	0.0093	A
5		Jack		1.8961	1.2128	26	1.56	0.1301	A
6		Williams82		2.7209	1.2884	26	2.11	0.0445	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.86562 maxSD=1.86562 -----

Obs Sample_Type

7 LeafPost
8 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			Early	3.4408	1.1597	26	2.97	0.0064	A
8			Late	2.7882	1.0326	26	2.70	0.0120	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=4.66975 maxSD=4.90499 -----

Obs Sample_Type

9 LeafPost
10 LeafPost
11 LeafPost
12 LeafPost
13 LeafPost
14 LeafPost
15 LeafPost
16 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	DC	Bass		3.7571	1.4614	26	2.57	0.0162	A

10	FS	Bass	4.8401	1.6365	26	2.96	0.0065	A
11	DC	Corsica	2.7964	1.5157	26	1.84	0.0765	A
12	FS	Corsica	4.2885	1.6416	26	2.61	0.0147	A
13	DC	Jack	0.5202	1.4447	26	0.36	0.7217	A
14	FS	Jack	3.2719	1.5583	26	2.10	0.0456	A
15	DC	Williams82	2.2197	1.4616	26	1.52	0.1409	A
16	FS	Williams82	3.2222	1.7698	26	1.82	0.0802	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=2.27442 maxSD=2.27442 -----

Obs Sample_Type

17 Seed
18 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			20.2659	6.5395	2	3.10	0.0903	A
18	FS			12.5160	6.5395	2	1.91	0.1957	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=4.55313 maxSD=4.5572 -----

Obs Sample_Type

19 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		14.1947	6.6147	33	2.15	0.0393	BC

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=4.55313 maxSD=4.5572 -----
(continued)

Obs Sample_Type

20 Seed
21 Seed
22 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
20		Corsica		17.7017	6.6149	33	2.68	0.0115	AB
21		Jack		11.4096	6.6149	33	1.72	0.0939	C
22		Williams82		22.2578	6.6155	33	3.36	0.0020	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.22871 maxSD=1.23163 -----

Obs Sample_Type

23 Seed
24 Seed
25 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23			Control	16.4564	6.5409	88	2.52	0.0137	A
24			Early	16.8359	6.5409	88	2.57	0.0117	A
25			Late	15.8806	6.5410	88	2.43	0.0172	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=2.13932 maxSD=2.17369 -----

Obs Sample_Type

26 Seed
27 Seed
28 Seed
29 Seed
30 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
26	DC	Bass		18.9319	6.6291	117	2.86	0.0051	A
27	FS	Bass		9.4576	6.6303	117	1.43	0.1564	B
28	DC	Corsica		20.9658	6.6301	117	3.16	0.0020	A
29	FS	Corsica		14.4375	6.6301	117	2.18	0.0314	B
30	DC	Jack		14.9129	6.6301	117	2.25	0.0264	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=2.13932 maxSD=2.17369 -----
(continued)

Obs Sample_Type

31 Seed
32 Seed
33 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31	FS	Jack		7.9064	6.6301	117	1.19	0.2355	B
32	DC	Williams82		26.2530	6.6325	117	3.96	0.0001	A
33	FS	Williams82		18.2626	6.6301	117	2.75	0.0068	B

Malonylgenistin Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	963.99041655	
1	4	903.66686151	0.00274108
2	2	903.16102053	0.00004826
3	2	903.14667876	0.00000059
4	1	903.14648823	0.00000000

Convergence criteria met.

----- Sample_Type=LeafPost -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	20.5700

Year*Farm	0
Year*Farm*Field_Type	21.6096
Bloc(Year*Farm*Fiel)	0.7449
Year*Farm*Bloc*Culti	8.26E-18
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	25.1273

Fit Statistics

-2 Res Log Likelihood	903.1
AIC (smaller is better)	911.1
AICC (smaller is better)	911.4
BIC (smaller is better)	905.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.29	0.6878
Field_Type	1	2	1.72	0.3202
Farm*Field_Type	1	2	0.13	0.7537
Cultivar	3	26	0.22	0.8796
Field_Type*Cultivar	3	26	0.09	0.9643
Timing	1	26	10.90	0.0028
Field_Type*Timing	1	26	2.33	0.1392
Cultivar*Timing	3	26	0.14	0.9336
Field_*Cultiv*Timing	3	26	0.07	0.9738

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51

Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1101.55217395	
1	2	994.48123576	0.04597139
2	3	992.45401515	.
3	3	991.55107681	.
4	3	982.12128484	.
5	2	981.17487119	0.00035281
6	3	981.14766372	.
7	1	981.06208571	0.00001718
8	1	981.05701550	0.00000019
9	1	981.05696244	0.00000000

----- Sample_Type=LeafPre -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	1.8412
Year*Farm	0
Year*Farm*Field_Type	4.9304
Bloc(Year*Farm*Fiel)	2.28E-36
Year*Farm*Bloc*Culti	0.3432
Yea*Far*Blo*Cul*Timi	1.56E-18
Ye*Fa*Fi*Blo*Cul*Tim	2.3546
Residual	1.4122

Fit Statistics

-2 Res Log Likelihood	981.1
AIC (smaller is better)	991.1
AICC (smaller is better)	991.3
BIC (smaller is better)	984.5

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.09	0.8107
Field_Type	1	2	2.46	0.2570
Farm*Field_Type	1	2	0.01	0.9483
Cultivar	3	33	5.24	0.0046
Field_Type*Cultivar	3	36	2.00	0.1307
Timing	1	36	1.64	0.2092

Field_Type*Timing	1	36	0.01	0.9211
Cultivar*Timing	3	36	0.86	0.4731
Field_*Cultiv*Timing	3	36	0.40	0.7528

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	2482.97218141	
1	2	2071.31099454	0.00390521
2	1	2067.46978069	0.00101242
3	1	2066.52274455	0.00014237
4	1	2066.39418860	0.00001351
5	1	2066.38233118	0.00000051
6	1	2066.38191118	0.00000000

----- Sample_Type=Seed -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	779.83
Year*Farm	35.9103
Year*Farm*Field_Type	1.5503
Bloc(Year*Farm*Fiel)	5.1722
Year*Farm*Bloc*Culti	53.5547
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	88.9296

Fit Statistics

-2 Res Log Likelihood	2066.4
AIC (smaller is better)	2078.4
AICC (smaller is better)	2078.7
BIC (smaller is better)	2070.5

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.31	0.6754
Field_Type	1	2	146.55	0.0068
Farm*Field_Type	1	2	9.44	0.0916
Cultivar	3	33	10.13	<.0001
Field_Type*Cultivar	3	117	3.85	0.0114
Timing	2	88	1.79	0.1731
Field_Type*Timing	2	117	0.08	0.9237
Cultivar*Timing	6	88	1.20	0.3160
Field_*Cultiv*Timing	6	117	0.68	0.6636

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=15.1877 maxSD=15.1877 -----

Obs Sample_Type

- 1 LeafPost
- 2 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			10.8456	4.0831	2	2.66	0.1173	A
2	FS			6.2181	4.0460	2	1.54	0.2641	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.57648 maxSD=3.70318 -----

Obs Sample_Type

- 3 LeafPost
- 4 LeafPost
- 5 LeafPost
- 6 LeafPost

Field_	Standard	Pr >	Let
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Obs	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
3		Bass		8.8772	3.7403	26	2.37	0.0253	A
4		Corsica		8.3912	3.7491	26	2.24	0.0340	A
5		Jack		7.9970	3.7359	26	2.14	0.0419	A
6		Williams82		8.8619	3.7647	26	2.35	0.0264	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=5.3666 maxSD=6.26825 -----

Obs Sample_Type

7 LeafPost
8 LeafPost
9 LeafPost
10 LeafPost
11 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	DC	Bass		11.4366	4.1874	26	2.73	0.0112	A
8	DC	Corsica		10.9082	4.2156	26	2.59	0.0156	A
9	DC	Jack		10.2374	4.2039	26	2.44	0.0220	A
10	DC	Williams82		10.8003	4.2102	26	2.57	0.0164	A
11	FS	Bass		6.3179	4.2252	26	1.50	0.1469	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=5.3666 maxSD=6.26825 -----
(continued)

Obs Sample_Type

12 LeafPost
13 LeafPost
14 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
12	FS	Corsica		5.8742	4.2270	26	1.39	0.1764	A
13	FS	Jack		5.7566	4.1916	26	1.37	0.1814	A
14	FS	Williams82		6.9236	4.2871	26	1.61	0.1184	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=2.0635 maxSD=2.0635 -----

Obs Sample_Type

15 LeafPost
16 LeafPost

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
15			Early	10.1886	3.7161	26	2.74	0.0109	A
16			Late	6.8751	3.6752	26	1.87	0.0727	B

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=6.92838 maxSD=6.92838 -----

Obs Sample_Type

17 LeafPre
18 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			5.7863	1.4963	2	3.87	0.0608	A
18	FS			3.2583	1.4864	2	2.19	0.1597	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.37193 maxSD=1.38291 -----

Obs Sample_Type

19 LeafPre
20 LeafPre
21 LeafPre
22 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		3.9040	1.2941	33	3.02	0.0049	B
20		Corsica		3.8747	1.2919	33	3.00	0.0051	B
21		Jack		4.7004	1.2934	33	3.63	0.0009	AB
22		Williams82		5.6101	1.2936	33	4.34	0.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.94101 maxSD=2.13723 -----

Obs Sample_Type

23 LeafPre
24 LeafPre
25 LeafPre
26 LeafPre
27 LeafPre
28 LeafPre
29 LeafPre
30 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	DC	Bass		4.7666	1.5659	36	3.04	0.0043	B
24	DC	Corsica		4.7732	1.5553	36	3.07	0.0041	B
25	DC	Jack		6.2423	1.5628	36	3.99	0.0003	AB
26	DC	Williams82		7.3629	1.5635	36	4.71	<.0001	A
27	FS	Bass		3.0413	1.5327	36	1.98	0.0549	A
28	FS	Corsica		2.9761	1.5367	36	1.94	0.0607	A
29	FS	Jack		3.1585	1.5339	36	2.06	0.0468	A
30	FS	Williams82		3.8573	1.5340	36	2.51	0.0165	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.7026 maxSD=0.7026 -----

Obs Sample_Type

31 LeafPre
32 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31			Early	4.7438	1.2613	36	3.76	0.0006	A
32			Late	4.3008	1.2732	36	3.38	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=7.30255 maxSD=7.30255 -----

Obs Sample_Type

33 Seed
34 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC			60.0591	20.0362	2	3.00	0.0956	A
34	FS			39.5126	20.0361	2	1.97	0.1874	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=9.13898 maxSD=9.15298 -----

Obs Sample_Type

35 Seed
36 Seed
37 Seed
38 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
35		Bass		47.3696	20.1241	33	2.35	0.0247	B
36		Corsica		46.3042	20.1246	33	2.30	0.0279	B
37		Jack		44.3992	20.1246	33	2.21	0.0344	B
38		Williams82		61.0704	20.1259	33	3.03	0.0047	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=10.3318 maxSD=10.3978 -----

Obs Sample_Type

39 Seed
40 Seed
41 Seed
42 Seed
43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	DC	Bass		58.9550	20.1631	117	2.92	0.0042	AB
40	DC	Corsica		54.1772	20.1654	117	2.69	0.0083	B
41	DC	Jack		56.9805	20.1654	117	2.83	0.0055	B

42	DC	Williams82		70.1237	20.1707	117	3.48	0.0007	A
43	FS	Bass		35.7842	20.1659	117	1.77	0.0786	B
44	FS	Corsica		38.4311	20.1654	117	1.91	0.0591	B
45	FS	Jack		31.8179	20.1654	117	1.58	0.1173	B
46	FS	Williams82		52.0171	20.1654	117	2.58	0.0111	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.25311 maxSD=3.26068 -----

Obs Sample_Type

47 Seed
48 Seed
49 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	49.8469	20.0336	88	2.49	0.0147	A
48			Early	51.0453	20.0335	88	2.55	0.0126	A
49			Late	48.4653	20.0339	88	2.42	0.0176	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=15.1877 maxSD=15.1877 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			10.8456	4.0831	2	2.66	0.1173	A
2	FS			6.2181	4.0460	2	1.54	0.2641	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.57648 maxSD=3.70318 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		8.8772	3.7403	26	2.37	0.0253	A
4		Corsica		8.3912	3.7491	26	2.24	0.0340	A
5		Jack		7.9970	3.7359	26	2.14	0.0419	A
6		Williams82		8.8619	3.7647	26	2.35	0.0264	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=9.62675 maxSD=9.78866 -----

Obs Sample_Type

7 LeafPost

8 LeafPost
9 LeafPost
10 LeafPost
11 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	DC	Bass		11.4366	4.1874	26	2.73	0.0112	A
8	FS	Bass		6.3179	4.2252	26	1.50	0.1469	A
9	DC	Corsica		10.9082	4.2156	26	2.59	0.0156	A
10	FS	Corsica		5.8742	4.2270	26	1.39	0.1764	A
11	DC	Jack		10.2374	4.2039	26	2.44	0.0220	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=9.62675 maxSD=9.78866 -----
(continued)

Obs Sample_Type

12 LeafPost
13 LeafPost
14 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
12	FS	Jack		5.7566	4.1916	26	1.37	0.1814	A
13	DC	Williams82		10.8003	4.2102	26	2.57	0.0164	A
14	FS	Williams82		6.9236	4.2871	26	1.61	0.1184	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=2.0635 maxSD=2.0635 -----

Obs Sample_Type

15 LeafPost
16 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
15			Early	10.1886	3.7161	26	2.74	0.0109	A
16			Late	6.8751	3.6752	26	1.87	0.0727	B

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=6.92838 maxSD=6.92838 -----

Obs Sample_Type

17 LeafPre
18 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			5.7863	1.4963	2	3.87	0.0608	A
18	FS			3.2583	1.4864	2	2.19	0.1597	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.37193 maxSD=1.38291 -----

Obs Sample_Type

19 LeafPre
20 LeafPre
21 LeafPre
22 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		3.9040	1.2941	33	3.02	0.0049	B
20		Corsica		3.8747	1.2919	33	3.00	0.0051	B
21		Jack		4.7004	1.2934	33	3.63	0.0009	AB
22		Williams82		5.6101	1.2936	33	4.34	0.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=4.1606 maxSD=4.16504 -----

Obs Sample_Type

23 LeafPre
24 LeafPre
25 LeafPre
26 LeafPre
27 LeafPre
28 LeafPre
29 LeafPre
30 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	DC	Bass		4.7666	1.5659	36	3.04	0.0043	A
24	FS	Bass		3.0413	1.5327	36	1.98	0.0549	A
25	DC	Corsica		4.7732	1.5553	36	3.07	0.0041	A
26	FS	Corsica		2.9761	1.5367	36	1.94	0.0607	A
27	DC	Jack		6.2423	1.5628	36	3.99	0.0003	A
28	FS	Jack		3.1585	1.5339	36	2.06	0.0468	A
29	DC	Williams82		7.3629	1.5635	36	4.71	<.0001	A
30	FS	Williams82		3.8573	1.5340	36	2.51	0.0165	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.7026 maxSD=0.7026 -----

Obs Sample_Type

31 LeafPre
32 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31			Early	4.7438	1.2613	36	3.76	0.0006	A
32			Late	4.3008	1.2732	36	3.38	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=7.30255 maxSD=7.30255 -----

Obs Sample_Type

33 Seed
34 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC			60.0591	20.0362	2	3.00	0.0956	A
34	FS			39.5126	20.0361	2	1.97	0.1874	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=9.13898 maxSD=9.15298 -----

Obs Sample_Type

35 Seed
36 Seed
37 Seed
38 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
35		Bass		47.3696	20.1241	33	2.35	0.0247	B
36		Corsica		46.3042	20.1246	33	2.30	0.0279	B
37		Jack		44.3992	20.1246	33	2.21	0.0344	B
38		Williams82		61.0704	20.1259	33	3.03	0.0047	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=6.10521 maxSD=6.18764 -----

Obs Sample_Type

39 Seed
40 Seed
41 Seed
42 Seed
43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	DC	Bass		58.9550	20.1631	117	2.92	0.0042	A
40	FS	Bass		35.7842	20.1659	117	1.77	0.0786	B
41	DC	Corsica		54.1772	20.1654	117	2.69	0.0083	A
42	FS	Corsica		38.4311	20.1654	117	1.91	0.0591	B
43	DC	Jack		56.9805	20.1654	117	2.83	0.0055	A
44	FS	Jack		31.8179	20.1654	117	1.58	0.1173	B
45	DC	Williams82		70.1237	20.1707	117	3.48	0.0007	A
46	FS	Williams82		52.0171	20.1654	117	2.58	0.0111	B

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.25311 maxSD=3.26068 -----

Obs Sample_Type

47 Seed
48 Seed

49 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	49.8469	20.0336	88	2.49	0.0147	A
48			Early	51.0453	20.0335	88	2.55	0.0126	A
49			Late	48.4653	20.0339	88	2.42	0.0176	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=15.1877 maxSD=15.1877 -----

Obs Sample_Type

1 LeafPost
2 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	DC			10.8456	4.0831	2	2.66	0.1173	A
2	FS			6.2181	4.0460	2	1.54	0.2641	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.57648 maxSD=3.70318 -----

Obs Sample_Type

3 LeafPost
4 LeafPost
5 LeafPost
6 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		Bass		8.8772	3.7403	26	2.37	0.0253	A
4		Corsica		8.3912	3.7491	26	2.24	0.0340	A
5		Jack		7.9970	3.7359	26	2.14	0.0419	A
6		Williams82		8.8619	3.7647	26	2.35	0.0264	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=9.86558 maxSD=12.9776 -----

Obs Sample_Type

7 LeafPost
8 LeafPost
9 LeafPost
10 LeafPost
11 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	DC	Bass		11.4366	4.1874	26	2.73	0.0112	A
8	DC	Corsica		10.9082	4.2156	26	2.59	0.0156	A
9	DC	Jack		10.2374	4.2039	26	2.44	0.0220	A
10	DC	Williams82		10.8003	4.2102	26	2.57	0.0164	A
11	FS	Bass		6.3179	4.2252	26	1.50	0.1469	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=9.86558 maxSD=12.9776 -----
 (continued)

Obs Sample_Type

12 LeafPost
 13 LeafPost
 14 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
12	FS	Corsica		5.8742	4.2270	26	1.39	0.1764	A
13	FS	Jack		5.7566	4.1916	26	1.37	0.1814	A
14	FS	Williams82		6.9236	4.2871	26	1.61	0.1184	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=2.0635 maxSD=2.0635 -----

Obs Sample_Type

15 LeafPost
 16 LeafPost

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
15			Early	10.1886	3.7161	26	2.74	0.0109	A
16			Late	6.8751	3.6752	26	1.87	0.0727	B

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=6.92838 maxSD=6.92838 -----

Obs Sample_Type

17 LeafPre
 18 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	DC			5.7863	1.4963	2	3.87	0.0608	A
18	FS			3.2583	1.4864	2	2.19	0.1597	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.37193 maxSD=1.38291 -----

Obs Sample_Type

19 LeafPre
 20 LeafPre
 21 LeafPre
 22 LeafPre

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19		Bass		3.9040	1.2941	33	3.02	0.0049	B
20		Corsica		3.8747	1.2919	33	3.00	0.0051	B

21	Jack	4.7004	1.2934	33	3.63	0.0009	AB
22	Williams82	5.6101	1.2936	33	4.34	0.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=4.08116 maxSD=5.54312 -----

Obs Sample_Type

23 LeafPre
24 LeafPre
25 LeafPre
26 LeafPre
27 LeafPre
28 LeafPre
29 LeafPre
30 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	DC	Bass		4.7666	1.5659	36	3.04	0.0043	B
24	DC	Corsica		4.7732	1.5553	36	3.07	0.0041	B
25	DC	Jack		6.2423	1.5628	36	3.99	0.0003	AB
26	DC	Williams82		7.3629	1.5635	36	4.71	<.0001	A
27	FS	Bass		3.0413	1.5327	36	1.98	0.0549	AB
28	FS	Corsica		2.9761	1.5367	36	1.94	0.0607	AB
29	FS	Jack		3.1585	1.5339	36	2.06	0.0468	AB
30	FS	Williams82		3.8573	1.5340	36	2.51	0.0165	AB

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.7026 maxSD=0.7026 -----

Obs Sample_Type

31 LeafPre
32 LeafPre

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31			Early	4.7438	1.2613	36	3.76	0.0006	A
32			Late	4.3008	1.2732	36	3.38	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=7.30255 maxSD=7.30255 -----

Obs Sample_Type

33 Seed
34 Seed

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	DC			60.0591	20.0362	2	3.00	0.0956	A
34	FS			39.5126	20.0361	2	1.97	0.1874	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=9.13898 maxSD=9.15298 -----

Obs Sample_Type

35 Seed
36 Seed
37 Seed
38 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
35		Bass		47.3696	20.1241	33	2.35	0.0247	B
36		Corsica		46.3042	20.1246	33	2.30	0.0279	B
37		Jack		44.3992	20.1246	33	2.21	0.0344	B
38		Williams82		61.0704	20.1259	33	3.03	0.0047	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=11.281 maxSD=12.2456 -----

Obs Sample_Type

39 Seed
40 Seed
41 Seed
42 Seed
43 Seed
44 Seed
45 Seed
46 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	DC	Bass		58.9550	20.1631	117	2.92	0.0042	AB
40	DC	Corsica		54.1772	20.1654	117	2.69	0.0083	B
41	DC	Jack		56.9805	20.1654	117	2.83	0.0055	B
42	DC	Williams82		70.1237	20.1707	117	3.48	0.0007	A
43	FS	Bass		35.7842	20.1659	117	1.77	0.0786	C
44	FS	Corsica		38.4311	20.1654	117	1.91	0.0591	C
45	FS	Jack		31.8179	20.1654	117	1.58	0.1173	C
46	FS	Williams82		52.0171	20.1654	117	2.58	0.0111	B

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.25311 maxSD=3.26068 -----

Obs Sample_Type

47 Seed
48 Seed
49 Seed

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
47			Control	49.8469	20.0336	88	2.49	0.0147	A
48			Early	51.0453	20.0335	88	2.55	0.0126	A
49			Late	48.4653	20.0339	88	2.42	0.0176	A

Malnoylglycitin Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Glycitin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Satterthwaite

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	683.02389098	
1	4	627.58546906	0.00510310
2	2	626.99083332	0.00087231
3	2	626.79986828	0.00014554
4	1	626.76944746	0.00000897
5	1	626.76769995	0.00000008
6	1	626.76768579	0.00000000

Malnoylglycitin Analysis

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----- Sample_Type=LeafPost -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	2.1534
Year*Farm	0
Year*Farm*Field_Type	4.5554
Bloc(Year*Farm*Fiel)	0.09976
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	3.4650

Fit Statistics

-2 Res Log Likelihood	626.8
AIC (smaller is better)	634.8
AICC (smaller is better)	635.1
BIC (smaller is better)	629.5

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	2.76	0.11	0.7639
Field_Type	1	2.84	2.71	0.2032
Farm*Field_Type	1	2.76	0.11	0.7596
Cultivar	3	130	0.25	0.8620
Field_Type*Cultivar	3	130	0.39	0.7589
Timing	1	134	0.40	0.5268
Field_Type*Timing	1	134	0.82	0.3664
Cultivar*Timing	3	130	0.64	0.5922
Field_*Cultiv*Timing	3	130	0.59	0.6200

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Glycitin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Satterthwaite

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	455.40175972	
1	2	409.85293277	477.75672487
2	1	384.89335516	86.57168638
3	1	350.78125191	22.04098081
4	1	310.80120042	6.26256525
5	1	267.35831615	1.86832520
6	1	221.90694510	0.57275686
7	1	175.47657600	0.17869141
8	1	128.90938883	0.05639550

----- Sample_Type=LeafPre -----

The Mixed Procedure

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
9	1	83.03755667	0.01791314
10	1	38.81833531	0.00569528
11	1	-2.59216973	0.00180094
12	3	-26.69352736	.
13	1	-72.13255412	0.09738260
14	1	-104.26762148	0.05356535
15	1	-122.60817631	0.02247523
16	3	-131.39098823	0.00342668
17	3	-132.50400839	0.00047745
18	2	-132.62497415	.
19	2	-132.62778424	0.00000001

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0
Year*Farm	0.001693
Year*Farm*Field_Type	0.008130
Bloc(Year*Farm*Fiel)	0.2399
Year*Farm*Bloc*Culti	0.06003
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0.3476
Residual	0.000344

Fit Statistics

-2 Res Log Likelihood	-132.6
AIC (smaller is better)	-120.6
AICC (smaller is better)	-120.3
BIC (smaller is better)	-128.5

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	2.02	1.41	0.3563
Field_Type	1	2.05	1.41	0.3539

----- Sample_Type=LeafPre -----

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm*Field_Type	1	2.03	1.43	0.3532
Cultivar	3	18.7	0.88	0.4694
Field_Type*Cultivar	3	77.6	1.08	0.3625
Timing	1	57.6	0.01	0.9434
Field_Type*Timing	1	57.6	0.00	0.9447
Cultivar*Timing	3	74.1	0.56	0.6412
Field_*Cultiv*Timing	3	60.8	0.91	0.4393

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Malonyl_Glycitin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Satterthwaite

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	190.08293174	
1	3	122.17034830	.
2	2	121.82873239	.
3	1	121.41291987	0.00736767
4	1	114.94229045	0.01096299
5	1	112.15805525	0.01084028
6	1	109.38295991	0.01075114
7	1	106.60978547	0.01066972
8	1	103.83705497	0.01059094

----- Sample_Type=Seed -----

The Mixed Procedure

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
9	1	101.06443136	0.01051364
10	1	98.29183398	0.01043755
11	1	95.51924310	0.01036257
12	1	92.74665384	0.01028867
13	1	89.97406499	0.01021582
14	1	87.20147623	0.01014399
15	1	84.42888750	0.01007316
16	1	81.65629877	0.01000331
17	1	78.88371003	0.00993443
18	1	76.11112134	0.00986649
19	1	73.33853258	0.00979947
20	1	70.56594400	0.00973336
21	1	67.79335517	0.00966813
22	1	65.02076655	0.00960377
23	1	62.24817617	0.00954027
24	1	59.47558936	0.00947758
25	1	56.70300447	0.00941572
26	1	53.93040520	0.00935472
27	1	51.15781190	0.00929445
28	1	48.38524702	0.00923483
29	1	45.61256250	0.00917659
30	1	42.83987096	0.00911882
31	1	40.06754354	0.00906012
32	1	37.29459900	0.00900554
33	1	34.52026318	0.00895689
34	1	31.74600828	0.00890476
35	1	28.96554214	0.00887847
36	1	26.20471062	0.00875458
37	1	25.30750083	0.00876323
38	1	25.28908621	0.00877333
39	1	25.27883550	0.00880167
40	1	25.27676361	0.00880318

41	6	25.27622874	0.00880368
42	5	25.27588525	0.00880388
43	15	25.27388751	0.00881056
44	18	25.27388179	0.00881058
45	19	25.27386960	0.00881064

WARNING: Did not converge.

----- Sample_Type=Seed -----

The Mixed Procedure

Covariance Parameter Values
At Last Iteration

Cov Parm	Estimate
Year	0
Year*Farm	0
Year*Farm*Field_Type	0.000767
Bloc(Year*Farm*Fiel)	0.02629
Year*Farm*Bloc*Culti	0.01319
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0.05545
Residual	1.11E-12

Malnoylglycitin Analysis

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15:01 Thursday, August 11, 2005

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.20394 maxSD=5.20394 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost	DC			2.6540	1.5350	1.79	1.73	0.2405	A
2	LeafPost	FS			0.04513	1.5197	1.72	0.03	0.9794	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.25991 maxSD=1.30451 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		1.3415	1.3362	1.1	1.00	0.4860	A
4	LeafPost		Corsica		1.1701	1.3396	1.11	0.87	0.5306	A
5	LeafPost		Jack		1.5686	1.3346	1.1	1.18	0.4352	A
6	LeafPost		Williams82		1.3180	1.3457	1.13	0.98	0.4907	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.73829 maxSD=0.73829 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost			Early	1.2311	1.3268	1.07	0.93	0.5153	A
8	LeafPost			Late	1.4680	1.3113	1.02	1.12	0.4609	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.88228 maxSD=2.19852 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		2.6507	1.5728	1.97	1.69	0.2357	A
10	LeafPost	DC	Corsica		2.2178	1.5834	2.02	1.40	0.2949	A
11	LeafPost	DC	Jack		3.1263	1.5797	2	1.98	0.1862	A
12	LeafPost	DC	Williams82		2.6210	1.5820	2.02	1.66	0.2385	A
13	LeafPost	FS	Bass		0.03227	1.5855	2.04	0.02	0.9856	A
14	LeafPost	FS	Corsica		0.1223	1.5862	2.05	0.08	0.9454	A
15	LeafPost	FS	Jack		0.01096	1.5732	1.98	0.01	0.9951	A
16	LeafPost	FS	Williams82		0.01497	1.6083	2.16	0.01	0.9934	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.00422 maxSD=1.00422 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre	DC			0.2921	0.1786	3.96	1.64	0.1779	A
18	LeafPre	FS			0.007830	0.1693	3.17	0.05	0.9659	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.49498 maxSD=0.49906 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		0.06647	0.1666	5.67	0.40	0.7045	A
20	LeafPre		Corsica		0.06714	0.1648	5.42	0.41	0.6992	A
21	LeafPre		Jack		0.1516	0.1669	5.73	0.91	0.4003	A
22	LeafPre		Williams82		0.3147	0.1669	5.7	1.89	0.1108	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.22465 maxSD=0.22465 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre			Early	0.1460	0.1327	2.47	1.10	0.3668	A
24	LeafPre			Late	0.1540	0.1437	3.43	1.07	0.3534	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.64355 maxSD=0.70112 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		0.1284	0.2352	11.5	0.55	0.5956	A
26	LeafPre	DC	Corsica		0.1279	0.2275	10.1	0.56	0.5862	A
27	LeafPre	DC	Jack		0.3073	0.2352	11.5	1.31	0.2169	A
28	LeafPre	DC	Williams82		0.6050	0.2351	11.4	2.57	0.0252	A
29	LeafPre	FS	Bass		0.004577	0.2124	7.64	0.02	0.9834	A
30	LeafPre	FS	Corsica		0.006374	0.2160	8.08	0.03	0.9772	A
31	LeafPre	FS	Jack		-0.00404	0.2139	7.87	-0.02	0.9854	A
32	LeafPre	FS	Williams82		0.02441	0.2139	7.87	0.11	0.9120	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.20394 maxSD=5.20394 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost	DC			2.6540	1.5350	1.79	1.73	0.2405	A
2	LeafPost	FS			0.04513	1.5197	1.72	0.03	0.9794	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.25991 maxSD=1.30451 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		1.3415	1.3362	1.1	1.00	0.4860	A
4	LeafPost		Corsica		1.1701	1.3396	1.11	0.87	0.5306	A
5	LeafPost		Jack		1.5686	1.3346	1.1	1.18	0.4352	A
6	LeafPost		Williams82		1.3180	1.3457	1.13	0.98	0.4907	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.73829 maxSD=0.73829 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost			Early	1.2311	1.3268	1.07	0.93	0.5153	A
8	LeafPost			Late	1.4680	1.3113	1.02	1.12	0.4609	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=6.12301 maxSD=6.19881 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		2.6507	1.5728	1.97	1.69	0.2357	A
10	LeafPost	FS	Bass		0.03227	1.5855	2.04	0.02	0.9856	A
11	LeafPost	DC	Corsica		2.2178	1.5834	2.02	1.40	0.2949	A
12	LeafPost	FS	Corsica		0.1223	1.5862	2.05	0.08	0.9454	A
13	LeafPost	DC	Jack		3.1263	1.5797	2	1.98	0.1862	A
14	LeafPost	FS	Jack		0.01096	1.5732	1.98	0.01	0.9951	A
15	LeafPost	DC	Williams82		2.6210	1.5820	2.02	1.66	0.2385	A
16	LeafPost	FS	Williams82		0.01497	1.6083	2.16	0.01	0.9934	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.00422 maxSD=1.00422 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre	DC			0.2921	0.1786	3.96	1.64	0.1779	A
18	LeafPre	FS			0.007830	0.1693	3.17	0.05	0.9659	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.49498 maxSD=0.49906 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		0.06647	0.1666	5.67	0.40	0.7045	A
20	LeafPre		Corsica		0.06714	0.1648	5.42	0.41	0.6992	A
21	LeafPre		Jack		0.1516	0.1669	5.73	0.91	0.4003	A
22	LeafPre		Williams82		0.3147	0.1669	5.7	1.89	0.1108	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.22465 maxSD=0.22465 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre			Early	0.1460	0.1327	2.47	1.10	0.3668	A
24	LeafPre			Late	0.1540	0.1437	3.43	1.07	0.3534	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.96769 maxSD=0.97244 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		0.1284	0.2352	11.5	0.55	0.5956	A
26	LeafPre	FS	Bass		0.004577	0.2124	7.64	0.02	0.9834	A
27	LeafPre	DC	Corsica		0.1279	0.2275	10.1	0.56	0.5862	A
28	LeafPre	FS	Corsica		0.006374	0.2160	8.08	0.03	0.9772	A
29	LeafPre	DC	Jack		0.3073	0.2352	11.5	1.31	0.2169	A
30	LeafPre	FS	Jack		-0.00404	0.2139	7.87	-0.02	0.9854	A
31	LeafPre	DC	Williams82		0.6050	0.2351	11.4	2.57	0.0252	A
32	LeafPre	FS	Williams82		0.02441	0.2139	7.87	0.11	0.9120	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.20394 maxSD=5.20394 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost	DC			2.6540	1.5350	1.79	1.73	0.2405	A
2	LeafPost	FS			0.04513	1.5197	1.72	0.03	0.9794	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.25991 maxSD=1.30451 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		1.3415	1.3362	1.1	1.00	0.4860	A
4	LeafPost		Corsica		1.1701	1.3396	1.11	0.87	0.5306	A
5	LeafPost		Jack		1.5686	1.3346	1.1	1.18	0.4352	A
6	LeafPost		Williams82		1.3180	1.3457	1.13	0.98	0.4907	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.73829 maxSD=0.73829 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost			Early	1.2311	1.3268	1.07	0.93	0.5153	A
8	LeafPost			Late	1.4680	1.3113	1.02	1.12	0.4609	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.87634 maxSD=5.28021 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		2.6507	1.5728	1.97	1.69	0.2357	A
10	LeafPost	DC	Corsica		2.2178	1.5834	2.02	1.40	0.2949	A
11	LeafPost	DC	Jack		3.1263	1.5797	2	1.98	0.1862	A
12	LeafPost	DC	Williams82		2.6210	1.5820	2.02	1.66	0.2385	A
13	LeafPost	FS	Bass		0.03227	1.5855	2.04	0.02	0.9856	A
14	LeafPost	FS	Corsica		0.1223	1.5862	2.05	0.08	0.9454	A
15	LeafPost	FS	Jack		0.01096	1.5732	1.98	0.01	0.9951	A
16	LeafPost	FS	Williams82		0.01497	1.6083	2.16	0.01	0.9934	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.00422 maxSD=1.00422 -----

Sample_ Type	Field_ Type	Standard Error	Pr > t	Let Grp
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Obs	Type	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
17	LeafPre	DC			0.2921	0.1786	3.96	1.64	0.1779	A
18	LeafPre	FS			0.007830	0.1693	3.17	0.05	0.9659	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.49498 maxSD=0.49906 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		0.06647	0.1666	5.67	0.40	0.7045	A
20	LeafPre		Corsica		0.06714	0.1648	5.42	0.41	0.6992	A
21	LeafPre		Jack		0.1516	0.1669	5.73	0.91	0.4003	A
22	LeafPre		Williams82		0.3147	0.1669	5.7	1.89	0.1108	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.22465 maxSD=0.22465 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre			Early	0.1460	0.1327	2.47	1.10	0.3668	A
24	LeafPre			Late	0.1540	0.1437	3.43	1.07	0.3534	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.86443 maxSD=0.99503 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		0.1284	0.2352	11.5	0.55	0.5956	A
26	LeafPre	DC	Corsica		0.1279	0.2275	10.1	0.56	0.5862	A
27	LeafPre	DC	Jack		0.3073	0.2352	11.5	1.31	0.2169	A
28	LeafPre	DC	Williams82		0.6050	0.2351	11.4	2.57	0.0252	A
29	LeafPre	FS	Bass		0.004577	0.2124	7.64	0.02	0.9834	A
30	LeafPre	FS	Corsica		0.006374	0.2160	8.08	0.03	0.9772	A
31	LeafPre	FS	Jack		-0.00404	0.2139	7.87	-0.02	0.9854	A
32	LeafPre	FS	Williams82		0.02441	0.2139	7.87	0.11	0.9120	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.20394 maxSD=5.20394 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost	DC			2.6540	1.5350	1.79	1.73	0.2405	A
2	LeafPost	FS			0.04513	1.5197	1.72	0.03	0.9794	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.25991 maxSD=1.30451 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		1.3415	1.3362	1.1	1.00	0.4860	A
4	LeafPost		Corsica		1.1701	1.3396	1.11	0.87	0.5306	A
5	LeafPost		Jack		1.5686	1.3346	1.1	1.18	0.4352	A
6	LeafPost		Williams82		1.3180	1.3457	1.13	0.98	0.4907	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.73829 maxSD=0.73829 -----

Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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Obs	Type	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
7	LeafPost			Early	1.2311	1.3268	1.07	0.93	0.5153	A
8	LeafPost			Late	1.4680	1.3113	1.02	1.12	0.4609	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.87634 maxSD=5.28021 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		2.6507	1.5728	1.97	1.69	0.2357	A
10	LeafPost	DC	Corsica		2.2178	1.5834	2.02	1.40	0.2949	A
11	LeafPost	DC	Jack		3.1263	1.5797	2	1.98	0.1862	A
12	LeafPost	DC	Williams82		2.6210	1.5820	2.02	1.66	0.2385	A
13	LeafPost	FS	Bass		0.03227	1.5855	2.04	0.02	0.9856	A
14	LeafPost	FS	Corsica		0.1223	1.5862	2.05	0.08	0.9454	A
15	LeafPost	FS	Jack		0.01096	1.5732	1.98	0.01	0.9951	A
16	LeafPost	FS	Williams82		0.01497	1.6083	2.16	0.01	0.9934	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.00422 maxSD=1.00422 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre	DC			0.2921	0.1786	3.96	1.64	0.1779	A
18	LeafPre	FS			0.007830	0.1693	3.17	0.05	0.9659	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.49498 maxSD=0.49906 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		0.06647	0.1666	5.67	0.40	0.7045	A
20	LeafPre		Corsica		0.06714	0.1648	5.42	0.41	0.6992	A
21	LeafPre		Jack		0.1516	0.1669	5.73	0.91	0.4003	A
22	LeafPre		Williams82		0.3147	0.1669	5.7	1.89	0.1108	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.22465 maxSD=0.22465 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre			Early	0.1460	0.1327	2.47	1.10	0.3668	A
24	LeafPre			Late	0.1540	0.1437	3.43	1.07	0.3534	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.86443 maxSD=0.99503 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		0.1284	0.2352	11.5	0.55	0.5956	A
26	LeafPre	DC	Corsica		0.1279	0.2275	10.1	0.56	0.5862	A
27	LeafPre	DC	Jack		0.3073	0.2352	11.5	1.31	0.2169	A
28	LeafPre	DC	Williams82		0.6050	0.2351	11.4	2.57	0.0252	A
29	LeafPre	FS	Bass		0.004577	0.2124	7.64	0.02	0.9834	A
30	LeafPre	FS	Corsica		0.006374	0.2160	8.08	0.03	0.9772	A
31	LeafPre	FS	Jack		-0.00404	0.2139	7.87	-0.02	0.9854	A
32	LeafPre	FS	Williams82		0.02441	0.2139	7.87	0.11	0.9120	A

Genistein Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	98.33895094	
1	4	98.13867694	0.00951723
2	3	97.98700591	0.00152020
3	2	97.91210953	0.00005542
4	1	97.90739946	0.00000065
5	1	97.90734718	0.00000000

Convergence criteria met.

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----- Sample_Type=LeafPost -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
----------	----------

Year	5.91E-20
Year*Farm	0
Year*Farm*Field_Type	0.002435
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	0.08747

Fit Statistics

-2 Res Log Likelihood	97.9
AIC (smaller is better)	101.9
AICC (smaller is better)	102.0
BIC (smaller is better)	99.3

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	6.58	0.2366
Field_Type	1	2	0.26	0.6637
Farm*Field_Type	1	2	0.04	0.8685
Cultivar	3	26	0.35	0.7919
Field_Type*Cultivar	3	26	0.51	0.6784
Timing	1	26	19.58	0.0002
Field_Type*Timing	1	26	1.27	0.2704
Cultivar*Timing	3	26	0.11	0.9525
Field_*Cultiv*Timing	3	26	0.90	0.4536

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	-103.23537154	
1	3	-109.63260505	0.00227340
2	3	-110.28409590	0.00024626
3	1	-110.35360269	0.00000168
4	1	-110.35405670	0.00000000

Convergence criteria met.

----- Sample_Type=LeafPre -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0
Year*Farm	0.001385
Year*Farm*Field_Type	0
Bloc(Year*Farm*Fiel)	0
Year*Farm*Bloc*Culti	1.41E-20
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0.009942
Residual	0.02125

Fit Statistics

-2 Res Log Likelihood	-110.4
AIC (smaller is better)	-104.4
AICC (smaller is better)	-104.2
BIC (smaller is better)	-108.3

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.01	0.9439
Field_Type	1	2	1.61	0.3322
Farm*Field_Type	1	2	20.57	0.0453
Cultivar	3	33	4.64	0.0082
Field_Type*Cultivar	3	36	0.52	0.6705
Timing	1	36	4.66	0.0376
Field_Type*Timing	1	36	0.13	0.7199
Cultivar*Timing	3	36	1.98	0.1349
Field_*Cultiv*Timing	3	36	0.04	0.9901

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Genistein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	370.53513501	
1	2	57.91741166	0.00034508
2	1	57.83937474	0.00000434
3	1	57.83844633	0.00000000

Convergence criteria met.

----- Sample_Type=Seed -----

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.07428
Year*Farm	0

Year*Farm*Field_Type	0.1688
Bloc(Year*Farm*Fiel)	0.002278
Year*Farm*Bloc*Culti	0.004029
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	0.04797

Fit Statistics

-2 Res Log Likelihood	57.8
AIC (smaller is better)	67.8
AICC (smaller is better)	68.1
BIC (smaller is better)	61.3

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.00	0.9876
Field_Type	1	2	3.65	0.1961
Farm*Field_Type	1	2	0.00	0.9613
Cultivar	3	33	3.27	0.0332
Field_Type*Cultivar	3	117	3.72	0.0135
Timing	2	88	2.05	0.1349
Field_Type*Timing	2	117	1.63	0.2002
Cultivar*Timing	6	88	1.41	0.2185
Field_*Cultiv*Timing	6	117	1.14	0.3423

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.11509 maxSD=0.11509 -----

Obs	Sample_ Type	Field_ Farm Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost			Early	0.3135	0.04955	26	6.33	<.0001	A
2	LeafPost			Late	0.06578	0.03882	26	1.69	0.1021	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.21001 maxSD=0.21783 -----

Obs	Sample_ Type	Field_ Farm Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		0.2310	0.05772	26	4.00	0.0005	A
4	LeafPost		Corsica		0.1534	0.05907	26	2.60	0.0153	A
5	LeafPost		Jack		0.1832	0.05493	26	3.34	0.0026	A
6	LeafPost		Williams82		0.1909	0.06122	26	3.12	0.0044	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.31518 maxSD=0.36645 -----

Obs	Sample_ Type	Field_ Farm Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost	DC	Bass		0.2709	0.07460	26	3.63	0.0012	A
8	LeafPost	DC	Corsica		0.1125	0.07864	26	1.43	0.1644	A
9	LeafPost	DC	Jack		0.2121	0.07306	26	2.90	0.0074	A
10	LeafPost	DC	Williams82		0.2329	0.07434	26	3.13	0.0043	A
11	LeafPost	FS	Bass		0.1910	0.08811	26	2.17	0.0395	A
12	LeafPost	FS	Corsica		0.1943	0.08816	26	2.20	0.0366	A
13	LeafPost	FS	Jack		0.1544	0.08205	26	1.88	0.0712	A

14 LeafPost FS Williams82 0.1490 0.09728 26 1.53 0.1378 A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.5254 maxSD=0.54268 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
15	LeafPost	PHill	DC			0.1202	0.07588	2	1.58	0.2539	A
16	LeafPost	Wye	DC			0.2940	0.05340	2	5.51	0.0314	A
17	LeafPost	PHill	FS			0.09713	0.07321	2	1.33	0.3158	A
18	LeafPost	Wye	FS			0.2472	0.05977	2	4.14	0.0538	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.05882 maxSD=0.05882 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre				Early	0.1562	0.02549	36	6.13	<.0001	A
20	LeafPre				Late	0.09361	0.03017	36	3.10	0.0037	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1017 maxSD=0.10263 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	LeafPre			Bass		0.1227	0.03355	33	3.66	0.0009	AB
22	LeafPre			Corsica		0.06064	0.03279	33	1.85	0.0734	B
23	LeafPre			Jack		0.1172	0.03304	33	3.55	0.0012	AB
24	LeafPre			Williams82		0.1992	0.03327	33	5.99	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.15184 maxSD=0.1704 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre		DC	Bass		0.1636	0.04795	36	3.41	0.0016	A
26	LeafPre		DC	Corsica		0.08541	0.04546	36	1.88	0.0684	A
27	LeafPre		DC	Jack		0.1316	0.04667	36	2.82	0.0078	A
28	LeafPre		DC	Williams82		0.1939	0.04723	36	4.10	0.0002	A
29	LeafPre		FS	Bass		0.08184	0.03856	36	2.12	0.0408	AB
30	LeafPre		FS	Corsica		0.03587	0.03906	36	0.92	0.3646	B
31	LeafPre		FS	Jack		0.1027	0.03866	36	2.66	0.0117	AB
32	LeafPre		FS	Williams82		0.2044	0.03865	36	5.29	<.0001	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.32596 maxSD=0.34817 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	LeafPre	PHill	DC			0.08060	0.04838	2	1.67	0.2376	A
34	LeafPre	Wye	DC			0.2066	0.03525	2	5.86	0.0279	A
35	LeafPre	PHill	FS			0.1734	0.03449	2	5.03	0.0373	A
36	LeafPre	Wye	FS			0.03901	0.03809	2	1.02	0.4135	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.0755 maxSD=0.07565 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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37	Seed			Contr	0.2836	0.2427	88	1.17	0.2459	A
38	Seed			Early	0.3254	0.2427	88	1.34	0.1836	A
39	Seed			Late	0.2624	0.2428	88	1.08	0.2827	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp
40	Seed		Bass		0.2361	0.2436	33	0.97	0.3395	B
41	Seed		Corsica		0.2505	0.2436	33	1.03	0.3114	AB

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----
(continued)

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp
42	Seed		Jack		0.3162	0.2436	33	1.30	0.2033	AB
43	Seed		Williams82		0.3591	0.2437	33	1.47	0.1500	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.16037 maxSD=0.16239 -----

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp
44	Seed		DC	Bass	0.4603	0.2849	117	1.62	0.1088	B
45	Seed		DC	Corsica	0.5009	0.2850	117	1.76	0.0814	B
46	Seed		DC	Jack	0.6323	0.2850	117	2.22	0.0284	AB
47	Seed		DC	Williams82	0.6857	0.2851	117	2.40	0.0177	A
48	Seed		FS	Bass	0.01182	0.2850	117	0.04	0.9670	A
49	Seed		FS	Corsica	8.2E-15	0.2850	117	0.00	1.0000	A
50	Seed		FS	Jack	8.27E-15	0.2850	117	0.00	1.0000	A
51	Seed		FS	Williams82	0.03245	0.2850	117	0.11	0.9095	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=2.43779 maxSD=2.43781 -----

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp
52	Seed	PHill	DC		0.5589	0.3504	2	1.60	0.2517	A
53	Seed	Wye	DC		0.5807	0.3504	2	1.66	0.2393	A
54	Seed	PHill	FS		0.01623	0.3504	2	0.05	0.9673	A
55	Seed	Wye	FS		0.005912	0.3504	2	0.02	0.9881	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.11509 maxSD=0.11509 -----

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp
1	LeafPost			Early	0.3135	0.04955	26	6.33	<.0001	A
2	LeafPost			Late	0.06578	0.03882	26	1.69	0.1021	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.21001 maxSD=0.21783 -----

Obs	Sample_	Field_	Cultivar	Timing	Estimate	Standard	DF	t Value	Pr > t	Let
	Type	Farm	Type			Error				Grp

3	LeafPost		Bass		0.2310	0.05772	26	4.00	0.0005	A
4	LeafPost		Corsica		0.1534	0.05907	26	2.60	0.0153	A
5	LeafPost		Jack		0.1832	0.05493	26	3.34	0.0026	A
6	LeafPost		Williams82		0.1909	0.06122	26	3.12	0.0044	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.28941 maxSD=0.30424 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost		DC	Bass		0.2709	0.07460	26	3.63	0.0012	A
8	LeafPost		FS	Bass		0.1910	0.08811	26	2.17	0.0395	A
9	LeafPost		DC	Corsica		0.1125	0.07864	26	1.43	0.1644	A
10	LeafPost		FS	Corsica		0.1943	0.08816	26	2.20	0.0366	A
11	LeafPost		DC	Jack		0.2121	0.07306	26	2.90	0.0074	A
12	LeafPost		FS	Jack		0.1544	0.08205	26	1.88	0.0712	A
13	LeafPost		DC	Williams82		0.2329	0.07434	26	3.13	0.0043	A
14	LeafPost		FS	Williams82		0.1490	0.09728	26	1.53	0.1378	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.63645 maxSD=0.73051 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
15	LeafPost	PHill	DC			0.1202	0.07588	2	1.58	0.2539	A
16	LeafPost	PHill	FS			0.09713	0.07321	2	1.33	0.3158	A
17	LeafPost	Wye	DC			0.2940	0.05340	2	5.51	0.0314	A
18	LeafPost	Wye	FS			0.2472	0.05977	2	4.14	0.0538	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.05882 maxSD=0.05882 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre				Early	0.1562	0.02549	36	6.13	<.0001	A
20	LeafPre				Late	0.09361	0.03017	36	3.10	0.0037	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1017 maxSD=0.10263 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	LeafPre			Bass		0.1227	0.03355	33	3.66	0.0009	AB
22	LeafPre			Corsica		0.06064	0.03279	33	1.85	0.0734	B
23	LeafPre			Jack		0.1172	0.03304	33	3.55	0.0012	AB
24	LeafPre			Williams82		0.1992	0.03327	33	5.99	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.13362 maxSD=0.13545 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre		DC	Bass		0.1636	0.04795	36	3.41	0.0016	A
26	LeafPre		FS	Bass		0.08184	0.03856	36	2.12	0.0408	A
27	LeafPre		DC	Corsica		0.08541	0.04546	36	1.88	0.0684	A
28	LeafPre		FS	Corsica		0.03587	0.03906	36	0.92	0.3646	A
29	LeafPre		DC	Jack		0.1316	0.04667	36	2.82	0.0078	A
30	LeafPre		FS	Jack		0.1027	0.03866	36	2.66	0.0117	A
31	LeafPre		DC	Williams82		0.1939	0.04723	36	4.10	0.0002	A

32 LeafPre FS Williams82 0.2044 0.03865 36 5.29 <.0001 A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.35021 maxSD=0.42745 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	LeafPre	PHill	DC			0.08060	0.04838	2	1.67	0.2376	A
34	LeafPre	PHill	FS			0.1734	0.03449	2	5.03	0.0373	A
35	LeafPre	Wye	DC			0.2066	0.03525	2	5.86	0.0279	A
36	LeafPre	Wye	FS			0.03901	0.03809	2	1.02	0.4135	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.0755 maxSD=0.07565 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
37	Seed				Contr	0.2836	0.2427	88	1.17	0.2459	A
38	Seed				Early	0.3254	0.2427	88	1.34	0.1836	A
39	Seed				Late	0.2624	0.2428	88	1.08	0.2827	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
40	Seed			Bass		0.2361	0.2436	33	0.97	0.3395	B
41	Seed			Corsica		0.2505	0.2436	33	1.03	0.3114	AB

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----
(continued)

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
42	Seed			Jack		0.3162	0.2436	33	1.30	0.2033	AB
43	Seed			Williams82		0.3591	0.2437	33	1.47	0.1500	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.7021 maxSD=0.70244 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
44	Seed		DC	Bass		0.4603	0.2849	117	1.62	0.1088	A
45	Seed		FS	Bass		0.01182	0.2850	117	0.04	0.9670	A
46	Seed		DC	Corsica		0.5009	0.2850	117	1.76	0.0814	A
47	Seed		FS	Corsica		8.2E-15	0.2850	117	0.00	1.0000	A
48	Seed		DC	Jack		0.6323	0.2850	117	2.22	0.0284	A
49	Seed		FS	Jack		8.27E-15	0.2850	117	0.00	1.0000	A
50	Seed		DC	Williams82		0.6857	0.2851	117	2.40	0.0177	A
51	Seed		FS	Williams82		0.03245	0.2850	117	0.11	0.9095	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=2.86619 maxSD=2.86716 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
52	Seed	PHill	DC			0.5589	0.3504	2	1.60	0.2517	A

53	Seed	PHill	FS		0.01623	0.3504	2	0.05	0.9673	A
54	Seed	Wye	DC		0.5807	0.3504	2	1.66	0.2393	A
55	Seed	Wye	FS		0.005912	0.3504	2	0.02	0.9881	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.11509 maxSD=0.11509 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
1	LeafPost			Early	0.3135	0.04955	26	6.33	<.0001	A
2	LeafPost			Late	0.06578	0.03882	26	1.69	0.1021	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.21001 maxSD=0.21783 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
3	LeafPost		Bass		0.2310	0.05772	26	4.00	0.0005	A
4	LeafPost		Corsica		0.1534	0.05907	26	2.60	0.0153	A
5	LeafPost		Jack		0.1832	0.05493	26	3.34	0.0026	A
6	LeafPost		Williams82		0.1909	0.06122	26	3.12	0.0044	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.37066 maxSD=0.41162 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
7	LeafPost	DC	Bass		0.2709	0.07460	26	3.63	0.0012	A
8	LeafPost	DC	Corsica		0.1125	0.07864	26	1.43	0.1644	A
9	LeafPost	DC	Jack		0.2121	0.07306	26	2.90	0.0074	A
10	LeafPost	DC	Williams82		0.2329	0.07434	26	3.13	0.0043	A
11	LeafPost	FS	Bass		0.1910	0.08811	26	2.17	0.0395	A
12	LeafPost	FS	Corsica		0.1943	0.08816	26	2.20	0.0366	A
13	LeafPost	FS	Jack		0.1544	0.08205	26	1.88	0.0712	A
14	LeafPost	FS	Williams82		0.1490	0.09728	26	1.53	0.1378	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.63645 maxSD=0.73051 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
15	LeafPost	PHill	DC		0.1202	0.07588	2	1.58	0.2539	A
16	LeafPost	PHill	FS		0.09713	0.07321	2	1.33	0.3158	A
17	LeafPost	Wye	DC		0.2940	0.05340	2	5.51	0.0314	A
18	LeafPost	Wye	FS		0.2472	0.05977	2	4.14	0.0538	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.05882 maxSD=0.05882 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
19	LeafPre			Early	0.1562	0.02549	36	6.13	<.0001	A
20	LeafPre			Late	0.09361	0.03017	36	3.10	0.0037	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1017 maxSD=0.10263 -----

Obs	Sample_	Field_			Standard			Pr >	Let	
Type	Farm	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp

21	LeafPre		Bass		0.1227	0.03355	33	3.66	0.0009	AB
22	LeafPre		Corsica		0.06064	0.03279	33	1.85	0.0734	B
23	LeafPre		Jack		0.1172	0.03304	33	3.55	0.0012	AB
24	LeafPre		Williams82		0.1992	0.03327	33	5.99	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.17332 maxSD=0.19086 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre		DC	Bass		0.1636	0.04795	36	3.41	0.0016	AB
26	LeafPre		DC	Corsica		0.08541	0.04546	36	1.88	0.0684	AB
27	LeafPre		DC	Jack		0.1316	0.04667	36	2.82	0.0078	AB
28	LeafPre		DC	Williams82		0.1939	0.04723	36	4.10	0.0002	AB
29	LeafPre		FS	Bass		0.08184	0.03856	36	2.12	0.0408	AB
30	LeafPre		FS	Corsica		0.03587	0.03906	36	0.92	0.3646	B
31	LeafPre		FS	Jack		0.1027	0.03866	36	2.66	0.0117	AB
32	LeafPre		FS	Williams82		0.2044	0.03865	36	5.29	<.0001	A

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=0.35021 maxSD=0.42745 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	LeafPre	PHill	DC			0.08060	0.04838	2	1.67	0.2376	A
34	LeafPre	PHill	FS			0.1734	0.03449	2	5.03	0.0373	A
35	LeafPre	Wye	DC			0.2066	0.03525	2	5.86	0.0279	A
36	LeafPre	Wye	FS			0.03901	0.03809	2	1.02	0.4135	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.0755 maxSD=0.07565 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
37	Seed				Contr	0.2836	0.2427	88	1.17	0.2459	A
38	Seed				Early	0.3254	0.2427	88	1.34	0.1836	A
39	Seed				Late	0.2624	0.2428	88	1.08	0.2827	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
40	Seed			Bass		0.2361	0.2436	33	0.97	0.3395	B
41	Seed			Corsica		0.2505	0.2436	33	1.03	0.3114	AB

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----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.1213 maxSD=0.12183 -----
(continued)

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
42	Seed			Jack		0.3162	0.2436	33	1.30	0.2033	AB
43	Seed			Williams82		0.3591	0.2437	33	1.47	0.1500	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.59969 maxSD=0.91682 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
44	Seed		DC	Bass		0.4603	0.2849	117	1.62	0.1088	B
45	Seed		DC	Corsica		0.5009	0.2850	117	1.76	0.0814	B
46	Seed		DC	Jack		0.6323	0.2850	117	2.22	0.0284	AB
47	Seed		DC	Williams82		0.6857	0.2851	117	2.40	0.0177	A
48	Seed		FS	Bass		0.01182	0.2850	117	0.04	0.9670	AB
49	Seed		FS	Corsica		8.2E-15	0.2850	117	0.00	1.0000	AB
50	Seed		FS	Jack		8.27E-15	0.2850	117	0.00	1.0000	AB
51	Seed		FS	Williams82		0.03245	0.2850	117	0.11	0.9095	AB

----- Effect=Farm*Field_Type A=Tukey-Kramer(.05) avgSD=2.86619 maxSD=2.86716 -----

Obs	Sample_ Type	Farm	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
52	Seed	PHill	DC			0.5589	0.3504	2	1.60	0.2517	A
53	Seed	PHill	FS			0.01623	0.3504	2	0.05	0.9673	A
54	Seed	Wye	DC			0.5807	0.3504	2	1.66	0.2393	A
55	Seed	Wye	FS			0.005912	0.3504	2	0.02	0.9881	A

Total Isoflavone Analysis

----- Sample_Type=LeafPost -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Total_Iso
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
Columns in X	51
Columns in Z	298
Subjects	1
Max Obs Per Subject	158
Observations Used	158
Observations Not Used	0
Total Observations	158

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1131.98530584	
1	4	1085.01518006	0.03637163
2	2	1084.41881731	0.00205476
3	3	1083.92871574	.
4	1	1083.91484049	0.00000022
5	1	1083.91474817	0.00000000

----- Sample_Type=LeafPost -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
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Year	58.3395
Year*Farm	0
Year*Farm*Field_Type	49.5690
Bloc(Year*Farm*Fiel)	0.4479
Year*Farm*Bloc*Culti	0
Yea*Far*Blo*Cul*Timi	2.82E-17
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	93.9313

Fit Statistics

-2 Res Log Likelihood	1083.9
AIC (smaller is better)	1091.9
AICC (smaller is better)	1092.2
BIC (smaller is better)	1086.7

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.86	0.5235
Field_Type	1	2	1.14	0.3976
Farm*Field_Type	1	2	0.37	0.6038
Cultivar	3	26	0.62	0.6103
Field_Type*Cultivar	3	26	0.08	0.9680
Timing	1	26	5.67	0.0249
Field_Type*Timing	1	26	0.89	0.3553
Cultivar*Timing	3	26	0.15	0.9290
Field_*Cultiv*Timing	3	26	0.00	0.9999

----- Sample_Type=LeafPre -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Total_Iso
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	2	Early Late

Dimensions

Covariance Parameters	8
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Columns in X	51
Columns in Z	329
Subjects	1
Max Obs Per Subject	250
Observations Used	250
Observations Not Used	0
Total Observations	250

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1256.77579809	
1	2	1157.75456467	0.03972301
2	3	1156.54707231	.
3	3	1142.18808955	.
4	2	1140.31937424	.
5	2	1139.84390098	0.00027467
6	1	1139.72701639	0.00004032
7	1	1139.71114530	0.00000128
8	1	1139.71067845	0.00000000

----- Sample_Type=LeafPre -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	3.8407
Year*Farm	0
Year*Farm*Field_Type	7.8084
Bloc(Year*Farm*Fiel)	0.9708
Year*Farm*Bloc*Culti	0.5946
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	5.3032
Residual	2.4367

Fit Statistics

-2 Res Log Likelihood	1139.7
AIC (smaller is better)	1151.7
AICC (smaller is better)	1152.1
BIC (smaller is better)	1143.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.20	0.7295
Field_Type	1	2	2.94	0.2287
Farm*Field_Type	1	2	0.00	0.9905
Cultivar	3	33	5.36	0.0041
Field_Type*Cultivar	3	36	1.39	0.2607
Timing	1	36	0.65	0.4237

Field_Type*Timing	1	36	0.21	0.6493
Cultivar*Timing	3	36	0.88	0.4586
Field_*Cultiv*Timing	3	36	0.70	0.5601

Total Isoflavone Analysis

37

----- Sample_Type=Seed -----

The Mixed Procedure

Model Information

Data Set	WORK.NEWHPLC
Dependent Variable	Total_Iso
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	PHill Wye
Field_Type	2	DC FS
Block	3	1 2 3
Cultivar	4	Bass Corsica Jack Williams82
Timing	3	Control Early Late

Dimensions

Covariance Parameters	8
Columns in X	66
Columns in Z	514
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	2704.75692835	
1	2	2334.47798241	0.00458326
2	1	2329.14773499	0.00143209
3	1	2327.55637447	0.00025582
4	1	2327.28508141	0.00002807
5	1	2327.25561882	0.00000210
6	1	2327.25355325	0.00000003
7	1	2327.25352980	0.00000000

----- Sample_Type=Seed -----

The Mixed Procedure

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Year	1724.80
Year*Farm	56.3131
Year*Farm*Field_Type	8.2692
Bloc(Year*Farm*Fiel)	8.8683
Year*Farm*Bloc*Culti	162.65
Yea*Far*Blo*Cul*Timi	0
Ye*Fa*Fi*Blo*Cul*Tim	0
Residual	238.91

Fit Statistics

-2 Res Log Likelihood	2327.3
AIC (smaller is better)	2339.3
AICC (smaller is better)	2339.6
BIC (smaller is better)	2331.4

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.37	0.6522
Field_Type	1	2	156.83	0.0063
Farm*Field_Type	1	2	9.00	0.0955
Cultivar	3	33	12.00	<.0001
Field_Type*Cultivar	3	117	2.46	0.0661
Timing	2	88	1.92	0.1530
Field_Type*Timing	2	117	0.07	0.9336
Cultivar*Timing	6	88	1.18	0.3255
Field_*Cultiv*Timing	6	117	0.48	0.8252

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.96493 maxSD=3.96493 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost			Early	17.2497	6.1869	26	2.79	0.0098	A
2	LeafPost			Late	12.6574	6.0938	26	2.08	0.0478	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=6.90134 maxSD=7.1467 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		16.5346	6.2421	26	2.65	0.0135	A
4	LeafPost		Corsica		14.9727	6.2612	26	2.39	0.0243	A
5	LeafPost		Jack		13.2539	6.2308	26	2.13	0.0431	A
6	LeafPost		Williams82		15.0530	6.2939	26	2.39	0.0243	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=23.6802 maxSD=23.6802 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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7	LeafPost	DC			17.8904	6.6932	2	2.67	0.1161	A
8	LeafPost	FS			12.0167	6.6255	2	1.81	0.2114	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=10.3561 maxSD=12.0822 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		20.1814	6.9332	26	2.91	0.0073	A
10	LeafPost	DC	Corsica		17.9201	6.9941	26	2.56	0.0165	A
11	LeafPost	DC	Jack		15.7492	6.9640	26	2.26	0.0323	A
12	LeafPost	DC	Williams82		17.7108	6.9776	26	2.54	0.0175	A
13	LeafPost	FS	Bass		12.8878	7.0303	26	1.83	0.0783	A
14	LeafPost	FS	Corsica		12.0252	7.0340	26	1.71	0.0993	A
15	LeafPost	FS	Jack		10.7586	6.9549	26	1.55	0.1340	A
16	LeafPost	FS	Williams82		12.3953	7.1648	26	1.73	0.0955	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.02007 maxSD=1.02007 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre			Early	6.7914	1.7458	36	3.89	0.0004	A
18	LeafPre			Late	6.3843	1.7639	36	3.62	0.0009	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.94968 maxSD=1.96691 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		5.8598	1.7931	33	3.27	0.0025	B
20	LeafPre		Corsica		5.5757	1.7898	33	3.12	0.0038	B
21	LeafPre		Jack		6.7220	1.7924	33	3.75	0.0007	AB
22	LeafPre		Williams82		8.1939	1.7926	33	4.57	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=8.95777 maxSD=8.95777 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre	DC			8.3721	2.0326	2	4.12	0.0542	A
24	LeafPre	FS			4.8036	2.0171	2	2.38	0.1402	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=2.78206 maxSD=3.06882 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		7.2428	2.1374	36	3.39	0.0017	AB
26	LeafPre	DC	Corsica		6.8400	2.1207	36	3.23	0.0027	B
27	LeafPre	DC	Jack		8.8435	2.1336	36	4.14	0.0002	AB
28	LeafPre	DC	Williams82		10.5622	2.1342	36	4.95	<.0001	A
29	LeafPre	FS	Bass		4.4768	2.0867	36	2.15	0.0387	A
30	LeafPre	FS	Corsica		4.3114	2.0931	36	2.06	0.0467	A
31	LeafPre	FS	Jack		4.6004	2.0889	36	2.20	0.0341	A
32	LeafPre	FS	Williams82		5.8257	2.0890	36	2.79	0.0084	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=5.33208 maxSD=5.34452 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	Seed			Contr	81.5628	29.7282	88	2.74	0.0074	A
34	Seed			Early	83.3463	29.7280	88	2.80	0.0062	A
35	Seed			Late	78.9871	29.7288	88	2.66	0.0094	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
36	Seed		Bass		76.0548	29.9117	33	2.54	0.0159	B
37	Seed		Corsica		79.4908	29.9125	33	2.66	0.0120	B
38	Seed		Jack		68.1615	29.9125	33	2.28	0.0293	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----
(continued)

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	Seed		Williams82		101.49	29.9149	33	3.39	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=12.8745 maxSD=12.8745 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
40	Seed	DC			100.03	29.7381	2	3.36	0.0782	A
41	Seed	FS			62.5627	29.7378	2	2.10	0.1701	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=17.6294 maxSD=17.7335 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
42	Seed	DC	Bass		97.6779	29.9872	117	3.26	0.0015	B
43	Seed	DC	Corsica		94.8169	29.9913	117	3.16	0.0020	B
44	Seed	DC	Jack		88.6347	29.9913	117	2.96	0.0038	B
45	Seed	DC	Williams82		119.01	30.0010	117	3.97	0.0001	A
46	Seed	FS	Bass		54.4317	29.9922	117	1.81	0.0721	B
47	Seed	FS	Corsica		64.1647	29.9913	117	2.14	0.0345	B
48	Seed	FS	Jack		47.6883	29.9913	117	1.59	0.1145	B
49	Seed	FS	Williams82		83.9661	29.9913	117	2.80	0.0060	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.96493 maxSD=3.96493 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost			Early	17.2497	6.1869	26	2.79	0.0098	A
2	LeafPost			Late	12.6574	6.0938	26	2.08	0.0478	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=6.90134 maxSD=7.1467 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		16.5346	6.2421	26	2.65	0.0135	A
4	LeafPost		Corsica		14.9727	6.2612	26	2.39	0.0243	A
5	LeafPost		Jack		13.2539	6.2308	26	2.13	0.0431	A
6	LeafPost		Williams82		15.0530	6.2939	26	2.39	0.0243	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=23.6802 maxSD=23.6802 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost	DC			17.8904	6.6932	2	2.67	0.1161	A
8	LeafPost	FS			12.0167	6.6255	2	1.81	0.2114	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=15.6721 maxSD=16.0247 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		20.1814	6.9332	26	2.91	0.0073	A
10	LeafPost	FS	Bass		12.8878	7.0303	26	1.83	0.0783	A
11	LeafPost	DC	Corsica		17.9201	6.9941	26	2.56	0.0165	A
12	LeafPost	FS	Corsica		12.0252	7.0340	26	1.71	0.0993	A
13	LeafPost	DC	Jack		15.7492	6.9640	26	2.26	0.0323	A
14	LeafPost	FS	Jack		10.7586	6.9549	26	1.55	0.1340	A
15	LeafPost	DC	Williams82		17.7108	6.9776	26	2.54	0.0175	A
16	LeafPost	FS	Williams82		12.3953	7.1648	26	1.73	0.0955	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.02007 maxSD=1.02007 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre			Early	6.7914	1.7458	36	3.89	0.0004	A
18	LeafPre			Late	6.3843	1.7639	36	3.62	0.0009	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.94968 maxSD=1.96691 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		5.8598	1.7931	33	3.27	0.0025	B
20	LeafPre		Corsica		5.5757	1.7898	33	3.12	0.0038	B
21	LeafPre		Jack		6.7220	1.7924	33	3.75	0.0007	AB
22	LeafPre		Williams82		8.1939	1.7926	33	4.57	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=8.95777 maxSD=8.95777 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre	DC			8.3721	2.0326	2	4.12	0.0542	A
24	LeafPre	FS			4.8036	2.0171	2	2.38	0.1402	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=5.45098 maxSD=5.45719 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		7.2428	2.1374	36	3.39	0.0017	A
26	LeafPre	FS	Bass		4.4768	2.0867	36	2.15	0.0387	A
27	LeafPre	DC	Corsica		6.8400	2.1207	36	3.23	0.0027	A
28	LeafPre	FS	Corsica		4.3114	2.0931	36	2.06	0.0467	A
29	LeafPre	DC	Jack		8.8435	2.1336	36	4.14	0.0002	A
30	LeafPre	FS	Jack		4.6004	2.0889	36	2.20	0.0341	A
31	LeafPre	DC	Williams82		10.5622	2.1342	36	4.95	<.0001	A
32	LeafPre	FS	Williams82		5.8257	2.0890	36	2.79	0.0084	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=5.33208 maxSD=5.34452 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	Seed			Contr	81.5628	29.7282	88	2.74	0.0074	A
34	Seed			Early	83.3463	29.7280	88	2.80	0.0062	A
35	Seed			Late	78.9871	29.7288	88	2.66	0.0094	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
36	Seed		Bass		76.0548	29.9117	33	2.54	0.0159	B
37	Seed		Corsica		79.4908	29.9125	33	2.66	0.0120	B
38	Seed		Jack		68.1615	29.9125	33	2.28	0.0293	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----
(continued)

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	Seed		Williams82		101.49	29.9149	33	3.39	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=12.8745 maxSD=12.8745 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
40	Seed	DC			100.03	29.7381	2	3.36	0.0782	A
41	Seed	FS			62.5627	29.7378	2	2.10	0.1701	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=10.3431 maxSD=10.474 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
42	Seed	DC	Bass		97.6779	29.9872	117	3.26	0.0015	A
43	Seed	FS	Bass		54.4317	29.9922	117	1.81	0.0721	B
44	Seed	DC	Corsica		94.8169	29.9913	117	3.16	0.0020	A
45	Seed	FS	Corsica		64.1647	29.9913	117	2.14	0.0345	B
46	Seed	DC	Jack		88.6347	29.9913	117	2.96	0.0038	A
47	Seed	FS	Jack		47.6883	29.9913	117	1.59	0.1145	B
48	Seed	DC	Williams82		119.01	30.0010	117	3.97	0.0001	A
49	Seed	FS	Williams82		83.9661	29.9913	117	2.80	0.0060	B

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=3.96493 maxSD=3.96493 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	LeafPost			Early	17.2497	6.1869	26	2.79	0.0098	A
2	LeafPost			Late	12.6574	6.0938	26	2.08	0.0478	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=6.90134 maxSD=7.1467 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	LeafPost		Bass		16.5346	6.2421	26	2.65	0.0135	A
4	LeafPost		Corsica		14.9727	6.2612	26	2.39	0.0243	A
5	LeafPost		Jack		13.2539	6.2308	26	2.13	0.0431	A
6	LeafPost		Williams82		15.0530	6.2939	26	2.39	0.0243	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=23.6802 maxSD=23.6802 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	LeafPost	DC			17.8904	6.6932	2	2.67	0.1161	A
8	LeafPost	FS			12.0167	6.6255	2	1.81	0.2114	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=16.8407 maxSD=21.2745 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
9	LeafPost	DC	Bass		20.1814	6.9332	26	2.91	0.0073	A
10	LeafPost	DC	Corsica		17.9201	6.9941	26	2.56	0.0165	A
11	LeafPost	DC	Jack		15.7492	6.9640	26	2.26	0.0323	A
12	LeafPost	DC	Williams82		17.7108	6.9776	26	2.54	0.0175	A
13	LeafPost	FS	Bass		12.8878	7.0303	26	1.83	0.0783	A
14	LeafPost	FS	Corsica		12.0252	7.0340	26	1.71	0.0993	A
15	LeafPost	FS	Jack		10.7586	6.9549	26	1.55	0.1340	A
16	LeafPost	FS	Williams82		12.3953	7.1648	26	1.73	0.0955	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=1.02007 maxSD=1.02007 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
17	LeafPre			Early	6.7914	1.7458	36	3.89	0.0004	A
18	LeafPre			Late	6.3843	1.7639	36	3.62	0.0009	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.94968 maxSD=1.96691 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
19	LeafPre		Bass		5.8598	1.7931	33	3.27	0.0025	B
20	LeafPre		Corsica		5.5757	1.7898	33	3.12	0.0038	B
21	LeafPre		Jack		6.7220	1.7924	33	3.75	0.0007	AB
22	LeafPre		Williams82		8.1939	1.7926	33	4.57	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=8.95777 maxSD=8.95777 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
23	LeafPre	DC			8.3721	2.0326	2	4.12	0.0542	A
24	LeafPre	FS			4.8036	2.0171	2	2.38	0.1402	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=5.46178 maxSD=7.26754 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
25	LeafPre	DC	Bass		7.2428	2.1374	36	3.39	0.0017	AB
26	LeafPre	DC	Corsica		6.8400	2.1207	36	3.23	0.0027	B
27	LeafPre	DC	Jack		8.8435	2.1336	36	4.14	0.0002	AB
28	LeafPre	DC	Williams82		10.5622	2.1342	36	4.95	<.0001	A
29	LeafPre	FS	Bass		4.4768	2.0867	36	2.15	0.0387	AB
30	LeafPre	FS	Corsica		4.3114	2.0931	36	2.06	0.0467	AB
31	LeafPre	FS	Jack		4.6004	2.0889	36	2.20	0.0341	AB
32	LeafPre	FS	Williams82		5.8257	2.0890	36	2.79	0.0084	AB

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=5.33208 maxSD=5.34452 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
33	Seed			Contr	81.5628	29.7282	88	2.74	0.0074	A
34	Seed			Early	83.3463	29.7280	88	2.80	0.0062	A
35	Seed			Late	78.9871	29.7288	88	2.66	0.0094	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
36	Seed		Bass		76.0548	29.9117	33	2.54	0.0159	B
37	Seed		Corsica		79.4908	29.9125	33	2.66	0.0120	B
38	Seed		Jack		68.1615	29.9125	33	2.28	0.0293	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=15.725 maxSD=15.747 -----
(continued)

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
39	Seed		Williams82		101.49	29.9149	33	3.39	0.0018	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=12.8745 maxSD=12.8745 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
40	Seed	DC			100.03	29.7381	2	3.36	0.0782	A
41	Seed	FS			62.5627	29.7378	2	2.10	0.1701	B

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=19.3182 maxSD=21.0769 -----

Obs	Sample_ Type	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
42	Seed	DC	Bass		97.6779	29.9872	117	3.26	0.0015	B
43	Seed	DC	Corsica		94.8169	29.9913	117	3.16	0.0020	B
44	Seed	DC	Jack		88.6347	29.9913	117	2.96	0.0038	B
45	Seed	DC	Williams82		119.01	30.0010	117	3.97	0.0001	A
46	Seed	FS	Bass		54.4317	29.9922	117	1.81	0.0721	C
47	Seed	FS	Corsica		64.1647	29.9913	117	2.14	0.0345	C
48	Seed	FS	Jack		47.6883	29.9913	117	1.59	0.1145	C
49	Seed	FS	Williams82		83.9661	29.9913	117	2.80	0.0060	B

Output Yield, Seed Weight, Protein, and Oil Analysis - Lactofen Study

Yield

The Mixed Procedure

Model Information

Data Set	WORK.SEED
Dependent Variable	Yield
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Satterthwaite

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	P W
Field_Type	2	D F
Cultivar	4	BASS CORC JACK WM82
Timing	3	c e l
Rep	3	1 2 3

Dimensions

Covariance Parameters	7
Columns in X	66
Columns in Z	230
Subjects	1
Max Obs Per Subject	288
Observations Used	211
Observations Not Used	77
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	2921.44318929	
1	2	2891.22230764	0.00014496
2	1	2891.01824823	0.00000457
3	1	2891.01229461	0.00000001

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
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Year	25122
Year*Farm	0
Year*Farm*Field_Type	0
Rep(Year*Farm*Field)	39081
Year*Farm*Cultiv*Rep	90667
Yea*Far*Cul*Timi*Rep	0
Residual	191355

Fit Statistics

-2 Res Log Likelihood	2891.0
AIC (smaller is better)	2899.0
AICC (smaller is better)	2899.2
BIC (smaller is better)	2893.8

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	16.6	2.18	0.1583
Field_Type	1	8.68	7.46	0.0240
Farm*Field_Type	1	9.04	4.82	0.0556
Cultivar	3	29.4	0.76	0.5253
Field_Type*Cultivar	3	171	1.29	0.2791
Timing	2	133	0.57	0.5661
Field_Type*Timing	2	133	2.20	0.1146
Cultivar*Timing	6	134	0.91	0.4917
Field_*Cultiv*Timing	6	133	0.77	0.5935

----- Effect=Cultivar A=' ' avgSD=412.899 maxSD=414.306 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		BASS		2061.79	164.08	1.96	12.57	0.0068	
2		CORC		2197.05	163.89	1.95	13.41	0.0061	
3		JACK		1995.79	163.71	1.94	12.19	0.0074	
4		WM82		2167.52	164.24	1.97	13.20	0.0061	

----- Effect=Field_*Cultiv*Timing A=' ' avgSD=948.936 maxSD=1133.7 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
5	D	BASS	c	2642.09	220.41	6.16	11.99	<.0001	
6	D	BASS	e	2184.80	220.41	6.16	9.91	<.0001	
7	D	BASS	l	2049.26	236.58	8.03	8.66	<.0001	
8	D	CORC	c	2469.07	220.38	6.15	11.20	<.0001	
9	D	CORC	e	2334.66	220.38	6.15	10.59	<.0001	
10	D	CORC	l	2551.46	228.26	7.06	11.18	<.0001	
11	D	JACK	c	2243.94	220.40	6.16	10.18	<.0001	
12	D	JACK	e	2063.68	220.40	6.16	9.36	<.0001	
13	D	JACK	l	2159.77	220.40	6.16	9.80	<.0001	
14	D	WM82	c	2263.53	220.58	6.17	10.26	<.0001	
15	D	WM82	e	2080.65	220.58	6.17	9.43	<.0001	
16	D	WM82	l	2397.04	220.58	6.17	10.87	<.0001	
17	F	BASS	c	1806.06	236.43	8.01	7.64	<.0001	
18	F	BASS	e	1901.45	220.47	6.16	8.62	0.0001	
19	F	BASS	l	1787.06	212.48	5.36	8.41	0.0003	
20	F	CORC	c	1973.72	220.37	6.16	8.96	<.0001	

21	F	CORC	e	1865.62	220.37	6.16	8.47	0.0001
22	F	CORC	l	1987.74	220.37	6.16	9.02	<.0001
23	F	JACK	c	1831.45	236.16	7.99	7.76	<.0001
24	F	JACK	e	1808.06	216.11	5.72	8.37	0.0002
25	F	JACK	l	1867.85	216.15	5.72	8.64	0.0002
26	F	WM82	c	1916.44	248.24	9.58	7.72	<.0001
27	F	WM82	e	2267.65	212.39	5.35	10.68	<.0001
28	F	WM82	l	2079.78	227.79	6.96	9.13	<.0001

----- Effect=Field_Type A=' ' avgSD=301.791 maxSD=301.791 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
29	D			2286.66	150.49	1.35	15.19	0.0178	
30	F			1924.41	150.49	1.35	12.79	0.0225	

----- Effect=Timing A=' ' avgSD=178.536 maxSD=182.538 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
31			c	2143.29	142.57	1.13	15.03	0.0308	
32			e	2063.32	141.27	1.09	14.61	0.0351	
33			l	2109.99	141.90	1.11	14.87	0.0328	

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=301.791 maxSD=301.791 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			2286.66	150.49	1.35	15.19	0.0178	A
2	F			1924.41	150.49	1.35	12.79	0.0225	B

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=178.536 maxSD=182.538 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3			c	2143.29	142.57	1.13	15.03	0.0308	A
4			e	2063.32	141.27	1.09	14.61	0.0351	A
5			l	2109.99	141.90	1.11	14.87	0.0328	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=412.899 maxSD=414.306 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
6		BASS		2061.79	164.08	1.96	12.57	0.0068	A
7		CORC		2197.05	163.89	1.95	13.41	0.0061	A
8		JACK		1995.79	163.71	1.94	12.19	0.0074	A
9		WM82		2167.52	164.24	1.97	13.20	0.0061	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=855.293 maxSD=995.393 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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10	D	BASS	c	2642.09	220.41	6.16	11.99	<.0001	A
11	D	BASS	e	2184.80	220.41	6.16	9.91	<.0001	A
12	D	BASS	l	2049.26	236.58	8.03	8.66	<.0001	A
13	D	CORC	c	2469.07	220.38	6.15	11.20	<.0001	A
14	D	CORC	e	2334.66	220.38	6.15	10.59	<.0001	A
15	D	CORC	l	2551.46	228.26	7.06	11.18	<.0001	A
16	D	JACK	c	2243.94	220.40	6.16	10.18	<.0001	A
17	D	JACK	e	2063.68	220.40	6.16	9.36	<.0001	A
18	D	JACK	l	2159.77	220.40	6.16	9.80	<.0001	A
19	D	WM82	c	2263.53	220.58	6.17	10.26	<.0001	A
20	D	WM82	e	2080.65	220.58	6.17	9.43	<.0001	A
21	D	WM82	l	2397.04	220.58	6.17	10.87	<.0001	A
22	F	BASS	c	1806.06	236.43	8.01	7.64	<.0001	A
23	F	BASS	e	1901.45	220.47	6.16	8.62	0.0001	A
24	F	BASS	l	1787.06	212.48	5.36	8.41	0.0003	A
25	F	CORC	c	1973.72	220.37	6.16	8.96	<.0001	A
26	F	CORC	e	1865.62	220.37	6.16	8.47	0.0001	A
27	F	CORC	l	1987.74	220.37	6.16	9.02	<.0001	A
28	F	JACK	c	1831.45	236.16	7.99	7.76	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=855.293 maxSD=995.393 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
29	F	JACK	e	1808.06	216.11	5.72	8.37	0.0002	A
30	F	JACK	l	1867.85	216.15	5.72	8.64	0.0002	A
31	F	WM82	c	1916.44	248.24	9.58	7.72	<.0001	A
32	F	WM82	e	2267.65	212.39	5.35	10.68	<.0001	A
33	F	WM82	l	2079.78	227.79	6.96	9.13	<.0001	A

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=301.791 maxSD=301.791 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			2286.66	150.49	1.35	15.19	0.0178	A
2	F			1924.41	150.49	1.35	12.79	0.0225	B

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=178.536 maxSD=182.538 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3			c	2143.29	142.57	1.13	15.03	0.0308	A
4			e	2063.32	141.27	1.09	14.61	0.0351	A
5			l	2109.99	141.90	1.11	14.87	0.0328	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=412.899 maxSD=414.306 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
6		BASS		2061.79	164.08	1.96	12.57	0.0068	A
7		CORC		2197.05	163.89	1.95	13.41	0.0061	A
8		JACK		1995.79	163.71	1.94	12.19	0.0074	A
9		WM82		2167.52	164.24	1.97	13.20	0.0061	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=875.906 maxSD=988.85 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS	c	2642.09	220.41	6.16	11.99	<.0001	A
11	D	CORC	c	2469.07	220.38	6.15	11.20	<.0001	A
12	D	JACK	c	2243.94	220.40	6.16	10.18	<.0001	A
13	D	WM82	c	2263.53	220.58	6.17	10.26	<.0001	A
14	F	BASS	c	1806.06	236.43	8.01	7.64	<.0001	A
15	F	CORC	c	1973.72	220.37	6.16	8.96	<.0001	A
16	F	JACK	c	1831.45	236.16	7.99	7.76	<.0001	A
17	F	WM82	c	1916.44	248.24	9.58	7.72	<.0001	A
18	D	BASS	e	2184.80	220.41	6.16	9.91	<.0001	A
19	D	CORC	e	2334.66	220.38	6.15	10.59	<.0001	A
20	D	JACK	e	2063.68	220.40	6.16	9.36	<.0001	A
21	D	WM82	e	2080.65	220.58	6.17	9.43	<.0001	A
22	F	BASS	e	1901.45	220.47	6.16	8.62	0.0001	A
23	F	CORC	e	1865.62	220.37	6.16	8.47	0.0001	A
24	F	JACK	e	1808.06	216.11	5.72	8.37	0.0002	A
25	F	WM82	e	2267.65	212.39	5.35	10.68	<.0001	A
26	D	BASS	l	2049.26	236.58	8.03	8.66	<.0001	A
27	D	CORC	l	2551.46	228.26	7.06	11.18	<.0001	A
28	D	JACK	l	2159.77	220.40	6.16	9.80	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=875.906 maxSD=988.85 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
29	D	WM82	l	2397.04	220.58	6.17	10.87	<.0001	A
30	F	BASS	l	1787.06	212.48	5.36	8.41	0.0003	A
31	F	CORC	l	1987.74	220.37	6.16	9.02	<.0001	A
32	F	JACK	l	1867.85	216.15	5.72	8.64	0.0002	A
33	F	WM82	l	2079.78	227.79	6.96	9.13	<.0001	A

Seed Weight / 100

Model Information

Data Set	WORK.SEED
Dependent Variable	HndSedWt
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	P W
Field_Type	2	D F
Cultivar	4	BASS CORC JACK WM82
Timing	3	c e l
Rep	3	1 2 3

Dimensions

Covariance Parameters	7
Columns in X	66
Columns in Z	230
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	1209.99618216	
1	3	1068.25997628	0.00000272
2	1	1068.25917037	0.00000000

Convergence criteria met.

Seed Hundred Weight

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0
Year*Farm	0
Year*Farm*Field_Type	3.6038
Rep(Year*Farm*Field)	0
Year*Farm*Cultiv*Rep	0.5006
Yea*Far*Cul*Timi*Rep	0

Residual 2.2015

Fit Statistics

-2 Res Log Likelihood 1068.3
 AIC (smaller is better) 1074.3
 AICC (smaller is better) 1074.4
 BIC (smaller is better) 1070.3

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	1.07	0.4899
Field_Type	1	2	1.86	0.3060
Farm*Field_Type	1	2	0.34	0.6198
Cultivar	3	33	15.14	<.0001
Field_Type*Cultivar	3	121	5.89	0.0009
Timing	2	88	1.59	0.2096
Field_Type*Timing	2	121	0.98	0.3799
Cultivar*Timing	6	88	0.52	0.7939
Field_*Cultiv*Timing	6	121	0.34	0.9147

Seed Hundred Weight

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.82594 maxSD=5.82594 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			14.6111	0.9626	2	15.18	0.0043	A
2	F			12.7653	0.9631	2	13.25	0.0056	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.03495 maxSD=1.03992 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		13.2589	0.7232	33	18.33	<.0001	B
4		CORC		14.4891	0.7231	33	20.04	<.0001	A
5		JACK		12.3955	0.7244	33	17.11	<.0001	B
6		WM82		14.6093	0.7239	33	20.18	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.52307 maxSD=0.53565 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	13.8986	0.6993	88	19.87	<.0001	A
8			e	13.4980	0.6948	88	19.43	<.0001	A
9			l	13.6681	0.6948	88	19.67	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=0.80768 maxSD=0.8648 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D		c	14.9937	0.9784	121	15.32	<.0001	A

11	D		e	14.2812	0.9784	121	14.60	<.0001	A
12	D		l	14.5583	0.9784	121	14.88	<.0001	A
13	F		c	12.8034	0.9890	121	12.95	<.0001	A
14	F		e	12.7147	0.9762	121	13.03	<.0001	A
15	F		l	12.7778	0.9762	121	13.09	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.26704 maxSD=1.29476 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
16	D	BASS		14.5000	1.0019	121	14.47	<.0001	AB
17	D	CORC		15.8000	1.0019	121	15.77	<.0001	A
18	D	JACK		13.1278	1.0019	121	13.10	<.0001	B
19	D	WM82		15.0167	1.0019	121	14.99	<.0001	A
20	F	BASS		12.0179	1.0025	121	11.99	<.0001	BC

Seed Hundred Weight

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.26704 maxSD=1.29476 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	F	CORC		13.1781	1.0021	121	13.15	<.0001	AB
22	F	JACK		11.6633	1.0060	121	11.59	<.0001	C
23	F	WM82		14.2020	1.0043	121	14.14	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=2.36522 maxSD=2.9562 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
24	D	BASS	c	14.9250	1.0612	121	14.06	<.0001	ABCD
25	D	BASS	e	14.3083	1.0612	121	13.48	<.0001	ABCD
26	D	BASS	l	14.2667	1.0612	121	13.44	<.0001	ABCD
27	D	CORC	c	16.3333	1.0612	121	15.39	<.0001	A
28	D	CORC	e	15.1667	1.0612	121	14.29	<.0001	ABC
29	D	CORC	l	15.9000	1.0612	121	14.98	<.0001	AB
30	D	JACK	c	13.5667	1.0612	121	12.78	<.0001	BCD
31	D	JACK	e	12.6083	1.0612	121	11.88	<.0001	D
32	D	JACK	l	13.2083	1.0612	121	12.45	<.0001	CD
33	D	WM82	c	15.1500	1.0612	121	14.28	<.0001	ABC
34	D	WM82	e	15.0417	1.0612	121	14.17	<.0001	ABCD
35	D	WM82	l	14.8583	1.0612	121	14.00	<.0001	ABCD
36	F	BASS	c	12.0753	1.0807	121	11.17	<.0001	AB
37	F	BASS	e	11.8250	1.0612	121	11.14	<.0001	B
38	F	BASS	l	12.1534	1.0500	121	11.57	<.0001	AB
39	F	CORC	c	13.5862	1.0699	121	12.70	<.0001	AB
40	F	CORC	e	12.8732	1.0552	121	12.20	<.0001	AB
41	F	CORC	l	13.0750	1.0612	121	12.32	<.0001	AB
42	F	JACK	c	11.2978	1.1301	121	10.00	<.0001	B
43	F	JACK	e	11.8641	1.0498	121	11.30	<.0001	B
44	F	JACK	l	11.8278	1.0451	121	11.32	<.0001	B
45	F	WM82	c	14.2544	1.1098	121	12.84	<.0001	AB
46	F	WM82	e	14.2965	1.0451	121	13.68	<.0001	A
47	F	WM82	l	14.0552	1.0552	121	13.32	<.0001	AB

Seed Hundred Weight

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.82594 maxSD=5.82594 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			14.6111	0.9626	2	15.18	0.0043	A
2	F			12.7653	0.9631	2	13.25	0.0056	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.03495 maxSD=1.03992 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		13.2589	0.7232	33	18.33	<.0001	B
4		CORC		14.4891	0.7231	33	20.04	<.0001	A
5		JACK		12.3955	0.7244	33	17.11	<.0001	B
6		WM82		14.6093	0.7239	33	20.18	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.52307 maxSD=0.53565 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	13.8986	0.6993	88	19.87	<.0001	A
8			e	13.4980	0.6948	88	19.43	<.0001	A
9			l	13.6681	0.6948	88	19.67	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=2.7527 maxSD=4.00685 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D		c	14.9937	0.9784	121	15.32	<.0001	A
11	D		e	14.2812	0.9784	121	14.60	<.0001	A
12	D		l	14.5583	0.9784	121	14.88	<.0001	A
13	F		c	12.8034	0.9890	121	12.95	<.0001	A
14	F		e	12.7147	0.9762	121	13.03	<.0001	A
15	F		l	12.7778	0.9762	121	13.09	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.29474 maxSD=3.29862 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
16	D	BASS		14.5000	1.0019	121	14.47	<.0001	A
17	F	BASS		12.0179	1.0025	121	11.99	<.0001	A
18	D	CORC		15.8000	1.0019	121	15.77	<.0001	A
19	F	CORC		13.1781	1.0021	121	13.15	<.0001	A
20	D	JACK		13.1278	1.0019	121	13.10	<.0001	A

Seed Hundred Weight

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.29474 maxSD=3.29862 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	F	JACK		11.6633	1.0060	121	11.59	<.0001	A
22	D	WM82		15.0167	1.0019	121	14.99	<.0001	A
23	F	WM82		14.2020	1.0043	121	14.14	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=3.72017 maxSD=4.99767 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
24	D	BASS	c	14.9250	1.0612	121	14.06	<.0001	A
25	D	BASS	e	14.3083	1.0612	121	13.48	<.0001	A
26	D	BASS	l	14.2667	1.0612	121	13.44	<.0001	A
27	F	BASS	c	12.0753	1.0807	121	11.17	<.0001	A
28	F	BASS	e	11.8250	1.0612	121	11.14	<.0001	A
29	F	BASS	l	12.1534	1.0500	121	11.57	<.0001	A
30	D	CORC	c	16.3333	1.0612	121	15.39	<.0001	A
31	D	CORC	e	15.1667	1.0612	121	14.29	<.0001	A
32	D	CORC	l	15.9000	1.0612	121	14.98	<.0001	A
33	F	CORC	c	13.5862	1.0699	121	12.70	<.0001	A
34	F	CORC	e	12.8732	1.0552	121	12.20	<.0001	A
35	F	CORC	l	13.0750	1.0612	121	12.32	<.0001	A
36	D	JACK	c	13.5667	1.0612	121	12.78	<.0001	A
37	D	JACK	e	12.6083	1.0612	121	11.88	<.0001	A
38	D	JACK	l	13.2083	1.0612	121	12.45	<.0001	A
39	F	JACK	c	11.2978	1.1301	121	10.00	<.0001	A
40	F	JACK	e	11.8641	1.0498	121	11.30	<.0001	A
41	F	JACK	l	11.8278	1.0451	121	11.32	<.0001	A
42	D	WM82	c	15.1500	1.0612	121	14.28	<.0001	A
43	D	WM82	e	15.0417	1.0612	121	14.17	<.0001	A
44	D	WM82	l	14.8583	1.0612	121	14.00	<.0001	A
45	F	WM82	c	14.2544	1.1098	121	12.84	<.0001	A
46	F	WM82	e	14.2965	1.0451	121	13.68	<.0001	A
47	F	WM82	l	14.0552	1.0552	121	13.32	<.0001	A

Seed Hundred Weight

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=5.82594 maxSD=5.82594 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			14.6111	0.9626	2	15.18	0.0043	A
2	F			12.7653	0.9631	2	13.25	0.0056	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.03495 maxSD=1.03992 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		13.2589	0.7232	33	18.33	<.0001	B
4		CORC		14.4891	0.7231	33	20.04	<.0001	A
5		JACK		12.3955	0.7244	33	17.11	<.0001	B
6		WM82		14.6093	0.7239	33	20.18	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.52307 maxSD=0.53565 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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7		c	13.8986	0.6993	88	19.87	<.0001	A
8		e	13.4980	0.6948	88	19.43	<.0001	A
9		l	13.6681	0.6948	88	19.67	<.0001	A

----- Effect=Field_Type*Timing A=Tukey-Kramer(.05) avgSD=3.26884 maxSD=3.28325 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D		c	14.9937	0.9784	121	15.32	<.0001	A
11	F		c	12.8034	0.9890	121	12.95	<.0001	A
12	D		e	14.2812	0.9784	121	14.60	<.0001	A
13	F		e	12.7147	0.9762	121	13.03	<.0001	A
14	D		l	14.5583	0.9784	121	14.88	<.0001	A
15	F		l	12.7778	0.9762	121	13.09	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.09155 maxSD=4.37961 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
16	D	BASS		14.5000	1.0019	121	14.47	<.0001	ABCD
17	D	CORC		15.8000	1.0019	121	15.77	<.0001	ABC
18	D	JACK		13.1278	1.0019	121	13.10	<.0001	DE
19	D	WM82		15.0167	1.0019	121	14.99	<.0001	ABC
20	F	BASS		12.0179	1.0025	121	11.99	<.0001	BCE

Seed Hundred Weight

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=3.09155 maxSD=4.37961 -----
(continued)

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	F	CORC		13.1781	1.0021	121	13.15	<.0001	ABD
22	F	JACK		11.6633	1.0060	121	11.59	<.0001	CE
23	F	WM82		14.2020	1.0043	121	14.14	<.0001	AD

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=3.87916 maxSD=5.24001 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
24	D	BASS	c	14.9250	1.0612	121	14.06	<.0001	AB
25	D	CORC	c	16.3333	1.0612	121	15.39	<.0001	A
26	D	JACK	c	13.5667	1.0612	121	12.78	<.0001	B
27	D	WM82	c	15.1500	1.0612	121	14.28	<.0001	AB
28	F	BASS	c	12.0753	1.0807	121	11.17	<.0001	AB
29	F	CORC	c	13.5862	1.0699	121	12.70	<.0001	AB
30	F	JACK	c	11.2978	1.1301	121	10.00	<.0001	AB
31	F	WM82	c	14.2544	1.1098	121	12.84	<.0001	AB
32	D	BASS	e	14.3083	1.0612	121	13.48	<.0001	ABC
33	D	CORC	e	15.1667	1.0612	121	14.29	<.0001	AB
34	D	JACK	e	12.6083	1.0612	121	11.88	<.0001	CD
35	D	WM82	e	15.0417	1.0612	121	14.17	<.0001	ABC
36	F	BASS	e	11.8250	1.0612	121	11.14	<.0001	BD
37	F	CORC	e	12.8732	1.0552	121	12.20	<.0001	ABC
38	F	JACK	e	11.8641	1.0498	121	11.30	<.0001	BD

39	F	WM82	e	14.2965	1.0451	121	13.68	<.0001	AC
40	D	BASS	1	14.2667	1.0612	121	13.44	<.0001	AB
41	D	CORC	1	15.9000	1.0612	121	14.98	<.0001	A
42	D	JACK	1	13.2083	1.0612	121	12.45	<.0001	B
43	D	WM82	1	14.8583	1.0612	121	14.00	<.0001	AB
44	F	BASS	1	12.1534	1.0500	121	11.57	<.0001	AB
45	F	CORC	1	13.0750	1.0612	121	12.32	<.0001	AB
46	F	JACK	1	11.8278	1.0451	121	11.32	<.0001	AB
47	F	WM82	1	14.0552	1.0552	121	13.32	<.0001	AB

Seed Protein

The Mixed Procedure

Model Information

Data Set	WORK.SEED
Dependent Variable	Protein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	P W
Field_Type	2	D F
Cultivar	4	BASS CORC JACK WM82
Timing	3	c e l
Rep	3	1 2 3

Dimensions

Covariance Parameters	7
Columns in X	66
Columns in Z	230
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	979.47619376	
1	3	817.74631779	0.00052721
2	1	817.65102636	0.00000868
3	1	817.64954724	0.00000000

Convergence criteria met.

Seed Protein

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0.3924
Year*Farm	0
Year*Farm*Field_Type	1.1132
Rep(Year*Farm*Field)	0.1852

```

Year*Farm*Cultiv*Rep      0.07319
Yea*Far*Cul*Timi*Rep      0
Residual                   0.8445
    
```

Fit Statistics

```

-2 Res Log Likelihood      817.6
AIC (smaller is better)    827.6
AICC (smaller is better)   827.9
BIC (smaller is better)    821.1
    
```

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	0.39	0.6430
Field_Type	1	2	1.22	0.3850
Farm*Field_Type	1	2	0.01	0.9231
Cultivar	3	33	13.52	<.0001
Field_Type*Cultivar	3	121	10.85	<.0001
Timing	2	88	2.54	0.0844
Field_Type*Timing	2	121	1.82	0.1669
Cultivar*Timing	6	88	0.12	0.9931
Field_*Cultiv*Timing	6	121	0.60	0.7277

Seed Protein

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.33148 maxSD=3.33148 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			40.8937	0.7052	2	57.99	0.0003	A
2	F			41.7478	0.7055	2	59.18	0.0003	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.51564 maxSD=0.51941 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		40.9948	0.6008	33	68.23	<.0001	B
4		CORC		41.9201	0.6008	33	69.78	<.0001	A
5		JACK		40.8437	0.6014	33	67.92	<.0001	B
6		WM82		41.5245	0.6011	33	69.08	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.32379 maxSD=0.33144 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	41.5056	0.5961	88	69.63	<.0001	A
8			e	41.2317	0.5941	88	69.40	<.0001	A
9			l	41.2250	0.5941	88	69.39	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.68101 maxSD=0.7005 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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10	D	BASS		40.8306	0.7207	121	56.65	<.0001	B
11	D	CORC		41.8361	0.7207	121	58.05	<.0001	A
12	D	JACK		40.0028	0.7207	121	55.50	<.0001	C
13	D	WM82		40.9056	0.7207	121	56.75	<.0001	B
14	F	BASS		41.1590	0.7211	121	57.08	<.0001	B
15	F	CORC		42.0041	0.7208	121	58.27	<.0001	A
16	F	JACK		41.6846	0.7229	121	57.66	<.0001	AB
17	F	WM82		42.1434	0.7220	121	58.37	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.39385 maxSD=1.75376 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	41.0167	0.7526	121	54.50	<.0001	AB
19	D	BASS	e	40.7833	0.7526	121	54.19	<.0001	AB
20	D	BASS	l	40.6917	0.7526	121	54.07	<.0001	AB

Seed Protein

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.39385 maxSD=1.75376 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	D	CORC	c	41.7917	0.7526	121	55.53	<.0001	A
22	D	CORC	e	41.7583	0.7526	121	55.49	<.0001	A
23	D	CORC	l	41.9583	0.7526	121	55.75	<.0001	A
24	D	JACK	c	39.9917	0.7526	121	53.14	<.0001	B
25	D	JACK	e	39.9667	0.7526	121	53.11	<.0001	B
26	D	JACK	l	40.0500	0.7526	121	53.22	<.0001	B
27	D	WM82	c	40.9083	0.7526	121	54.36	<.0001	AB
28	D	WM82	e	40.8917	0.7526	121	54.33	<.0001	AB
29	D	WM82	l	40.9167	0.7526	121	54.37	<.0001	AB
30	F	BASS	c	41.2530	0.7630	121	54.07	<.0001	AB
31	F	BASS	e	40.9833	0.7526	121	54.46	<.0001	B
32	F	BASS	l	41.2407	0.7465	121	55.25	<.0001	AB
33	F	CORC	c	42.2640	0.7573	121	55.81	<.0001	AB
34	F	CORC	e	42.0151	0.7493	121	56.07	<.0001	AB
35	F	CORC	l	41.7333	0.7526	121	55.45	<.0001	AB
36	F	JACK	c	42.2002	0.7894	121	53.46	<.0001	AB
37	F	JACK	e	41.5042	0.7464	121	55.60	<.0001	AB
38	F	JACK	l	41.3493	0.7439	121	55.59	<.0001	AB
39	F	WM82	c	42.6193	0.7785	121	54.74	<.0001	A
40	F	WM82	e	41.9510	0.7439	121	56.40	<.0001	AB
41	F	WM82	l	41.8601	0.7493	121	55.86	<.0001	AB

Seed Protein

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.33148 maxSD=3.33148 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			40.8937	0.7052	2	57.99	0.0003	A
2	F			41.7478	0.7055	2	59.18	0.0003	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.51564 maxSD=0.51941 -----

Field_	Standard	Pr >	Let
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Obs	Type	Cultivar	Timing	Estimate	Error	DF	t Value	t	Grp
3		BASS		40.9948	0.6008	33	68.23	<.0001	B
4		CORC		41.9201	0.6008	33	69.78	<.0001	A
5		JACK		40.8437	0.6014	33	67.92	<.0001	B
6		WM82		41.5245	0.6011	33	69.08	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.32379 maxSD=0.33144 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	41.5056	0.5961	88	69.63	<.0001	A
8			e	41.2317	0.5941	88	69.40	<.0001	A
9			l	41.2250	0.5941	88	69.39	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.89201 maxSD=1.89456 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS		40.8306	0.7207	121	56.65	<.0001	A
11	F	BASS		41.1590	0.7211	121	57.08	<.0001	A
12	D	CORC		41.8361	0.7207	121	58.05	<.0001	A
13	F	CORC		42.0041	0.7208	121	58.27	<.0001	A
14	D	JACK		40.0028	0.7207	121	55.50	<.0001	A
15	F	JACK		41.6846	0.7229	121	57.66	<.0001	A
16	D	WM82		40.9056	0.7207	121	56.75	<.0001	A
17	F	WM82		42.1434	0.7220	121	58.37	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=2.18809 maxSD=2.90706 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	41.0167	0.7526	121	54.50	<.0001	A
19	D	BASS	e	40.7833	0.7526	121	54.19	<.0001	A
20	D	BASS	l	40.6917	0.7526	121	54.07	<.0001	A

Seed Protein

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=2.18809 maxSD=2.90706 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	F	BASS	c	41.2530	0.7630	121	54.07	<.0001	A
22	F	BASS	e	40.9833	0.7526	121	54.46	<.0001	A
23	F	BASS	l	41.2407	0.7465	121	55.25	<.0001	A
24	D	CORC	c	41.7917	0.7526	121	55.53	<.0001	A
25	D	CORC	e	41.7583	0.7526	121	55.49	<.0001	A
26	D	CORC	l	41.9583	0.7526	121	55.75	<.0001	A
27	F	CORC	c	42.2640	0.7573	121	55.81	<.0001	A
28	F	CORC	e	42.0151	0.7493	121	56.07	<.0001	A
29	F	CORC	l	41.7333	0.7526	121	55.45	<.0001	A
30	D	JACK	c	39.9917	0.7526	121	53.14	<.0001	A
31	D	JACK	e	39.9667	0.7526	121	53.11	<.0001	A
32	D	JACK	l	40.0500	0.7526	121	53.22	<.0001	A
33	F	JACK	c	42.2002	0.7894	121	53.46	<.0001	A
34	F	JACK	e	41.5042	0.7464	121	55.60	<.0001	A

35	F	JACK	l	41.3493	0.7439	121	55.59	<.0001	A
36	D	WM82	c	40.9083	0.7526	121	54.36	<.0001	A
37	D	WM82	e	40.8917	0.7526	121	54.33	<.0001	A
38	D	WM82	l	40.9167	0.7526	121	54.37	<.0001	A
39	F	WM82	c	42.6193	0.7785	121	54.74	<.0001	A
40	F	WM82	e	41.9510	0.7439	121	56.40	<.0001	A
41	F	WM82	l	41.8601	0.7493	121	55.86	<.0001	A

Seed Protein

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=3.33148 maxSD=3.33148 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			40.8937	0.7052	2	57.99	0.0003	A
2	F			41.7478	0.7055	2	59.18	0.0003	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.51564 maxSD=0.51941 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		40.9948	0.6008	33	68.23	<.0001	B
4		CORC		41.9201	0.6008	33	69.78	<.0001	A
5		JACK		40.8437	0.6014	33	67.92	<.0001	B
6		WM82		41.5245	0.6011	33	69.08	<.0001	A

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.32379 maxSD=0.33144 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	41.5056	0.5961	88	69.63	<.0001	A
8			e	41.2317	0.5941	88	69.40	<.0001	A
9			l	41.2250	0.5941	88	69.39	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=1.74058 maxSD=2.48627 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS		40.8306	0.7207	121	56.65	<.0001	BE
11	D	CORC		41.8361	0.7207	121	58.05	<.0001	AD
12	D	JACK		40.0028	0.7207	121	55.50	<.0001	CF
13	D	WM82		40.9056	0.7207	121	56.75	<.0001	BE
14	F	BASS		41.1590	0.7211	121	57.08	<.0001	DEF
15	F	CORC		42.0041	0.7208	121	58.27	<.0001	ABC
16	F	JACK		41.6846	0.7229	121	57.66	<.0001	ABCD
17	F	WM82		42.1434	0.7220	121	58.37	<.0001	ABC

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=2.23873 maxSD=3.01782 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	41.0167	0.7526	121	54.50	<.0001	AB
19	D	CORC	c	41.7917	0.7526	121	55.53	<.0001	A
20	D	JACK	c	39.9917	0.7526	121	53.14	<.0001	B

Seed Protein

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=2.23873 maxSD=3.01782 -----
 (continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	D	WM82	c	40.9083	0.7526	121	54.36	<.0001	AB
22	F	BASS	c	41.2530	0.7630	121	54.07	<.0001	AB
23	F	CORC	c	42.2640	0.7573	121	55.81	<.0001	AB
24	F	JACK	c	42.2002	0.7894	121	53.46	<.0001	AB
25	F	WM82	c	42.6193	0.7785	121	54.74	<.0001	AB
26	D	BASS	e	40.7833	0.7526	121	54.19	<.0001	AB
27	D	CORC	e	41.7583	0.7526	121	55.49	<.0001	A
28	D	JACK	e	39.9667	0.7526	121	53.11	<.0001	B
29	D	WM82	e	40.8917	0.7526	121	54.33	<.0001	AB
30	F	BASS	e	40.9833	0.7526	121	54.46	<.0001	AB
31	F	CORC	e	42.0151	0.7493	121	56.07	<.0001	AB
32	F	JACK	e	41.5042	0.7464	121	55.60	<.0001	AB
33	F	WM82	e	41.9510	0.7439	121	56.40	<.0001	AB
34	D	BASS	l	40.6917	0.7526	121	54.07	<.0001	AB
35	D	CORC	l	41.9583	0.7526	121	55.75	<.0001	A
36	D	JACK	l	40.0500	0.7526	121	53.22	<.0001	B
37	D	WM82	l	40.9167	0.7526	121	54.37	<.0001	AB
38	F	BASS	l	41.2407	0.7465	121	55.25	<.0001	AB
39	F	CORC	l	41.7333	0.7526	121	55.45	<.0001	AB
40	F	JACK	l	41.3493	0.7439	121	55.59	<.0001	AB
41	F	WM82	l	41.8601	0.7493	121	55.86	<.0001	AB

Seed Oil

The Mixed Procedure

Model Information

Data Set	WORK.SEED
Dependent Variable	Oil
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
Year	2	2002 2003
Farm	2	P W
Field_Type	2	D F
Cultivar	4	BASS CORC JACK WM82
Timing	3	c e l
Rep	3	1 2 3

Dimensions

Covariance Parameters	7
Columns in X	66
Columns in Z	230
Subjects	1
Max Obs Per Subject	288
Observations Used	288
Observations Not Used	0
Total Observations	288

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	717.82538339	
1	4	686.59349386	0.00576743
2	2	686.04883414	0.00114227
3	1	685.91704019	0.00006706
4	1	685.90982038	0.00000056
5	1	685.90976293	0.00000000

Convergence criteria met.

The Mixed Procedure

Covariance Parameter Estimates

Cov Parm	Estimate
Year	0
Year*Farm	0
Year*Farm*Field_Type	0.1582
Rep(Year*Farm*Field)	0.04101
Year*Farm*Cultiv*Rep	0.05398
Yea*Far*Cul*Timi*Rep	0
Residual	0.5384

Fit Statistics

-2 Res Log Likelihood	685.9
AIC (smaller is better)	693.9
AICC (smaller is better)	694.1
BIC (smaller is better)	688.7

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Farm	1	1	6.18	0.2435
Field_Type	1	2	3.77	0.1916
Farm*Field_Type	1	2	0.02	0.8916
Cultivar	3	33	5.08	0.0053
Field_Type*Cultivar	3	121	5.32	0.0018
Timing	2	88	0.87	0.4237
Field_Type*Timing	2	121	2.60	0.0786
Cultivar*Timing	6	88	0.19	0.9776
Field_*Cultiv*Timing	6	121	0.89	0.5070

Seed Oil

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.31652 maxSD=1.31652 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			19.9639	0.2187	2	91.29	0.0001	A
2	F			20.5581	0.2192	2	93.79	0.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.42241 maxSD=0.42534 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		20.5935	0.1831	33	112.46	<.0001	A
4		CORC		19.9953	0.1830	33	109.29	<.0001	B
5		JACK		20.2228	0.1843	33	109.76	<.0001	AB
6		WM82		20.2324	0.1837	33	110.13	<.0001	AB

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.25835 maxSD=0.26442 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
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7		c	20.1769	0.1716	88	117.57	<.0001	A
8		e	20.3177	0.1672	88	121.54	<.0001	A
9		l	20.2884	0.1672	88	121.36	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.55227 maxSD=0.56759 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS		20.1583	0.2498	121	80.69	<.0001	AB
11	D	CORC		19.5889	0.2498	121	78.41	<.0001	B
12	D	JACK		20.2278	0.2498	121	80.97	<.0001	A
13	D	WM82		19.8806	0.2498	121	79.58	<.0001	AB
14	F	BASS		21.0287	0.2504	121	83.97	<.0001	A
15	F	CORC		20.4017	0.2500	121	81.62	<.0001	B
16	F	JACK		20.2179	0.2537	121	79.68	<.0001	B
17	F	WM82		20.5842	0.2522	121	81.63	<.0001	AB

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.1182 maxSD=1.40567 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	20.2333	0.3038	121	66.59	<.0001	A
19	D	BASS	e	20.0833	0.3038	121	66.10	<.0001	A
20	D	BASS	l	20.1583	0.3038	121	66.34	<.0001	A

Seed Oil

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.1182 maxSD=1.40567 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	D	CORC	c	19.6833	0.3038	121	64.78	<.0001	A
22	D	CORC	e	19.5667	0.3038	121	64.40	<.0001	A
23	D	CORC	l	19.5167	0.3038	121	64.23	<.0001	A
24	D	JACK	c	20.3417	0.3038	121	66.95	<.0001	A
25	D	JACK	e	20.4000	0.3038	121	67.14	<.0001	A
26	D	JACK	l	19.9417	0.3038	121	65.63	<.0001	A
27	D	WM82	c	19.7167	0.3038	121	64.89	<.0001	A
28	D	WM82	e	20.1083	0.3038	121	66.18	<.0001	A
29	D	WM82	l	19.8167	0.3038	121	65.22	<.0001	A
30	F	BASS	c	20.8884	0.3199	121	65.29	<.0001	A
31	F	BASS	e	21.1250	0.3038	121	69.53	<.0001	A
32	F	BASS	l	21.0726	0.2940	121	71.67	<.0001	A
33	F	CORC	c	20.2534	0.3112	121	65.09	<.0001	A
34	F	CORC	e	20.3933	0.2986	121	68.29	<.0001	A
35	F	CORC	l	20.5583	0.3038	121	67.66	<.0001	A
36	F	JACK	c	19.7756	0.3583	121	55.20	<.0001	A
37	F	JACK	e	20.2995	0.2939	121	69.07	<.0001	A
38	F	JACK	l	20.5785	0.2897	121	71.03	<.0001	A
39	F	WM82	c	20.5227	0.3428	121	59.86	<.0001	A
40	F	WM82	e	20.5652	0.2897	121	70.98	<.0001	A
41	F	WM82	l	20.6646	0.2986	121	69.20	<.0001	A

Seed Oil

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.31652 maxSD=1.31652 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			19.9639	0.2187	2	91.29	0.0001	A
2	F			20.5581	0.2192	2	93.79	0.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.42241 maxSD=0.42534 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		20.5935	0.1831	33	112.46	<.0001	A
4		CORC		19.9953	0.1830	33	109.29	<.0001	B
5		JACK		20.2228	0.1843	33	109.76	<.0001	AB
6		WM82		20.2324	0.1837	33	110.13	<.0001	AB

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.25835 maxSD=0.26442 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	20.1769	0.1716	88	117.57	<.0001	A
8			e	20.3177	0.1672	88	121.54	<.0001	A
9			l	20.2884	0.1672	88	121.36	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.81065 maxSD=0.81445 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS		20.1583	0.2498	121	80.69	<.0001	A
11	F	BASS		21.0287	0.2504	121	83.97	<.0001	A
12	D	CORC		19.5889	0.2498	121	78.41	<.0001	A
13	F	CORC		20.4017	0.2500	121	81.62	<.0001	A
14	D	JACK		20.2278	0.2498	121	80.97	<.0001	A
15	F	JACK		20.2179	0.2537	121	79.68	<.0001	A
16	D	WM82		19.8806	0.2498	121	79.58	<.0001	A
17	F	WM82		20.5842	0.2522	121	81.63	<.0001	A

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.23322 maxSD=1.50969 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	20.2333	0.3038	121	66.59	<.0001	A
19	D	BASS	e	20.0833	0.3038	121	66.10	<.0001	A
20	D	BASS	l	20.1583	0.3038	121	66.34	<.0001	A

Seed Oil

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.23322 maxSD=1.50969 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	F	BASS	c	20.8884	0.3199	121	65.29	<.0001	A
22	F	BASS	e	21.1250	0.3038	121	69.53	<.0001	A
23	F	BASS	l	21.0726	0.2940	121	71.67	<.0001	A
24	D	CORC	c	19.6833	0.3038	121	64.78	<.0001	A

25	D	CORC	e	19.5667	0.3038	121	64.40	<.0001	A
26	D	CORC	l	19.5167	0.3038	121	64.23	<.0001	A
27	F	CORC	c	20.2534	0.3112	121	65.09	<.0001	A
28	F	CORC	e	20.3933	0.2986	121	68.29	<.0001	A
29	F	CORC	l	20.5583	0.3038	121	67.66	<.0001	A
30	D	JACK	c	20.3417	0.3038	121	66.95	<.0001	A
31	D	JACK	e	20.4000	0.3038	121	67.14	<.0001	A
32	D	JACK	l	19.9417	0.3038	121	65.63	<.0001	A
33	F	JACK	c	19.7756	0.3583	121	55.20	<.0001	A
34	F	JACK	e	20.2995	0.2939	121	69.07	<.0001	A
35	F	JACK	l	20.5785	0.2897	121	71.03	<.0001	A
36	D	WM82	c	19.7167	0.3038	121	64.89	<.0001	A
37	D	WM82	e	20.1083	0.3038	121	66.18	<.0001	A
38	D	WM82	l	19.8167	0.3038	121	65.22	<.0001	A
39	F	WM82	c	20.5227	0.3428	121	59.86	<.0001	A
40	F	WM82	e	20.5652	0.2897	121	70.98	<.0001	A
41	F	WM82	l	20.6646	0.2986	121	69.20	<.0001	A

Seed Oil

----- Effect=Field_Type A=Tukey-Kramer(.05) avgSD=1.31652 maxSD=1.31652 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1	D			19.9639	0.2187	2	91.29	0.0001	A
2	F			20.5581	0.2192	2	93.79	0.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.42241 maxSD=0.42534 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3		BASS		20.5935	0.1831	33	112.46	<.0001	A
4		CORC		19.9953	0.1830	33	109.29	<.0001	B
5		JACK		20.2228	0.1843	33	109.76	<.0001	AB
6		WM82		20.2324	0.1837	33	110.13	<.0001	AB

----- Effect=Timing A=Tukey-Kramer(.05) avgSD=0.25835 maxSD=0.26442 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7			c	20.1769	0.1716	88	117.57	<.0001	A
8			e	20.3177	0.1672	88	121.54	<.0001	A
9			l	20.2884	0.1672	88	121.36	<.0001	A

----- Effect=Field_Type*Cultivar A=Tukey-Kramer(.05) avgSD=0.88289 maxSD=1.09842 -----

Obs	Field_Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
10	D	BASS		20.1583	0.2498	121	80.69	<.0001	ABC
11	D	CORC		19.5889	0.2498	121	78.41	<.0001	C
12	D	JACK		20.2278	0.2498	121	80.97	<.0001	AB
13	D	WM82		19.8806	0.2498	121	79.58	<.0001	BC
14	F	BASS		21.0287	0.2504	121	83.97	<.0001	A
15	F	CORC		20.4017	0.2500	121	81.62	<.0001	BC
16	F	JACK		20.2179	0.2537	121	79.68	<.0001	BC
17	F	WM82		20.5842	0.2522	121	81.63	<.0001	ABC

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.29328 maxSD=1.58788 -----

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
18	D	BASS	c	20.2333	0.3038	121	66.59	<.0001	A
19	D	CORC	c	19.6833	0.3038	121	64.78	<.0001	A
20	D	JACK	c	20.3417	0.3038	121	66.95	<.0001	A

Seed Oil

----- Effect=Field_*Cultiv*Timing A=Tukey-Kramer(.05) avgSD=1.29328 maxSD=1.58788 -----
(continued)

Obs	Field_ Type	Cultivar	Timing	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
21	D	WM82	c	19.7167	0.3038	121	64.89	<.0001	A
22	F	BASS	c	20.8884	0.3199	121	65.29	<.0001	A
23	F	CORC	c	20.2534	0.3112	121	65.09	<.0001	A
24	F	JACK	c	19.7756	0.3583	121	55.20	<.0001	A
25	F	WM82	c	20.5227	0.3428	121	59.86	<.0001	A
26	D	BASS	e	20.0833	0.3038	121	66.10	<.0001	A
27	D	CORC	e	19.5667	0.3038	121	64.40	<.0001	A
28	D	JACK	e	20.4000	0.3038	121	67.14	<.0001	A
29	D	WM82	e	20.1083	0.3038	121	66.18	<.0001	A
30	F	BASS	e	21.1250	0.3038	121	69.53	<.0001	A
31	F	CORC	e	20.3933	0.2986	121	68.29	<.0001	A
32	F	JACK	e	20.2995	0.2939	121	69.07	<.0001	A
33	F	WM82	e	20.5652	0.2897	121	70.98	<.0001	A
34	D	BASS	l	20.1583	0.3038	121	66.34	<.0001	A
35	D	CORC	l	19.5167	0.3038	121	64.23	<.0001	A
36	D	JACK	l	19.9417	0.3038	121	65.63	<.0001	A
37	D	WM82	l	19.8167	0.3038	121	65.22	<.0001	A
38	F	BASS	l	21.0726	0.2940	121	71.67	<.0001	A
39	F	CORC	l	20.5583	0.3038	121	67.66	<.0001	A
40	F	JACK	l	20.5785	0.2897	121	71.03	<.0001	A
41	F	WM82	l	20.6646	0.2986	121	69.20	<.0001	A

Chapter 4: SAS Output for Statistical Analysis of Ozone Effects
on the Concentration of Seed Isoflavones in Soybean [*Glycine max*
(L.) Merr.] Seeds

Isoflavone Analysis - Ozone Study

Genistin

The Mixed Procedure

Model Information

Data Set	WORK.OZONEISO
Dependent Variable	Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Williams
Treatmnt	2	F 0

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	77.66568411	
1	1	77.22756996	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0.6309

Residual 3.7049

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood 77.2
 AIC (smaller is better) 81.2
 AICC (smaller is better) 82.2
 BIC (smaller is better) 80.8

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	12	7.31	0.0048
Treatmnt	1	4	6.08	0.0693
Cultivar*Treatmnt	3	12	0.43	0.7357

----- Effect=Treatmnt A=Tukey(.05) avgSD=2.82887 maxSD=2.82887 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	10.7287	0.7205	4	14.89	0.0001	A
2		0	8.2173	0.7205	4	11.41	0.0003	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.29922 maxSD=3.29922 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		9.1971	0.8501	15	10.82	<.0001	AB
4	Corsica		8.6906	0.8501	15	10.22	<.0001	B
5	Jack		7.5229	0.8501	15	8.85	<.0001	B
6	Williams		12.4812	0.8501	15	14.68	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=5.00928 maxSD=5.00928 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	10.1516	1.2022	15	8.44	<.0001	A
8	Corsica	F	9.6496	1.2022	15	8.03	<.0001	A
9	Jack	F	9.5456	1.2022	15	7.94	<.0001	A
10	Williams	F	13.5678	1.2022	15	11.29	<.0001	A
11	Bass	0	8.2426	1.2022	15	6.86	<.0001	AB
12	Corsica	0	7.7316	1.2022	15	6.43	<.0001	AB
13	Jack	0	5.5003	1.2022	15	4.58	0.0004	B
14	Williams	0	11.3945	1.2022	15	9.48	<.0001	A

----- Effect=Treatmnt A=Tukey(.05) avgSD=2.82887 maxSD=2.82887 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	10.7287	0.7205	4	14.89	0.0001	A
2		0	8.2173	0.7205	4	11.41	0.0003	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.29922 maxSD=3.29922 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		9.1971	0.8501	15	10.82	<.0001	AB
4	Corsica		8.6906	0.8501	15	10.22	<.0001	B
5	Jack		7.5229	0.8501	15	8.85	<.0001	B
6	Williams		12.4812	0.8501	15	14.68	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=4.41476 maxSD=4.41476 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	10.1516	1.2022	15	8.44	<.0001	A
8	Bass	0	8.2426	1.2022	15	6.86	<.0001	A
9	Corsica	F	9.6496	1.2022	15	8.03	<.0001	A
10	Corsica	0	7.7316	1.2022	15	6.43	<.0001	A
11	Jack	F	9.5456	1.2022	15	7.94	<.0001	A
12	Jack	0	5.5003	1.2022	15	4.58	0.0004	A
13	Williams	F	13.5678	1.2022	15	11.29	<.0001	A
14	Williams	0	11.3945	1.2022	15	9.48	<.0001	A

MalonylGenistin

The Mixed Procedure

Model Information

Data Set	WORK.OZONEISO
Dependent Variable	M_Genistin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Williams
Treatmnt	2	F 0

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	116.56352009	
1	1	116.34754855	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	4.9438
Residual	44.3618

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	116.3
AIC (smaller is better)	120.3
AICC (smaller is better)	121.3

BIC (smaller is better) 119.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	12	15.35	0.0002
Treatmnt	1	4	11.84	0.0263
Cultivar*Treatmnt	3	12	1.40	0.2903

----- Effect=Treatmnt A=Tukey(.05) avgSD=9.07757 maxSD=9.07757 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	51.0553	2.3119	4	22.08	<.0001	A
2		0	39.8067	2.3119	4	17.22	<.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=11.4163 maxSD=11.4163 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		44.1722	2.8666	15.5	15.41	<.0001	B
4	Corsica		42.2632	2.8666	15.5	14.74	<.0001	B
5	Jack		35.0143	2.8666	15.5	12.21	<.0001	B
6	Williams		60.2743	2.8666	15.5	21.03	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=17.3336 maxSD=17.3336 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	51.0748	4.0540	15.5	12.60	<.0001	A
8	Corsica	F	47.3203	4.0540	15.5	11.67	<.0001	A
9	Jack	F	44.0826	4.0540	15.5	10.87	<.0001	A
10	Williams	F	61.7433	4.0540	15.5	15.23	<.0001	A
11	Bass	0	37.2697	4.0540	15.5	9.19	<.0001	B
12	Corsica	0	37.2061	4.0540	15.5	9.18	<.0001	B
13	Jack	0	25.9459	4.0540	15.5	6.40	<.0001	B
14	Williams	0	58.8052	4.0540	15.5	14.51	<.0001	A

----- Effect=Treatmnt A=Tukey(.05) avgSD=9.07757 maxSD=9.07757 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	51.0553	2.3119	4	22.08	<.0001	A
2		0	39.8067	2.3119	4	17.22	<.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=11.4163 maxSD=11.4163 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		44.1722	2.8666	15.5	15.41	<.0001	B
4	Corsica		42.2632	2.8666	15.5	14.74	<.0001	B
5	Jack		35.0143	2.8666	15.5	12.21	<.0001	B

6	Williams	60.2743	2.8666	15.5	21.03	<.0001	A
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----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=14.8381 maxSD=14.8381 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	51.0748	4.0540	15.5	12.60	<.0001	A
8	Bass	O	37.2697	4.0540	15.5	9.19	<.0001	A
9	Corsica	F	47.3203	4.0540	15.5	11.67	<.0001	A
10	Corsica	O	37.2061	4.0540	15.5	9.18	<.0001	A
11	Jack	F	44.0826	4.0540	15.5	10.87	<.0001	A
12	Jack	O	25.9459	4.0540	15.5	6.40	<.0001	A
13	Williams	F	61.7433	4.0540	15.5	15.23	<.0001	A
14	Williams	O	58.8052	4.0540	15.5	14.51	<.0001	A

Daidzin

The Mixed Procedure

Model Information

Data Set	WORK.OZONEISO
Dependent Variable	Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Williams
Treatmnt	2	F 0

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	37.46166550	
1	1	36.62931177	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0.07189
Residual	0.2795

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	36.6
AIC (smaller is better)	40.6
AICC (smaller is better)	41.6

BIC (smaller is better) 40.2

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	12	26.61	<.0001
Treatmnt	1	4	9.01	0.0399
Cultivar*Treatmnt	3	12	0.10	0.9564

----- Effect=Treatmnt A=Tukey(.05) avgSD=0.85355 maxSD=0.85355 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	4.1668	0.2174	4	19.17	<.0001	A
2		0	3.2440	0.2174	4	14.92	0.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.9062 maxSD=0.9062 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		3.0518	0.2420	14.2	12.61	<.0001	C
4	Corsica		3.9843	0.2420	14.2	16.46	<.0001	B
5	Jack		2.6389	0.2420	14.2	10.90	<.0001	C
6	Williams		5.1465	0.2420	14.2	21.27	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=1.3759 maxSD=1.3759 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	3.4345	0.3422	14.2	10.04	<.0001	B
8	Corsica	F	4.4800	0.3422	14.2	13.09	<.0001	AB
9	Jack	F	3.1778	0.3422	14.2	9.29	<.0001	B
10	Williams	F	5.5747	0.3422	14.2	16.29	<.0001	A
11	Bass	0	2.6690	0.3422	14.2	7.80	<.0001	B
12	Corsica	0	3.4886	0.3422	14.2	10.19	<.0001	AB
13	Jack	0	2.0999	0.3422	14.2	6.14	<.0001	B
14	Williams	0	4.7182	0.3422	14.2	13.79	<.0001	A

----- Effect=Treatmnt A=Tukey(.05) avgSD=0.85355 maxSD=0.85355 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	4.1668	0.2174	4	19.17	<.0001	A
2		0	3.2440	0.2174	4	14.92	0.0001	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.9062 maxSD=0.9062 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		3.0518	0.2420	14.2	12.61	<.0001	C
4	Corsica		3.9843	0.2420	14.2	16.46	<.0001	B

5	Jack	2.6389	0.2420	14.2	10.90	<.0001	C
6	Williams	5.1465	0.2420	14.2	21.27	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=1.26461 maxSD=1.26461 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	3.4345	0.3422	14.2	10.04	<.0001	A
8	Bass	O	2.6690	0.3422	14.2	7.80	<.0001	A
9	Corsica	F	4.4800	0.3422	14.2	13.09	<.0001	A
10	Corsica	O	3.4886	0.3422	14.2	10.19	<.0001	A
11	Jack	F	3.1778	0.3422	14.2	9.29	<.0001	A
12	Jack	O	2.0999	0.3422	14.2	6.14	<.0001	A
13	Williams	F	5.5747	0.3422	14.2	16.29	<.0001	A
14	Williams	O	4.7182	0.3422	14.2	13.79	<.0001	A

MalonlyDaidzin

The Mixed Procedure

Model Information

Data Set	WORK.OZONEISO
Dependent Variable	M_Daidzin
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Williams
Treatmnt	2	F 0

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	80.39951076	
1	1	78.78122363	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	1.4976
Residual	3.6461

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	78.8
AIC (smaller is better)	82.8
AICC (smaller is better)	83.7
BIC (smaller is better)	82.4

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	12	38.13	<.0001
Treatmnt	1	4	8.53	0.0432
Cultivar*Treatmnt	3	12	0.44	0.7310

----- Effect=Treatmnt A=Tukey(.05) avgSD=3.51868 maxSD=3.51868 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	14.5976	0.8961	4	16.29	<.0001	A
2		0	10.8955	0.8961	4	12.16	0.0003	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.27293 maxSD=3.27293 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		10.5450	0.9259	12.8	11.39	<.0001	BC
4	Corsica		13.3857	0.9259	12.8	14.46	<.0001	B
5	Jack		7.9140	0.9259	12.8	8.55	<.0001	C
6	Williams		19.1415	0.9259	12.8	20.67	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=4.96936 maxSD=4.96936 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	12.7165	1.3094	12.8	9.71	<.0001	B
8	Corsica	F	15.4538	1.3094	12.8	11.80	<.0001	AB
9	Jack	F	9.9969	1.3094	12.8	7.63	<.0001	B
10	Williams	F	20.2232	1.3094	12.8	15.44	<.0001	A
11	Bass	0	8.3736	1.3094	12.8	6.39	<.0001	B
12	Corsica	0	11.3175	1.3094	12.8	8.64	<.0001	B
13	Jack	0	5.8310	1.3094	12.8	4.45	0.0007	B
14	Williams	0	18.0598	1.3094	12.8	13.79	<.0001	A

----- Effect=Treatmnt A=Tukey(.05) avgSD=3.51868 maxSD=3.51868 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	14.5976	0.8961	4	16.29	<.0001	A
2		O	10.8955	0.8961	4	12.16	0.0003	B

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=3.27293 maxSD=3.27293 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		10.5450	0.9259	12.8	11.39	<.0001	BC
4	Corsica		13.3857	0.9259	12.8	14.46	<.0001	B
5	Jack		7.9140	0.9259	12.8	8.55	<.0001	C
6	Williams		19.1415	0.9259	12.8	20.67	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=4.90116 maxSD=4.90116 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	12.7165	1.3094	12.8	9.71	<.0001	A
8	Bass	O	8.3736	1.3094	12.8	6.39	<.0001	A
9	Corsica	F	15.4538	1.3094	12.8	11.80	<.0001	A
10	Corsica	O	11.3175	1.3094	12.8	8.64	<.0001	A
11	Jack	F	9.9969	1.3094	12.8	7.63	<.0001	A
12	Jack	O	5.8310	1.3094	12.8	4.45	0.0007	A
13	Williams	F	20.2232	1.3094	12.8	15.44	<.0001	A
14	Williams	O	18.0598	1.3094	12.8	13.79	<.0001	A

Genistein

The Mixed Procedure

Model Information

Data Set	WORK.OZONEISO
Dependent Variable	Genistein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Williams
Treatmnt	2	F 0

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	-23.13121316	
1	1	-24.01139657	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0.001678
Residual	0.006285

Genistein

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The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	-24.0
AIC (smaller is better)	-20.0
AICC (smaller is better)	-19.1
BIC (smaller is better)	-20.4

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	12	8.61	0.0025
Treatmnt	1	4	2.32	0.2023
Cultivar*Treatmnt	3	12	3.72	0.0423

----- Effect=Treatmnt A=Tukey(.05) avgSD=0.12923 maxSD=0.12923 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	0.2487	0.03291	4	7.56	0.0016	A
2		0	0.1777	0.03291	4	5.40	0.0057	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.13589 maxSD=0.13589 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		0.1405	0.03643	14.1	3.86	0.0017	BC
4	Corsica		0.1268	0.03643	14.1	3.48	0.0036	C
5	Jack		0.2640	0.03643	14.1	7.25	<.0001	AB
6	Williams		0.3215	0.03643	14.1	8.82	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=0.20632 maxSD=0.20632 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	0.1182	0.05152	14.1	2.29	0.0376	B
8	Corsica	F	0.1487	0.05152	14.1	2.89	0.0119	B
9	Jack	F	0.3881	0.05152	14.1	7.53	<.0001	A
10	Williams	F	0.3396	0.05152	14.1	6.59	<.0001	AB
11	Bass	0	0.1628	0.05152	14.1	3.16	0.0069	A
12	Corsica	0	0.1049	0.05152	14.1	2.04	0.0609	A
13	Jack	0	0.1399	0.05152	14.1	2.72	0.0166	A
14	Williams	0	0.3034	0.05152	14.1	5.89	<.0001	A

----- Effect=Treatmnt A=Tukey(.05) avgSD=0.12923 maxSD=0.12923 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		F	0.2487	0.03291	4	7.56	0.0016	A
2		O	0.1777	0.03291	4	5.40	0.0057	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.13589 maxSD=0.13589 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		0.1405	0.03643	14.1	3.86	0.0017	BC
4	Corsica		0.1268	0.03643	14.1	3.48	0.0036	C
5	Jack		0.2640	0.03643	14.1	7.25	<.0001	AB
6	Williams		0.3215	0.03643	14.1	8.82	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=0.19052 maxSD=0.19052 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	F	0.1182	0.05152	14.1	2.29	0.0376	A
8	Bass	O	0.1628	0.05152	14.1	3.16	0.0069	A
9	Corsica	F	0.1487	0.05152	14.1	2.89	0.0119	A
10	Corsica	O	0.1049	0.05152	14.1	2.04	0.0609	A
11	Jack	F	0.3881	0.05152	14.1	7.53	<.0001	A
12	Jack	O	0.1399	0.05152	14.1	2.72	0.0166	A
13	Williams	F	0.3396	0.05152	14.1	6.59	<.0001	A
14	Williams	O	0.3034	0.05152	14.1	5.89	<.0001	A

Yield, Seed Weight, Protein, and Oil - Ozone Study

WtHundrd

The Mixed Procedure

Model Information

Data Set	WORK.OZONE
Dependent Variable	Wtg
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Willms82
Treatmnt	2	CF 03

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	159.11309228	
1	1	159.11309228	0.00000000

Convergence criteria met.

Covariance Parameter
Estimates

Cov Parm	Estimate
Chamber	0
Residual	709.63

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	159.1
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AIC (smaller is better)	161.1
AICC (smaller is better)	161.4
BIC (smaller is better)	160.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	16	1.29	0.3130
Treatmnt	1	16	4.39	0.0525
Cultivar*Treatmnt	3	16	0.47	0.7061

Least Squares Means

Effect	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t
Treatmnt		CF	113.97	7.9267	16	14.38	<.0001
Treatmnt		O3	90.8417	7.6900	16	11.81	<.0001
Cultivar	Bass		97.8167	10.8753	16	8.99	<.0001
Cultivar	Corsica		108.93	10.1729	16	10.71	<.0001
Cultivar	Jack		86.6250	12.1589	16	7.12	<.0001
Cultivar	Willms82		116.25	10.8753	16	10.69	<.0001
Cultivar*Treatmnt	Bass	CF	106.10	15.3800	16	6.90	<.0001
Cultivar*Treatmnt	Bass	O3	89.5333	15.3800	16	5.82	<.0001
Cultivar*Treatmnt	Corsica	CF	125.10	13.3195	16	9.39	<.0001
Cultivar*Treatmnt	Corsica	O3	92.7667	15.3800	16	6.03	<.0001
Cultivar*Treatmnt	Jack	CF	88.8500	18.8366	16	4.72	0.0002
Cultivar*Treatmnt	Jack	O3	84.4000	15.3800	16	5.49	<.0001
Cultivar*Treatmnt	Willms82	CF	135.83	15.3800	16	8.83	<.0001
Cultivar*Treatmnt	Willms82	O3	96.6667	15.3800	16	6.29	<.0001

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value
Treatmnt		CF		O3	23.1292	11.0439	16	2.09
Cultivar	Bass		Corsica		-11.1167	14.8916	16	-0.75
Cultivar	Bass		Jack		11.1917	16.3129	16	0.69
Cultivar	Bass		Willms82		-18.4333	15.3800	16	-1.20
Cultivar	Corsica		Jack		22.3083	15.8533	16	1.41
Cultivar	Corsica		Willms82		-7.3167	14.8916	16	-0.49
Cultivar	Jack		Willms82		-29.6250	16.3129	16	-1.82

The Mixed Procedure

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value
Cultivar*Treatmnt	Bass	CF	Bass	O3	16.5667	21.7506	16	0.76
Cultivar*Treatmnt	Bass	CF	Corsica	CF	-19.0000	20.3458	16	-0.93
Cultivar*Treatmnt	Bass	CF	Corsica	O3	13.3333	21.7506	16	0.61
Cultivar*Treatmnt	Bass	CF	Jack	CF	17.2500	24.3179	16	0.71
Cultivar*Treatmnt	Bass	CF	Jack	O3	21.7000	21.7506	16	1.00
Cultivar*Treatmnt	Bass	CF	Willms82	CF	-29.7333	21.7506	16	-1.37
Cultivar*Treatmnt	Bass	CF	Willms82	O3	9.4333	21.7506	16	0.43
Cultivar*Treatmnt	Bass	O3	Corsica	CF	-35.5667	20.3458	16	-1.75
Cultivar*Treatmnt	Bass	O3	Corsica	O3	-3.2333	21.7506	16	-0.15
Cultivar*Treatmnt	Bass	O3	Jack	CF	0.6833	24.3179	16	0.03
Cultivar*Treatmnt	Bass	O3	Jack	O3	5.1333	21.7506	16	0.24
Cultivar*Treatmnt	Bass	O3	Willms82	CF	-46.3000	21.7506	16	-2.13
Cultivar*Treatmnt	Bass	O3	Willms82	O3	-7.1333	21.7506	16	-0.33
Cultivar*Treatmnt	Corsica	CF	Corsica	O3	32.3333	20.3458	16	1.59
Cultivar*Treatmnt	Corsica	CF	Jack	CF	36.2500	23.0700	16	1.57
Cultivar*Treatmnt	Corsica	CF	Jack	O3	40.7000	20.3458	16	2.00
Cultivar*Treatmnt	Corsica	CF	Willms82	CF	-10.7333	20.3458	16	-0.53
Cultivar*Treatmnt	Corsica	CF	Willms82	O3	28.4333	20.3458	16	1.40
Cultivar*Treatmnt	Corsica	O3	Jack	CF	3.9167	24.3179	16	0.16
Cultivar*Treatmnt	Corsica	O3	Jack	O3	8.3667	21.7506	16	0.38
Cultivar*Treatmnt	Corsica	O3	Willms82	CF	-43.0667	21.7506	16	-1.98
Cultivar*Treatmnt	Corsica	O3	Willms82	O3	-3.9000	21.7506	16	-0.18
Cultivar*Treatmnt	Jack	CF	Jack	O3	4.4500	24.3179	16	0.18
Cultivar*Treatmnt	Jack	CF	Willms82	CF	-46.9833	24.3179	16	-1.93
Cultivar*Treatmnt	Jack	CF	Willms82	O3	-7.8167	24.3179	16	-0.32
Cultivar*Treatmnt	Jack	O3	Willms82	CF	-51.4333	21.7506	16	-2.36
Cultivar*Treatmnt	Jack	O3	Willms82	O3	-12.2667	21.7506	16	-0.56
Cultivar*Treatmnt	Willms82	CF	Willms82	O3	39.1667	21.7506	16	1.80

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Pr > t	Adjustment	Adj P
Treatmnt		CF		O3	0.0525	Tukey-Kramer	0.0525
Cultivar	Bass		Corsica		0.4662	Tukey-Kramer	0.8768
Cultivar	Bass		Jack		0.5025	Tukey-Kramer	0.9009
Cultivar	Bass		Willms82		0.2482	Tukey-Kramer	0.6365
Cultivar	Corsica		Jack		0.1785	Tukey-Kramer	0.5130
Cultivar	Corsica		Willms82		0.6299	Tukey-Kramer	0.9599
Cultivar	Jack		Willms82		0.0881	Tukey-Kramer	0.3021
Cultivar*Treatmnt	Bass	CF	Bass	O3	0.4573	Tukey-Kramer	0.9930
Cultivar*Treatmnt	Bass	CF	Corsica	CF	0.3643	Tukey-Kramer	0.9777
Cultivar*Treatmnt	Bass	CF	Corsica	O3	0.5485	Tukey-Kramer	0.9981
Cultivar*Treatmnt	Bass	CF	Jack	CF	0.4883	Tukey-Kramer	0.9954
Cultivar*Treatmnt	Bass	CF	Jack	O3	0.3333	Tukey-Kramer	0.9682
Cultivar*Treatmnt	Bass	CF	Willms82	CF	0.1905	Tukey-Kramer	0.8591

The Mixed Procedure

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Pr > t	Adjustment	Adj P
Cultivar*Treatmnt	Bass	CF	Willms82	O3	0.6703	Tukey-Kramer	0.9998
Cultivar*Treatmnt	Bass	O3	Corsica	CF	0.0996	Tukey-Kramer	0.6594

Cultivar*Treatmnt	Bass	03	Corsica	03	0.8837	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Jack	CF	0.9779	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Jack	03	0.8164	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Willms82	CF	0.0492	Tukey-Kramer	0.4383
Cultivar*Treatmnt	Bass	03	Willms82	03	0.7472	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Corsica	CF	Corsica	03	0.1316	Tukey-Kramer	0.7500
Cultivar*Treatmnt	Corsica	CF	Jack	CF	0.1357	Tukey-Kramer	0.7597
Cultivar*Treatmnt	Corsica	CF	Jack	03	0.0627	Tukey-Kramer	0.5105
Cultivar*Treatmnt	Corsica	CF	Willms82	CF	0.6051	Tukey-Kramer	0.9993
Cultivar*Treatmnt	Corsica	CF	Willms82	03	0.1813	Tukey-Kramer	0.8458
Cultivar*Treatmnt	Corsica	03	Jack	CF	0.8741	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Corsica	03	Jack	03	0.7056	Tukey-Kramer	0.9999
Cultivar*Treatmnt	Corsica	03	Willms82	CF	0.0652	Tukey-Kramer	0.5223
Cultivar*Treatmnt	Corsica	03	Willms82	03	0.8599	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	CF	Jack	03	0.8571	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	CF	Willms82	CF	0.0713	Tukey-Kramer	0.5504
Cultivar*Treatmnt	Jack	CF	Willms82	03	0.7520	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	03	Willms82	CF	0.0310	Tukey-Kramer	0.3199
Cultivar*Treatmnt	Jack	03	Willms82	03	0.5806	Tukey-Kramer	0.9989
Cultivar*Treatmnt	Willms82	CF	Willms82	03	0.0906	Tukey-Kramer	0.6283

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=23.412 maxSD=23.412 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	113.97	7.9267	16	14.38	<.0001	A
2		03	90.8417	7.6900	16	11.81	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=44.6521 maxSD=46.6716 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		97.8167	10.8753	16	8.99	<.0001	A
4	Corsica		108.93	10.1729	16	10.71	<.0001	A
5	Jack		86.6250	12.1589	16	7.12	<.0001	A
6	Willms82		116.25	10.8753	16	10.69	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=67.5671 maxSD=74.5021 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	CF	106.10	15.3800	16	6.90	<.0001	A
8	Corsica	CF	125.10	13.3195	16	9.39	<.0001	A
9	Jack	CF	88.8500	18.8366	16	4.72	0.0002	A
10	Willms82	CF	135.83	15.3800	16	8.83	<.0001	A
11	Bass	03	89.5333	15.3800	16	5.82	<.0001	A
12	Corsica	03	92.7667	15.3800	16	6.03	<.0001	A
13	Jack	03	84.4000	15.3800	16	5.49	<.0001	A
14	Willms82	03	96.6667	15.3800	16	6.29	<.0001	A

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=23.412 maxSD=23.412 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	113.97	7.9267	16	14.38	<.0001	A
2		O3	90.8417	7.6900	16	11.81	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=44.6521 maxSD=46.6716 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		97.8167	10.8753	16	8.99	<.0001	A
4	Corsica		108.93	10.1729	16	10.71	<.0001	A
5	Jack		86.6250	12.1589	16	7.12	<.0001	A
6	Willms2		116.25	10.8753	16	10.69	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=56.8736 maxSD=62.7482 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	CF	106.10	15.3800	16	6.90	<.0001	A
8	Bass	O3	89.5333	15.3800	16	5.82	<.0001	A
9	Corsica	CF	125.10	13.3195	16	9.39	<.0001	A
10	Corsica	O3	92.7667	15.3800	16	6.03	<.0001	A
11	Jack	CF	88.8500	18.8366	16	4.72	0.0002	A
12	Jack	O3	84.4000	15.3800	16	5.49	<.0001	A
13	Willms82	CF	135.83	15.3800	16	8.83	<.0001	A
14	Willms82	O3	96.6667	15.3800	16	6.29	<.0001	A

Yield

The Mixed Procedure

Model Information

Data Set	WORK.OZONE
Dependent Variable	Wtg
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Willms82
Treatmnt	2	CF 03

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	159.11309228	
1	1	159.11309228	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0
Residual	709.63

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	159.1
AIC (smaller is better)	161.1
AICC (smaller is better)	161.4
BIC (smaller is better)	160.9

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	16	1.29	0.3130
Treatmnt	1	16	4.39	0.0525
Cultivar*Treatmnt	3	16	0.47	0.7061

Least Squares Means

Effect	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t
Treatmnt		CF	113.97	7.9267	16	14.38	<.0001
Treatmnt		03	90.8417	7.6900	16	11.81	<.0001
Cultivar	Bass		97.8167	10.8753	16	8.99	<.0001
Cultivar	Corsica		108.93	10.1729	16	10.71	<.0001
Cultivar	Jack		86.6250	12.1589	16	7.12	<.0001
Cultivar	Willms82		116.25	10.8753	16	10.69	<.0001
Cultivar*Treatmnt	Bass	CF	106.10	15.3800	16	6.90	<.0001
Cultivar*Treatmnt	Bass	03	89.5333	15.3800	16	5.82	<.0001
Cultivar*Treatmnt	Corsica	CF	125.10	13.3195	16	9.39	<.0001
Cultivar*Treatmnt	Corsica	03	92.7667	15.3800	16	6.03	<.0001
Cultivar*Treatmnt	Jack	CF	88.8500	18.8366	16	4.72	0.0002
Cultivar*Treatmnt	Jack	03	84.4000	15.3800	16	5.49	<.0001
Cultivar*Treatmnt	Willms82	CF	135.83	15.3800	16	8.83	<.0001
Cultivar*Treatmnt	Willms82	03	96.6667	15.3800	16	6.29	<.0001

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value
Treatmnt		CF		03	23.1292	11.0439	16	2.09
Cultivar	Bass		Corsica		-11.1167	14.8916	16	-0.75
Cultivar	Bass		Jack		11.1917	16.3129	16	0.69
Cultivar	Bass		Willms82		-18.4333	15.3800	16	-1.20
Cultivar	Corsica		Jack		22.3083	15.8533	16	1.41
Cultivar	Corsica		Willms82		-7.3167	14.8916	16	-0.49
Cultivar	Jack		Willms82		-29.6250	16.3129	16	-1.82

The Mixed Procedure

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value
Cultivar*Treatmnt	Bass	CF	Bass	O3	16.5667	21.7506	16	0.76
Cultivar*Treatmnt	Bass	CF	Corsica	CF	-19.0000	20.3458	16	-0.93
Cultivar*Treatmnt	Bass	CF	Corsica	O3	13.3333	21.7506	16	0.61
Cultivar*Treatmnt	Bass	CF	Jack	CF	17.2500	24.3179	16	0.71
Cultivar*Treatmnt	Bass	CF	Jack	O3	21.7000	21.7506	16	1.00
Cultivar*Treatmnt	Bass	CF	Willms82	CF	-29.7333	21.7506	16	-1.37
Cultivar*Treatmnt	Bass	CF	Willms82	O3	9.4333	21.7506	16	0.43
Cultivar*Treatmnt	Bass	O3	Corsica	CF	-35.5667	20.3458	16	-1.75
Cultivar*Treatmnt	Bass	O3	Corsica	O3	-3.2333	21.7506	16	-0.15
Cultivar*Treatmnt	Bass	O3	Jack	CF	0.6833	24.3179	16	0.03
Cultivar*Treatmnt	Bass	O3	Jack	O3	5.1333	21.7506	16	0.24
Cultivar*Treatmnt	Bass	O3	Willms82	CF	-46.3000	21.7506	16	-2.13
Cultivar*Treatmnt	Bass	O3	Willms82	O3	-7.1333	21.7506	16	-0.33
Cultivar*Treatmnt	Corsica	CF	Corsica	O3	32.3333	20.3458	16	1.59
Cultivar*Treatmnt	Corsica	CF	Jack	CF	36.2500	23.0700	16	1.57
Cultivar*Treatmnt	Corsica	CF	Jack	O3	40.7000	20.3458	16	2.00
Cultivar*Treatmnt	Corsica	CF	Willms82	CF	-10.7333	20.3458	16	-0.53
Cultivar*Treatmnt	Corsica	CF	Willms82	O3	28.4333	20.3458	16	1.40
Cultivar*Treatmnt	Corsica	O3	Jack	CF	3.9167	24.3179	16	0.16
Cultivar*Treatmnt	Corsica	O3	Jack	O3	8.3667	21.7506	16	0.38
Cultivar*Treatmnt	Corsica	O3	Willms82	CF	-43.0667	21.7506	16	-1.98
Cultivar*Treatmnt	Corsica	O3	Willms82	O3	-3.9000	21.7506	16	-0.18
Cultivar*Treatmnt	Jack	CF	Jack	O3	4.4500	24.3179	16	0.18
Cultivar*Treatmnt	Jack	CF	Willms82	CF	-46.9833	24.3179	16	-1.93
Cultivar*Treatmnt	Jack	CF	Willms82	O3	-7.8167	24.3179	16	-0.32
Cultivar*Treatmnt	Jack	O3	Willms82	CF	-51.4333	21.7506	16	-2.36
Cultivar*Treatmnt	Jack	O3	Willms82	O3	-12.2667	21.7506	16	-0.56
Cultivar*Treatmnt	Willms82	CF	Willms82	O3	39.1667	21.7506	16	1.80

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Pr > t	Adjustment	Adj P
Treatmnt		CF		O3	0.0525	Tukey-Kramer	0.0525
Cultivar	Bass		Corsica		0.4662	Tukey-Kramer	0.8768
Cultivar	Bass		Jack		0.5025	Tukey-Kramer	0.9009
Cultivar	Bass		Willms82		0.2482	Tukey-Kramer	0.6365
Cultivar	Corsica		Jack		0.1785	Tukey-Kramer	0.5130
Cultivar	Corsica		Willms82		0.6299	Tukey-Kramer	0.9599
Cultivar	Jack		Willms82		0.0881	Tukey-Kramer	0.3021
Cultivar*Treatmnt	Bass	CF	Bass	O3	0.4573	Tukey-Kramer	0.9930
Cultivar*Treatmnt	Bass	CF	Corsica	CF	0.3643	Tukey-Kramer	0.9777
Cultivar*Treatmnt	Bass	CF	Corsica	O3	0.5485	Tukey-Kramer	0.9981
Cultivar*Treatmnt	Bass	CF	Jack	CF	0.4883	Tukey-Kramer	0.9954
Cultivar*Treatmnt	Bass	CF	Jack	O3	0.3333	Tukey-Kramer	0.9682
Cultivar*Treatmnt	Bass	CF	Willms82	CF	0.1905	Tukey-Kramer	0.8591

The Mixed Procedure

Differences of Least Squares Means

Effect	Cultivar	Treatmnt	Cultivar	Treatmnt	Pr > t	Adjustment	Adj P
Cultivar*Treatmnt	Bass	CF	Willms82	03	0.6703	Tukey-Kramer	0.9998
Cultivar*Treatmnt	Bass	03	Corsica	CF	0.0996	Tukey-Kramer	0.6594
Cultivar*Treatmnt	Bass	03	Corsica	03	0.8837	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Jack	CF	0.9779	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Jack	03	0.8164	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Bass	03	Willms82	CF	0.0492	Tukey-Kramer	0.4383
Cultivar*Treatmnt	Bass	03	Willms82	03	0.7472	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Corsica	CF	Corsica	03	0.1316	Tukey-Kramer	0.7500
Cultivar*Treatmnt	Corsica	CF	Jack	CF	0.1357	Tukey-Kramer	0.7597
Cultivar*Treatmnt	Corsica	CF	Jack	03	0.0627	Tukey-Kramer	0.5105
Cultivar*Treatmnt	Corsica	CF	Willms82	CF	0.6051	Tukey-Kramer	0.9993
Cultivar*Treatmnt	Corsica	CF	Willms82	03	0.1813	Tukey-Kramer	0.8458
Cultivar*Treatmnt	Corsica	03	Jack	CF	0.8741	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Corsica	03	Jack	03	0.7056	Tukey-Kramer	0.9999
Cultivar*Treatmnt	Corsica	03	Willms82	CF	0.0652	Tukey-Kramer	0.5223
Cultivar*Treatmnt	Corsica	03	Willms82	03	0.8599	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	CF	Jack	03	0.8571	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	CF	Willms82	CF	0.0713	Tukey-Kramer	0.5504
Cultivar*Treatmnt	Jack	CF	Willms82	03	0.7520	Tukey-Kramer	1.0000
Cultivar*Treatmnt	Jack	03	Willms82	CF	0.0310	Tukey-Kramer	0.3199
Cultivar*Treatmnt	Jack	03	Willms82	03	0.5806	Tukey-Kramer	0.9989
Cultivar*Treatmnt	Willms82	CF	Willms82	03	0.0906	Tukey-Kramer	0.6283

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=23.412 maxSD=23.412 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	113.97	7.9267	16	14.38	<.0001	A
2		03	90.8417	7.6900	16	11.81	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=44.6521 maxSD=46.6716 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		97.8167	10.8753	16	8.99	<.0001	A
4	Corsica		108.93	10.1729	16	10.71	<.0001	A
5	Jack		86.6250	12.1589	16	7.12	<.0001	A
6	Willms82		116.25	10.8753	16	10.69	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=67.5671 maxSD=74.5021 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	CF	106.10	15.3800	16	6.90	<.0001	A
8	Corsica	CF	125.10	13.3195	16	9.39	<.0001	A
9	Jack	CF	88.8500	18.8366	16	4.72	0.0002	A
10	Willms82	CF	135.83	15.3800	16	8.83	<.0001	A
11	Bass	03	89.5333	15.3800	16	5.82	<.0001	A
12	Corsica	03	92.7667	15.3800	16	6.03	<.0001	A
13	Jack	03	84.4000	15.3800	16	5.49	<.0001	A

14	Willms82	03	96.6667	15.3800	16	6.29	<.0001	A
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----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=23.412 maxSD=23.412 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	113.97	7.9267	16	14.38	<.0001	A
2		O3	90.8417	7.6900	16	11.81	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=44.6521 maxSD=46.6716 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		97.8167	10.8753	16	8.99	<.0001	A
4	Corsica		108.93	10.1729	16	10.71	<.0001	A
5	Jack		86.6250	12.1589	16	7.12	<.0001	A
6	Willms2		116.25	10.8753	16	10.69	<.0001	A

----- Effect=Cultivar*Treatmnt A=Tukey-Kramer(.05) avgSD=56.8736 maxSD=62.7482 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
7	Bass	CF	106.10	15.3800	16	6.90	<.0001	A
8	Bass	O3	89.5333	15.3800	16	5.82	<.0001	A
9	Corsica	CF	125.10	13.3195	16	9.39	<.0001	A
10	Corsica	O3	92.7667	15.3800	16	6.03	<.0001	A
11	Jack	CF	88.8500	18.8366	16	4.72	0.0002	A
12	Jack	O3	84.4000	15.3800	16	5.49	<.0001	A
13	Willms82	CF	135.83	15.3800	16	8.83	<.0001	A
14	Willms82	O3	96.6667	15.3800	16	6.29	<.0001	A

Oil

The Mixed Procedure

Model Information

Data Set	WORK.OZONE
Dependent Variable	Oil
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Willms82
Treatmnt	2	CF O3

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	31.71204678	
1	1	31.71204678	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0
Residual	0.2471

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	31.7
AIC (smaller is better)	33.7
AICC (smaller is better)	34.0
BIC (smaller is better)	33.5

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	16	15.88	<.0001
Treatmnt	1	16	0.85	0.3713
Cultivar*Treatmnt	3	16	4.83	0.0140

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=0.43691 maxSD=0.43691 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	22.1063	0.1479	16	149.44	<.0001	A
2		O3	21.9167	0.1435	16	152.72	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.83328 maxSD=0.87097 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		22.7833	0.2030	16	112.26	<.0001	A
4	Corsica		21.6292	0.1898	16	113.93	<.0001	B
5	Jack		21.0000	0.2269	16	92.55	<.0001	B
6	Willms82		22.6333	0.2030	16	111.52	<.0001	A

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=0.43691 maxSD=0.43691 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	22.1063	0.1479	16	149.44	<.0001	A
2		O3	21.9167	0.1435	16	152.72	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=0.83328 maxSD=0.87097 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		22.7833	0.2030	16	112.26	<.0001	A
4	Corsica		21.6292	0.1898	16	113.93	<.0001	B
5	Jack		21.0000	0.2269	16	92.55	<.0001	B
6	Willms82		22.6333	0.2030	16	111.52	<.0001	A

Protein

The Mixed Procedure

Model Information

Data Set	WORK.OZONE
Dependent Variable	Protein
Covariance Structure	Variance Components
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Prasad-Rao-Jeske- Kackar-Harville
Degrees of Freedom Method	Kenward-Roger

Class Level Information

Class	Levels	Values
Chamber	6	1 2 3 4 5 6
Cultivar	4	Bass Corsica Jack Willms82
Treatmnt	2	CF 03

Dimensions

Covariance Parameters	2
Columns in X	15
Columns in Z	6
Subjects	1
Max Obs Per Subject	24
Observations Used	24
Observations Not Used	0
Total Observations	24

Iteration History

Iteration	Evaluations	-2 Res Log Like	Criterion
0	1	55.31006813	
1	1	55.31006813	0.00000000

Convergence criteria met.

Covariance Parameter Estimates

Cov Parm	Estimate
Chamber	0
Residual	1.0801

The Mixed Procedure

Fit Statistics

-2 Res Log Likelihood	55.3
AIC (smaller is better)	57.3
AICC (smaller is better)	57.6
BIC (smaller is better)	57.1

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Cultivar	3	16	4.61	0.0165
Treatmnt	1	16	0.54	0.4730
Cultivar*Treatmnt	3	16	1.25	0.3248

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=0.91339 maxSD=0.91339 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	40.4417	0.3092	16	130.77	<.0001	A
2		O3	40.7583	0.3000	16	135.85	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.74204 maxSD=1.82083 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		39.6000	0.4243	16	93.33	<.0001	B
4	Corsica		41.4583	0.3969	16	104.46	<.0001	A
5	Jack		41.2750	0.4744	16	87.01	<.0001	AB
6	Willms82		40.0667	0.4243	16	94.43	<.0001	AB

----- Effect=Treatmnt A=Tukey-Kramer(.05) avgSD=0.91339 maxSD=0.91339 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
1		CF	40.4417	0.3092	16	130.77	<.0001	A
2		O3	40.7583	0.3000	16	135.85	<.0001	A

----- Effect=Cultivar A=Tukey-Kramer(.05) avgSD=1.74204 maxSD=1.82083 -----

Obs	Cultivar	Treatmnt	Estimate	Standard Error	DF	t Value	Pr > t	Let Grp
3	Bass		39.6000	0.4243	16	93.33	<.0001	B
4	Corsica		41.4583	0.3969	16	104.46	<.0001	A
5	Jack		41.2750	0.4744	16	87.01	<.0001	AB
6	Willms82		40.0667	0.4243	16	94.43	<.0001	AB

Data Sets

Seed and Leaf Tissue Isoflavone Analysis Data

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Farm      Year Field_Type Block Sample_TypeTiming Cultivar Plot Isoflavone Isof.Concen.
PHill    2002   DC       1      LeafPost Late      Bass   2      1      0
PHill    2002   DC       1      LeafPost Late      Bass   2      2      0
PHill    2002   DC       1      LeafPost Late      Bass   2      3      0
PHill    2002   DC       1      LeafPost Late      Bass   2      4      0
PHill    2002   DC       1      LeafPost Late      Bass   2      5      2.709462584
PHill    2002   DC       1      LeafPost Late      Bass   2      6      0
PHill    2002   DC       1      LeafPost Late      Bass   2      7      0
PHill    2002   DC       1      Seed      Late      Bass   2      1      8.23800508
PHill    2002   DC       1      Seed      Late      Bass   2      2      16.56165854
PHill    2002   DC       1      Seed      Late      Bass   2      3      0
PHill    2002   DC       1      Seed      Late      Bass   2      4      27.2837303
PHill    2002   DC       1      Seed      Late      Bass   2      5      68.10513895
PHill    2002   DC       1      Seed      Late      Bass   2      6      0
PHill    2002   DC       1      Seed      Late      Bass   2      7      0
PHill    2002   DC       1      LeafPost Early     Bass   3      1      0
PHill    2002   DC       1      LeafPost Early     Bass   3      2      2.06752268
PHill    2002   DC       1      LeafPost Early     Bass   3      3      0
PHill    2002   DC       1      LeafPost Early     Bass   3      4      0
PHill    2002   DC       1      LeafPost Early     Bass   3      5      4.321613661
PHill    2002   DC       1      LeafPost Early     Bass   3      6      0
PHill    2002   DC       1      LeafPost Early     Bass   3      7      0.345680852
PHill    2002   DC       1      Seed      Early     Bass   3      1      7.76169661
PHill    2002   DC       1      Seed      Early     Bass   3      2      15.67024064
PHill    2002   DC       1      Seed      Early     Bass   3      3      0
PHill    2002   DC       1      Seed      Early     Bass   3      4      26.4922947
PHill    2002   DC       1      Seed      Early     Bass   3      5      67.24208527
PHill    2002   DC       1      Seed      Early     Bass   3      6      0
PHill    2002   DC       1      Seed      Early     Bass   3      7      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      1      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      2      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      3      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      4      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      5      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      6      0
PHill    2002   DC       1      LeafPost Late     Corsica 5      7      0
PHill    2002   DC       1      Seed      Late     Corsica 5      1      3.7964453
PHill    2002   DC       1      Seed      Late     Corsica 5      2      9.67890578
PHill    2002   DC       1      Seed      Late     Corsica 5      3      0
PHill    2002   DC       1      Seed      Late     Corsica 5      4      12.86048928
PHill    2002   DC       1      Seed      Late     Corsica 5      5      43.03097719
PHill    2002   DC       1      Seed      Late     Corsica 5      6      0
PHill    2002   DC       1      Seed      Late     Corsica 5      7      0.503561384
PHill    2002   DC       1      LeafPost Early     Corsica 6      1      0
PHill    2002   DC       1      LeafPost Early     Corsica 6      2      1.95297854
PHill    2002   DC       1      LeafPost Early     Corsica 6      3      0
PHill    2002   DC       1      LeafPost Early     Corsica 6      4      0
PHill    2002   DC       1      LeafPost Early     Corsica 6      5      5.030946898
PHill    2002   DC       1      LeafPost Early     Corsica 6      6      0
PHill    2002   DC       1      LeafPost Early     Corsica 6      7      0.289918328
PHill    2002   DC       1      Seed      Early     Corsica 6      1      4.23662755
PHill    2002   DC       1      Seed      Early     Corsica 6      2      10.97030564
PHill    2002   DC       1      Seed      Early     Corsica 6      3      0
PHill    2002   DC       1      Seed      Early     Corsica 6      4      14.01009398
PHill    2002   DC       1      Seed      Early     Corsica 6      5      48.15582813
PHill    2002   DC       1      Seed      Early     Corsica 6      6      0
PHill    2002   DC       1      Seed      Early     Corsica 6      7      0
PHill    2002   DC       1      LeafPost Early     Jack    7      1      0
PHill    2002   DC       1      LeafPost Early     Jack    7      2      1.75884152
PHill    2002   DC       1      LeafPost Early     Jack    7      3      0
PHill    2002   DC       1      LeafPost Early     Jack    7      4      0
PHill    2002   DC       1      LeafPost Early     Jack    7      5      3.852071609
PHill    2002   DC       1      LeafPost Early     Jack    7      6      0
PHill    2002   DC       1      LeafPost Early     Jack    7      7      0.2252564
PHill    2002   DC       1      Seed      Early     Jack    7      1      2.58180357
PHill    2002   DC       1      Seed      Early     Jack    7      2      9.60473216
PHill    2002   DC       1      Seed      Early     Jack    7      3      0
PHill    2002   DC       1      Seed      Early     Jack    7      4      13.32600048

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PHill	2002	DC	1	Seed	Early	Jack	7	5	0
PHill	2002	DC	1	Seed	Early	Jack	7	6	0
PHill	2002	DC	1	Seed	Early	Jack	7	7	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	1	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	2	0.998387
PHill	2002	DC	1	LeafPost	Late	Jack	8	3	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	4	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	5	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	6	0
PHill	2002	DC	1	LeafPost	Late	Jack	8	7	0
PHill	2002	DC	1	Seed	Late	Jack	8	1	2.91356172
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PHill	2002	DC	1	Seed	Late	Jack	8	3	0
PHill	2002	DC	1	Seed	Late	Jack	8	4	8.462290531
PHill	2002	DC	1	Seed	Late	Jack	8	5	27.9493657
PHill	2002	DC	1	Seed	Late	Jack	8	6	0
PHill	2002	DC	1	Seed	Late	Jack	8	7	0
PHill	2002	DC	1	LeafPost	Late	Williams82	10	1	0
PHill	2002	DC	1	LeafPost	Late	Williams82	10	2	1.1645597
PHill	2002	DC	1	LeafPost	Late	Williams82	10	3	0
PHill	2002	DC	1	LeafPost	Late	Williams82	10	4	0
PHill	2002	DC	1	LeafPost	Late	Williams82	10	5	2.22897182
PHill	2002	DC	1	LeafPost	Late	Williams82	10	6	0
PHill	2002	DC	1	LeafPost	Late	Williams82	10	7	0
PHill	2002	DC	1	Seed	Late	Williams82	10	1	4.61363684
PHill	2002	DC	1	Seed	Late	Williams82	10	2	8.37069338
PHill	2002	DC	1	Seed	Late	Williams82	10	3	0
PHill	2002	DC	1	Seed	Late	Williams82	10	4	15.57137476
PHill	2002	DC	1	Seed	Late	Williams82	10	5	38.03821732
PHill	2002	DC	1	Seed	Late	Williams82	10	6	0
PHill	2002	DC	1	Seed	Late	Williams82	10	7	0
PHill	2002	DC	1	LeafPost	Early	Williams82	11	1	0
PHill	2002	DC	1	LeafPost	Early	Williams82	11	2	2.03037722
PHill	2002	DC	1	LeafPost	Early	Williams82	11	3	0
PHill	2002	DC	1	LeafPost	Early	Williams82	11	4	0
PHill	2002	DC	1	LeafPost	Early	Williams82	11	5	6.348693947
PHill	2002	DC	1	LeafPost	Early	Williams82	11	6	0
PHill	2002	DC	1	LeafPost	Early	Williams82	11	7	0.15822168
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PHill	2002	DC	1	Seed	Early	Williams82	11	2	9.87640586
PHill	2002	DC	1	Seed	Early	Williams82	11	3	0
PHill	2002	DC	1	Seed	Early	Williams82	11	4	16.91492226
PHill	2002	DC	1	Seed	Early	Williams82	11	5	42.01903294
PHill	2002	DC	1	Seed	Early	Williams82	11	6	0
PHill	2002	DC	1	Seed	Early	Williams82	11	7	0.812031992
PHill	2002	DC	2	LeafPost	Early	Williams82	12	1	0
PHill	2002	DC	2	LeafPost	Early	Williams82	12	2	1.2178829
PHill	2002	DC	2	LeafPost	Early	Williams82	12	3	0
PHill	2002	DC	2	LeafPost	Early	Williams82	12	4	0
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PHill	2002	DC	2	LeafPost	Early	Williams82	12	6	0
PHill	2002	DC	2	LeafPost	Early	Williams82	12	7	0
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PHill	2002	DC	2	LeafPost	Late	Corsica	13	2	0
PHill	2002	DC	2	LeafPost	Late	Corsica	13	3	0
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PHill	2002	DC	2	Seed	Late	Corsica	13	3	0
PHill	2002	DC	2	Seed	Late	Corsica	13	4	15.72095358
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PHill	2002	DC	2	Seed	Late	Corsica	13	7	0.50308912
PHill	2002	DC	2	LeafPost	Early	Corsica	14	1	0
PHill	2002	DC	2	LeafPost	Early	Corsica	14	2	1.50173648
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PHill	2002	DC	2	LeafPost	Early	Corsica	14	4	0
PHill	2002	DC	2	LeafPost	Early	Corsica	14	5	3.567151942
PHill	2002	DC	2	LeafPost	Early	Corsica	14	6	0
PHill	2002	DC	2	LeafPost	Early	Corsica	14	7	0.124146016
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PHill	2002	DC	2	Seed	Early	Corsica	14	3	0
PHill	2002	DC	2	Seed	Early	Corsica	14	4	19.29248548
PHill	2002	DC	2	Seed	Early	Corsica	14	5	45.10382464
PHill	2002	DC	2	Seed	Early	Corsica	14	6	0

PHill	2002	DC	2	Seed	Early	Corsica	14	7	0.509001024
PHill	2002	DC	2	LeafPost	Late	Jack	16	1	0
PHill	2002	DC	2	LeafPost	Late	Jack	16	2	0
PHill	2002	DC	2	LeafPost	Late	Jack	16	3	0
PHill	2002	DC	2	LeafPost	Late	Jack	16	4	0
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PHill	2002	DC	2	LeafPost	Late	Jack	16	6	0
PHill	2002	DC	2	LeafPost	Late	Jack	16	7	0
PHill	2002	DC	2	Seed	Late	Jack	16	1	25.57925595
PHill	2002	DC	2	Seed	Late	Jack	16	2	9.74209874
PHill	2002	DC	2	Seed	Late	Jack	16	3	0
PHill	2002	DC	2	Seed	Late	Jack	16	4	11.54112381
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PHill	2002	DC	2	Seed	Late	Jack	16	6	0
PHill	2002	DC	2	Seed	Late	Jack	16	7	0.774223148
PHill	2002	DC	2	LeafPost	Early	Jack	17	1	0
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PHill	2002	DC	2	LeafPost	Early	Jack	17	4	0
PHill	2002	DC	2	LeafPost	Early	Jack	17	5	5.595038034
PHill	2002	DC	2	LeafPost	Early	Jack	17	6	0
PHill	2002	DC	2	LeafPost	Early	Jack	17	7	0.295115144
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PHill	2002	DC	2	Seed	Early	Jack	17	2	10.64507
PHill	2002	DC	2	Seed	Early	Jack	17	3	0
PHill	2002	DC	2	Seed	Early	Jack	17	4	12.38611009
PHill	2002	DC	2	Seed	Early	Jack	17	5	44.08462317
PHill	2002	DC	2	Seed	Early	Jack	17	6	0
PHill	2002	DC	2	Seed	Early	Jack	17	7	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	1	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	2	1.40295056
PHill	2002	DC	2	LeafPost	Late	Bass	20	3	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	4	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	5	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	6	0
PHill	2002	DC	2	LeafPost	Late	Bass	20	7	0
PHill	2002	DC	2	Seed	Late	Bass	20	1	5.61533679
PHill	2002	DC	2	Seed	Late	Bass	20	2	11.04181862
PHill	2002	DC	2	Seed	Late	Bass	20	3	0
PHill	2002	DC	2	Seed	Late	Bass	20	4	17.66023673
PHill	2002	DC	2	Seed	Late	Bass	20	5	43.91786752
PHill	2002	DC	2	Seed	Late	Bass	20	6	0
PHill	2002	DC	2	Seed	Late	Bass	20	7	0
PHill	2002	DC	2	LeafPost	Early	Bass	21	1	0
PHill	2002	DC	2	LeafPost	Early	Bass	21	2	2.18450114
PHill	2002	DC	2	LeafPost	Early	Bass	21	3	0
PHill	2002	DC	2	LeafPost	Early	Bass	21	4	0
PHill	2002	DC	2	LeafPost	Early	Bass	21	5	4.558712757
PHill	2002	DC	2	LeafPost	Early	Bass	21	6	0
PHill	2002	DC	2	LeafPost	Early	Bass	21	7	0.231402524
PHill	2002	DC	2	Seed	Early	Bass	21	1	7.46888338
PHill	2002	DC	2	Seed	Early	Bass	21	2	15.58044404
PHill	2002	DC	2	Seed	Early	Bass	21	3	0
PHill	2002	DC	2	Seed	Early	Bass	21	4	20.4651516
PHill	2002	DC	2	Seed	Early	Bass	21	5	52.62578494
PHill	2002	DC	2	Seed	Early	Bass	21	6	0
PHill	2002	DC	2	Seed	Early	Bass	21	7	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	1	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	2	0.87121724
PHill	2002	DC	2	LeafPost	Late	Williams82	22	3	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	4	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	5	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	6	0
PHill	2002	DC	2	LeafPost	Late	Williams82	22	7	0
PHill	2002	DC	2	Seed	Late	Williams82	22	1	3.73719438
PHill	2002	DC	2	Seed	Late	Williams82	22	2	9.45471236
PHill	2002	DC	2	Seed	Late	Williams82	22	3	0
PHill	2002	DC	2	Seed	Late	Williams82	22	4	10.18533624
PHill	2002	DC	2	Seed	Late	Williams82	22	5	33.75621036
PHill	2002	DC	2	Seed	Late	Williams82	22	6	0
PHill	2002	DC	2	Seed	Late	Williams82	22	7	0
PHill	2002	DC	2	LeafPost	Early	Williams82	23	1	0
PHill	2002	DC	2	LeafPost	Early	Williams82	23	2	1.5116711
PHill	2002	DC	2	LeafPost	Early	Williams82	23	3	0
PHill	2002	DC	2	LeafPost	Early	Williams82	23	4	0
PHill	2002	DC	2	LeafPost	Early	Williams82	23	5	3.069515862
PHill	2002	DC	2	LeafPost	Early	Williams82	23	6	0
PHill	2002	DC	2	LeafPost	Early	Williams82	23	7	0.153691196
PHill	2002	DC	2	Seed	Early	Williams82	23	1	3.30422218

PHill	2002	DC	2	Seed	Early	Williams82	23	2	8.98336094
PHill	2002	DC	2	Seed	Early	Williams82	23	3	0
PHill	2002	DC	2	Seed	Early	Williams82	23	4	9.102546089
PHill	2002	DC	2	Seed	Early	Williams82	23	5	33.08811722
PHill	2002	DC	2	Seed	Early	Williams82	23	6	0
PHill	2002	DC	2	Seed	Early	Williams82	23	7	0
PHill	2002	DC	3	Seed	Late	Williams82	26	1	7.19646277
PHill	2002	DC	3	Seed	Late	Williams82	26	2	14.72673464
PHill	2002	DC	3	Seed	Late	Williams82	26	3	0
PHill	2002	DC	3	Seed	Late	Williams82	26	4	21.55464908
PHill	2002	DC	3	Seed	Late	Williams82	26	5	54.70631651
PHill	2002	DC	3	Seed	Late	Williams82	26	6	0
PHill	2002	DC	3	Seed	Late	Williams82	26	7	0
PHill	2002	DC	3	LeafPost	Early	Williams82	27	1	0
PHill	2002	DC	3	LeafPost	Early	Williams82	27	2	1.94327576
PHill	2002	DC	3	LeafPost	Early	Williams82	27	3	0
PHill	2002	DC	3	LeafPost	Early	Williams82	27	4	0
PHill	2002	DC	3	LeafPost	Early	Williams82	27	5	3.901172867
PHill	2002	DC	3	LeafPost	Early	Williams82	27	6	0
PHill	2002	DC	3	LeafPost	Early	Williams82	27	7	0.301036608
PHill	2002	DC	3	Seed	Early	Williams82	27	1	8.0194969
PHill	2002	DC	3	Seed	Early	Williams82	27	2	16.8720164
PHill	2002	DC	3	Seed	Early	Williams82	27	3	0
PHill	2002	DC	3	Seed	Early	Williams82	27	4	23.49073663
PHill	2002	DC	3	Seed	Early	Williams82	27	5	59.47378641
PHill	2002	DC	3	Seed	Early	Williams82	27	6	0
PHill	2002	DC	3	Seed	Early	Williams82	27	7	0
PHill	2002	DC	3	Seed	Late	Corsica	28	1	4.87132779
PHill	2002	DC	3	Seed	Late	Corsica	28	2	9.73555202
PHill	2002	DC	3	Seed	Late	Corsica	28	3	0
PHill	2002	DC	3	Seed	Late	Corsica	28	4	13.58746634
PHill	2002	DC	3	Seed	Late	Corsica	28	5	34.27030674
PHill	2002	DC	3	Seed	Late	Corsica	28	6	0
PHill	2002	DC	3	Seed	Late	Corsica	28	7	0
PHill	2002	DC	3	LeafPost	Early	Corsica	29	1	0
PHill	2002	DC	3	LeafPost	Early	Corsica	29	2	1.64626802
PHill	2002	DC	3	LeafPost	Early	Corsica	29	3	0
PHill	2002	DC	3	LeafPost	Early	Corsica	29	4	0
PHill	2002	DC	3	LeafPost	Early	Corsica	29	5	3.69783161
PHill	2002	DC	3	LeafPost	Early	Corsica	29	6	0
PHill	2002	DC	3	LeafPost	Early	Corsica	29	7	0.10957562
PHill	2002	DC	3	Seed	Early	Corsica	29	1	4.77886804
PHill	2002	DC	3	Seed	Early	Corsica	29	2	9.8617475
PHill	2002	DC	3	Seed	Early	Corsica	29	3	0
PHill	2002	DC	3	Seed	Early	Corsica	29	4	13.27447768
PHill	2002	DC	3	Seed	Early	Corsica	29	5	34.23405702
PHill	2002	DC	3	Seed	Early	Corsica	29	6	0
PHill	2002	DC	3	Seed	Early	Corsica	29	7	0
PHill	2002	DC	3	LeafPost	Late	Jack	31	1	0
PHill	2002	DC	3	LeafPost	Late	Jack	31	2	0.93126794
PHill	2002	DC	3	LeafPost	Late	Jack	31	3	0
PHill	2002	DC	3	LeafPost	Late	Jack	31	4	0
PHill	2002	DC	3	LeafPost	Late	Jack	31	5	2.228207379
PHill	2002	DC	3	LeafPost	Late	Jack	31	6	0
PHill	2002	DC	3	LeafPost	Late	Jack	31	7	0
PHill	2002	DC	3	Seed	Late	Jack	31	1	3.75167199
PHill	2002	DC	3	Seed	Late	Jack	31	2	10.9670861
PHill	2002	DC	3	Seed	Late	Jack	31	3	0
PHill	2002	DC	3	Seed	Late	Jack	31	4	11.35762882
PHill	2002	DC	3	Seed	Late	Jack	31	5	44.41434536
PHill	2002	DC	3	Seed	Late	Jack	31	6	0
PHill	2002	DC	3	Seed	Late	Jack	31	7	0
PHill	2002	DC	3	LeafPost	Early	Jack	33	1	0
PHill	2002	DC	3	LeafPost	Early	Jack	33	2	1.19288972
PHill	2002	DC	3	LeafPost	Early	Jack	33	3	0
PHill	2002	DC	3	LeafPost	Early	Jack	33	4	0
PHill	2002	DC	3	LeafPost	Early	Jack	33	5	1.614468955
PHill	2002	DC	3	LeafPost	Early	Jack	33	6	0
PHill	2002	DC	3	LeafPost	Early	Jack	33	7	0
PHill	2002	DC	3	Seed	Early	Jack	33	1	3.38312022
PHill	2002	DC	3	Seed	Early	Jack	33	2	9.40995482
PHill	2002	DC	3	Seed	Early	Jack	33	3	0
PHill	2002	DC	3	Seed	Early	Jack	33	4	9.408112909
PHill	2002	DC	3	Seed	Early	Jack	33	5	37.43851681
PHill	2002	DC	3	Seed	Early	Jack	33	6	0
PHill	2002	DC	3	Seed	Early	Jack	33	7	0
PHill	2002	DC	3	Seed	Late	Bass	34	1	4.382032
PHill	2002	DC	3	Seed	Late	Bass	34	2	11.61037448
PHill	2002	DC	3	Seed	Late	Bass	34	3	0

PHill	2002	DC	3	Seed	Late	Bass	34	4	11.58999247
PHill	2002	DC	3	Seed	Late	Bass	34	5	41.884953
PHill	2002	DC	3	Seed	Late	Bass	34	6	0
PHill	2002	DC	3	Seed	Late	Bass	34	7	0
PHill	2002	DC	3	LeafPost	Early	Bass	36	1	0
PHill	2002	DC	3	LeafPost	Early	Bass	36	2	2.47215524
PHill	2002	DC	3	LeafPost	Early	Bass	36	3	0
PHill	2002	DC	3	LeafPost	Early	Bass	36	4	0
PHill	2002	DC	3	LeafPost	Early	Bass	36	5	6.803614
PHill	2002	DC	3	LeafPost	Early	Bass	36	6	2.718217864
PHill	2002	DC	3	LeafPost	Early	Bass	36	7	0.25831488
PHill	2002	DC	3	Seed	Early	Bass	36	1	4.14726979
PHill	2002	DC	3	Seed	Early	Bass	36	2	10.36679714
PHill	2002	DC	3	Seed	Early	Bass	36	3	0
PHill	2002	DC	3	Seed	Early	Bass	36	4	11.94088366
PHill	2002	DC	3	Seed	Early	Bass	36	5	40.82956468
PHill	2002	DC	3	Seed	Early	Bass	36	6	0
PHill	2002	DC	3	Seed	Early	Bass	36	7	0
PHill	2002	FS	1	LeafPost	Late	Williams82		1	0
PHill	2002	FS	1	LeafPost	Late	Williams82		1	2.128578856
PHill	2002	FS	1	LeafPost	Late	Williams82		1	3
PHill	2002	FS	1	LeafPost	Late	Williams82		1	4
PHill	2002	FS	1	LeafPost	Late	Williams82		1	5
PHill	2002	FS	1	LeafPost	Late	Williams82		1	6
PHill	2002	FS	1	LeafPost	Late	Williams82		1	7
PHill	2002	FS	1	Seed	Late	Williams82		1	1
PHill	2002	FS	1	Seed	Late	Williams82		1	2
PHill	2002	FS	1	Seed	Late	Williams82		1	3
PHill	2002	FS	1	Seed	Late	Williams82		1	4
PHill	2002	FS	1	Seed	Late	Williams82		1	5
PHill	2002	FS	1	Seed	Late	Williams82		1	6
PHill	2002	FS	1	Seed	Late	Williams82		1	7
PHill	2002	FS	1	Seed	Early	Williams82		2	1
PHill	2002	FS	1	Seed	Early	Williams82		2	2
PHill	2002	FS	1	Seed	Early	Williams82		2	3
PHill	2002	FS	1	Seed	Early	Williams82		2	4
PHill	2002	FS	1	Seed	Early	Williams82		2	5
PHill	2002	FS	1	Seed	Early	Williams82		2	6
PHill	2002	FS	1	Seed	Early	Williams82		2	7
PHill	2002	FS	1	LeafPost	Early	Williams82		3	1
PHill	2002	FS	1	LeafPost	Early	Williams82		3	2
PHill	2002	FS	1	LeafPost	Early	Williams82		3	3
PHill	2002	FS	1	LeafPost	Early	Williams82		3	4
PHill	2002	FS	1	LeafPost	Early	Williams82		3	5
PHill	2002	FS	1	LeafPost	Early	Williams82		3	6
PHill	2002	FS	1	LeafPost	Early	Williams82		3	7
PHill	2002	FS	1	LeafPost	Late	Bass	4	1	0
PHill	2002	FS	1	LeafPost	Late	Bass	4	2	1.46045654
PHill	2002	FS	1	LeafPost	Late	Bass	4	3	0
PHill	2002	FS	1	LeafPost	Late	Bass	4	4	0
PHill	2002	FS	1	LeafPost	Late	Bass	4	5	4.915005053
PHill	2002	FS	1	LeafPost	Late	Bass	4	6	0
PHill	2002	FS	1	LeafPost	Late	Bass	4	7	0.357497968
PHill	2002	FS	1	Seed	Late	Bass	4	1	2.5282717
PHill	2002	FS	1	Seed	Late	Bass	4	2	5.0074526
PHill	2002	FS	1	Seed	Late	Bass	4	3	0
PHill	2002	FS	1	Seed	Late	Bass	4	4	6.275648418
PHill	2002	FS	1	Seed	Late	Bass	4	5	20.73619152
PHill	2002	FS	1	Seed	Late	Bass	4	6	0
PHill	2002	FS	1	Seed	Late	Bass	4	7	0
PHill	2002	FS	1	Seed	Early	Bass	5	1	1.83334003
PHill	2002	FS	1	Seed	Early	Bass	5	2	3.78065606
PHill	2002	FS	1	Seed	Early	Bass	5	3	0
PHill	2002	FS	1	Seed	Early	Bass	5	4	3.678850057
PHill	2002	FS	1	Seed	Early	Bass	5	5	16.5465942
PHill	2002	FS	1	Seed	Early	Bass	5	6	0
PHill	2002	FS	1	Seed	Early	Bass	5	7	0
PHill	2002	FS	1	Seed	Early	Jack	7	1	1.70140783
PHill	2002	FS	1	Seed	Early	Jack	7	2	1.90286936
PHill	2002	FS	1	Seed	Early	Jack	7	3	0
PHill	2002	FS	1	Seed	Early	Jack	7	4	4.303662225
PHill	2002	FS	1	Seed	Early	Jack	7	5	8.622766384
PHill	2002	FS	1	Seed	Early	Jack	7	6	0
PHill	2002	FS	1	Seed	Early	Jack	7	7	0
PHill	2002	FS	1	LeafPost	Late	Jack	9	1	0
PHill	2002	FS	1	LeafPost	Late	Jack	9	2	1.47458912
PHill	2002	FS	1	LeafPost	Late	Jack	9	3	0
PHill	2002	FS	1	LeafPost	Late	Jack	9	4	0
PHill	2002	FS	1	LeafPost	Late	Jack	9	5	4.515933854

PHill	2002	FS	1	LeafPost	Late	Jack	9	6	0
PHill	2002	FS	1	LeafPost	Late	Jack	9	7	0
PHill	2002	FS	1	Seed	Late	Jack	9	1	1.98823363
PHill	2002	FS	1	Seed	Late	Jack	9	2	2.91603776
PHill	2002	FS	1	Seed	Late	Jack	9	3	0
PHill	2002	FS	1	Seed	Late	Jack	9	4	5.113769369
PHill	2002	FS	1	Seed	Late	Jack	9	5	14.58531043
PHill	2002	FS	1	Seed	Late	Jack	9	6	0
PHill	2002	FS	1	Seed	Late	Jack	9	7	0
PHill	2002	FS	1	LeafPost	Early	Corsica	10	1	0
PHill	2002	FS	1	LeafPost	Early	Corsica	10	2	1.1730536
PHill	2002	FS	1	LeafPost	Early	Corsica	10	3	0
PHill	2002	FS	1	LeafPost	Early	Corsica	10	4	3.985854468
PHill	2002	FS	1	LeafPost	Early	Corsica	10	5	4.846670331
PHill	2002	FS	1	LeafPost	Early	Corsica	10	6	0
PHill	2002	FS	1	LeafPost	Early	Corsica	10	7	0
PHill	2002	FS	1	Seed	Early	Corsica	10	1	3.14909002
PHill	2002	FS	1	Seed	Early	Corsica	10	2	8.25782318
PHill	2002	FS	1	Seed	Early	Corsica	10	3	0
PHill	2002	FS	1	Seed	Early	Corsica	10	4	9.321835198
PHill	2002	FS	1	Seed	Early	Corsica	10	5	33.29799594
PHill	2002	FS	1	Seed	Early	Corsica	10	6	0
PHill	2002	FS	1	Seed	Early	Corsica	10	7	0
PHill	2002	FS	1	LeafPost	Late	Corsica	12	1	0
PHill	2002	FS	1	LeafPost	Late	Corsica	12	2	1.34956802
PHill	2002	FS	1	LeafPost	Late	Corsica	12	3	0
PHill	2002	FS	1	LeafPost	Late	Corsica	12	4	0
PHill	2002	FS	1	LeafPost	Late	Corsica	12	5	3.884140067
PHill	2002	FS	1	LeafPost	Late	Corsica	12	6	0
PHill	2002	FS	1	LeafPost	Late	Corsica	12	7	0
PHill	2002	FS	1	Seed	Late	Corsica	12	1	3.40772598
PHill	2002	FS	1	Seed	Late	Corsica	12	2	8.26193006
PHill	2002	FS	1	Seed	Late	Corsica	12	3	0
PHill	2002	FS	1	Seed	Late	Corsica	12	4	9.475536593
PHill	2002	FS	1	Seed	Late	Corsica	12	5	36.38301102
PHill	2002	FS	1	Seed	Late	Corsica	12	6	0
PHill	2002	FS	1	Seed	Late	Corsica	12	7	0
PHill	2002	FS	2	Seed	Early	Corsica	14	1	3.28825641
PHill	2002	FS	2	Seed	Early	Corsica	14	2	8.22603212
PHill	2002	FS	2	Seed	Early	Corsica	14	3	0
PHill	2002	FS	2	Seed	Early	Corsica	14	4	9.904867283
PHill	2002	FS	2	Seed	Early	Corsica	14	5	35.30929763
PHill	2002	FS	2	Seed	Early	Corsica	14	6	0
PHill	2002	FS	2	Seed	Early	Corsica	14	7	0
PHill	2002	FS	2	LeafPost	Late	Corsica	15	1	0
PHill	2002	FS	2	LeafPost	Late	Corsica	15	2	1.12175486
PHill	2002	FS	2	LeafPost	Late	Corsica	15	3	0
PHill	2002	FS	2	LeafPost	Late	Corsica	15	4	0
PHill	2002	FS	2	LeafPost	Late	Corsica	15	5	2.910146499
PHill	2002	FS	2	LeafPost	Late	Corsica	15	6	0
PHill	2002	FS	2	LeafPost	Late	Corsica	15	7	0
PHill	2002	FS	2	Seed	Late	Corsica	15	1	3.21895899
PHill	2002	FS	2	Seed	Late	Corsica	15	2	7.86463634
PHill	2002	FS	2	Seed	Late	Corsica	15	3	0
PHill	2002	FS	2	Seed	Late	Corsica	15	4	8.614245056
PHill	2002	FS	2	Seed	Late	Corsica	15	5	33.60337184
PHill	2002	FS	2	Seed	Late	Corsica	15	6	0
PHill	2002	FS	2	Seed	Late	Corsica	15	7	0
PHill	2002	FS	2	Seed	Early	Bass	16	1	1.83650166
PHill	2002	FS	2	Seed	Early	Bass	16	2	3.86591522
PHill	2002	FS	2	Seed	Early	Bass	16	3	0
PHill	2002	FS	2	Seed	Early	Bass	16	4	3.890454311
PHill	2002	FS	2	Seed	Early	Bass	16	5	16.68449635
PHill	2002	FS	2	Seed	Early	Bass	16	6	0
PHill	2002	FS	2	Seed	Early	Bass	16	7	0
PHill	2002	FS	2	LeafPost	Late	Bass	17	1	0
PHill	2002	FS	2	LeafPost	Late	Bass	17	2	2.01766328
PHill	2002	FS	2	LeafPost	Late	Bass	17	3	0
PHill	2002	FS	2	LeafPost	Late	Bass	17	4	0
PHill	2002	FS	2	LeafPost	Late	Bass	17	5	4.09111159
PHill	2002	FS	2	LeafPost	Late	Bass	17	6	0
PHill	2002	FS	2	LeafPost	Late	Bass	17	7	0
PHill	2002	FS	2	Seed	Late	Bass	17	1	1.62890618
PHill	2002	FS	2	Seed	Late	Bass	17	2	1.94712044
PHill	2002	FS	2	Seed	Late	Bass	17	3	0
PHill	2002	FS	2	Seed	Late	Bass	17	4	2.892839263
PHill	2002	FS	2	Seed	Late	Bass	17	5	7.198603217
PHill	2002	FS	2	Seed	Late	Bass	17	6	0
PHill	2002	FS	2	Seed	Late	Bass	17	7	0

PHill	2002	FS	2	Seed	Early	Williams82	19	1	2.46360064
PHill	2002	FS	2	Seed	Early	Williams82	19	2	6.04607234
PHill	2002	FS	2	Seed	Early	Williams82	19	3	0
PHill	2002	FS	2	Seed	Early	Williams82	19	4	6.706114273
PHill	2002	FS	2	Seed	Early	Williams82	19	5	25.50805612
PHill	2002	FS	2	Seed	Early	Williams82	19	6	0
PHill	2002	FS	2	Seed	Early	Williams82	19	7	0
PHill	2002	FS	2	LeafPost	Late	Williams82	21	1	0
PHill	2002	FS	2	LeafPost	Late	Williams82	21	2	2.17387238
PHill	2002	FS	2	LeafPost	Late	Williams82	21	3	0
PHill	2002	FS	2	LeafPost	Late	Williams82	21	4	0
PHill	2002	FS	2	LeafPost	Late	Williams82	21	5	3.06234468
PHill	2002	FS	2	LeafPost	Late	Williams82	21	6	0
PHill	2002	FS	2	LeafPost	Late	Williams82	21	7	0
PHill	2002	FS	2	Seed	Late	Williams82	21	1	3.02721213
PHill	2002	FS	2	Seed	Late	Williams82	21	2	7.1469977
PHill	2002	FS	2	Seed	Late	Williams82	21	3	0
PHill	2002	FS	2	Seed	Late	Williams82	21	4	7.604141475
PHill	2002	FS	2	Seed	Late	Williams82	21	5	29.20507722
PHill	2002	FS	2	Seed	Late	Williams82	21	6	0
PHill	2002	FS	2	Seed	Late	Williams82	21	7	0
PHill	2002	FS	2	Seed	Early	Jack	22	1	1.72435361
PHill	2002	FS	2	Seed	Early	Jack	22	2	1.34732966
PHill	2002	FS	2	Seed	Early	Jack	22	3	0
PHill	2002	FS	2	Seed	Early	Jack	22	4	2.885769539
PHill	2002	FS	2	Seed	Early	Jack	22	5	4.406845503
PHill	2002	FS	2	Seed	Early	Jack	22	6	0
PHill	2002	FS	2	Seed	Early	Jack	22	7	0
PHill	2002	FS	2	LeafPost	Early	Jack	23	1	0
PHill	2002	FS	2	LeafPost	Early	Jack	23	2	1.38829634
PHill	2002	FS	2	LeafPost	Early	Jack	23	3	0
PHill	2002	FS	2	LeafPost	Early	Jack	23	4	4.197340493
PHill	2002	FS	2	LeafPost	Early	Jack	23	5	4.852531044
PHill	2002	FS	2	LeafPost	Early	Jack	23	6	0
PHill	2002	FS	2	LeafPost	Early	Jack	23	7	0
PHill	2002	FS	2	LeafPost	Late	Jack	23	1	0
PHill	2002	FS	2	LeafPost	Late	Jack	23	2	1.369331
PHill	2002	FS	2	LeafPost	Late	Jack	23	3	0
PHill	2002	FS	2	LeafPost	Late	Jack	23	4	0
PHill	2002	FS	2	LeafPost	Late	Jack	23	5	2.461979006
PHill	2002	FS	2	LeafPost	Late	Jack	23	6	0
PHill	2002	FS	2	LeafPost	Late	Jack	23	7	0
PHill	2002	FS	2	Seed	Late	Jack	23	1	1.55548366
PHill	2002	FS	2	Seed	Late	Jack	23	2	1.53948638
PHill	2002	FS	2	Seed	Late	Jack	23	3	0
PHill	2002	FS	2	Seed	Late	Jack	23	4	2.925699088
PHill	2002	FS	2	Seed	Late	Jack	23	5	5.780328891
PHill	2002	FS	2	Seed	Late	Jack	23	6	0
PHill	2002	FS	2	Seed	Late	Jack	23	7	0
PHill	2002	FS	3	Seed	Early	Williams82	26	1	2.92386879
PHill	2002	FS	3	Seed	Early	Williams82	26	2	7.82726042
PHill	2002	FS	3	Seed	Early	Williams82	26	3	0
PHill	2002	FS	3	Seed	Early	Williams82	26	4	7.743734263
PHill	2002	FS	3	Seed	Early	Williams82	26	5	32.29151198
PHill	2002	FS	3	Seed	Early	Williams82	26	6	0
PHill	2002	FS	3	Seed	Early	Williams82	26	7	0
PHill	2002	FS	3	LeafPost	Late	Williams82	27	1	0
PHill	2002	FS	3	LeafPost	Late	Williams82	27	2	3.15040592
PHill	2002	FS	3	LeafPost	Late	Williams82	27	3	0
PHill	2002	FS	3	LeafPost	Late	Williams82	27	4	0
PHill	2002	FS	3	LeafPost	Late	Williams82	27	5	2.498557996
PHill	2002	FS	3	LeafPost	Late	Williams82	27	6	0
PHill	2002	FS	3	LeafPost	Late	Williams82	27	7	0
PHill	2002	FS	3	Seed	Late	Williams82	27	1	2.26185343
PHill	2002	FS	3	Seed	Late	Williams82	27	2	4.75060838
PHill	2002	FS	3	Seed	Late	Williams82	27	3	0
PHill	2002	FS	3	Seed	Late	Williams82	27	4	4.985140993
PHill	2002	FS	3	Seed	Late	Williams82	27	5	19.46259341
PHill	2002	FS	3	Seed	Late	Williams82	27	6	0
PHill	2002	FS	3	Seed	Late	Williams82	27	7	0
PHill	2002	FS	3	Seed	Early	Corsica	28	1	3.18603416
PHill	2002	FS	3	Seed	Early	Corsica	28	2	7.42444118
PHill	2002	FS	3	Seed	Early	Corsica	28	3	0
PHill	2002	FS	3	Seed	Early	Corsica	28	4	7.805072604
PHill	2002	FS	3	Seed	Early	Corsica	28	5	28.34362192
PHill	2002	FS	3	Seed	Early	Corsica	28	6	0
PHill	2002	FS	3	Seed	Early	Corsica	28	7	0
PHill	2002	FS	3	LeafPost	Late	Corsica	30	1	0
PHill	2002	FS	3	LeafPost	Late	Corsica	30	2	0.98168072

PHill	2002	FS	3	LeafPost	Late	Corsica	30	3	0
PHill	2002	FS	3	LeafPost	Late	Corsica	30	4	0
PHill	2002	FS	3	LeafPost	Late	Corsica	30	5	2.611539701
PHill	2002	FS	3	LeafPost	Late	Corsica	30	6	0
PHill	2002	FS	3	LeafPost	Late	Corsica	30	7	0
PHill	2002	FS	3	Seed	Late	Corsica	30	1	2.74341448
PHill	2002	FS	3	Seed	Late	Corsica	30	2	7.07384666
PHill	2002	FS	3	Seed	Late	Corsica	30	3	0
PHill	2002	FS	3	Seed	Late	Corsica	30	4	6.899868587
PHill	2002	FS	3	Seed	Late	Corsica	30	5	25.2354734
PHill	2002	FS	3	Seed	Late	Corsica	30	6	0
PHill	2002	FS	3	Seed	Late	Corsica	30	7	0
PHill	2002	FS	3	Seed	Early	Jack	31	1	1.54840709
PHill	2002	FS	3	Seed	Early	Jack	31	2	1.43124884
PHill	2002	FS	3	Seed	Early	Jack	31	3	0
PHill	2002	FS	3	Seed	Early	Jack	31	4	2.558182224
PHill	2002	FS	3	Seed	Early	Jack	31	5	3.97639252
PHill	2002	FS	3	Seed	Early	Jack	31	6	0
PHill	2002	FS	3	Seed	Early	Jack	31	7	0
PHill	2002	FS	3	LeafPost	Late	Jack	32	1	0
PHill	2002	FS	3	LeafPost	Late	Jack	32	2	1.57088828
PHill	2002	FS	3	LeafPost	Late	Jack	32	3	0
PHill	2002	FS	3	LeafPost	Late	Jack	32	4	0
PHill	2002	FS	3	LeafPost	Late	Jack	32	5	3.260339815
PHill	2002	FS	3	LeafPost	Late	Jack	32	6	0
PHill	2002	FS	3	LeafPost	Late	Jack	32	7	0
PHill	2002	FS	3	Seed	Late	Jack	32	1	1.6422556
PHill	2002	FS	3	Seed	Late	Jack	32	2	1.6706747
PHill	2002	FS	3	Seed	Late	Jack	32	3	0
PHill	2002	FS	3	Seed	Late	Jack	32	4	2.979009882
PHill	2002	FS	3	Seed	Late	Jack	32	5	4.764301006
PHill	2002	FS	3	Seed	Late	Jack	32	6	0
PHill	2002	FS	3	Seed	Late	Jack	32	7	0
PHill	2002	FS	3	Seed	Early	Bass	34	1	2.12345597
PHill	2002	FS	3	Seed	Early	Bass	34	2	6.7998725
PHill	2002	FS	3	Seed	Early	Bass	34	3	0
PHill	2002	FS	3	Seed	Early	Bass	34	4	4.184469002
PHill	2002	FS	3	Seed	Early	Bass	34	5	21.95143897
PHill	2002	FS	3	Seed	Early	Bass	34	6	0
PHill	2002	FS	3	Seed	Early	Bass	34	7	0
PHill	2002	FS	3	LeafPost	Late	Bass	35	1	0
PHill	2002	FS	3	LeafPost	Late	Bass	35	2	1.99681148
PHill	2002	FS	3	LeafPost	Late	Bass	35	3	0
PHill	2002	FS	3	LeafPost	Late	Bass	35	4	0
PHill	2002	FS	3	LeafPost	Late	Bass	35	5	5.648409902
PHill	2002	FS	3	LeafPost	Late	Bass	35	6	0
PHill	2002	FS	3	LeafPost	Late	Bass	35	7	0
PHill	2002	FS	3	Seed	Late	Bass	35	1	1.80033923
PHill	2002	FS	3	Seed	Late	Bass	35	2	3.477626
PHill	2002	FS	3	Seed	Late	Bass	35	3	0
PHill	2002	FS	3	Seed	Late	Bass	35	4	3.35072386
PHill	2002	FS	3	Seed	Late	Bass	35	5	12.11335703
PHill	2002	FS	3	Seed	Late	Bass	35	6	0
PHill	2002	FS	3	Seed	Late	Bass	35	7	0
Wye	2002	DC	1	LeafPost	Early	Corsica	1	1	0
Wye	2002	DC	1	LeafPost	Early	Corsica	1	2	1.7054024
Wye	2002	DC	1	LeafPost	Early	Corsica	1	3	0
Wye	2002	DC	1	LeafPost	Early	Corsica	1	4	0
Wye	2002	DC	1	LeafPost	Early	Corsica	1	5	5.311433801
Wye	2002	DC	1	LeafPost	Early	Corsica	1	6	0
Wye	2002	DC	1	LeafPost	Early	Corsica	1	7	0
Wye	2002	DC	1	Seed	Early	Corsica	1	1	5.69385995
Wye	2002	DC	1	Seed	Early	Corsica	1	2	13.32913412
Wye	2002	DC	1	Seed	Early	Corsica	1	3	0
Wye	2002	DC	1	Seed	Early	Corsica	1	4	20.45112353
Wye	2002	DC	1	Seed	Early	Corsica	1	5	52.88037186
Wye	2002	DC	1	Seed	Early	Corsica	1	6	0
Wye	2002	DC	1	Seed	Early	Corsica	1	7	0
Wye	2002	DC	1	LeafPost	Early	Corsica	3	1	0
Wye	2002	DC	1	LeafPost	Early	Corsica	3	2	2.69438078
Wye	2002	DC	1	LeafPost	Early	Corsica	3	3	0
Wye	2002	DC	1	LeafPost	Early	Corsica	3	4	0
Wye	2002	DC	1	LeafPost	Early	Corsica	3	5	7.717835576
Wye	2002	DC	1	LeafPost	Early	Corsica	3	6	0
Wye	2002	DC	1	LeafPost	Early	Corsica	3	7	0.363831468
Wye	2002	DC	1	Seed	Late	Corsica	3	1	3.81978584
Wye	2002	DC	1	Seed	Late	Corsica	3	2	6.13686392
Wye	2002	DC	1	Seed	Late	Corsica	3	3	0
Wye	2002	DC	1	Seed	Late	Corsica	3	4	13.44088436

Wye	2002	DC	1	Seed	Late	Corsica	3	5	30.90287545	
Wye	2002	DC	1	Seed	Late	Corsica	3	6	0	
Wye	2002	DC	1	Seed	Late	Corsica	3	7	0	
Wye	2002	DC	1	LeafPost	Late	Williams82		4	1	2.37089807
Wye	2002	DC	1	LeafPost	Late	Williams82		4	2	1.74255476
Wye	2002	DC	1	LeafPost	Late	Williams82		4	3	0
Wye	2002	DC	1	LeafPost	Late	Williams82		4	4	6.92398721
Wye	2002	DC	1	LeafPost	Late	Williams82		4	5	6.077357169
Wye	2002	DC	1	LeafPost	Late	Williams82		4	6	0
Wye	2002	DC	1	LeafPost	Late	Williams82		4	7	0.072380528
Wye	2002	DC	1	Seed	Late	Williams82		4	1	2.69010129
Wye	2002	DC	1	Seed	Late	Williams82		4	2	5.43729086
Wye	2002	DC	1	Seed	Late	Williams82		4	3	0
Wye	2002	DC	1	Seed	Late	Williams82		4	4	7.671210474
Wye	2002	DC	1	Seed	Late	Williams82		4	5	25.70771912
Wye	2002	DC	1	Seed	Late	Williams82		4	6	0
Wye	2002	DC	1	Seed	Late	Williams82		4	7	0
Wye	2002	DC	1	LeafPost	Early	Williams82		5	1	0
Wye	2002	DC	1	LeafPost	Early	Williams82		5	2	1.93318796
Wye	2002	DC	1	LeafPost	Early	Williams82		5	3	0
Wye	2002	DC	1	LeafPost	Early	Williams82		5	4	0
Wye	2002	DC	1	LeafPost	Early	Williams82		5	5	4.501196031
Wye	2002	DC	1	LeafPost	Early	Williams82		5	6	0
Wye	2002	DC	1	LeafPost	Early	Williams82		5	7	0
Wye	2002	DC	1	Seed	Early	Williams82		5	1	3.16773959
Wye	2002	DC	1	Seed	Early	Williams82		5	2	6.80932688
Wye	2002	DC	1	Seed	Early	Williams82		5	3	0
Wye	2002	DC	1	Seed	Early	Williams82		5	4	10.01685113
Wye	2002	DC	1	Seed	Early	Williams82		5	5	33.29532039
Wye	2002	DC	1	Seed	Early	Williams82		5	6	0
Wye	2002	DC	1	Seed	Early	Williams82		5	7	0
Wye	2002	DC	1	LeafPost	Early	Jack	7	1	0	
Wye	2002	DC	1	LeafPost	Early	Jack	7	2	3.50392466	
Wye	2002	DC	1	LeafPost	Early	Jack	7	3	0	
Wye	2002	DC	1	LeafPost	Early	Jack	7	4	0	
Wye	2002	DC	1	LeafPost	Early	Jack	7	5	7.517388274	
Wye	2002	DC	1	LeafPost	Early	Jack	7	6	0	
Wye	2002	DC	1	LeafPost	Early	Jack	7	7	0	
Wye	2002	DC	1	Seed	Early	Jack	7	1	3.33483667	
Wye	2002	DC	1	Seed	Early	Jack	7	2	8.87331008	
Wye	2002	DC	1	Seed	Early	Jack	7	3	0	
Wye	2002	DC	1	Seed	Early	Jack	7	4	10.21005971	
Wye	2002	DC	1	Seed	Early	Jack	7	5	38.05213941	
Wye	2002	DC	1	Seed	Early	Jack	7	6	0	
Wye	2002	DC	1	Seed	Early	Jack	7	7	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	1	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	2	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	3	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	4	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	5	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	6	0	
Wye	2002	DC	1	LeafPost	Late	Jack	8	7	0	
Wye	2002	DC	1	Seed	Late	Jack	8	1	3.76076709	
Wye	2002	DC	1	Seed	Late	Jack	8	2	10.02293564	
Wye	2002	DC	1	Seed	Late	Jack	8	3	0	
Wye	2002	DC	1	Seed	Late	Jack	8	4	12.91567032	
Wye	2002	DC	1	Seed	Late	Jack	8	5	47.44162696	
Wye	2002	DC	1	Seed	Late	Jack	8	6	0	
Wye	2002	DC	1	Seed	Late	Jack	8	7	0	
Wye	2002	DC	1	LeafPost	Early	Bass	11	1	0	
Wye	2002	DC	1	LeafPost	Early	Bass	11	2	3.16046198	
Wye	2002	DC	1	LeafPost	Early	Bass	11	3	0	
Wye	2002	DC	1	LeafPost	Early	Bass	11	4	0	
Wye	2002	DC	1	LeafPost	Early	Bass	11	5	8.145106699	
Wye	2002	DC	1	LeafPost	Early	Bass	11	6	0	
Wye	2002	DC	1	LeafPost	Early	Bass	11	7	0.780097768	
Wye	2002	DC	1	Seed	Early	Bass	11	1	4.58692025	
Wye	2002	DC	1	Seed	Early	Bass	11	2	10.19627606	
Wye	2002	DC	1	Seed	Early	Bass	11	3	0	
Wye	2002	DC	1	Seed	Early	Bass	11	4	14.27529689	
Wye	2002	DC	1	Seed	Early	Bass	11	5	43.11480921	
Wye	2002	DC	1	Seed	Early	Bass	11	6	0	
Wye	2002	DC	1	Seed	Early	Bass	11	7	0	
Wye	2002	DC	1	LeafPost	Late	Bass	12	1	0	
Wye	2002	DC	1	LeafPost	Late	Bass	12	2	2.11240028	
Wye	2002	DC	1	LeafPost	Late	Bass	12	3	0	
Wye	2002	DC	1	LeafPost	Late	Bass	12	4	11.35490271	
Wye	2002	DC	1	LeafPost	Late	Bass	12	5	8.092221293	
Wye	2002	DC	1	LeafPost	Late	Bass	12	6	0	

Wye	2002	DC	1	LeafPost	Late	Bass	12	7	0	
Wye	2002	DC	1	Seed	Late	Bass	12	1	5.79822782	
Wye	2002	DC	1	Seed	Late	Bass	12	2	13.42468808	
Wye	2002	DC	1	Seed	Late	Bass	12	3	0	
Wye	2002	DC	1	Seed	Late	Bass	12	4	18.14183557	
Wye	2002	DC	1	Seed	Late	Bass	12	5	51.18707257	
Wye	2002	DC	1	Seed	Late	Bass	12	6	0	
Wye	2002	DC	1	Seed	Late	Bass	12	7	0	
Wye	2002	DC	2	LeafPost	Early	Williams82		14	1	0
Wye	2002	DC	2	LeafPost	Early	Williams82		14	2	1.84686206
Wye	2002	DC	2	LeafPost	Early	Williams82		14	3	0
Wye	2002	DC	2	LeafPost	Early	Williams82		14	4	0
Wye	2002	DC	2	LeafPost	Early	Williams82		14	5	4.937097723
Wye	2002	DC	2	LeafPost	Early	Williams82		14	6	0
Wye	2002	DC	2	LeafPost	Early	Williams82		14	7	0.49879668
Wye	2002	DC	2	Seed	Early	Williams82		14	1	2.96154139
Wye	2002	DC	2	Seed	Early	Williams82		14	2	6.94469522
Wye	2002	DC	2	Seed	Early	Williams82		14	3	0
Wye	2002	DC	2	Seed	Early	Williams82		14	4	8.690526457
Wye	2002	DC	2	Seed	Early	Williams82		14	5	30.13333671
Wye	2002	DC	2	Seed	Early	Williams82		14	6	0
Wye	2002	DC	2	Seed	Early	Williams82		14	7	0
Wye	2002	DC	2	LeafPost	Late	Williams82		15	1	0
Wye	2002	DC	2	LeafPost	Late	Williams82		15	2	1.53783728
Wye	2002	DC	2	LeafPost	Late	Williams82		15	3	0
Wye	2002	DC	2	LeafPost	Late	Williams82		15	4	6.959014559
Wye	2002	DC	2	LeafPost	Late	Williams82		15	5	7.21641204
Wye	2002	DC	2	LeafPost	Late	Williams82		15	6	0
Wye	2002	DC	2	LeafPost	Late	Williams82		15	7	0.130973768
Wye	2002	DC	2	Seed	Late	Williams82		15	1	2.77341056
Wye	2002	DC	2	Seed	Late	Williams82		15	2	6.32396708
Wye	2002	DC	2	Seed	Late	Williams82		15	3	0
Wye	2002	DC	2	Seed	Late	Williams82		15	4	7.903000967
Wye	2002	DC	2	Seed	Late	Williams82		15	5	26.23687763
Wye	2002	DC	2	Seed	Late	Williams82		15	6	0
Wye	2002	DC	2	Seed	Late	Williams82		15	7	0
Wye	2002	DC	2	LeafPost	Early	Jack	16	1	0	
Wye	2002	DC	2	LeafPost	Early	Jack	16	2	1.3817096	
Wye	2002	DC	2	LeafPost	Early	Jack	16	3	0	
Wye	2002	DC	2	LeafPost	Early	Jack	16	4	0	
Wye	2002	DC	2	LeafPost	Early	Jack	16	5	2.003200347	
Wye	2002	DC	2	LeafPost	Early	Jack	16	6	0	
Wye	2002	DC	2	LeafPost	Early	Jack	16	7	0	
Wye	2002	DC	2	Seed	Early	Jack	16	1	2.48637815	
Wye	2002	DC	2	Seed	Early	Jack	16	2	5.62203836	
Wye	2002	DC	2	Seed	Early	Jack	16	3	0	
Wye	2002	DC	2	Seed	Early	Jack	16	4	7.239608596	
Wye	2002	DC	2	Seed	Early	Jack	16	5	25.85959796	
Wye	2002	DC	2	Seed	Early	Jack	16	6	0	
Wye	2002	DC	2	Seed	Early	Jack	16	7	0	
Wye	2002	DC	2	LeafPost	Late	Jack	17	1	0	
Wye	2002	DC	2	LeafPost	Late	Jack	17	2	1.52534	
Wye	2002	DC	2	LeafPost	Late	Jack	17	3	0	
Wye	2002	DC	2	LeafPost	Late	Jack	17	4	5.651790646	
Wye	2002	DC	2	LeafPost	Late	Jack	17	5	5.032651171	
Wye	2002	DC	2	LeafPost	Late	Jack	17	6	0	
Wye	2002	DC	2	LeafPost	Late	Jack	17	7	0.175774796	
Wye	2002	DC	2	Seed	Late	Jack	17	1	3.97440751	
Wye	2002	DC	2	Seed	Late	Jack	17	2	10.40262194	
Wye	2002	DC	2	Seed	Late	Jack	17	3	0	
Wye	2002	DC	2	Seed	Late	Jack	17	4	13.87586003	
Wye	2002	DC	2	Seed	Late	Jack	17	5	48.35232251	
Wye	2002	DC	2	Seed	Late	Jack	17	6	0	
Wye	2002	DC	2	Seed	Late	Jack	17	7	0	
Wye	2002	DC	2	Seed	Early	Corsica	20	1	7.17967908	
Wye	2002	DC	2	Seed	Early	Corsica	20	2	19.22172446	
Wye	2002	DC	2	Seed	Early	Corsica	20	3	0	
Wye	2002	DC	2	Seed	Early	Corsica	20	4	13.38450305	
Wye	2002	DC	2	Seed	Early	Corsica	20	5	40.7024855	
Wye	2002	DC	2	Seed	Early	Corsica	20	6	0	
Wye	2002	DC	2	Seed	Early	Corsica	20	7	0	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	1	0	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	2	1.94356556	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	3	0	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	4	6.878279026	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	5	7.279989689	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	6	0	
Wye	2002	DC	2	LeafPost	Late	Corsica	21	7	0	
Wye	2002	DC	2	Seed	Late	Corsica	21	1	6.73886067	

Wye	2002	DC	2	Seed	Late	Corsica	21	2	17.62509068
Wye	2002	DC	2	Seed	Late	Corsica	21	3	0
Wye	2002	DC	2	Seed	Late	Corsica	21	4	13.47289602
Wye	2002	DC	2	Seed	Late	Corsica	21	5	39.99644167
Wye	2002	DC	2	Seed	Late	Corsica	21	6	0
Wye	2002	DC	2	Seed	Late	Corsica	21	7	0
Wye	2002	DC	2	Seed	Early	Bass	22	1	7.31075644
Wye	2002	DC	2	Seed	Early	Bass	22	2	15.73094546
Wye	2002	DC	2	Seed	Early	Bass	22	3	0
Wye	2002	DC	2	Seed	Early	Bass	22	4	11.9738857
Wye	2002	DC	2	Seed	Early	Bass	22	5	27.97845582
Wye	2002	DC	2	Seed	Early	Bass	22	6	0
Wye	2002	DC	2	Seed	Early	Bass	22	7	0.094299696
Wye	2002	DC	2	LeafPost	Late	Bass	24	1	0
Wye	2002	DC	2	LeafPost	Late	Bass	24	2	1.34550806
Wye	2002	DC	2	LeafPost	Late	Bass	24	3	0
Wye	2002	DC	2	LeafPost	Late	Bass	24	4	3.911916219
Wye	2002	DC	2	LeafPost	Late	Bass	24	5	4.066525386
Wye	2002	DC	2	LeafPost	Late	Bass	24	6	0
Wye	2002	DC	2	LeafPost	Late	Bass	24	7	0.065401728
Wye	2002	DC	2	Seed	Late	Bass	24	1	10.03143455
Wye	2002	DC	2	Seed	Late	Bass	24	2	22.43895986
Wye	2002	DC	2	Seed	Late	Bass	24	3	0
Wye	2002	DC	2	Seed	Late	Bass	24	4	15.88788029
Wye	2002	DC	2	Seed	Late	Bass	24	5	36.81531057
Wye	2002	DC	2	Seed	Late	Bass	24	6	0
Wye	2002	DC	2	Seed	Late	Bass	24	7	0.437202556
Wye	2002	DC	3	LeafPost	Early	Corsica	20	1	0
Wye	2002	DC	3	LeafPost	Early	Corsica	20	2	3.40411616
Wye	2002	DC	3	LeafPost	Early	Corsica	20	3	0
Wye	2002	DC	3	LeafPost	Early	Corsica	20	4	0
Wye	2002	DC	3	LeafPost	Early	Corsica	20	5	5.812049876
Wye	2002	DC	3	LeafPost	Early	Corsica	20	6	0
Wye	2002	DC	3	LeafPost	Early	Corsica	20	7	0
Wye	2002	DC	3	LeafPost	Early	Bass	22	1	0
Wye	2002	DC	3	LeafPost	Early	Bass	22	2	2.1227075
Wye	2002	DC	3	LeafPost	Early	Bass	22	3	0
Wye	2002	DC	3	LeafPost	Early	Bass	22	4	0
Wye	2002	DC	3	LeafPost	Early	Bass	22	5	7.283537224
Wye	2002	DC	3	LeafPost	Early	Bass	22	6	0
Wye	2002	DC	3	LeafPost	Early	Bass	22	7	0
Wye	2002	DC	3	LeafPost	Early	Corsica	25	1	0
Wye	2002	DC	3	LeafPost	Early	Corsica	25	2	3.22638182
Wye	2002	DC	3	LeafPost	Early	Corsica	25	3	0
Wye	2002	DC	3	LeafPost	Early	Corsica	25	4	0
Wye	2002	DC	3	LeafPost	Early	Corsica	25	5	10.51248725
Wye	2002	DC	3	LeafPost	Early	Corsica	25	6	0
Wye	2002	DC	3	LeafPost	Early	Corsica	25	7	0.739424748
Wye	2002	DC	3	Seed	Early	Corsica	25	1	2.87705778
Wye	2002	DC	3	Seed	Early	Corsica	25	2	7.13289824
Wye	2002	DC	3	Seed	Early	Corsica	25	3	0
Wye	2002	DC	3	Seed	Early	Corsica	25	4	3.34214201
Wye	2002	DC	3	Seed	Early	Corsica	25	5	8.448045328
Wye	2002	DC	3	Seed	Early	Corsica	25	6	0
Wye	2002	DC	3	Seed	Early	Corsica	25	7	0
Wye	2002	DC	3	LeafPost	Late	Corsica	26	1	0
Wye	2002	DC	3	LeafPost	Late	Corsica	26	2	3.69480764
Wye	2002	DC	3	LeafPost	Late	Corsica	26	3	0
Wye	2002	DC	3	LeafPost	Late	Corsica	26	4	13.88636095
Wye	2002	DC	3	LeafPost	Late	Corsica	26	5	13.2649259
Wye	2002	DC	3	LeafPost	Late	Corsica	26	6	0
Wye	2002	DC	3	LeafPost	Late	Corsica	26	7	0.280426204
Wye	2002	DC	3	Seed	Late	Corsica	26	1	6.09309863
Wye	2002	DC	3	Seed	Late	Corsica	26	2	18.51183728
Wye	2002	DC	3	Seed	Late	Corsica	26	3	0
Wye	2002	DC	3	Seed	Late	Corsica	26	4	12.91101914
Wye	2002	DC	3	Seed	Late	Corsica	26	5	47.33868722
Wye	2002	DC	3	Seed	Late	Corsica	26	6	0
Wye	2002	DC	3	Seed	Late	Corsica	26	7	0
Wye	2002	DC	3	LeafPost	Early	Bass	28	1	0
Wye	2002	DC	3	LeafPost	Early	Bass	28	2	3.09764024
Wye	2002	DC	3	LeafPost	Early	Bass	28	3	0
Wye	2002	DC	3	LeafPost	Early	Bass	28	4	0
Wye	2002	DC	3	LeafPost	Early	Bass	28	5	8.227027618
Wye	2002	DC	3	LeafPost	Early	Bass	28	6	0
Wye	2002	DC	3	LeafPost	Early	Bass	28	7	0.66156046
Wye	2002	DC	3	Seed	Early	Bass	28	1	7.23417442
Wye	2002	DC	3	Seed	Early	Bass	28	2	17.97514976
Wye	2002	DC	3	Seed	Early	Bass	28	3	0

Wye	2002	DC	3	Seed	Early	Bass	28	4	15.54561979
Wye	2002	DC	3	Seed	Early	Bass	28	5	46.65585626
Wye	2002	DC	3	Seed	Early	Bass	28	6	0
Wye	2002	DC	3	Seed	Early	Bass	28	7	0
Wye	2002	DC	3	LeafPost	Late	Bass	30	1	0
Wye	2002	DC	3	LeafPost	Late	Bass	30	2	2.05365782
Wye	2002	DC	3	LeafPost	Late	Bass	30	3	0
Wye	2002	DC	3	LeafPost	Late	Bass	30	4	7.763439878
Wye	2002	DC	3	LeafPost	Late	Bass	30	5	7.78342526
Wye	2002	DC	3	LeafPost	Late	Bass	30	6	0
Wye	2002	DC	3	LeafPost	Late	Bass	30	7	0.074295396
Wye	2002	DC	3	Seed	Late	Bass	30	1	4.96221986
Wye	2002	DC	3	Seed	Late	Bass	30	2	11.84088002
Wye	2002	DC	3	Seed	Late	Bass	30	3	0
Wye	2002	DC	3	Seed	Late	Bass	30	4	17.6337364
Wye	2002	DC	3	Seed	Late	Bass	30	5	53.27495072
Wye	2002	DC	3	Seed	Late	Bass	30	6	0
Wye	2002	DC	3	Seed	Late	Bass	30	7	0
Wye	2002	DC	3	LeafPost	Late	Jack	31	1	0
Wye	2002	DC	3	LeafPost	Late	Jack	31	2	1.53216686
Wye	2002	DC	3	LeafPost	Late	Jack	31	3	0
Wye	2002	DC	3	LeafPost	Late	Jack	31	4	5.50231121
Wye	2002	DC	3	LeafPost	Late	Jack	31	5	7.587015264
Wye	2002	DC	3	LeafPost	Late	Jack	31	6	0
Wye	2002	DC	3	LeafPost	Late	Jack	31	7	0.330209904
Wye	2002	DC	3	Seed	Late	Jack	31	1	2.73707986
Wye	2002	DC	3	Seed	Late	Jack	31	2	6.65699558
Wye	2002	DC	3	Seed	Late	Jack	31	3	0
Wye	2002	DC	3	Seed	Late	Jack	31	4	9.227212951
Wye	2002	DC	3	Seed	Late	Jack	31	5	3.771388356
Wye	2002	DC	3	Seed	Late	Jack	31	6	0
Wye	2002	DC	3	Seed	Late	Jack	31	7	0
Wye	2002	DC	3	LeafPost	Early	Jack	32	1	0
Wye	2002	DC	3	LeafPost	Early	Jack	32	2	1.91841644
Wye	2002	DC	3	LeafPost	Early	Jack	32	3	0
Wye	2002	DC	3	LeafPost	Early	Jack	32	4	0
Wye	2002	DC	3	LeafPost	Early	Jack	32	5	7.286416287
Wye	2002	DC	3	LeafPost	Early	Jack	32	6	0
Wye	2002	DC	3	LeafPost	Early	Jack	32	7	0.67238238
Wye	2002	DC	3	Seed	Early	Jack	32	1	1.980954
Wye	2002	DC	3	Seed	Early	Jack	32	2	2.77400678
Wye	2002	DC	3	Seed	Early	Jack	32	3	0
Wye	2002	DC	3	Seed	Early	Jack	32	4	4.980502665
Wye	2002	DC	3	Seed	Early	Jack	32	5	12.07840124
Wye	2002	DC	3	Seed	Early	Jack	32	6	0
Wye	2002	DC	3	Seed	Early	Jack	32	7	0
Wye	2002	DC	3	LeafPost	Early	Williams82	34	1	0
Wye	2002	DC	3	LeafPost	Early	Williams82	34	2	2.37946478
Wye	2002	DC	3	LeafPost	Early	Williams82	34	3	0
Wye	2002	DC	3	LeafPost	Early	Williams82	34	4	0
Wye	2002	DC	3	LeafPost	Early	Williams82	34	5	5.918133413
Wye	2002	DC	3	LeafPost	Early	Williams82	34	6	0
Wye	2002	DC	3	LeafPost	Early	Williams82	34	7	0
Wye	2002	DC	3	Seed	Early	Williams82	34	1	4.26959072
Wye	2002	DC	3	Seed	Early	Williams82	34	2	7.93401446
Wye	2002	DC	3	Seed	Early	Williams82	34	3	0
Wye	2002	DC	3	Seed	Early	Williams82	34	4	15.01450717
Wye	2002	DC	3	Seed	Early	Williams82	34	5	35.97212077
Wye	2002	DC	3	Seed	Early	Williams82	34	6	0
Wye	2002	DC	3	Seed	Early	Williams82	34	7	0
Wye	2002	DC	3	LeafPost	Late	Williams82	36	1	0
Wye	2002	DC	3	LeafPost	Late	Williams82	36	2	1.45379528
Wye	2002	DC	3	LeafPost	Late	Williams82	36	3	0
Wye	2002	DC	3	LeafPost	Late	Williams82	36	4	3.962356116
Wye	2002	DC	3	LeafPost	Late	Williams82	36	5	4.339778231
Wye	2002	DC	3	LeafPost	Late	Williams82	36	6	0
Wye	2002	DC	3	LeafPost	Late	Williams82	36	7	0.601774132
Wye	2002	DC	3	Seed	Late	Williams82	36	1	4.72028381
Wye	2002	DC	3	Seed	Late	Williams82	36	2	8.80342826
Wye	2002	DC	3	Seed	Late	Williams82	36	3	0
Wye	2002	DC	3	Seed	Late	Williams82	36	4	19.06076438
Wye	2002	DC	3	Seed	Late	Williams82	36	5	44.65054102
Wye	2002	DC	3	Seed	Late	Williams82	36	6	0
Wye	2002	DC	3	Seed	Late	Williams82	36	7	0
Wye	2002	FS	1	LeafPost	Late	Corsica	1	1	0
Wye	2002	FS	1	LeafPost	Late	Corsica	1	2	2.34808772
Wye	2002	FS	1	LeafPost	Late	Corsica	1	3	0
Wye	2002	FS	1	LeafPost	Late	Corsica	1	4	4.565053548
Wye	2002	FS	1	LeafPost	Late	Corsica	1	5	6.416858241

Wye	2002	FS	1	LeafPost	Late	Corsica	1	6	0
Wye	2002	FS	1	LeafPost	Late	Corsica	1	7	0
Wye	2002	FS	1	Seed	Late	Corsica	1	1	2.98576304
Wye	2002	FS	1	Seed	Late	Corsica	1	2	4.95586958
Wye	2002	FS	1	Seed	Late	Corsica	1	3	0
Wye	2002	FS	1	Seed	Late	Corsica	1	4	7.906591516
Wye	2002	FS	1	Seed	Late	Corsica	1	5	19.31801481
Wye	2002	FS	1	Seed	Late	Corsica	1	6	0
Wye	2002	FS	1	Seed	Late	Corsica	1	7	0
Wye	2002	FS	1	LeafPost	Early	Corsica	3	1	0
Wye	2002	FS	1	LeafPost	Early	Corsica	3	2	1.18760846
Wye	2002	FS	1	LeafPost	Early	Corsica	3	3	0
Wye	2002	FS	1	LeafPost	Early	Corsica	3	4	3.807274531
Wye	2002	FS	1	LeafPost	Early	Corsica	3	5	5.18849451
Wye	2002	FS	1	LeafPost	Early	Corsica	3	6	0.187162708
Wye	2002	FS	1	LeafPost	Early	Corsica	3	7	0.542164664
Wye	2002	FS	1	Seed	Early	Corsica	3	1	3.73722917
Wye	2002	FS	1	Seed	Early	Corsica	3	2	7.5344465
Wye	2002	FS	1	Seed	Early	Corsica	3	3	0
Wye	2002	FS	1	Seed	Early	Corsica	3	4	9.144972146
Wye	2002	FS	1	Seed	Early	Corsica	3	5	19.91475353
Wye	2002	FS	1	Seed	Early	Corsica	3	6	0
Wye	2002	FS	1	Seed	Early	Corsica	3	7	0
Wye	2002	FS	1	LeafPost	Early	Jack	5	1	0
Wye	2002	FS	1	LeafPost	Early	Jack	5	2	1.25395058
Wye	2002	FS	1	LeafPost	Early	Jack	5	3	0
Wye	2002	FS	1	LeafPost	Early	Jack	5	4	3.044768086
Wye	2002	FS	1	LeafPost	Early	Jack	5	5	5.107832767
Wye	2002	FS	1	LeafPost	Early	Jack	5	6	0
Wye	2002	FS	1	LeafPost	Early	Jack	5	7	0
Wye	2002	FS	1	Seed	Early	Jack	5	1	1.79637601
Wye	2002	FS	1	Seed	Early	Jack	5	2	2.56794242
Wye	2002	FS	1	Seed	Early	Jack	5	3	0
Wye	2002	FS	1	Seed	Early	Jack	5	4	4.050390976
Wye	2002	FS	1	Seed	Early	Jack	5	5	10.58209438
Wye	2002	FS	1	Seed	Early	Jack	5	6	0
Wye	2002	FS	1	Seed	Early	Jack	5	7	0
Wye	2002	FS	1	LeafPost	Late	Jack	6	1	0
Wye	2002	FS	1	LeafPost	Late	Jack	6	2	1.85151956
Wye	2002	FS	1	LeafPost	Late	Jack	6	3	0
Wye	2002	FS	1	LeafPost	Late	Jack	6	4	3.89989032
Wye	2002	FS	1	LeafPost	Late	Jack	6	5	5.061196913
Wye	2002	FS	1	LeafPost	Late	Jack	6	6	0
Wye	2002	FS	1	LeafPost	Late	Jack	6	7	0.408995776
Wye	2002	FS	1	Seed	Late	Jack	6	1	2.11102955
Wye	2002	FS	1	Seed	Late	Jack	6	2	4.06419914
Wye	2002	FS	1	Seed	Late	Jack	6	3	0
Wye	2002	FS	1	Seed	Late	Jack	6	4	5.167120429
Wye	2002	FS	1	Seed	Late	Jack	6	5	15.54001097
Wye	2002	FS	1	Seed	Late	Jack	6	6	0
Wye	2002	FS	1	Seed	Late	Jack	6	7	0
Wye	2002	FS	1	LeafPost	Early	Bass	7	1	0
Wye	2002	FS	1	LeafPost	Early	Bass	7	2	1.65988172
Wye	2002	FS	1	LeafPost	Early	Bass	7	3	0
Wye	2002	FS	1	LeafPost	Early	Bass	7	4	4.797801864
Wye	2002	FS	1	LeafPost	Early	Bass	7	5	7.395767726
Wye	2002	FS	1	LeafPost	Early	Bass	7	6	0.08959891
Wye	2002	FS	1	LeafPost	Early	Bass	7	7	0.548069876
Wye	2002	FS	1	Seed	Early	Bass	7	1	3.39959364
Wye	2002	FS	1	Seed	Early	Bass	7	2	9.57990458
Wye	2002	FS	1	Seed	Early	Bass	7	3	0
Wye	2002	FS	1	Seed	Early	Bass	7	4	8.330689308
Wye	2002	FS	1	Seed	Early	Bass	7	5	33.9851455
Wye	2002	FS	1	Seed	Early	Bass	7	6	0
Wye	2002	FS	1	Seed	Early	Bass	7	7	0
Wye	2002	FS	1	Seed	Late	Bass	8	1	2.64223735
Wye	2002	FS	1	Seed	Late	Bass	8	2	6.83945918
Wye	2002	FS	1	Seed	Late	Bass	8	3	0
Wye	2002	FS	1	Seed	Late	Bass	8	4	5.479931745
Wye	2002	FS	1	Seed	Late	Bass	8	5	20.75746183
Wye	2002	FS	1	Seed	Late	Bass	8	6	0
Wye	2002	FS	1	Seed	Late	Bass	8	7	0
Wye	2002	FS	1	LeafPost	Late	Bass	9	1	0
Wye	2002	FS	1	LeafPost	Late	Bass	9	2	2.95779932
Wye	2002	FS	1	LeafPost	Late	Bass	9	3	0
Wye	2002	FS	1	LeafPost	Late	Bass	9	4	4.501532263
Wye	2002	FS	1	LeafPost	Late	Bass	9	5	6.237145155
Wye	2002	FS	1	LeafPost	Late	Bass	9	6	0
Wye	2002	FS	1	LeafPost	Late	Bass	9	7	0.276577348

Wye	2002	FS	1	LeafPost Late	Williams82	10	1	0
Wye	2002	FS	1	LeafPost Late	Williams82	10	2	2.97321254
Wye	2002	FS	1	LeafPost Late	Williams82	10	3	0
Wye	2002	FS	1	LeafPost Late	Williams82	10	4	6.954317973
Wye	2002	FS	1	LeafPost Late	Williams82	10	5	6.854656143
Wye	2002	FS	1	LeafPost Late	Williams82	10	6	0
Wye	2002	FS	1	LeafPost Late	Williams82	10	7	0
Wye	2002	FS	1	Seed Late	Williams82	10	1	3.57956728
Wye	2002	FS	1	Seed Late	Williams82	10	2	7.6509599
Wye	2002	FS	1	Seed Late	Williams82	10	3	0
Wye	2002	FS	1	Seed Late	Williams82	10	4	6.956412674
Wye	2002	FS	1	Seed Late	Williams82	10	5	19.47152347
Wye	2002	FS	1	Seed Late	Williams82	10	6	0
Wye	2002	FS	1	Seed Late	Williams82	10	7	0
Wye	2002	FS	1	LeafPost Early	Williams82	12	1	0
Wye	2002	FS	1	LeafPost Early	Williams82	12	2	1.91803142
Wye	2002	FS	1	LeafPost Early	Williams82	12	3	0
Wye	2002	FS	1	LeafPost Early	Williams82	12	4	4.169489959
Wye	2002	FS	1	LeafPost Early	Williams82	12	5	8.312654917
Wye	2002	FS	1	LeafPost Early	Williams82	12	6	0
Wye	2002	FS	1	LeafPost Early	Williams82	12	7	0.609727096
Wye	2002	FS	1	Seed Early	Williams82	12	1	3.87989444
Wye	2002	FS	1	Seed Early	Williams82	12	2	8.00352092
Wye	2002	FS	1	Seed Early	Williams82	12	3	0
Wye	2002	FS	1	Seed Early	Williams82	12	4	10.80379919
Wye	2002	FS	1	Seed Early	Williams82	12	5	31.0659512
Wye	2002	FS	1	Seed Early	Williams82	12	6	0
Wye	2002	FS	1	Seed Early	Williams82	12	7	0
Wye	2002	FS	1	LeafPost Early	Jack	20	1	0
Wye	2002	FS	1	LeafPost Early	Jack	20	2	1.5481445
Wye	2002	FS	1	LeafPost Early	Jack	20	3	0
Wye	2002	FS	1	LeafPost Early	Jack	20	4	3.684226029
Wye	2002	FS	1	LeafPost Early	Jack	20	5	5.836483853
Wye	2002	FS	1	LeafPost Early	Jack	20	6	0
Wye	2002	FS	1	LeafPost Early	Jack	20	7	0.420774652
Wye	2002	FS	2	LeafPost Early	Jack	13	1	0
Wye	2002	FS	2	LeafPost Early	Jack	13	2	2.13207356
Wye	2002	FS	2	LeafPost Early	Jack	13	3	0
Wye	2002	FS	2	LeafPost Early	Jack	13	4	4.590082874
Wye	2002	FS	2	LeafPost Early	Jack	13	5	9.984526692
Wye	2002	FS	2	LeafPost Early	Jack	13	6	0
Wye	2002	FS	2	LeafPost Early	Jack	13	7	1.024270684
Wye	2002	FS	2	Seed Early	Jack	13	1	2.46986497
Wye	2002	FS	2	Seed Early	Jack	13	2	6.10079348
Wye	2002	FS	2	Seed Early	Jack	13	3	0
Wye	2002	FS	2	Seed Early	Jack	13	4	7.249634035
Wye	2002	FS	2	Seed Early	Jack	13	5	24.88084236
Wye	2002	FS	2	Seed Early	Jack	13	6	0
Wye	2002	FS	2	Seed Early	Jack	13	7	0
Wye	2002	FS	2	LeafPost Late	Jack	14	1	0
Wye	2002	FS	2	LeafPost Late	Jack	14	2	1.75391216
Wye	2002	FS	2	LeafPost Late	Jack	14	3	0
Wye	2002	FS	2	LeafPost Late	Jack	14	4	6.188764144
Wye	2002	FS	2	LeafPost Late	Jack	14	5	6.530836036
Wye	2002	FS	2	LeafPost Late	Jack	14	6	0
Wye	2002	FS	2	LeafPost Late	Jack	14	7	0.382688568
Wye	2002	FS	2	Seed Late	Jack	14	1	2.62614449
Wye	2002	FS	2	Seed Late	Jack	14	2	6.76606802
Wye	2002	FS	2	Seed Late	Jack	14	3	0
Wye	2002	FS	2	Seed Late	Jack	14	4	8.292238472
Wye	2002	FS	2	Seed Late	Jack	14	5	28.46153774
Wye	2002	FS	2	Seed Late	Jack	14	6	0
Wye	2002	FS	2	Seed Late	Jack	14	7	0
Wye	2002	FS	2	LeafPost Early	Bass	16	1	0
Wye	2002	FS	2	LeafPost Early	Bass	16	2	1.81447346
Wye	2002	FS	2	LeafPost Early	Bass	16	3	0
Wye	2002	FS	2	LeafPost Early	Bass	16	4	5.371890558
Wye	2002	FS	2	LeafPost Early	Bass	16	5	7.197564107
Wye	2002	FS	2	LeafPost Early	Bass	16	6	0.034734774
Wye	2002	FS	2	LeafPost Early	Bass	16	7	0.47810406
Wye	2002	FS	2	Seed Early	Bass	16	1	3.32741859
Wye	2002	FS	2	Seed Early	Bass	16	2	9.61261058
Wye	2002	FS	2	Seed Early	Bass	16	3	0
Wye	2002	FS	2	Seed Early	Bass	16	4	8.620077665
Wye	2002	FS	2	Seed Early	Bass	16	5	32.56149527
Wye	2002	FS	2	Seed Early	Bass	16	6	0
Wye	2002	FS	2	Seed Early	Bass	16	7	0
Wye	2002	FS	2	LeafPost Late	Bass	17	1	0
Wye	2002	FS	2	LeafPost Late	Bass	17	2	2.64218642

Wye	2002	FS	2	LeafPost	Late	Bass	17	3	0	
Wye	2002	FS	2	LeafPost	Late	Bass	17	4	6.243713003	
Wye	2002	FS	2	LeafPost	Late	Bass	17	5	5.373535517	
Wye	2002	FS	2	LeafPost	Late	Bass	17	6	0	
Wye	2002	FS	2	LeafPost	Late	Bass	17	7	0	
Wye	2002	FS	2	Seed	Late	Bass	17	1	3.00525609	
Wye	2002	FS	2	Seed	Late	Bass	17	2	7.88367482	
Wye	2002	FS	2	Seed	Late	Bass	17	3	0	
Wye	2002	FS	2	Seed	Late	Bass	17	4	7.448963081	
Wye	2002	FS	2	Seed	Late	Bass	17	5	27.65027906	
Wye	2002	FS	2	Seed	Late	Bass	17	6	0	
Wye	2002	FS	2	Seed	Late	Bass	17	7	0	
Wye	2002	FS	2	LeafPost	Late	Williams82		19	1	0
Wye	2002	FS	2	LeafPost	Late	Williams82		19	2	2.20979378
Wye	2002	FS	2	LeafPost	Late	Williams82		19	3	0
Wye	2002	FS	2	LeafPost	Late	Williams82		19	4	0
Wye	2002	FS	2	LeafPost	Late	Williams82		19	5	1.784810196
Wye	2002	FS	2	LeafPost	Late	Williams82		19	6	0
Wye	2002	FS	2	LeafPost	Late	Williams82		19	7	0
Wye	2002	FS	2	Seed	Late	Williams82		19	1	4.15918856
Wye	2002	FS	2	Seed	Late	Williams82		19	2	9.30590006
Wye	2002	FS	2	Seed	Late	Williams82		19	3	0
Wye	2002	FS	2	Seed	Late	Williams82		19	4	11.17125351
Wye	2002	FS	2	Seed	Late	Williams82		19	5	34.31135655
Wye	2002	FS	2	Seed	Late	Williams82		19	6	0
Wye	2002	FS	2	Seed	Late	Williams82		19	7	0
Wye	2002	FS	2	Seed	Early	Williams82		20	1	5.40035234
Wye	2002	FS	2	Seed	Early	Williams82		20	2	11.93257964
Wye	2002	FS	2	Seed	Early	Williams82		20	3	0
Wye	2002	FS	2	Seed	Early	Williams82		20	4	13.80995361
Wye	2002	FS	2	Seed	Early	Williams82		20	5	39.60059039
Wye	2002	FS	2	Seed	Early	Williams82		20	6	0
Wye	2002	FS	2	Seed	Early	Williams82		20	7	0
Wye	2002	FS	2	LeafPost	Early	Corsica	23	1	0	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	2	1.56617282	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	3	0	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	4	5.885697258	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	5	8.477029548	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	6	0.438110977	
Wye	2002	FS	2	LeafPost	Early	Corsica	23	7	0.770188828	
Wye	2002	FS	2	Seed	Early	Corsica	23	1	2.39822739	
Wye	2002	FS	2	Seed	Early	Corsica	23	2	4.5707516	
Wye	2002	FS	2	Seed	Early	Corsica	23	3	0	
Wye	2002	FS	2	Seed	Early	Corsica	23	4	6.016453747	
Wye	2002	FS	2	Seed	Early	Corsica	23	5	18.38036693	
Wye	2002	FS	2	Seed	Early	Corsica	23	6	0	
Wye	2002	FS	2	Seed	Early	Corsica	23	7	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	1	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	1	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	2	2.58797726	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	2	2.74993406	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	3	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	3	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	4	4.949190948	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	4	7.094391385	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	5	5.8368578	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	5	8.591614593	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	6	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	6	0	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	7	0.262168516	
Wye	2002	FS	2	LeafPost	Late	Corsica	24	7	0	
Wye	2002	FS	2	Seed	Late	Corsica	24	1	3.41571064	
Wye	2002	FS	2	Seed	Late	Corsica	24	2	5.55885506	
Wye	2002	FS	2	Seed	Late	Corsica	24	3	0	
Wye	2002	FS	2	Seed	Late	Corsica	24	4	8.61706455	
Wye	2002	FS	2	Seed	Late	Corsica	24	5	19.72987137	
Wye	2002	FS	2	Seed	Late	Corsica	24	6	0	
Wye	2002	FS	2	Seed	Late	Corsica	24	7	0	
Wye	2002	FS	3	LeafPost	Late	Bass	26	1	0	
Wye	2002	FS	3	LeafPost	Late	Bass	26	2	3.0659582	
Wye	2002	FS	3	LeafPost	Late	Bass	26	3	0	
Wye	2002	FS	3	LeafPost	Late	Bass	26	4	4.810579971	
Wye	2002	FS	3	LeafPost	Late	Bass	26	5	7.229450555	
Wye	2002	FS	3	LeafPost	Late	Bass	26	6	0	
Wye	2002	FS	3	LeafPost	Late	Bass	26	7	0.367541704	
Wye	2002	FS	3	Seed	Late	Bass	26	1	2.07334062	
Wye	2002	FS	3	Seed	Late	Bass	26	2	5.00126606	
Wye	2002	FS	3	Seed	Late	Bass	26	3	0	
Wye	2002	FS	3	Seed	Late	Bass	26	4	3.813402711	

Wye	2002	FS	3	Seed	Late	Bass	26	5	14.31549757	
Wye	2002	FS	3	Seed	Late	Bass	26	6	0	
Wye	2002	FS	3	Seed	Late	Bass	26	7	0	
Wye	2002	FS	3	LeafPost	Early	Bass	27	1	0	
Wye	2002	FS	3	LeafPost	Early	Bass	27	2	2.20159106	
Wye	2002	FS	3	LeafPost	Early	Bass	27	3	0	
Wye	2002	FS	3	LeafPost	Early	Bass	27	4	7.016788052	
Wye	2002	FS	3	LeafPost	Early	Bass	27	5	9.587525441	
Wye	2002	FS	3	LeafPost	Early	Bass	27	6	0.138388786	
Wye	2002	FS	3	LeafPost	Early	Bass	27	7	0.317766608	
Wye	2002	FS	3	Seed	Early	Bass	27	1	2.09544434	
Wye	2002	FS	3	Seed	Early	Bass	27	2	5.34679046	
Wye	2002	FS	3	Seed	Early	Bass	27	3	0	
Wye	2002	FS	3	Seed	Early	Bass	27	4	4.065069307	
Wye	2002	FS	3	Seed	Early	Bass	27	5	15.38950713	
Wye	2002	FS	3	Seed	Early	Bass	27	6	0	
Wye	2002	FS	3	Seed	Early	Bass	27	7	0	
Wye	2002	FS	3	LeafPost	Late	Williams82		28	1	0
Wye	2002	FS	3	LeafPost	Late	Williams82		28	2	2.66843678
Wye	2002	FS	3	LeafPost	Late	Williams82		28	3	0
Wye	2002	FS	3	LeafPost	Late	Williams82		28	4	0
Wye	2002	FS	3	LeafPost	Late	Williams82		28	5	3.429306055
Wye	2002	FS	3	LeafPost	Late	Williams82		28	6	0
Wye	2002	FS	3	LeafPost	Late	Williams82		28	7	0.186783136
Wye	2002	FS	3	LeafPost	Early	Williams82		29	1	0
Wye	2002	FS	3	LeafPost	Early	Williams82		29	2	1.852124
Wye	2002	FS	3	LeafPost	Early	Williams82		29	3	0
Wye	2002	FS	3	LeafPost	Early	Williams82		29	4	0
Wye	2002	FS	3	LeafPost	Early	Williams82		29	5	9.422338384
Wye	2002	FS	3	LeafPost	Early	Williams82		29	6	0
Wye	2002	FS	3	LeafPost	Early	Williams82		29	7	0
Wye	2002	FS	3	Seed	Early	Williams82		29	1	2.93197344
Wye	2002	FS	3	Seed	Early	Williams82		29	2	6.4258028
Wye	2002	FS	3	Seed	Early	Williams82		29	3	0
Wye	2002	FS	3	Seed	Early	Williams82		29	4	8.317921482
Wye	2002	FS	3	Seed	Early	Williams82		29	5	26.90258314
Wye	2002	FS	3	Seed	Early	Williams82		29	6	0
Wye	2002	FS	3	Seed	Early	Williams82		29	7	0
Wye	2002	FS	3	LeafPost	Late	Williams82		30	1	0
Wye	2002	FS	3	LeafPost	Late	Williams82		30	2	1.51391222
Wye	2002	FS	3	LeafPost	Late	Williams82		30	3	0
Wye	2002	FS	3	LeafPost	Late	Williams82		30	4	3.920140814
Wye	2002	FS	3	LeafPost	Late	Williams82		30	5	4.761061233
Wye	2002	FS	3	LeafPost	Late	Williams82		30	6	0
Wye	2002	FS	3	LeafPost	Late	Williams82		30	7	0.248551252
Wye	2002	FS	3	Seed	Late	Williams82		30	1	2.66781155
Wye	2002	FS	3	Seed	Late	Williams82		30	2	5.00882846
Wye	2002	FS	3	Seed	Late	Williams82		30	3	0
Wye	2002	FS	3	Seed	Late	Williams82		30	4	6.2874747
Wye	2002	FS	3	Seed	Late	Williams82		30	5	18.57734778
Wye	2002	FS	3	Seed	Late	Williams82		30	6	0
Wye	2002	FS	3	Seed	Late	Williams82		30	7	0
Wye	2002	FS	3	LeafPost	Early	Jack	32	1	0	
Wye	2002	FS	3	LeafPost	Early	Jack	32	2	1.80249368	
Wye	2002	FS	3	LeafPost	Early	Jack	32	3	0	
Wye	2002	FS	3	LeafPost	Early	Jack	32	4	3.982922742	
Wye	2002	FS	3	LeafPost	Early	Jack	32	5	8.051255869	
Wye	2002	FS	3	LeafPost	Early	Jack	32	6	0	
Wye	2002	FS	3	LeafPost	Early	Jack	32	7	0	
Wye	2002	FS	3	Seed	Early	Jack	32	1	1.61594513	
Wye	2002	FS	3	Seed	Early	Jack	32	2	2.4191315	
Wye	2002	FS	3	Seed	Early	Jack	32	3	0	
Wye	2002	FS	3	Seed	Early	Jack	32	4	0	
Wye	2002	FS	3	Seed	Early	Jack	32	5	6.614504248	
Wye	2002	FS	3	Seed	Early	Jack	32	6	1.446043483	
Wye	2002	FS	3	Seed	Early	Jack	32	7	0	
Wye	2002	FS	3	LeafPost	Late	Jack	33	1	0	
Wye	2002	FS	3	LeafPost	Late	Jack	33	2	2.03611664	
Wye	2002	FS	3	LeafPost	Late	Jack	33	3	0	
Wye	2002	FS	3	LeafPost	Late	Jack	33	4	0	
Wye	2002	FS	3	LeafPost	Late	Jack	33	5	2.374663981	
Wye	2002	FS	3	LeafPost	Late	Jack	33	6	0	
Wye	2002	FS	3	LeafPost	Late	Jack	33	7	0	
Wye	2002	FS	3	Seed	Late	Jack	33	1	1.7300826	
Wye	2002	FS	3	Seed	Late	Jack	33	2	3.54447596	
Wye	2002	FS	3	Seed	Late	Jack	33	3	0	
Wye	2002	FS	3	Seed	Late	Jack	33	4	0	
Wye	2002	FS	3	Seed	Late	Jack	33	5	11.74331142	
Wye	2002	FS	3	Seed	Late	Jack	33	6	1.332365783	

Wye	2002	FS	3	Seed	Late	Jack	33	7	0
Wye	2002	FS	3	Seed	Late	Corsica	34	1	2.71897486
Wye	2002	FS	3	Seed	Late	Corsica	34	2	5.34850166
Wye	2002	FS	3	Seed	Late	Corsica	34	3	0
Wye	2002	FS	3	Seed	Late	Corsica	34	4	0
Wye	2002	FS	3	Seed	Late	Corsica	34	5	15.9433081
Wye	2002	FS	3	Seed	Late	Corsica	34	6	3.297631549
Wye	2002	FS	3	Seed	Late	Corsica	34	7	0
Wye	2002	FS	3	LeafPost	Early	Corsica	35	1	0
Wye	2002	FS	3	LeafPost	Early	Corsica	35	2	1.29368216
Wye	2002	FS	3	LeafPost	Early	Corsica	35	3	0
Wye	2002	FS	3	LeafPost	Early	Corsica	35	4	3.996535303
Wye	2002	FS	3	LeafPost	Early	Corsica	35	5	4.765264003
Wye	2002	FS	3	LeafPost	Early	Corsica	35	6	0.257107338
Wye	2002	FS	3	LeafPost	Early	Corsica	35	7	0.374962176
Wye	2002	FS	3	Seed	Early	Corsica	35	1	2.31109761
Wye	2002	FS	3	Seed	Early	Corsica	35	2	4.29483854
Wye	2002	FS	3	Seed	Early	Corsica	35	3	0
Wye	2002	FS	3	Seed	Early	Corsica	35	4	0
Wye	2002	FS	3	Seed	Early	Corsica	35	5	16.14320938
Wye	2002	FS	3	Seed	Early	Corsica	35	6	3.378259797
Wye	2002	FS	3	Seed	Early	Corsica	35	7	0
PHill	2003	DC	1	Seed	Late	Corsica	1	1	5.50705895
PHill	2003	DC	1	Seed	Late	Corsica	1	2	11.99283458
PHill	2003	DC	1	Seed	Late	Corsica	1	3	0
PHill	2003	DC	1	Seed	Late	Corsica	1	4	26.08340556
PHill	2003	DC	1	Seed	Late	Corsica	1	5	64.29434522
PHill	2003	DC	1	Seed	Late	Corsica	1	6	0
PHill	2003	DC	1	Seed	Late	Corsica	1	7	0.444731056
PHill	2003	DC	1	LeafPost	Early	Corsica	2	1	0
PHill	2003	DC	1	LeafPost	Early	Corsica	2	2	2.24502794
PHill	2003	DC	1	LeafPost	Early	Corsica	2	3	0
PHill	2003	DC	1	LeafPost	Early	Corsica	2	4	0
PHill	2003	DC	1	LeafPost	Early	Corsica	2	5	8.634932906
PHill	2003	DC	1	LeafPost	Early	Corsica	2	6	3.94942798
PHill	2003	DC	1	LeafPost	Early	Corsica	2	7	0
PHill	2003	DC	1	Seed	Early	Corsica	2	1	5.56526901
PHill	2003	DC	1	Seed	Early	Corsica	2	2	12.2099831
PHill	2003	DC	1	Seed	Early	Corsica	2	3	0
PHill	2003	DC	1	Seed	Early	Corsica	2	4	25.25866292
PHill	2003	DC	1	Seed	Early	Corsica	2	5	62.10449365
PHill	2003	DC	1	Seed	Early	Corsica	2	6	0
PHill	2003	DC	1	Seed	Early	Corsica	2	7	0.664205712
PHill	2003	DC	1	Seed	Late	Williams82	5	1	8.20255123
PHill	2003	DC	1	Seed	Late	Williams82	5	2	20.09638778
PHill	2003	DC	1	Seed	Late	Williams82	5	3	0
PHill	2003	DC	1	Seed	Late	Williams82	5	4	37.0539772
PHill	2003	DC	1	Seed	Late	Williams82	5	5	97.09068293
PHill	2003	DC	1	Seed	Late	Williams82	5	6	0
PHill	2003	DC	1	Seed	Late	Williams82	5	7	1.284395416
PHill	2003	DC	1	Seed	Early	Williams82	6	1	8.04411331
PHill	2003	DC	1	Seed	Early	Williams82	6	2	19.89576338
PHill	2003	DC	1	Seed	Early	Williams82	6	3	0
PHill	2003	DC	1	Seed	Early	Williams82	6	4	35.85463598
PHill	2003	DC	1	Seed	Early	Williams82	6	5	94.79103978
PHill	2003	DC	1	Seed	Early	Williams82	6	6	0
PHill	2003	DC	1	Seed	Early	Williams82	6	7	1.33934056
PHill	2003	DC	1	Seed	Early	Jack	7	1	4.64426624
PHill	2003	DC	1	Seed	Early	Jack	7	2	16.9458395
PHill	2003	DC	1	Seed	Early	Jack	7	3	0
PHill	2003	DC	1	Seed	Early	Jack	7	4	18.23403928
PHill	2003	DC	1	Seed	Early	Jack	7	5	79.61833905
PHill	2003	DC	1	Seed	Early	Jack	7	6	0
PHill	2003	DC	1	Seed	Early	Jack	7	7	1.383600492
PHill	2003	DC	1	Seed	Late	Jack	9	1	1.65267272
PHill	2003	DC	1	Seed	Late	Jack	9	2	15.7120712
PHill	2003	DC	1	Seed	Late	Jack	9	3	0
PHill	2003	DC	1	Seed	Late	Jack	9	4	17.24780073
PHill	2003	DC	1	Seed	Late	Jack	9	5	76.84433721
PHill	2003	DC	1	Seed	Late	Jack	9	6	0
PHill	2003	DC	1	Seed	Late	Jack	9	7	1.227695056
PHill	2003	DC	1	Seed	Early	Bass	10	1	4.21009911
PHill	2003	DC	1	Seed	Early	Bass	10	2	11.78059058
PHill	2003	DC	1	Seed	Early	Bass	10	3	0
PHill	2003	DC	1	Seed	Early	Bass	10	4	17.85522901
PHill	2003	DC	1	Seed	Early	Bass	10	5	63.5438811
PHill	2003	DC	1	Seed	Early	Bass	10	6	0
PHill	2003	DC	1	Seed	Early	Bass	10	7	0.862126392
PHill	2003	DC	1	Seed	Late	Bass	12	1	3.70744538

PHill	2003	DC	1	Seed	Late	Bass	12	2	9.89334536
PHill	2003	DC	1	Seed	Late	Bass	12	3	0
PHill	2003	DC	1	Seed	Late	Bass	12	4	16.40033765
PHill	2003	DC	1	Seed	Late	Bass	12	5	57.72655599
PHill	2003	DC	1	Seed	Late	Bass	12	6	0
PHill	2003	DC	1	Seed	Late	Bass	12	7	0.694785284
PHill	2003	DC	2	Seed	Early	Bass	14	1	9.2014126
PHill	2003	DC	2	Seed	Early	Bass	14	2	23.25677132
PHill	2003	DC	2	Seed	Early	Bass	14	3	0
PHill	2003	DC	2	Seed	Early	Bass	14	4	38.20402911
PHill	2003	DC	2	Seed	Early	Bass	14	5	103.0633434
PHill	2003	DC	2	Seed	Early	Bass	14	6	0
PHill	2003	DC	2	Seed	Early	Bass	14	7	1.4501075
PHill	2003	DC	2	Seed	Late	Bass	15	1	9.87921836
PHill	2003	DC	2	Seed	Late	Bass	15	2	24.22250774
PHill	2003	DC	2	Seed	Late	Bass	15	3	0
PHill	2003	DC	2	Seed	Late	Bass	15	4	40.03307785
PHill	2003	DC	2	Seed	Late	Bass	15	5	103.1121088
PHill	2003	DC	2	Seed	Late	Bass	15	6	0
PHill	2003	DC	2	Seed	Late	Bass	15	7	1.359731084
PHill	2003	DC	2	Seed	Early	Jack	16	1	4.70199847
PHill	2003	DC	2	Seed	Early	Jack	16	2	16.36251626
PHill	2003	DC	2	Seed	Early	Jack	16	3	0
PHill	2003	DC	2	Seed	Early	Jack	16	4	18.14398682
PHill	2003	DC	2	Seed	Early	Jack	16	5	76.37910052
PHill	2003	DC	2	Seed	Early	Jack	16	6	0
PHill	2003	DC	2	Seed	Early	Jack	16	7	1.212769984
PHill	2003	DC	2	Seed	Late	Jack	17	1	5.20655713
PHill	2003	DC	2	Seed	Late	Jack	17	2	18.9720728
PHill	2003	DC	2	Seed	Late	Jack	17	3	0
PHill	2003	DC	2	Seed	Late	Jack	17	4	18.24336562
PHill	2003	DC	2	Seed	Late	Jack	17	5	77.36086756
PHill	2003	DC	2	Seed	Late	Jack	17	6	0
PHill	2003	DC	2	Seed	Late	Jack	17	7	1.541288868
PHill	2003	DC	2	Seed	Late	Corsica	20	1	7.21336148
PHill	2003	DC	2	Seed	Late	Corsica	20	2	17.34313046
PHill	2003	DC	2	Seed	Late	Corsica	20	3	0
PHill	2003	DC	2	Seed	Late	Corsica	20	4	27.52037845
PHill	2003	DC	2	Seed	Late	Corsica	20	5	70.24653292
PHill	2003	DC	2	Seed	Late	Corsica	20	6	0
PHill	2003	DC	2	Seed	Late	Corsica	20	7	1.012998488
PHill	2003	DC	2	Seed	Early	Corsica	21	1	7.53842859
PHill	2003	DC	2	Seed	Early	Corsica	21	2	17.5647074
PHill	2003	DC	2	Seed	Early	Corsica	21	3	0
PHill	2003	DC	2	Seed	Early	Corsica	21	4	27.39493625
PHill	2003	DC	2	Seed	Early	Corsica	21	5	70.0217443
PHill	2003	DC	2	Seed	Early	Corsica	21	6	0
PHill	2003	DC	2	Seed	Early	Corsica	21	7	1.036781856
PHill	2003	DC	2	Seed	Early	Bass	23	1	4.84516145
PHill	2003	DC	2	Seed	Early	Bass	23	2	14.62632584
PHill	2003	DC	2	Seed	Early	Bass	23	3	0
PHill	2003	DC	2	Seed	Early	Bass	23	4	18.30657677
PHill	2003	DC	2	Seed	Early	Bass	23	5	68.51182312
PHill	2003	DC	2	Seed	Early	Bass	23	6	0
PHill	2003	DC	2	Seed	Early	Bass	23	7	0.409098068
PHill	2003	DC	2	Seed	Late	Bass	24	1	4.9883223
PHill	2003	DC	2	Seed	Late	Bass	24	2	15.0904019
PHill	2003	DC	2	Seed	Late	Bass	24	3	0
PHill	2003	DC	2	Seed	Late	Bass	24	4	18.5021148
PHill	2003	DC	2	Seed	Late	Bass	24	5	66.7346521
PHill	2003	DC	2	Seed	Late	Bass	24	6	0
PHill	2003	DC	2	Seed	Late	Bass	24	7	0.836622224
PHill	2003	DC	3	Seed	Early	Corsica	25	1	6.80042619
PHill	2003	DC	3	Seed	Early	Corsica	25	2	15.8911607
PHill	2003	DC	3	Seed	Early	Corsica	25	3	0
PHill	2003	DC	3	Seed	Early	Corsica	25	4	26.58884887
PHill	2003	DC	3	Seed	Early	Corsica	25	5	67.92459193
PHill	2003	DC	3	Seed	Early	Corsica	25	6	0
PHill	2003	DC	3	Seed	Early	Corsica	25	7	0.932601756
PHill	2003	DC	3	Seed	Late	Corsica	27	1	6.92019964
PHill	2003	DC	3	Seed	Late	Corsica	27	2	15.37429274
PHill	2003	DC	3	Seed	Late	Corsica	27	3	0
PHill	2003	DC	3	Seed	Late	Corsica	27	4	26.17574377
PHill	2003	DC	3	Seed	Late	Corsica	27	5	63.98155987
PHill	2003	DC	3	Seed	Late	Corsica	27	6	0
PHill	2003	DC	3	Seed	Late	Corsica	27	7	0.723655528
PHill	2003	DC	3	Seed	Early	Bass	28	1	4.55401317
PHill	2003	DC	3	Seed	Early	Bass	28	2	13.79029976
PHill	2003	DC	3	Seed	Early	Bass	28	3	0

PHill	2003	DC	3	Seed	Early	Bass	28	4	17.38560724
PHill	2003	DC	3	Seed	Early	Bass	28	5	63.99649956
PHill	2003	DC	3	Seed	Early	Bass	28	6	0
PHill	2003	DC	3	Seed	Early	Bass	28	7	0.790385284
PHill	2003	DC	3	Seed	Late	Bass	30	1	4.85263633
PHill	2003	DC	3	Seed	Late	Bass	30	2	14.963987
PHill	2003	DC	3	Seed	Late	Bass	30	3	0
PHill	2003	DC	3	Seed	Late	Bass	30	4	17.08340736
PHill	2003	DC	3	Seed	Late	Bass	30	5	63.17862731
PHill	2003	DC	3	Seed	Late	Bass	30	6	0
PHill	2003	DC	3	Seed	Late	Bass	30	7	0.880059996
PHill	2003	DC	3	Seed	Early	Jack	32	1	5.59764572
PHill	2003	DC	3	Seed	Early	Jack	32	2	21.71734406
PHill	2003	DC	3	Seed	Early	Jack	32	3	0
PHill	2003	DC	3	Seed	Early	Jack	32	4	18.10827409
PHill	2003	DC	3	Seed	Early	Jack	32	5	79.32755371
PHill	2003	DC	3	Seed	Early	Jack	32	6	0
PHill	2003	DC	3	Seed	Early	Jack	32	7	1.4807234
PHill	2003	DC	3	Seed	Late	Jack	33	1	5.28529116
PHill	2003	DC	3	Seed	Late	Jack	33	2	20.63268476
PHill	2003	DC	3	Seed	Late	Jack	33	3	0
PHill	2003	DC	3	Seed	Late	Jack	33	4	18.13454481
PHill	2003	DC	3	Seed	Late	Jack	33	5	81.87275278
PHill	2003	DC	3	Seed	Late	Jack	33	6	0
PHill	2003	DC	3	Seed	Late	Jack	33	7	0
PHill	2003	DC	3	Seed	Late	Williams82	35	1	9.47112101
PHill	2003	DC	3	Seed	Late	Williams82	35	2	23.65974788
PHill	2003	DC	3	Seed	Late	Williams82	35	3	0
PHill	2003	DC	3	Seed	Late	Williams82	35	4	35.88541224
PHill	2003	DC	3	Seed	Late	Williams82	35	5	96.55974073
PHill	2003	DC	3	Seed	Late	Williams82	35	6	0
PHill	2003	DC	3	Seed	Late	Williams82	35	7	0
PHill	2003	DC	3	LeafPost	Early	Bass	36	1	0
PHill	2003	DC	3	LeafPost	Early	Bass	36	2	5.20409432
PHill	2003	DC	3	LeafPost	Early	Bass	36	3	0
PHill	2003	DC	3	LeafPost	Early	Bass	36	4	0
PHill	2003	DC	3	LeafPost	Early	Bass	36	5	32.35907564
PHill	2003	DC	3	LeafPost	Early	Bass	36	6	8.552150689
PHill	2003	DC	3	LeafPost	Early	Bass	36	7	1.0007875
PHill	2003	DC	3	Seed	Early	Williams82	36	1	8.69775067
PHill	2003	DC	3	Seed	Early	Williams82	36	2	22.12906154
PHill	2003	DC	3	Seed	Early	Williams82	36	3	0
PHill	2003	DC	3	Seed	Early	Williams82	36	4	46.36445898
PHill	2003	DC	3	Seed	Early	Williams82	36	5	126.6248257
PHill	2003	DC	3	Seed	Early	Williams82	36	6	0
PHill	2003	DC	3	Seed	Early	Williams82	36	7	2.102750536
PHill	2003	FS	1	LeafPost	Late	Corsica	2	1	0
PHill	2003	FS	1	LeafPost	Late	Corsica	2	2	1.73975888
PHill	2003	FS	1	LeafPost	Late	Corsica	2	3	0
PHill	2003	FS	1	LeafPost	Late	Corsica	2	4	6.521549231
PHill	2003	FS	1	LeafPost	Late	Corsica	2	5	8.376786869
PHill	2003	FS	1	LeafPost	Late	Corsica	2	6	0
PHill	2003	FS	1	LeafPost	Late	Corsica	2	7	0
PHill	2003	FS	1	Seed	Late	Corsica	2	1	4.0140106
PHill	2003	FS	1	Seed	Late	Corsica	2	2	7.55640506
PHill	2003	FS	1	Seed	Late	Corsica	2	3	0
PHill	2003	FS	1	Seed	Late	Corsica	2	4	16.63706204
PHill	2003	FS	1	Seed	Late	Corsica	2	5	45.26061112
PHill	2003	FS	1	Seed	Late	Corsica	2	6	0
PHill	2003	FS	1	Seed	Late	Corsica	2	7	0
PHill	2003	FS	1	Seed	Early	Corsica	3	1	4.87031391
PHill	2003	FS	1	Seed	Early	Corsica	3	2	8.80450052
PHill	2003	FS	1	Seed	Early	Corsica	3	3	0
PHill	2003	FS	1	Seed	Early	Corsica	3	4	24.10191396
PHill	2003	FS	1	Seed	Early	Corsica	3	5	59.94947211
PHill	2003	FS	1	Seed	Early	Corsica	3	6	0
PHill	2003	FS	1	Seed	Early	Corsica	3	7	0
PHill	2003	FS	1	Seed	Early	Jack	4	1	3.01710386
PHill	2003	FS	1	Seed	Early	Jack	4	2	9.06290966
PHill	2003	FS	1	Seed	Early	Jack	4	3	0
PHill	2003	FS	1	Seed	Early	Jack	4	4	10.77103875
PHill	2003	FS	1	Seed	Early	Jack	4	5	49.15780321
PHill	2003	FS	1	Seed	Early	Jack	4	6	0
PHill	2003	FS	1	Seed	Early	Jack	4	7	0
PHill	2003	FS	1	LeafPost	Late	Jack	5	1	0
PHill	2003	FS	1	LeafPost	Late	Jack	5	2	1.72420904
PHill	2003	FS	1	LeafPost	Late	Jack	5	3	0
PHill	2003	FS	1	LeafPost	Late	Jack	5	4	4.290348663
PHill	2003	FS	1	LeafPost	Late	Jack	5	5	5.957333342

PHill	2003	FS	1	LeafPost	Late	Jack	5	6	0
PHill	2003	FS	1	LeafPost	Late	Jack	5	7	0
PHill	2003	FS	1	Seed	Late	Jack	5	1	2.66091532
PHill	2003	FS	1	Seed	Late	Jack	5	2	7.6367804
PHill	2003	FS	1	Seed	Late	Jack	5	3	0
PHill	2003	FS	1	Seed	Late	Jack	5	4	9.12916122
PHill	2003	FS	1	Seed	Late	Jack	5	5	40.79710408
PHill	2003	FS	1	Seed	Late	Jack	5	6	0
PHill	2003	FS	1	Seed	Late	Jack	5	7	0
PHill	2003	FS	1	LeafPost	Late	Bass	7	1	0
PHill	2003	FS	1	LeafPost	Late	Bass	7	2	1.8071291
PHill	2003	FS	1	LeafPost	Late	Bass	7	3	0
PHill	2003	FS	1	LeafPost	Late	Bass	7	4	6.940852769
PHill	2003	FS	1	LeafPost	Late	Bass	7	5	5.687232575
PHill	2003	FS	1	LeafPost	Late	Bass	7	6	0
PHill	2003	FS	1	LeafPost	Late	Bass	7	7	0
PHill	2003	FS	1	Seed	Late	Bass	7	1	3.26139711
PHill	2003	FS	1	Seed	Late	Bass	7	2	7.92662042
PHill	2003	FS	1	Seed	Late	Bass	7	3	0
PHill	2003	FS	1	Seed	Late	Bass	7	4	14.9278465
PHill	2003	FS	1	Seed	Late	Bass	7	5	57.30839032
PHill	2003	FS	1	Seed	Late	Bass	7	6	0
PHill	2003	FS	1	Seed	Late	Bass	7	7	0
PHill	2003	FS	1	Seed	Early	Bass	8	1	3.06058213
PHill	2003	FS	1	Seed	Early	Bass	8	2	7.8422486
PHill	2003	FS	1	Seed	Early	Bass	8	3	0
PHill	2003	FS	1	Seed	Early	Bass	8	4	11.61579542
PHill	2003	FS	1	Seed	Early	Bass	8	5	47.72131136
PHill	2003	FS	1	Seed	Early	Bass	8	6	0
PHill	2003	FS	1	Seed	Early	Bass	8	7	0
PHill	2003	FS	1	Seed	Early	Williams82	10	1	7.17723881
PHill	2003	FS	1	Seed	Early	Williams82	10	2	14.74129088
PHill	2003	FS	1	Seed	Early	Williams82	10	3	0
PHill	2003	FS	1	Seed	Early	Williams82	10	4	34.49435144
PHill	2003	FS	1	Seed	Early	Williams82	10	5	86.61194168
PHill	2003	FS	1	Seed	Early	Williams82	10	6	0
PHill	2003	FS	1	Seed	Early	Williams82	10	7	0
PHill	2003	FS	1	LeafPost	Late	Williams82	12	1	0
PHill	2003	FS	1	LeafPost	Late	Williams82	12	2	1.9575146
PHill	2003	FS	1	LeafPost	Late	Williams82	12	3	0
PHill	2003	FS	1	LeafPost	Late	Williams82	12	4	4.454002674
PHill	2003	FS	1	LeafPost	Late	Williams82	12	5	7.621294313
PHill	2003	FS	1	LeafPost	Late	Williams82	12	6	0
PHill	2003	FS	1	LeafPost	Late	Williams82	12	7	0
PHill	2003	FS	1	Seed	Late	Williams82	12	1	3.76915432
PHill	2003	FS	1	Seed	Late	Williams82	12	2	6.64468322
PHill	2003	FS	1	Seed	Late	Williams82	12	3	0
PHill	2003	FS	1	Seed	Late	Williams82	12	4	16.73566293
PHill	2003	FS	1	Seed	Late	Williams82	12	5	45.16630196
PHill	2003	FS	1	Seed	Late	Williams82	12	6	0
PHill	2003	FS	1	Seed	Late	Williams82	12	7	0
PHill	2003	FS	2	Seed	Early	Jack	13	1	2.4309307
PHill	2003	FS	2	Seed	Early	Jack	13	2	5.84947202
PHill	2003	FS	2	Seed	Early	Jack	13	3	0
PHill	2003	FS	2	Seed	Early	Jack	13	4	9.626816016
PHill	2003	FS	2	Seed	Early	Jack	13	5	41.14595218
PHill	2003	FS	2	Seed	Early	Jack	13	6	0
PHill	2003	FS	2	Seed	Early	Jack	13	7	0
PHill	2003	FS	2	LeafPost	Late	Jack	15	1	0
PHill	2003	FS	2	LeafPost	Late	Jack	15	2	1.30742006
PHill	2003	FS	2	LeafPost	Late	Jack	15	3	0
PHill	2003	FS	2	LeafPost	Late	Jack	15	4	3.949697094
PHill	2003	FS	2	LeafPost	Late	Jack	15	5	5.114138576
PHill	2003	FS	2	LeafPost	Late	Jack	15	6	0
PHill	2003	FS	2	LeafPost	Late	Jack	15	7	0
PHill	2003	FS	2	Seed	Late	Jack	15	1	2.30276789
PHill	2003	FS	2	Seed	Late	Jack	15	2	5.658992
PHill	2003	FS	2	Seed	Late	Jack	15	3	0
PHill	2003	FS	2	Seed	Late	Jack	15	4	8.045582881
PHill	2003	FS	2	Seed	Late	Jack	15	5	33.97162548
PHill	2003	FS	2	Seed	Late	Jack	15	6	0
PHill	2003	FS	2	Seed	Late	Jack	15	7	0
PHill	2003	FS	2	Seed	Early	Bass	16	1	2.42222255
PHill	2003	FS	2	Seed	Early	Bass	16	2	5.44141844
PHill	2003	FS	2	Seed	Early	Bass	16	3	0
PHill	2003	FS	2	Seed	Early	Bass	16	4	8.564647324
PHill	2003	FS	2	Seed	Early	Bass	16	5	34.18225871
PHill	2003	FS	2	Seed	Early	Bass	16	6	0
PHill	2003	FS	2	Seed	Early	Bass	16	7	0

PHill	2003	FS	2	LeafPost	Late	Bass	17	1	0	
PHill	2003	FS	2	LeafPost	Late	Bass	17	2	1.87418054	
PHill	2003	FS	2	LeafPost	Late	Bass	17	3	0	
PHill	2003	FS	2	LeafPost	Late	Bass	17	4	5.342875731	
PHill	2003	FS	2	LeafPost	Late	Bass	17	5	5.510934653	
PHill	2003	FS	2	LeafPost	Late	Bass	17	6	0	
PHill	2003	FS	2	LeafPost	Late	Bass	17	7	0	
PHill	2003	FS	2	Seed	Late	Bass	17	1	2.8425461	
PHill	2003	FS	2	Seed	Late	Bass	17	2	6.7102691	
PHill	2003	FS	2	Seed	Late	Bass	17	3	0	
PHill	2003	FS	2	Seed	Late	Bass	17	4	11.28836917	
PHill	2003	FS	2	Seed	Late	Bass	17	5	42.56564949	
PHill	2003	FS	2	Seed	Late	Bass	17	6	0	
PHill	2003	FS	2	Seed	Late	Bass	17	7	0	
PHill	2003	FS	2	Seed	Early	Williams82	19	1	4.30869184	
PHill	2003	FS	2	Seed	Early	Williams82	19	2	7.74305972	
PHill	2003	FS	2	Seed	Early	Williams82	19	3	0	
PHill	2003	FS	2	Seed	Early	Williams82	19	4	24.07995001	
PHill	2003	FS	2	Seed	Early	Williams82	19	5	63.84511711	
PHill	2003	FS	2	Seed	Early	Williams82	19	6	0	
PHill	2003	FS	2	Seed	Early	Williams82	19	7	0	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	1	0	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	2	2.64186764	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	3	0	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	4	5.919880729	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	5	7.922374788	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	6	0	
PHill	2003	FS	2	LeafPost	Late	Williams82	21	7	0	
PHill	2003	FS	2	Seed	Late	Williams82	21	1	5.09121976	
PHill	2003	FS	2	Seed	Late	Williams82	21	2	9.97721348	
PHill	2003	FS	2	Seed	Late	Williams82	21	3	0	
PHill	2003	FS	2	Seed	Late	Williams82	21	4	23.26315439	
PHill	2003	FS	2	Seed	Late	Williams82	21	5	61.00841789	
PHill	2003	FS	2	Seed	Late	Williams82	21	6	0	
PHill	2003	FS	2	Seed	Late	Williams82	21	7	0.431177844	
PHill	2003	FS	2	Seed	Early	Corsica	23	1	4.14246948	
PHill	2003	FS	2	Seed	Early	Corsica	23	2	7.41899156	
PHill	2003	FS	2	Seed	Early	Corsica	23	3	0	
PHill	2003	FS	2	Seed	Early	Corsica	23	4	16.32693143	
PHill	2003	FS	2	Seed	Early	Corsica	23	5	40.55688931	
PHill	2003	FS	2	Seed	Early	Corsica	23	6	0	
PHill	2003	FS	2	Seed	Early	Corsica	23	7	0	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	1	0	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	2	2.22173906	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	3	0	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	4	5.709237725	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	5	7.705794806	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	6	0	
PHill	2003	FS	2	LeafPost	Late	Corsica	24	7	0	
PHill	2003	FS	2	Seed	Late	Corsica	24	1	3.09169433	
PHill	2003	FS	2	Seed	Late	Corsica	24	2	7.87813274	
PHill	2003	FS	2	Seed	Late	Corsica	24	3	0	
PHill	2003	FS	2	Seed	Late	Corsica	24	4	15.24495774	
PHill	2003	FS	2	Seed	Late	Corsica	24	5	56.62808432	
PHill	2003	FS	2	Seed	Late	Corsica	24	6	0	
PHill	2003	FS	2	Seed	Late	Corsica	24	7	0	
PHill	2003	FS	3	LeafPost	Late	Bass	26	1	0	
PHill	2003	FS	3	LeafPost	Late	Bass	26	2	2.04616994	
PHill	2003	FS	3	LeafPost	Late	Bass	26	3	0	
PHill	2003	FS	3	LeafPost	Late	Bass	26	4	7.550772424	
PHill	2003	FS	3	LeafPost	Late	Bass	26	5	9.735128703	
PHill	2003	FS	3	LeafPost	Late	Bass	26	6	0	
PHill	2003	FS	3	LeafPost	Late	Bass	26	7	0	
PHill	2003	FS	3	Seed	Late	Bass	26	1	2.26061945	
PHill	2003	FS	3	Seed	Late	Bass	26	2	4.45630544	
PHill	2003	FS	3	Seed	Late	Bass	26	3	0	
PHill	2003	FS	3	Seed	Late	Bass	26	4	9.230306598	
PHill	2003	FS	3	Seed	Late	Bass	26	5	37.8833287	
PHill	2003	FS	3	Seed	Late	Bass	26	6	0	
PHill	2003	FS	3	Seed	Late	Bass	26	7	0	
PHill	2003	FS	3	LeafPost	Early	Bass	27	1	0	
PHill	2003	FS	3	LeafPost	Early	Bass	27	2	1.1777732	
PHill	2003	FS	3	LeafPost	Early	Bass	27	3	0	
PHill	2003	FS	3	LeafPost	Early	Bass	27	4	5.300585037	
PHill	2003	FS	3	LeafPost	Early	Bass	27	5	4.732780232	
PHill	2003	FS	3	LeafPost	Early	Bass	27	6	0	
PHill	2003	FS	3	LeafPost	Early	Bass	27	7	0	
PHill	2003	FS	3	Seed	Early	Bass	27	1	2.50348134	
PHill	2003	FS	3	Seed	Early	Bass	27	2	5.42650754	

PHill	2003	FS	3	Seed	Early	Bass	27	3	0	
PHill	2003	FS	3	Seed	Early	Bass	27	4	11.82530669	
PHill	2003	FS	3	Seed	Early	Bass	27	5	45.56294416	
PHill	2003	FS	3	Seed	Early	Bass	27	6	0	
PHill	2003	FS	3	Seed	Early	Bass	27	7	0	
PHill	2003	FS	3	LeafPost	Late	Williams82		28	1	0
PHill	2003	FS	3	LeafPost	Late	Williams82		28	2	2.2929443
PHill	2003	FS	3	LeafPost	Late	Williams82		28	3	0
PHill	2003	FS	3	LeafPost	Late	Williams82		28	4	4.546480529
PHill	2003	FS	3	LeafPost	Late	Williams82		28	5	6.805980126
PHill	2003	FS	3	LeafPost	Late	Williams82		28	6	0
PHill	2003	FS	3	LeafPost	Late	Williams82		28	7	0.505855784
PHill	2003	FS	3	Seed	Late	Williams82		28	1	4.51041207
PHill	2003	FS	3	Seed	Late	Williams82		28	2	8.37784454
PHill	2003	FS	3	Seed	Late	Williams82		28	3	0
PHill	2003	FS	3	Seed	Late	Williams82		28	4	26.2529213
PHill	2003	FS	3	Seed	Late	Williams82		28	5	68.72689076
PHill	2003	FS	3	Seed	Late	Williams82		28	6	0
PHill	2003	FS	3	Seed	Late	Williams82		28	7	0
PHill	2003	FS	3	Seed	Early	Williams82		30	1	4.70146029
PHill	2003	FS	3	Seed	Early	Williams82		30	2	8.60429564
PHill	2003	FS	3	Seed	Early	Williams82		30	3	0
PHill	2003	FS	3	Seed	Early	Williams82		30	4	26.70918583
PHill	2003	FS	3	Seed	Early	Williams82		30	5	68.09423326
PHill	2003	FS	3	Seed	Early	Williams82		30	6	0
PHill	2003	FS	3	Seed	Early	Williams82		30	7	0
PHill	2003	FS	3	Seed	Early	Jack	32	1	2.64777109	
PHill	2003	FS	3	Seed	Early	Jack	32	2	6.12086144	
PHill	2003	FS	3	Seed	Early	Jack	32	3	0	
PHill	2003	FS	3	Seed	Early	Jack	32	4	12.08692761	
PHill	2003	FS	3	Seed	Early	Jack	32	5	47.25591582	
PHill	2003	FS	3	Seed	Early	Jack	32	6	0	
PHill	2003	FS	3	Seed	Early	Jack	32	7	0	
PHill	2003	FS	3	LeafPost	Late	Jack	33	1	0	
PHill	2003	FS	3	LeafPost	Late	Jack	33	2	1.35799016	
PHill	2003	FS	3	LeafPost	Late	Jack	33	3	0	
PHill	2003	FS	3	LeafPost	Late	Jack	33	4	5.183334017	
PHill	2003	FS	3	LeafPost	Late	Jack	33	5	6.931757115	
PHill	2003	FS	3	LeafPost	Late	Jack	33	6	0	
PHill	2003	FS	3	LeafPost	Late	Jack	33	7	0	
PHill	2003	FS	3	Seed	Late	Jack	33	1	2.17783984	
PHill	2003	FS	3	Seed	Late	Jack	33	2	5.0308574	
PHill	2003	FS	3	Seed	Late	Jack	33	3	0	
PHill	2003	FS	3	Seed	Late	Jack	33	4	8.771929382	
PHill	2003	FS	3	Seed	Late	Jack	33	5	36.45718659	
PHill	2003	FS	3	Seed	Late	Jack	33	6	0	
PHill	2003	FS	3	Seed	Late	Jack	33	7	0	
PHill	2003	FS	3	Seed	Early	Corsica	34	1	3.50314217	
PHill	2003	FS	3	Seed	Early	Corsica	34	2	5.50783922	
PHill	2003	FS	3	Seed	Early	Corsica	34	3	0	
PHill	2003	FS	3	Seed	Early	Corsica	34	4	16.91624162	
PHill	2003	FS	3	Seed	Early	Corsica	34	5	43.33805406	
PHill	2003	FS	3	Seed	Early	Corsica	34	6	0	
PHill	2003	FS	3	Seed	Early	Corsica	34	7	0	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	1	0	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	2	1.56533378	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	3	0	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	4	4.710799361	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	5	4.980100001	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	6	0	
PHill	2003	FS	3	LeafPost	Late	Corsica	35	7	0	
PHill	2003	FS	3	Seed	Late	Corsica	35	1	3.71452053	
PHill	2003	FS	3	Seed	Late	Corsica	35	2	6.2956136	
PHill	2003	FS	3	Seed	Late	Corsica	35	3	0	
PHill	2003	FS	3	Seed	Late	Corsica	35	4	17.95435508	
PHill	2003	FS	3	Seed	Late	Corsica	35	5	46.74566316	
PHill	2003	FS	3	Seed	Late	Corsica	35	6	0	
PHill	2003	FS	3	Seed	Late	Corsica	35	7	0	
Wye	2003	DC	1	LeafPost	Early	Bass	2	1	0	
Wye	2003	DC	1	LeafPost	Early	Bass	2	2	7.10892212	
Wye	2003	DC	1	LeafPost	Early	Bass	2	3	0	
Wye	2003	DC	1	LeafPost	Early	Bass	2	4	22.54139481	
Wye	2003	DC	1	LeafPost	Early	Bass	2	5	30.40169349	
Wye	2003	DC	1	LeafPost	Early	Bass	2	6	0	
Wye	2003	DC	1	LeafPost	Early	Bass	2	7	0	
Wye	2003	DC	1	Seed	Early	Bass	2	1	4.54158533	
Wye	2003	DC	1	Seed	Early	Bass	2	2	11.99264414	
Wye	2003	DC	1	Seed	Early	Bass	2	3	0	
Wye	2003	DC	1	Seed	Early	Bass	2	4	24.84333717	

Wye	2003	DC	1	Seed	Early	Bass	2	5	81.54799946
Wye	2003	DC	1	Seed	Early	Bass	2	6	0
Wye	2003	DC	1	Seed	Early	Bass	2	7	0.693144788
Wye	2003	DC	1	Seed	Early	Bass	3	1	4.18194903
Wye	2003	DC	1	Seed	Early	Bass	3	2	12.02637134
Wye	2003	DC	1	Seed	Early	Bass	3	3	0
Wye	2003	DC	1	Seed	Early	Bass	3	4	20.4579765
Wye	2003	DC	1	Seed	Early	Bass	3	5	72.74712803
Wye	2003	DC	1	Seed	Early	Bass	3	6	0
Wye	2003	DC	1	Seed	Early	Bass	3	7	1.272805828
Wye	2003	DC	1	LeafPost	Late	Bass	3	1	0
Wye	2003	DC	1	LeafPost	Late	Bass	3	2	1.77382004
Wye	2003	DC	1	LeafPost	Late	Bass	3	3	0
Wye	2003	DC	1	LeafPost	Late	Bass	3	4	0
Wye	2003	DC	1	LeafPost	Late	Bass	3	5	11.54202356
Wye	2003	DC	1	LeafPost	Late	Bass	3	6	6.293091952
Wye	2003	DC	1	LeafPost	Late	Bass	3	7	0
Wye	2003	DC	1	Seed	Late	Corsica	4	1	5.40436029
Wye	2003	DC	1	Seed	Late	Corsica	4	2	11.89666928
Wye	2003	DC	1	Seed	Late	Corsica	4	3	0
Wye	2003	DC	1	Seed	Late	Corsica	4	4	28.31792166
Wye	2003	DC	1	Seed	Late	Corsica	4	5	68.8641294
Wye	2003	DC	1	Seed	Late	Corsica	4	6	0
Wye	2003	DC	1	Seed	Late	Corsica	4	7	0.78013792
Wye	2003	DC	1	LeafPost	Early	Corsica	6	1	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	1	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	2	5.09572568
Wye	2003	DC	1	LeafPost	Early	Corsica	6	2	2.10322328
Wye	2003	DC	1	LeafPost	Early	Corsica	6	3	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	3	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	4	13.52264882
Wye	2003	DC	1	LeafPost	Early	Corsica	6	4	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	5	23.33019733
Wye	2003	DC	1	LeafPost	Early	Corsica	6	5	7.210678734
Wye	2003	DC	1	LeafPost	Early	Corsica	6	6	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	6	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	7	0
Wye	2003	DC	1	LeafPost	Early	Corsica	6	7	0
Wye	2003	DC	1	Seed	Early	Corsica	6	1	5.84426422
Wye	2003	DC	1	Seed	Early	Corsica	6	2	13.35493046
Wye	2003	DC	1	Seed	Early	Corsica	6	3	0
Wye	2003	DC	1	Seed	Early	Corsica	6	4	30.33197237
Wye	2003	DC	1	Seed	Early	Corsica	6	5	74.58749613
Wye	2003	DC	1	Seed	Early	Corsica	6	6	0
Wye	2003	DC	1	Seed	Early	Corsica	6	7	0.883838108
Wye	2003	DC	1	LeafPost	Early	Jack	7	1	0
Wye	2003	DC	1	LeafPost	Early	Jack	7	2	4.51492508
Wye	2003	DC	1	LeafPost	Early	Jack	7	3	0
Wye	2003	DC	1	LeafPost	Early	Jack	7	4	0
Wye	2003	DC	1	LeafPost	Early	Jack	7	5	28.69320302
Wye	2003	DC	1	LeafPost	Early	Jack	7	6	8.924942388
Wye	2003	DC	1	LeafPost	Early	Jack	7	7	1.02360244
Wye	2003	DC	1	LeafPost	Late	Jack	7	1	0
Wye	2003	DC	1	LeafPost	Late	Jack	7	2	1.30245344
Wye	2003	DC	1	LeafPost	Late	Jack	7	3	0
Wye	2003	DC	1	LeafPost	Late	Jack	7	4	0
Wye	2003	DC	1	LeafPost	Late	Jack	7	5	8.80295435
Wye	2003	DC	1	LeafPost	Late	Jack	7	6	4.500089738
Wye	2003	DC	1	LeafPost	Late	Jack	7	7	0
Wye	2003	DC	1	Seed	Late	Jack	7	1	4.02477065
Wye	2003	DC	1	Seed	Late	Jack	7	2	12.43099562
Wye	2003	DC	1	Seed	Late	Jack	7	3	0
Wye	2003	DC	1	Seed	Late	Jack	7	4	21.29826533
Wye	2003	DC	1	Seed	Late	Jack	7	5	82.81538442
Wye	2003	DC	1	Seed	Late	Jack	7	6	0
Wye	2003	DC	1	Seed	Late	Jack	7	7	1.187925456
Wye	2003	DC	1	LeafPost	Early	Jack	9	1	0
Wye	2003	DC	1	LeafPost	Early	Jack	9	2	1.19346932
Wye	2003	DC	1	LeafPost	Early	Jack	9	3	0
Wye	2003	DC	1	LeafPost	Early	Jack	9	4	0
Wye	2003	DC	1	LeafPost	Early	Jack	9	5	0
Wye	2003	DC	1	LeafPost	Early	Jack	9	6	1.617323666
Wye	2003	DC	1	LeafPost	Early	Jack	9	7	0
Wye	2003	DC	1	Seed	Early	Jack	9	1	4.48544421
Wye	2003	DC	1	Seed	Early	Jack	9	2	15.30586268
Wye	2003	DC	1	Seed	Early	Jack	9	3	0
Wye	2003	DC	1	Seed	Early	Jack	9	4	20.51244902
Wye	2003	DC	1	Seed	Early	Jack	9	5	88.86597319
Wye	2003	DC	1	Seed	Early	Jack	9	6	0

Wye	2003	DC	1	Seed	Early	Jack	9	7	1.42351158	
Wye	2003	DC	1	LeafPost	Early	Williams82		10	1	0
Wye	2003	DC	1	LeafPost	Early	Williams82		10	2	5.66535794
Wye	2003	DC	1	LeafPost	Early	Williams82		10	3	0
Wye	2003	DC	1	LeafPost	Early	Williams82		10	4	0
Wye	2003	DC	1	LeafPost	Early	Williams82		10	5	23.499104
Wye	2003	DC	1	LeafPost	Early	Williams82		10	6	8.13716479
Wye	2003	DC	1	LeafPost	Early	Williams82		10	7	0.991806836
Wye	2003	DC	1	LeafPost	Late	Williams82		11	1	0
Wye	2003	DC	1	LeafPost	Late	Williams82		11	2	2.18096972
Wye	2003	DC	1	LeafPost	Late	Williams82		11	3	0
Wye	2003	DC	1	LeafPost	Late	Williams82		11	4	0
Wye	2003	DC	1	LeafPost	Late	Williams82		11	5	13.32326332
Wye	2003	DC	1	LeafPost	Late	Williams82		11	6	5.710260408
Wye	2003	DC	1	LeafPost	Late	Williams82		11	7	0
Wye	2003	DC	1	Seed	Late	Williams82		11	1	7.04115808
Wye	2003	DC	1	Seed	Late	Williams82		11	2	17.21117624
Wye	2003	DC	1	Seed	Late	Williams82		11	3	0
Wye	2003	DC	1	Seed	Late	Williams82		11	4	33.55186859
Wye	2003	DC	1	Seed	Late	Williams82		11	5	85.83615504
Wye	2003	DC	1	Seed	Late	Williams82		11	6	0
Wye	2003	DC	1	Seed	Late	Williams82		11	7	1.172450684
Wye	2003	DC	1	LeafPost	Early	Williams82		12	1	0
Wye	2003	DC	1	LeafPost	Early	Williams82		12	2	4.17217034
Wye	2003	DC	1	LeafPost	Early	Williams82		12	3	0
Wye	2003	DC	1	LeafPost	Early	Williams82		12	4	10.85830084
Wye	2003	DC	1	LeafPost	Early	Williams82		12	5	18.30484779
Wye	2003	DC	1	LeafPost	Early	Williams82		12	6	0
Wye	2003	DC	1	LeafPost	Early	Williams82		12	7	0.876883208
Wye	2003	DC	1	Seed	Early	Williams82		12	1	8.25738595
Wye	2003	DC	1	Seed	Early	Williams82		12	2	21.54889298
Wye	2003	DC	1	Seed	Early	Williams82		12	3	0
Wye	2003	DC	1	Seed	Early	Williams82		12	4	40.58828425
Wye	2003	DC	1	Seed	Early	Williams82		12	5	105.1548535
Wye	2003	DC	1	Seed	Early	Williams82		12	6	0
Wye	2003	DC	1	Seed	Early	Williams82		12	7	1.38778108
Wye	2003	DC	2	LeafPost	Early	Corsica	13	1	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	2	4.27134956	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	3	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	4	12.25054907	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	5	19.84613587	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	6	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	13	7	0	
Wye	2003	DC	2	Seed	Early	Corsica	13	1	5.76820618	
Wye	2003	DC	2	Seed	Early	Corsica	13	2	13.66622948	
Wye	2003	DC	2	Seed	Early	Corsica	13	3	0	
Wye	2003	DC	2	Seed	Early	Corsica	13	4	31.54411912	
Wye	2003	DC	2	Seed	Early	Corsica	13	5	67.78780004	
Wye	2003	DC	2	Seed	Early	Corsica	13	6	0	
Wye	2003	DC	2	Seed	Early	Corsica	13	7	1.180028896	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	1	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	2	4.81579406	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	3	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	4	0	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	5	28.60963077	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	6	9.603716913	
Wye	2003	DC	2	LeafPost	Early	Corsica	14	7	0.367092384	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	1	0	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	2	1.96490864	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	3	0	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	4	0	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	5	7.681041485	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	6	2.16337824	
Wye	2003	DC	2	LeafPost	Late	Corsica	14	7	0	
Wye	2003	DC	2	Seed	Late	Corsica	14	1	6.17520374	
Wye	2003	DC	2	Seed	Late	Corsica	14	2	15.71979368	
Wye	2003	DC	2	Seed	Late	Corsica	14	3	0	
Wye	2003	DC	2	Seed	Late	Corsica	14	4	31.32083937	
Wye	2003	DC	2	Seed	Late	Corsica	14	5	79.64721076	
Wye	2003	DC	2	Seed	Late	Corsica	14	6	0	
Wye	2003	DC	2	Seed	Late	Corsica	14	7	1.005765392	
Wye	2003	DC	2	LeafPost	Early	Jack	16	1	3.21071944	
Wye	2003	DC	2	LeafPost	Early	Jack	16	1	2.17548974	
Wye	2003	DC	2	LeafPost	Early	Jack	16	2	5.2462685	
Wye	2003	DC	2	LeafPost	Early	Jack	16	2	3.83322854	
Wye	2003	DC	2	LeafPost	Early	Jack	16	3	0	
Wye	2003	DC	2	LeafPost	Early	Jack	16	3	0	
Wye	2003	DC	2	LeafPost	Early	Jack	16	4	15.18971331	
Wye	2003	DC	2	LeafPost	Early	Jack	16	4	0	

Wye	2003	DC	2	LeafPost	Early	Jack	16	5	27.34014608
Wye	2003	DC	2	LeafPost	Early	Jack	16	5	26.3160469
Wye	2003	DC	2	LeafPost	Early	Jack	16	6	0
Wye	2003	DC	2	LeafPost	Early	Jack	16	6	6.736983521
Wye	2003	DC	2	LeafPost	Early	Jack	16	7	0.80426736
Wye	2003	DC	2	LeafPost	Early	Jack	16	7	0.812016696
Wye	2003	DC	2	Seed	Early	Jack	16	1	4.12105446
Wye	2003	DC	2	Seed	Early	Jack	16	2	13.78505576
Wye	2003	DC	2	Seed	Early	Jack	16	3	0
Wye	2003	DC	2	Seed	Early	Jack	16	4	19.6337933
Wye	2003	DC	2	Seed	Early	Jack	16	5	79.06887819
Wye	2003	DC	2	Seed	Early	Jack	16	6	0
Wye	2003	DC	2	Seed	Early	Jack	16	7	1.462524984
Wye	2003	DC	2	LeafPost	Late	Jack	17	1	0
Wye	2003	DC	2	LeafPost	Late	Jack	17	2	2.52936176
Wye	2003	DC	2	LeafPost	Late	Jack	17	3	0
Wye	2003	DC	2	LeafPost	Late	Jack	17	4	0
Wye	2003	DC	2	LeafPost	Late	Jack	17	5	16.98161398
Wye	2003	DC	2	LeafPost	Late	Jack	17	6	6.829628301
Wye	2003	DC	2	LeafPost	Late	Jack	17	7	0
Wye	2003	DC	2	Seed	Late	Jack	17	1	3.395345
Wye	2003	DC	2	Seed	Late	Jack	17	2	9.9219707
Wye	2003	DC	2	Seed	Late	Jack	17	3	0
Wye	2003	DC	2	Seed	Late	Jack	17	4	14.01042811
Wye	2003	DC	2	Seed	Late	Jack	17	5	52.42668285
Wye	2003	DC	2	Seed	Late	Jack	17	6	0
Wye	2003	DC	2	Seed	Late	Jack	17	7	1.04891254
Wye	2003	DC	2	LeafPost	Late	Bass	19	1	0
Wye	2003	DC	2	LeafPost	Late	Bass	19	2	2.25791024
Wye	2003	DC	2	LeafPost	Late	Bass	19	3	0
Wye	2003	DC	2	LeafPost	Late	Bass	19	4	0
Wye	2003	DC	2	LeafPost	Late	Bass	19	5	14.14911256
Wye	2003	DC	2	LeafPost	Late	Bass	19	6	9.188614257
Wye	2003	DC	2	LeafPost	Late	Bass	19	7	0
Wye	2003	DC	2	Seed	Late	Bass	19	1	4.32202777
Wye	2003	DC	2	Seed	Late	Bass	19	2	12.6199052
Wye	2003	DC	2	Seed	Late	Bass	19	3	0
Wye	2003	DC	2	Seed	Late	Bass	19	4	19.95657866
Wye	2003	DC	2	Seed	Late	Bass	19	5	72.07386085
Wye	2003	DC	2	Seed	Late	Bass	19	6	0
Wye	2003	DC	2	Seed	Late	Bass	19	7	1.004275944
Wye	2003	DC	2	LeafPost	Early	Bass	20	1	0
Wye	2003	DC	2	LeafPost	Early	Bass	20	2	4.03060994
Wye	2003	DC	2	LeafPost	Early	Bass	20	3	0
Wye	2003	DC	2	LeafPost	Early	Bass	20	4	16.49706573
Wye	2003	DC	2	LeafPost	Early	Bass	20	5	21.12592396
Wye	2003	DC	2	LeafPost	Early	Bass	20	6	0
Wye	2003	DC	2	LeafPost	Early	Bass	20	7	1.366642008
Wye	2003	DC	2	Seed	Early	Bass	20	1	4.28393414
Wye	2003	DC	2	Seed	Early	Bass	20	2	11.99358392
Wye	2003	DC	2	Seed	Early	Bass	20	3	0
Wye	2003	DC	2	Seed	Early	Bass	20	4	20.50303186
Wye	2003	DC	2	Seed	Early	Bass	20	5	70.16166344
Wye	2003	DC	2	Seed	Early	Bass	20	6	0
Wye	2003	DC	2	Seed	Early	Bass	20	7	1.032338368
Wye	2003	DC	2	LeafPost	Early	Bass	21	1	0
Wye	2003	DC	2	LeafPost	Early	Bass	21	2	3.40362488
Wye	2003	DC	2	LeafPost	Early	Bass	21	3	0
Wye	2003	DC	2	LeafPost	Early	Bass	21	4	0
Wye	2003	DC	2	LeafPost	Early	Bass	21	5	4.278818212
Wye	2003	DC	2	LeafPost	Early	Bass	21	6	0
Wye	2003	DC	2	LeafPost	Early	Bass	21	7	0
Wye	2003	DC	2	LeafPost	Early	Williams82	22	1	0
Wye	2003	DC	2	LeafPost	Early	Williams82	22	2	6.73117334
Wye	2003	DC	2	LeafPost	Early	Williams82	22	3	0
Wye	2003	DC	2	LeafPost	Early	Williams82	22	4	19.2483888
Wye	2003	DC	2	LeafPost	Early	Williams82	22	5	33.0852696
Wye	2003	DC	2	LeafPost	Early	Williams82	22	6	0
Wye	2003	DC	2	LeafPost	Early	Williams82	22	7	1.309587928
Wye	2003	DC	2	Seed	Early	Williams82	22	1	8.82187784
Wye	2003	DC	2	Seed	Early	Williams82	22	2	21.99401198
Wye	2003	DC	2	Seed	Early	Williams82	22	3	0
Wye	2003	DC	2	Seed	Early	Williams82	22	4	37.76224416
Wye	2003	DC	2	Seed	Early	Williams82	22	5	98.11789283
Wye	2003	DC	2	Seed	Early	Williams82	22	6	0
Wye	2003	DC	2	Seed	Early	Williams82	22	7	1.797963396
Wye	2003	DC	2	LeafPost	Early	Williams82	23	1	0
Wye	2003	DC	2	LeafPost	Early	Williams82	23	2	3.2134319
Wye	2003	DC	2	LeafPost	Early	Williams82	23	3	0

Wye	2003	DC	2	LeafPost	Early	Williams82	23	4	0
Wye	2003	DC	2	LeafPost	Early	Williams82	23	5	8.670375162
Wye	2003	DC	2	LeafPost	Early	Williams82	23	6	0
Wye	2003	DC	2	LeafPost	Early	Williams82	23	7	0
Wye	2003	DC	2	LeafPost	Late	Williams82	23	1	0
Wye	2003	DC	2	LeafPost	Late	Williams82	23	2	2.0524586
Wye	2003	DC	2	LeafPost	Late	Williams82	23	3	0
Wye	2003	DC	2	LeafPost	Late	Williams82	23	4	0
Wye	2003	DC	2	LeafPost	Late	Williams82	23	5	10.81199747
Wye	2003	DC	2	LeafPost	Late	Williams82	23	6	5.192510315
Wye	2003	DC	2	LeafPost	Late	Williams82	23	7	0
Wye	2003	DC	2	Seed	Late	Williams82	23	1	8.93949715
Wye	2003	DC	2	Seed	Late	Williams82	23	2	21.78939248
Wye	2003	DC	2	Seed	Late	Williams82	23	3	0
Wye	2003	DC	2	Seed	Late	Williams82	23	4	38.97333884
Wye	2003	DC	2	Seed	Late	Williams82	23	5	102.4662307
Wye	2003	DC	2	Seed	Late	Williams82	23	6	0
Wye	2003	DC	2	Seed	Late	Williams82	23	7	1.69886348
Wye	2003	DC	3	LeafPost	Early	Williams82	25	1	0
Wye	2003	DC	3	LeafPost	Early	Williams82	25	1	0
Wye	2003	DC	3	LeafPost	Early	Williams82	25	2	7.34450744
Wye	2003	DC	3	LeafPost	Early	Williams82	25	2	3.39028718
Wye	2003	DC	3	LeafPost	Early	Williams82	25	3	0
Wye	2003	DC	3	LeafPost	Early	Williams82	25	3	0
Wye	2003	DC	3	LeafPost	Early	Williams82	25	4	18.87504447
Wye	2003	DC	3	LeafPost	Early	Williams82	25	4	0
Wye	2003	DC	3	LeafPost	Early	Williams82	25	5	38.37353217
Wye	2003	DC	3	LeafPost	Early	Williams82	25	5	17.36850045
Wye	2003	DC	3	LeafPost	Early	Williams82	25	6	4.098043548
Wye	2003	DC	3	LeafPost	Early	Williams82	25	6	5.30494285
Wye	2003	DC	3	LeafPost	Early	Williams82	25	7	1.445817928
Wye	2003	DC	3	LeafPost	Early	Williams82	25	7	0
Wye	2003	DC	3	Seed	Early	Williams82	25	1	11.90595312
Wye	2003	DC	3	Seed	Early	Williams82	25	2	31.23866372
Wye	2003	DC	3	Seed	Early	Williams82	25	3	0
Wye	2003	DC	3	Seed	Early	Williams82	25	4	54.39238635
Wye	2003	DC	3	Seed	Early	Williams82	25	5	149.5823882
Wye	2003	DC	3	Seed	Early	Williams82	25	6	0
Wye	2003	DC	3	Seed	Early	Williams82	25	7	1.948362272
Wye	2003	DC	3	LeafPost	Late	Williams82	27	1	0
Wye	2003	DC	3	LeafPost	Late	Williams82	27	2	2.58485846
Wye	2003	DC	3	LeafPost	Late	Williams82	27	3	0
Wye	2003	DC	3	LeafPost	Late	Williams82	27	4	0
Wye	2003	DC	3	LeafPost	Late	Williams82	27	5	17.43741264
Wye	2003	DC	3	LeafPost	Late	Williams82	27	6	7.358380374
Wye	2003	DC	3	LeafPost	Late	Williams82	27	7	0
Wye	2003	DC	3	Seed	Late	Williams82	27	1	7.68650903
Wye	2003	DC	3	Seed	Late	Williams82	27	2	19.0819277
Wye	2003	DC	3	Seed	Late	Williams82	27	3	0
Wye	2003	DC	3	Seed	Late	Williams82	27	4	38.40851909
Wye	2003	DC	3	Seed	Late	Williams82	27	5	99.70857007
Wye	2003	DC	3	Seed	Late	Williams82	27	6	0
Wye	2003	DC	3	Seed	Late	Williams82	27	7	1.10654022
Wye	2003	DC	3	LeafPost	Early	Corsica	28	1	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	1	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	2	7.30826726
Wye	2003	DC	3	LeafPost	Early	Corsica	28	2	5.70446852
Wye	2003	DC	3	LeafPost	Early	Corsica	28	3	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	3	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	4	22.21326519
Wye	2003	DC	3	LeafPost	Early	Corsica	28	4	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	5	34.14527103
Wye	2003	DC	3	LeafPost	Early	Corsica	28	5	29.91759563
Wye	2003	DC	3	LeafPost	Early	Corsica	28	6	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	6	12.67432742
Wye	2003	DC	3	LeafPost	Early	Corsica	28	7	0
Wye	2003	DC	3	LeafPost	Early	Corsica	28	7	1.396285656
Wye	2003	DC	3	Seed	Early	Corsica	28	1	5.79689515
Wye	2003	DC	3	Seed	Early	Corsica	28	2	13.5709598
Wye	2003	DC	3	Seed	Early	Corsica	28	3	0
Wye	2003	DC	3	Seed	Early	Corsica	28	4	28.18339129
Wye	2003	DC	3	Seed	Early	Corsica	28	5	70.86330263
Wye	2003	DC	3	Seed	Early	Corsica	28	6	0
Wye	2003	DC	3	Seed	Early	Corsica	28	7	0.754661476
Wye	2003	DC	3	LeafPost	Late	Corsica	29	1	0
Wye	2003	DC	3	LeafPost	Late	Corsica	29	2	2.15669966
Wye	2003	DC	3	LeafPost	Late	Corsica	29	3	0
Wye	2003	DC	3	LeafPost	Late	Corsica	29	4	0
Wye	2003	DC	3	LeafPost	Late	Corsica	29	5	12.07512837

Wye	2003	DC	3	LeafPost	Late	Corsica	29	6	4.408474739
Wye	2003	DC	3	LeafPost	Late	Corsica	29	7	0
Wye	2003	DC	3	Seed	Late	Corsica	29	1	5.64882394
Wye	2003	DC	3	Seed	Late	Corsica	29	2	13.24699514
Wye	2003	DC	3	Seed	Late	Corsica	29	3	0
Wye	2003	DC	3	Seed	Late	Corsica	29	4	27.10021989
Wye	2003	DC	3	Seed	Late	Corsica	29	5	67.31591503
Wye	2003	DC	3	Seed	Late	Corsica	29	6	0
Wye	2003	DC	3	Seed	Late	Corsica	29	7	0.67427048
Wye	2003	DC	3	LeafPost	Early	Jack	32	1	2.34104967
Wye	2003	DC	3	LeafPost	Early	Jack	32	2	4.55099414
Wye	2003	DC	3	LeafPost	Early	Jack	32	3	0
Wye	2003	DC	3	LeafPost	Early	Jack	32	4	0
Wye	2003	DC	3	LeafPost	Early	Jack	32	5	30.19257756
Wye	2003	DC	3	LeafPost	Early	Jack	32	6	7.992291245
Wye	2003	DC	3	LeafPost	Early	Jack	32	7	0.568190808
Wye	2003	DC	3	LeafPost	Late	Jack	32	1	0
Wye	2003	DC	3	LeafPost	Late	Jack	32	2	1.48416218
Wye	2003	DC	3	LeafPost	Late	Jack	32	3	0
Wye	2003	DC	3	LeafPost	Late	Jack	32	4	0
Wye	2003	DC	3	LeafPost	Late	Jack	32	5	9.233372586
Wye	2003	DC	3	LeafPost	Late	Jack	32	6	3.811147936
Wye	2003	DC	3	LeafPost	Late	Jack	32	7	0
Wye	2003	DC	3	Seed	Late	Jack	32	1	4.21780829
Wye	2003	DC	3	Seed	Late	Jack	32	2	13.54917236
Wye	2003	DC	3	Seed	Late	Jack	32	3	0
Wye	2003	DC	3	Seed	Late	Jack	32	4	20.45283698
Wye	2003	DC	3	Seed	Late	Jack	32	5	81.51357315
Wye	2003	DC	3	Seed	Late	Jack	32	6	0
Wye	2003	DC	3	Seed	Late	Jack	32	7	0.951523864
Wye	2003	DC	3	LeafPost	Early	Jack	33	1	2.6569663
Wye	2003	DC	3	LeafPost	Early	Jack	33	2	3.7166006
Wye	2003	DC	3	LeafPost	Early	Jack	33	3	0.260762656
Wye	2003	DC	3	LeafPost	Early	Jack	33	4	0
Wye	2003	DC	3	LeafPost	Early	Jack	33	5	23.20432602
Wye	2003	DC	3	LeafPost	Early	Jack	33	6	10.29837835
Wye	2003	DC	3	LeafPost	Early	Jack	33	7	0.876876516
Wye	2003	DC	3	Seed	Early	Jack	33	1	4.54269293
Wye	2003	DC	3	Seed	Early	Jack	33	2	16.62733826
Wye	2003	DC	3	Seed	Early	Jack	33	3	0
Wye	2003	DC	3	Seed	Early	Jack	33	4	22.74712619
Wye	2003	DC	3	Seed	Early	Jack	33	5	99.53461842
Wye	2003	DC	3	Seed	Early	Jack	33	6	0
Wye	2003	DC	3	Seed	Early	Jack	33	7	1.222903584
Wye	2003	DC	3	LeafPost	Late	Bass	34	1	0
Wye	2003	DC	3	LeafPost	Late	Bass	34	2	2.04583736
Wye	2003	DC	3	LeafPost	Late	Bass	34	3	0
Wye	2003	DC	3	LeafPost	Late	Bass	34	4	0
Wye	2003	DC	3	LeafPost	Late	Bass	34	5	13.39955518
Wye	2003	DC	3	LeafPost	Late	Bass	34	6	9.480488355
Wye	2003	DC	3	LeafPost	Late	Bass	34	7	0
Wye	2003	DC	3	Seed	Late	Bass	34	1	3.87868176
Wye	2003	DC	3	Seed	Late	Bass	34	2	11.28779534
Wye	2003	DC	3	Seed	Late	Bass	34	3	0
Wye	2003	DC	3	Seed	Late	Bass	34	4	18.16383122
Wye	2003	DC	3	Seed	Late	Bass	34	5	66.16933157
Wye	2003	DC	3	Seed	Late	Bass	34	6	0
Wye	2003	DC	3	Seed	Late	Bass	34	7	0.777479284
Wye	2003	DC	3	Seed	Early	Bass	35	1	4.59177026
Wye	2003	DC	3	Seed	Early	Bass	35	2	13.80880418
Wye	2003	DC	3	Seed	Early	Bass	35	3	0
Wye	2003	DC	3	Seed	Early	Bass	35	4	20.68893168
Wye	2003	DC	3	Seed	Early	Bass	35	5	72.75868234
Wye	2003	DC	3	Seed	Early	Bass	35	6	0
Wye	2003	DC	3	Seed	Early	Bass	35	7	0.884631588
Wye	2003	DC	3	LeafPost	Late	Bass	35	1	0
Wye	2003	DC	3	LeafPost	Late	Bass	35	2	4.14588272
Wye	2003	DC	3	LeafPost	Late	Bass	35	3	0
Wye	2003	DC	3	LeafPost	Late	Bass	35	4	21.03900641
Wye	2003	DC	3	LeafPost	Late	Bass	35	5	21.87427015
Wye	2003	DC	3	LeafPost	Late	Bass	35	6	0
Wye	2003	DC	3	LeafPost	Late	Bass	35	7	1.125181264
Wye	2003	FS	1	LeafPost	Late	Williams82		1	0
Wye	2003	FS	1	LeafPost	Late	Williams82		2	2.21507642
Wye	2003	FS	1	LeafPost	Late	Williams82		3	0
Wye	2003	FS	1	LeafPost	Late	Williams82		4	7.66571456
Wye	2003	FS	1	LeafPost	Late	Williams82		5	9.854255718
Wye	2003	FS	1	LeafPost	Late	Williams82		6	0
Wye	2003	FS	1	LeafPost	Late	Williams82		7	0.266820412

Wye	2003	FS	1	Seed	Late	Williams82	1	1	4.95983497
Wye	2003	FS	1	Seed	Late	Williams82	1	2	6.86185658
Wye	2003	FS	1	Seed	Late	Williams82	1	3	0
Wye	2003	FS	1	Seed	Late	Williams82	1	4	28.72626936
Wye	2003	FS	1	Seed	Late	Williams82	1	5	87.20686691
Wye	2003	FS	1	Seed	Late	Williams82	1	6	0
Wye	2003	FS	1	Seed	Late	Williams82	1	7	0
Wye	2003	FS	1	LeafPost	Late	Williams82	2	1	0
Wye	2003	FS	1	LeafPost	Late	Williams82	2	2	1.75066364
Wye	2003	FS	1	LeafPost	Late	Williams82	2	3	0
Wye	2003	FS	1	LeafPost	Late	Williams82	2	4	0
Wye	2003	FS	1	LeafPost	Late	Williams82	2	5	2.667444813
Wye	2003	FS	1	LeafPost	Late	Williams82	2	6	0
Wye	2003	FS	1	LeafPost	Late	Williams82	2	7	0.121919492
Wye	2003	FS	1	Seed	Early	Williams82	3	1	5.15685216
Wye	2003	FS	1	Seed	Early	Williams82	3	2	13.7711771
Wye	2003	FS	1	Seed	Early	Williams82	3	3	0
Wye	2003	FS	1	Seed	Early	Williams82	3	4	28.0848358
Wye	2003	FS	1	Seed	Early	Williams82	3	5	87.38263535
Wye	2003	FS	1	Seed	Early	Williams82	3	6	0
Wye	2003	FS	1	Seed	Early	Williams82	3	7	0
Wye	2003	FS	1	LeafPost	Late	Bass	4	1	0
Wye	2003	FS	1	LeafPost	Late	Bass	4	2	1.8693326
Wye	2003	FS	1	LeafPost	Late	Bass	4	3	0
Wye	2003	FS	1	LeafPost	Late	Bass	4	4	9.608991777
Wye	2003	FS	1	LeafPost	Late	Bass	4	5	8.875624212
Wye	2003	FS	1	LeafPost	Late	Bass	4	6	0
Wye	2003	FS	1	LeafPost	Late	Bass	4	7	0.251166868
Wye	2003	FS	1	Seed	Late	Bass	4	1	3.23183058
Wye	2003	FS	1	Seed	Late	Bass	4	2	8.96560034
Wye	2003	FS	1	Seed	Late	Bass	4	3	0
Wye	2003	FS	1	Seed	Late	Bass	4	4	16.16605065
Wye	2003	FS	1	Seed	Late	Bass	4	5	61.59384884
Wye	2003	FS	1	Seed	Late	Bass	4	6	0
Wye	2003	FS	1	Seed	Late	Bass	4	7	0
Wye	2003	FS	1	Seed	Early	Bass	5	1	2.78787965
Wye	2003	FS	1	Seed	Early	Bass	5	2	6.91040498
Wye	2003	FS	1	Seed	Early	Bass	5	3	0
Wye	2003	FS	1	Seed	Early	Bass	5	4	14.55589007
Wye	2003	FS	1	Seed	Early	Bass	5	5	54.61597185
Wye	2003	FS	1	Seed	Early	Bass	5	6	0
Wye	2003	FS	1	Seed	Early	Bass	5	7	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	1	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	2	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	3	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	4	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	5	1.800881654
Wye	2003	FS	1	LeafPost	Late	Bass	6	6	0
Wye	2003	FS	1	LeafPost	Late	Bass	6	7	0
Wye	2003	FS	1	Seed	Early	Jack	7	1	3.33250716
Wye	2003	FS	1	Seed	Early	Jack	7	2	11.20707776
Wye	2003	FS	1	Seed	Early	Jack	7	3	0
Wye	2003	FS	1	Seed	Early	Jack	7	4	16.15656323
Wye	2003	FS	1	Seed	Early	Jack	7	5	74.59046785
Wye	2003	FS	1	Seed	Early	Jack	7	6	0
Wye	2003	FS	1	Seed	Early	Jack	7	7	0
Wye	2003	FS	1	LeafPost	Late	Jack	8	1	0
Wye	2003	FS	1	LeafPost	Late	Jack	8	2	1.17149834
Wye	2003	FS	1	LeafPost	Late	Jack	8	3	0
Wye	2003	FS	1	LeafPost	Late	Jack	8	4	0
Wye	2003	FS	1	LeafPost	Late	Jack	8	5	2.212241818
Wye	2003	FS	1	LeafPost	Late	Jack	8	6	0
Wye	2003	FS	1	LeafPost	Late	Jack	8	7	0
Wye	2003	FS	1	Seed	Late	Jack	8	1	3.0869281
Wye	2003	FS	1	Seed	Late	Jack	8	2	9.59939156
Wye	2003	FS	1	Seed	Late	Jack	8	3	0
Wye	2003	FS	1	Seed	Late	Jack	8	4	15.15203353
Wye	2003	FS	1	Seed	Late	Jack	8	5	66.77337881
Wye	2003	FS	1	Seed	Late	Jack	8	6	0
Wye	2003	FS	1	Seed	Late	Jack	8	7	0
Wye	2003	FS	1	LeafPost	Late	Jack	9	1	0
Wye	2003	FS	1	LeafPost	Late	Jack	9	2	1.37976656
Wye	2003	FS	1	LeafPost	Late	Jack	9	3	0
Wye	2003	FS	1	LeafPost	Late	Jack	9	4	0
Wye	2003	FS	1	LeafPost	Late	Jack	9	5	1.964697019
Wye	2003	FS	1	LeafPost	Late	Jack	9	6	0
Wye	2003	FS	1	LeafPost	Late	Jack	9	7	0
Wye	2003	FS	1	Seed	Early	Corsica	10	1	3.91222145
Wye	2003	FS	1	Seed	Early	Corsica	10	2	7.12206524

Wye	2003	FS	1	Seed	Early	Corsica	10	3	0
Wye	2003	FS	1	Seed	Early	Corsica	10	4	20.12847097
Wye	2003	FS	1	Seed	Early	Corsica	10	5	47.86047434
Wye	2003	FS	1	Seed	Early	Corsica	10	6	0
Wye	2003	FS	1	Seed	Early	Corsica	10	7	0
Wye	2003	FS	1	Seed	Late	Corsica	11	1	4.74908212
Wye	2003	FS	1	Seed	Late	Corsica	11	2	9.26358926
Wye	2003	FS	1	Seed	Late	Corsica	11	3	0
Wye	2003	FS	1	Seed	Late	Corsica	11	4	24.39595778
Wye	2003	FS	1	Seed	Late	Corsica	11	5	57.90074922
Wye	2003	FS	1	Seed	Late	Corsica	11	6	0
Wye	2003	FS	1	Seed	Late	Corsica	11	7	0
Wye	2003	FS	1	LeafPost	Late	Corsica	12	1	0
Wye	2003	FS	1	LeafPost	Late	Corsica	12	2	1.13310674
Wye	2003	FS	1	LeafPost	Late	Corsica	12	3	0
Wye	2003	FS	1	LeafPost	Late	Corsica	12	4	0
Wye	2003	FS	1	LeafPost	Late	Corsica	12	5	2.265092476
Wye	2003	FS	1	LeafPost	Late	Corsica	12	6	0
Wye	2003	FS	1	LeafPost	Late	Corsica	12	7	0
Wye	2003	FS	2	LeafPost	Late	Corsica	11	1	0
Wye	2003	FS	2	LeafPost	Late	Corsica	11	2	1.81779374
Wye	2003	FS	2	LeafPost	Late	Corsica	11	3	0
Wye	2003	FS	2	LeafPost	Late	Corsica	11	4	7.248465457
Wye	2003	FS	2	LeafPost	Late	Corsica	11	5	9.396315959
Wye	2003	FS	2	LeafPost	Late	Corsica	11	6	0
Wye	2003	FS	2	LeafPost	Late	Corsica	11	7	0.146449496
Wye	2003	FS	2	LeafPost	Late	Corsica	13	1	0
Wye	2003	FS	2	LeafPost	Late	Corsica	13	2	2.43049442
Wye	2003	FS	2	LeafPost	Late	Corsica	13	3	0
Wye	2003	FS	2	LeafPost	Late	Corsica	13	4	8.708936698
Wye	2003	FS	2	LeafPost	Late	Corsica	13	5	9.687830996
Wye	2003	FS	2	LeafPost	Late	Corsica	13	6	0
Wye	2003	FS	2	LeafPost	Late	Corsica	13	7	0
Wye	2003	FS	2	Seed	Late	Corsica	13	1	4.61723015
Wye	2003	FS	2	Seed	Late	Corsica	13	2	8.71104416
Wye	2003	FS	2	Seed	Late	Corsica	13	3	0
Wye	2003	FS	2	Seed	Late	Corsica	13	4	24.1304713
Wye	2003	FS	2	Seed	Late	Corsica	13	5	56.88777082
Wye	2003	FS	2	Seed	Late	Corsica	13	6	0
Wye	2003	FS	2	Seed	Late	Corsica	13	7	0
Wye	2003	FS	2	LeafPost	Late	Corsica	14	1	0
Wye	2003	FS	2	LeafPost	Late	Corsica	14	2	1.20205154
Wye	2003	FS	2	LeafPost	Late	Corsica	14	3	0
Wye	2003	FS	2	LeafPost	Late	Corsica	14	4	0
Wye	2003	FS	2	LeafPost	Late	Corsica	14	5	2.160251569
Wye	2003	FS	2	LeafPost	Late	Corsica	14	6	0
Wye	2003	FS	2	LeafPost	Late	Corsica	14	7	0
Wye	2003	FS	2	Seed	Early	Corsica	15	1	4.93193268
Wye	2003	FS	2	Seed	Early	Corsica	15	2	10.21982162
Wye	2003	FS	2	Seed	Early	Corsica	15	3	0
Wye	2003	FS	2	Seed	Early	Corsica	15	4	27.13142966
Wye	2003	FS	2	Seed	Early	Corsica	15	5	66.67120351
Wye	2003	FS	2	Seed	Early	Corsica	15	6	0
Wye	2003	FS	2	Seed	Early	Corsica	15	7	0
Wye	2003	FS	2	LeafPost	Late	Bass	16	1	0
Wye	2003	FS	2	LeafPost	Late	Bass	16	2	1.91429576
Wye	2003	FS	2	LeafPost	Late	Bass	16	3	0
Wye	2003	FS	2	LeafPost	Late	Bass	16	4	9.978236663
Wye	2003	FS	2	LeafPost	Late	Bass	16	5	8.905622723
Wye	2003	FS	2	LeafPost	Late	Bass	16	6	0
Wye	2003	FS	2	LeafPost	Late	Bass	16	7	0.21776614
Wye	2003	FS	2	Seed	Late	Bass	16	1	2.74740326
Wye	2003	FS	2	Seed	Late	Bass	16	2	6.47846222
Wye	2003	FS	2	Seed	Late	Bass	16	3	0
Wye	2003	FS	2	Seed	Late	Bass	16	4	11.98464792
Wye	2003	FS	2	Seed	Late	Bass	16	5	44.2579957
Wye	2003	FS	2	Seed	Late	Bass	16	6	0
Wye	2003	FS	2	Seed	Late	Bass	16	7	0
Wye	2003	FS	2	Seed	Early	Bass	17	1	3.26369325
Wye	2003	FS	2	Seed	Early	Bass	17	2	8.57281508
Wye	2003	FS	2	Seed	Early	Bass	17	3	0
Wye	2003	FS	2	Seed	Early	Bass	17	4	17.43326362
Wye	2003	FS	2	Seed	Early	Bass	17	5	65.34253092
Wye	2003	FS	2	Seed	Early	Bass	17	6	0
Wye	2003	FS	2	Seed	Early	Bass	17	7	0
Wye	2003	FS	2	LeafPost	Late	Bass	18	1	0
Wye	2003	FS	2	LeafPost	Late	Bass	18	2	1.24561952
Wye	2003	FS	2	LeafPost	Late	Bass	18	3	0
Wye	2003	FS	2	LeafPost	Late	Bass	18	4	0

Wye	2003	FS	2	LeafPost	Late	Bass	18	5	2.190787836	
Wye	2003	FS	2	LeafPost	Late	Bass	18	6	0	
Wye	2003	FS	2	LeafPost	Late	Bass	18	7	0	
Wye	2003	FS	2	LeafPost	Late	Williams82		19	1	0
Wye	2003	FS	2	LeafPost	Late	Williams82		19	2	2.02368698
Wye	2003	FS	2	LeafPost	Late	Williams82		19	3	0
Wye	2003	FS	2	LeafPost	Late	Williams82		19	4	0
Wye	2003	FS	2	LeafPost	Late	Williams82		19	5	3.937579774
Wye	2003	FS	2	LeafPost	Late	Williams82		19	6	0
Wye	2003	FS	2	LeafPost	Late	Williams82		19	7	0.19702094
Wye	2003	FS	2	LeafPost	Late	Williams82		20	1	0
Wye	2003	FS	2	LeafPost	Late	Williams82		20	2	3.35962496
Wye	2003	FS	2	LeafPost	Late	Williams82		20	3	0
Wye	2003	FS	2	LeafPost	Late	Williams82		20	4	8.642178692
Wye	2003	FS	2	LeafPost	Late	Williams82		20	5	13.25417574
Wye	2003	FS	2	LeafPost	Late	Williams82		20	6	0
Wye	2003	FS	2	LeafPost	Late	Williams82		20	7	0.317258972
Wye	2003	FS	2	Seed	Late	Williams82		20	1	5.74663567
Wye	2003	FS	2	Seed	Late	Williams82		20	2	13.17360674
Wye	2003	FS	2	Seed	Late	Williams82		20	3	0
Wye	2003	FS	2	Seed	Late	Williams82		20	4	33.03912852
Wye	2003	FS	2	Seed	Late	Williams82		20	5	94.07884403
Wye	2003	FS	2	Seed	Late	Williams82		20	6	0
Wye	2003	FS	2	Seed	Late	Williams82		20	7	0
Wye	2003	FS	2	Seed	Early	Williams82		21	1	5.93752769
Wye	2003	FS	2	Seed	Early	Williams82		21	2	14.63031542
Wye	2003	FS	2	Seed	Early	Williams82		21	3	0
Wye	2003	FS	2	Seed	Early	Williams82		21	4	30.62596222
Wye	2003	FS	2	Seed	Early	Williams82		21	5	89.14886924
Wye	2003	FS	2	Seed	Early	Williams82		21	6	0
Wye	2003	FS	2	Seed	Early	Williams82		21	7	0
Wye	2003	FS	2	LeafPost	Late	Jack	22	1	0	
Wye	2003	FS	2	LeafPost	Late	Jack	22	2	1.47255086	
Wye	2003	FS	2	LeafPost	Late	Jack	22	3	0	
Wye	2003	FS	2	LeafPost	Late	Jack	22	4	0	
Wye	2003	FS	2	LeafPost	Late	Jack	22	5	2.492477216	
Wye	2003	FS	2	LeafPost	Late	Jack	22	6	0	
Wye	2003	FS	2	LeafPost	Late	Jack	22	7	0	
Wye	2003	FS	2	Seed	Early	Jack	23	1	3.07044616	
Wye	2003	FS	2	Seed	Early	Jack	23	2	9.3428399	
Wye	2003	FS	2	Seed	Early	Jack	23	3	0	
Wye	2003	FS	2	Seed	Early	Jack	23	4	16.01701842	
Wye	2003	FS	2	Seed	Early	Jack	23	5	70.02661554	
Wye	2003	FS	2	Seed	Early	Jack	23	6	0	
Wye	2003	FS	2	Seed	Early	Jack	23	7	0	
Wye	2003	FS	2	LeafPost	Late	Jack	24	1	0	
Wye	2003	FS	2	LeafPost	Late	Jack	24	2	1.9387604	
Wye	2003	FS	2	LeafPost	Late	Jack	24	3	0	
Wye	2003	FS	2	LeafPost	Late	Jack	24	4	6.085132539	
Wye	2003	FS	2	LeafPost	Late	Jack	24	5	8.366701876	
Wye	2003	FS	2	LeafPost	Late	Jack	24	6	0	
Wye	2003	FS	2	LeafPost	Late	Jack	24	7	0.227019264	
Wye	2003	FS	2	Seed	Late	Jack	24	1	2.50361624	
Wye	2003	FS	2	Seed	Late	Jack	24	2	6.63334238	
Wye	2003	FS	2	Seed	Late	Jack	24	3	0	
Wye	2003	FS	2	Seed	Late	Jack	24	4	12.01814687	
Wye	2003	FS	2	Seed	Late	Jack	24	5	54.8116869	
Wye	2003	FS	2	Seed	Late	Jack	24	6	0	
Wye	2003	FS	2	Seed	Late	Jack	24	7	0	
Wye	2003	FS	3	LeafPost	Late	Williams82		25	1	0
Wye	2003	FS	3	LeafPost	Late	Williams82		25	2	2.13043826
Wye	2003	FS	3	LeafPost	Late	Williams82		25	3	0
Wye	2003	FS	3	LeafPost	Late	Williams82		25	4	7.560416618
Wye	2003	FS	3	LeafPost	Late	Williams82		25	5	9.013109389
Wye	2003	FS	3	LeafPost	Late	Williams82		25	6	0
Wye	2003	FS	3	LeafPost	Late	Williams82		25	7	0.293353236
Wye	2003	FS	3	Seed	Late	Williams82		25	1	5.80647234
Wye	2003	FS	3	Seed	Late	Williams82		25	2	14.30808956
Wye	2003	FS	3	Seed	Late	Williams82		25	3	0
Wye	2003	FS	3	Seed	Late	Williams82		25	4	27.20573287
Wye	2003	FS	3	Seed	Late	Williams82		25	5	79.80889992
Wye	2003	FS	3	Seed	Late	Williams82		25	6	0
Wye	2003	FS	3	Seed	Late	Williams82		25	7	0
Wye	2003	FS	3	LeafPost	Late	Williams82		26	1	0
Wye	2003	FS	3	LeafPost	Late	Williams82		26	2	1.7955785
Wye	2003	FS	3	LeafPost	Late	Williams82		26	3	0
Wye	2003	FS	3	LeafPost	Late	Williams82		26	4	0
Wye	2003	FS	3	LeafPost	Late	Williams82		26	5	3.561766109
Wye	2003	FS	3	LeafPost	Late	Williams82		26	6	0

Wye	2003	FS	3	LeafPost	Late	Williams82	26	7	0.196317324
Wye	2003	FS	3	Seed	Early	Williams82	27	1	5.31488822
Wye	2003	FS	3	Seed	Early	Williams82	27	2	12.39685994
Wye	2003	FS	3	Seed	Early	Williams82	27	3	0
Wye	2003	FS	3	Seed	Early	Williams82	27	4	41.39752095
Wye	2003	FS	3	Seed	Early	Williams82	27	5	77.55285802
Wye	2003	FS	3	Seed	Early	Williams82	27	6	0
Wye	2003	FS	3	Seed	Early	Williams82	27	7	0
Wye	2003	FS	3	Seed	Early	Corsica	28	1	4.52755076
Wye	2003	FS	3	Seed	Early	Corsica	28	2	9.01431158
Wye	2003	FS	3	Seed	Early	Corsica	28	3	0
Wye	2003	FS	3	Seed	Early	Corsica	28	4	19.88098349
Wye	2003	FS	3	Seed	Early	Corsica	28	5	48.0045069
Wye	2003	FS	3	Seed	Early	Corsica	28	6	0
Wye	2003	FS	3	Seed	Early	Corsica	28	7	0
Wye	2003	FS	3	LeafPost	Late	Corsica	29	1	0
Wye	2003	FS	3	LeafPost	Late	Corsica	29	2	1.1678855
Wye	2003	FS	3	LeafPost	Late	Corsica	29	3	0
Wye	2003	FS	3	LeafPost	Late	Corsica	29	4	0
Wye	2003	FS	3	LeafPost	Late	Corsica	29	5	2.574844887
Wye	2003	FS	3	LeafPost	Late	Corsica	29	6	0
Wye	2003	FS	3	LeafPost	Late	Corsica	29	7	0
Wye	2003	FS	3	LeafPost	Late	Corsica	30	1	0
Wye	2003	FS	3	LeafPost	Late	Corsica	30	2	1.63754642
Wye	2003	FS	3	LeafPost	Late	Corsica	30	3	0
Wye	2003	FS	3	LeafPost	Late	Corsica	30	4	9.061038445
Wye	2003	FS	3	LeafPost	Late	Corsica	30	5	7.850803603
Wye	2003	FS	3	LeafPost	Late	Corsica	30	6	0
Wye	2003	FS	3	LeafPost	Late	Corsica	30	7	0
Wye	2003	FS	3	Seed	Late	Corsica	30	1	4.97130289
Wye	2003	FS	3	Seed	Late	Corsica	30	2	9.8426
Wye	2003	FS	3	Seed	Late	Corsica	30	3	0
Wye	2003	FS	3	Seed	Late	Corsica	30	4	25.33075063
Wye	2003	FS	3	Seed	Late	Corsica	30	5	61.68172975
Wye	2003	FS	3	Seed	Late	Corsica	30	6	0
Wye	2003	FS	3	Seed	Late	Corsica	30	7	0
Wye	2003	FS	3	LeafPost	Late	Jack	31	1	0
Wye	2003	FS	3	LeafPost	Late	Jack	31	2	1.47781832
Wye	2003	FS	3	LeafPost	Late	Jack	31	3	0
Wye	2003	FS	3	LeafPost	Late	Jack	31	4	0
Wye	2003	FS	3	LeafPost	Late	Jack	31	5	2.453508936
Wye	2003	FS	3	LeafPost	Late	Jack	31	6	0
Wye	2003	FS	3	LeafPost	Late	Jack	31	7	0
Wye	2003	FS	3	LeafPost	Late	Jack	32	1	0
Wye	2003	FS	3	LeafPost	Late	Jack	32	2	1.9134029
Wye	2003	FS	3	LeafPost	Late	Jack	32	3	0
Wye	2003	FS	3	LeafPost	Late	Jack	32	4	7.412221418
Wye	2003	FS	3	LeafPost	Late	Jack	32	5	8.333013531
Wye	2003	FS	3	LeafPost	Late	Jack	32	6	0
Wye	2003	FS	3	LeafPost	Late	Jack	32	7	0.313244728
Wye	2003	FS	3	Seed	Late	Jack	32	1	2.9832397
Wye	2003	FS	3	Seed	Late	Jack	32	2	8.62840424
Wye	2003	FS	3	Seed	Late	Jack	32	3	0
Wye	2003	FS	3	Seed	Late	Jack	32	4	12.13531564
Wye	2003	FS	3	Seed	Late	Jack	32	5	49.49266634
Wye	2003	FS	3	Seed	Late	Jack	32	6	0
Wye	2003	FS	3	Seed	Late	Jack	32	7	0
Wye	2003	FS	3	Seed	Early	Jack	33	1	3.49944378
Wye	2003	FS	3	Seed	Early	Jack	33	2	11.93756282
Wye	2003	FS	3	Seed	Early	Jack	33	3	0
Wye	2003	FS	3	Seed	Early	Jack	33	4	15.06999663
Wye	2003	FS	3	Seed	Early	Jack	33	5	65.98897152
Wye	2003	FS	3	Seed	Early	Jack	33	6	0
Wye	2003	FS	3	Seed	Early	Jack	33	7	0
Wye	2003	FS	3	LeafPost	Late	Bass	34	1	0
Wye	2003	FS	3	LeafPost	Late	Bass	34	2	2.06469368
Wye	2003	FS	3	LeafPost	Late	Bass	34	3	0
Wye	2003	FS	3	LeafPost	Late	Bass	34	4	10.85593113
Wye	2003	FS	3	LeafPost	Late	Bass	34	5	9.866665472
Wye	2003	FS	3	LeafPost	Late	Bass	34	6	0
Wye	2003	FS	3	LeafPost	Late	Bass	34	7	0.165044652
Wye	2003	FS	3	Seed	Late	Bass	34	1	3.55851365
Wye	2003	FS	3	Seed	Late	Bass	34	2	9.76967666
Wye	2003	FS	3	Seed	Late	Bass	34	3	0
Wye	2003	FS	3	Seed	Late	Bass	34	4	16.2649197
Wye	2003	FS	3	Seed	Late	Bass	34	5	60.02014483
Wye	2003	FS	3	Seed	Late	Bass	34	6	0
Wye	2003	FS	3	Seed	Late	Bass	34	7	0
Wye	2003	FS	3	Seed	Early	Bass	35	1	3.81643251

Wye	2003	FS	3	Seed	Early	Bass	35	2	10.73824208
Wye	2003	FS	3	Seed	Early	Bass	35	3	0
Wye	2003	FS	3	Seed	Early	Bass	35	4	16.49115773
Wye	2003	FS	3	Seed	Early	Bass	35	5	59.82608938
Wye	2003	FS	3	Seed	Early	Bass	35	6	0
Wye	2003	FS	3	Seed	Early	Bass	35	7	0
Wye	2003	FS	3	LeafPost	Late	Bass	36	1	0
Wye	2003	FS	3	LeafPost	Late	Bass	36	2	1.24061702
Wye	2003	FS	3	LeafPost	Late	Bass	36	3	0
Wye	2003	FS	3	LeafPost	Late	Bass	36	4	0
Wye	2003	FS	3	LeafPost	Late	Bass	36	5	2.974222193
Wye	2003	FS	3	LeafPost	Late	Bass	36	6	0
Wye	2003	FS	3	LeafPost	Late	Bass	36	7	0

 Seed Constituent Analysis Data

Year	Farm	Field Type	Cultivar	Timing	FieldID	Rep	TotlWgt	Yield	HndSedWt	Protein	Oil
2002	P	D	BASS	c	1	1	839.0	44.8	17.1	41.4	20.8
2002	P	D	CORC	c	4	1	1596.6	42.6	17.7	42.6	20.4
2002	P	D	JACK	c	9	1	1079.5	28.8	15.0	41.9	20.0
2002	P	D	WM82	c	12	1	1374.4	36.7	19.6	43.4	20.0
2002	P	D	CORC	c	15	2	1421.1	37.9	20.0	44.1	19.6
2002	P	D	JACK	c	18	2	1560.4	41.7	18.6	42.1	21.2
2002	P	D	BASS	c	19	2	1560.4	41.7	19.2	42.2	20.3
2002	P	D	WM82	c	24	2	1156.7	30.9	14.3	41.1	20.8
2002	P	D	WM82	c	25	3	1496.9	40.0	18.2	41.7	20.4
2002	P	D	CORC	c	30	3	1691.9	45.2	19.9	43.4	20.0
2002	P	D	JACK	c	32	3	1174.8	31.4	15.1	40.8	21.2
2002	P	D	BASS	c	35	3	1805.3	48.2	17.6	41.5	21.2
2002	P	D	BASS	e	3	1	1660.1	44.3	17.4	41.0	21.4
2002	P	D	CORC	e	6	1	1623.9	43.4	17.9	42.0	21.0
2002	P	D	JACK	e	7	1	807.4	43.1	15.2	41.5	20.1
2002	P	D	WM82	e	11	1	1687.4	45.1	19.1	43.3	20.2
2002	P	D	CORC	e	14	2	1746.4	46.6	19.1	42.8	20.1
2002	P	D	JACK	e	17	2	1623.9	43.4	17.5	42.1	21.1
2002	P	D	BASS	e	21	2	1651.1	44.1	17.7	41.4	20.6
2002	P	D	WM82	e	23	2	1056.9	28.2	15.2	41.3	21.0
2002	P	D	WM82	e	27	3	1161.2	31.0	18.0	41.1	20.8
2002	P	D	CORC	e	29	3	1646.5	44.0	19.5	43.9	19.7
2002	P	D	JACK	e	33	3	1220.2	32.6	15.2	40.8	21.4
2002	P	D	BASS	e	36	3	1723.7	46.0	17.2	42.0	20.6
2002	P	D	BASS	l	2	1	.	.	18.2	41.4	21.5
2002	P	D	CORC	l	5	1	1642.0	43.8	17.7	42.2	20.5
2002	P	D	JACK	l	8	1	1165.7	31.1	15.1	41.7	19.9
2002	P	D	WM82	l	10	1	1741.8	46.5	19.3	44.1	19.2
2002	P	D	CORC	l	13	2	1664.7	44.4	19.1	44.0	19.6
2002	P	D	JACK	l	16	2	1655.6	44.2	17.4	41.8	20.8
2002	P	D	BASS	l	20	2	1374.4	36.7	17.7	41.8	20.6
2002	P	D	WM82	l	22	2	1270.1	33.9	15.4	41.9	20.4
2002	P	D	WM82	l	26	3	1755.4	46.9	17.8	41.3	21.4
2002	P	D	CORC	l	28	3	1782.6	47.6	18.4	43.9	19.7
2002	P	D	JACK	l	31	3	1297.3	34.6	15.5	40.5	21.0
2002	P	D	BASS	l	34	3	.	.	17.8	41.7	21.5
2002	P	F	WM82	e	2	1	643.3	32.2	14.3	41.3	20.4
2002	P	F	BASS	e	5	1	358.3	17.9	9.3	40.7	20.3
2002	P	F	JACK	e	7	1	525.1	26.3	8.5	41.1	19.4
2002	P	F	CORC	e	10	1	714.5	35.7	14.1	42.2	20.0
2002	P	F	CORC	e	14	2	809.1	40.5	13.3	41.3	21.0
2002	P	F	BASS	e	16	2	386.4	19.3	9.9	40.1	21.3
2002	P	F	WM82	e	19	2	535.9	26.8	14.6	41.3	21.1
2002	P	F	JACK	e	22	2	690.4	34.5	8.6	40.4	19.3
2002	P	F	WM82	e	26	3	654.8	32.7	13.5	40.8	21.2
2002	P	F	CORC	e	28	3	718.0	35.9	13.6	41.7	20.9
2002	P	F	JACK	e	31	3	601.5	30.1	9.1	41.0	19.5
2002	P	F	BASS	e	34	3	751.6	37.6	10.2	39.0	22.3
2002	P	F	WM82	l	1	1	504.0	25.2	12.7	41.3	20.7
2002	P	F	BASS	l	4	1	390.0	19.5	10.2	40.9	20.8
2002	P	F	JACK	l	9	1	561.0	28.1	10.9	40.9	20.4
2002	P	F	CORC	l	12	1	713.7	35.7	13.4	41.4	20.7
2002	P	F	CORC	l	15	2	777.2	38.9	15.1	41.1	21.1
2002	P	F	BASS	l	17	2	349.0	17.5	8.5	40.9	20.3
2002	P	F	WM82	l	21	2	508.0	25.4	15.1	41.3	21.2
2002	P	F	JACK	l	23	2	708.9	35.4	9.4	40.6	19.6
2002	P	F	WM82	l	27	3	618.2	30.9	12.8	41.4	20.9
2002	P	F	CORC	l	30	3	666.3	33.3	13.4	41.6	20.5
2002	P	F	JACK	l	32	3	703.8	35.2	8.9	41.0	19.8
2002	P	F	BASS	l	35	3	586.5	29.3	10.3	40.1	21.5
2002	P	F	WM82	c	3	1	416.0	20.8	13.0	41.9	20.3
2002	P	F	BASS	c	6	1	356.2	17.8	9.7	41.7	19.3
2002	P	F	JACK	c	8	1	533.5	26.7	10.1	40.8	19.7
2002	P	F	CORC	c	11	1	718.0	35.9	14.6	42.2	20.3
2002	P	F	CORC	c	13	2	798.9	39.9	14.0	40.9	20.7
2002	P	F	BASS	c	18	2	396.0	19.8	10.1	40.2	21.2
2002	P	F	WM82	c	20	2	389.0	19.5	11.3	41.7	20.5
2002	P	F	JACK	c	24	2	685.3	34.3	10.2	40.1	20.5
2002	P	F	WM82	c	25	3	590.1	29.5	13.3	40.8	21.7
2002	P	F	CORC	c	29	3	568.6	28.4	13.2	41.6	20.6
2002	P	F	JACK	c	33	3	674.4	33.7	9.1	41.6	19.8
2002	P	F	BASS	c	36	3	557.1	27.9	9.5	40.7	20.6
2002	W	D	CORC	c	2	1	.	.	16.3	42.5	19.6

2002	W	D	WM82	c	6	1	.	.	10.5	40.7	19.2
2002	W	D	JACK	c	9	1	.	.	13.2	42.8	19.5
2002	W	D	BASS	c	10	1	.	.	13.9	42.4	19.8
2002	W	D	WM82	c	13	2	.	.	8.0	41.1	20.1
2002	W	D	JACK	c	18	2	.	.	12.4	41.5	20.3
2002	W	D	CORC	c	19	2	.	.	14.1	42.0	20.1
2002	W	D	BASS	c	23	2	.	.	14.9	42.9	19.0
2002	W	D	CORC	c	27	3	.	.	12.9	42.2	19.9
2002	W	D	BASS	c	29	3	.	.	14.5	42.7	19.3
2002	W	D	JACK	c	33	3	.	.	10.3	40.9	20.2
2002	W	D	WM82	c	35	3	.	.	14.7	42.4	19.9
2002	W	D	CORC	e	1	1	.	.	14.7	41.9	19.1
2002	W	D	WM82	e	5	1	.	.	10.7	40.4	19.8
2002	W	D	JACK	e	7	1	.	.	12.3	41.4	19.5
2002	W	D	BASS	e	11	1	.	.	12.9	42.0	20.0
2002	W	D	WM82	e	14	2	.	.	10.7	41.0	20.3
2002	W	D	JACK	e	16	2	.	.	12.2	42.1	19.4
2002	W	D	CORC	e	20	2	.	.	13.4	42.2	20.0
2002	W	D	BASS	e	22	2	.	.	14.8	43.6	18.6
2002	W	D	CORC	e	25	3	.	.	5.5	42.3	21.5
2002	W	D	BASS	e	28	3	.	.	14.1	42.1	21.1
2002	W	D	JACK	e	32	3	.	.	5.6	41.2	22.0
2002	W	D	WM82	e	34	3	.	.	14.7	43.2	18.9
2002	W	D	CORC	l	3	1	.	.	13.1	43.1	19.1
2002	W	D	WM82	l	4	1	.	.	10.0	41.8	19.6
2002	W	D	JACK	l	8	1	.	.	11.5	40.6	20.0
2002	W	D	BASS	l	12	1	.	.	12.7	43.8	19.1
2002	W	D	WM82	l	15	2	.	.	10.8	41.8	19.5
2002	W	D	JACK	l	17	2	.	.	11.6	41.6	19.7
2002	W	D	CORC	l	21	2	.	.	12.6	41.9	19.5
2002	W	D	BASS	l	24	2	.	.	14.9	41.8	19.1
2002	W	D	CORC	l	26	3	.	.	13.5	42.3	19.1
2002	W	D	BASS	l	30	3	.	.	12.5	41.2	19.5
2002	W	D	JACK	l	31	3	.	.	10.3	41.5	19.1
2002	W	D	WM82	l	36	3	.	.	14.0	42.6	20.1
2002	W	F	CORC	e	3	1	490.8	24.5	13.4	43.1	20.2
2002	W	F	JACK	e	5	1	723.8	36.2	7.2	41.1	16.9
2002	W	F	BASS	e	7	1	1183.8	59.2	10.9	38.2	22.5
2002	W	F	WM82	e	12	1	1075.9	53.8	14.8	42.5	20.4
2002	W	F	JACK	e	13	2	330.3	16.5	9.7	38.5	20.8
2002	W	F	BASS	e	16	2	897.6	44.9	12.2	39.9	22.1
2002	W	F	WM82	e	20	2	1214.3	60.7	15.5	42.4	20.4
2002	W	F	CORC	e	23	2	784.5	39.2	13.4	43.9	20.5
2002	W	F	BASS	e	27	3	485.9	24.3	10.2	44.0	19.5
2002	W	F	WM82	e	29	3	764.2	38.2	13.6	44.6	19.3
2002	W	F	CORC	e	32	3	334.2	16.7	7.1	44.0	16.0
2002	W	F	JACK	e	35	3	767.8	38.4	14.1	45.1	19.6
2002	W	F	CORC	l	1	1	1007.3	50.4	13.6	43.5	20.2
2002	W	F	JACK	l	6	1	843.8	42.2	8.4	40.3	19.0
2002	W	F	BASS	l	9	1	844.8	42.2	11.3	39.9	21.9
2002	W	F	WM82	l	10	1	946.7	47.3	13.7	42.8	20.6
2002	W	F	JACK	l	14	2	717.1	35.9	9.5	40.6	19.5
2002	W	F	BASS	l	17	2	703.6	35.2	9.6	40.1	21.5
2002	W	F	WM82	l	19	2	1040.9	52.0	14.3	42.5	20.0
2002	W	F	CORC	l	24	2	1029.4	51.5	13.9	43.9	20.2
2002	W	F	BASS	l	26	3	684.2	34.2	11.7	42.6	20.3
2002	W	F	WM82	l	30	3	948.4	47.4	13.2	44.1	20.2
2002	W	F	CORC	l	33	3	479.6	24.0	7.9	41.2	17.9
2002	W	F	JACK	l	34	3	692.0	34.6	12.6	45.4	19.9
2002	W	F	CORC	c	2	1	1050.5	52.5	14.1	43.6	20.5
2002	W	F	JACK	c	4	1	694.0	34.7	7.5	42.5	17.5
2002	W	F	BASS	c	8	1	760.8	38.0	9.7	40.6	21.0
2002	W	F	WM82	c	11	1	1051.6	52.6	14.8	43.2	20.3
2002	W	F	JACK	c	15	2	232.6	11.6	7.0	42.1	17.2
2002	W	F	BASS	c	18	2	1095.0	54.8	10.4	38.5	22.3
2002	W	F	WM82	c	21	2	968.7	48.4	14.3	44.4	19.3
2002	W	F	CORC	c	22	2	357.7	17.9	12.9	45.2	18.9
2002	W	F	BASS	c	25	3	753.1	37.7	12.6	43.3	20.3
2002	W	F	WM82	c	28	3	748.5	37.4	12.7	45.5	19.0
2002	W	F	CORC	c	31	3	489.4	24.5	8.0	42.5	17.2
2002	W	F	JACK	c	36	3	910.7	45.5	15.7	44.7	19.9
2003	P	D	CORC	c	3	1	671.3	35.8	15.8	41.6	19.3
2003	P	D	WM82	c	4	1	997.9	26.6	15.1	40.0	19.4
2003	P	D	JACK	c	8	1	1451.5	38.8	12.6	38.1	21.2
2003	P	D	BASS	c	11	1	1619.3	43.2	13.5	40.0	21.3
2003	P	D	WM82	c	13	2	1102.2	29.4	15.3	39.9	20.1
2003	P	D	JACK	c	18	2	1551.3	41.4	12.4	36.0	20.7
2003	P	D	CORC	c	19	2	1823.4	48.7	15.6	39.8	19.6
2003	P	D	BASS	c	22	2	1324.5	35.4	13.2	38.5	20.4

2003	P	D	CORC	c	26	3	1905.1	50.9	15.4	40.6	19.5
2003	P	D	BASS	c	29	3	1655.6	44.2	13.2	40.5	21.6
2003	P	D	JACK	c	31	3	1392.5	37.2	11.7	37.7	21.1
2003	P	D	WM82	c	34	3	1437.9	38.4	15.2	39.8	19.7
2003	P	D	CORC	e	2	1	1214.3	32.4	15.6	41.9	18.9
2003	P	D	WM82	e	6	1	1124.9	30.0	14.6	41.0	19.6
2003	P	D	JACK	e	7	1	1238.3	33.1	11.4	36.0	21.1
2003	P	D	BASS	e	10	1	775.6	20.7	13.0	39.9	20.0
2003	P	D	WM82	e	14	2	1419.7	37.9	14.4	39.5	19.6
2003	P	D	JACK	e	16	2	1115.8	29.8	12.0	37.8	20.4
2003	P	D	CORC	e	21	2	1669.2	44.6	14.7	40.5	19.6
2003	P	D	BASS	e	23	2	1020.6	27.3	13.3	39.6	20.5
2003	P	D	CORC	e	25	3	1292.7	34.5	14.3	40.4	19.0
2003	P	D	BASS	e	28	3	1233.7	32.9	12.5	38.9	19.9
2003	P	D	JACK	e	32	3	1542.2	41.2	12.0	38.6	20.1
2003	P	D	WM82	e	36	3	1115.8	29.8	14.9	39.6	20.0
2003	P	D	CORC	l	1	1	1311.5	35.0	15.9	40.9	20.0
2003	P	D	WM82	l	5	1	1061.4	28.3	14.6	39.6	20.0
2003	P	D	JACK	l	9	1	1528.6	40.8	12.3	38.2	20.7
2003	P	D	BASS	l	12	1	807.4	21.6	13.9	39.7	19.9
2003	P	D	WM82	l	15	2	1292.7	34.5	15.1	38.5	20.2
2003	P	D	JACK	l	17	2	1487.8	39.7	12.7	37.1	21.3
2003	P	D	CORC	l	20	2	1841.6	49.2	15.4	40.3	21.0
2003	P	D	BASS	l	24	2	743.9	19.9	12.7	39.2	20.5
2003	P	D	CORC	l	27	3	1714.6	45.8	15.3	40.5	20.1
2003	P	D	BASS	l	30	3	1601.2	42.8	12.5	39.0	19.8
2003	P	D	JACK	l	33	3	1759.9	47.0	13.0	36.9	20.9
2003	P	D	WM82	l	35	3	1841.6	49.2	15.4	38.0	20.1
2003	P	F	WM82	e	2	1	50.5	.	15.1	42.7	20.7
2003	P	F	BASS	e	5	1	49.1	.	13.1	41.1	22.3
2003	P	F	JACK	e	7	1	49.1	.	14.9	41.8	22.0
2003	P	F	CORC	e	10	1	51.0	.	15.4	41.7	21.7
2003	P	F	CORC	e	14	2	51.0	.	13.7	41.0	22.2
2003	P	F	BASS	e	16	2	50.7	.	13.2	41.8	21.7
2003	P	F	WM82	e	19	2	49.2	.	14.1	41.6	21.1
2003	P	F	JACK	e	22	2	50.3	.	16.6	43.2	20.7
2003	P	F	WM82	e	26	3	49.4	.	12.5	41.8	20.8
2003	P	F	CORC	e	28	3	51.1	.	14.3	41.5	21.0
2003	P	F	JACK	e	31	3	49.4	.	13.6	41.4	22.0
2003	P	F	BASS	e	34	3	.	.	14.8	42.1	20.7
2003	P	F	WM82	l	1	1	50.0	.	17.1	41.1	20.9
2003	P	F	BASS	l	4	1	50.4	.	14.5	41.8	21.8
2003	P	F	JACK	l	9	1	51.0	.	14.4	41.1	21.8
2003	P	F	CORC	l	12	1	49.6	.	14.7	41.8	21.1
2003	P	F	CORC	l	15	2	50.5	.	13.2	41.7	22.0
2003	P	F	BASS	l	17	2	50.7	.	14.3	41.9	21.0
2003	P	F	WM82	l	21	2	49.5	.	15.0	41.5	21.4
2003	P	F	JACK	l	23	2	50.6	.	15.5	42.1	20.6
2003	P	F	WM82	l	27	3	49.8	.	13.0	41.3	21.5
2003	P	F	CORC	l	30	3	49.7	.	15.0	41.6	21.4
2003	P	F	JACK	l	32	3	50.9	.	14.5	41.2	22.1
2003	P	F	BASS	l	35	3	.	.	14.7	42.3	21.0
2003	P	F	WM82	e	3	1	50.3	.	16.7	42.5	20.8
2003	P	F	BASS	c	6	1	50.1	.	13.8	41.5	21.7
2003	P	F	JACK	e	8	1	50.6	.	13.1	41.2	21.7
2003	P	F	CORC	c	11	1	50.4	.	15.0	41.7	21.0
2003	P	F	CORC	e	13	2	51.0	.	13.6	41.3	21.9
2003	P	F	BASS	c	18	2	49.8	.	14.8	42.6	20.7
2003	P	F	WM82	c	20	2	50.1	.	15.9	41.6	21.2
2003	P	F	JACK	l	24	2	50.5	.	15.3	42.3	21.5
2003	P	F	WM82	c	25	3	50.9	.	14.8	42.3	21.3
2003	P	F	CORC	c	29	3	51.1	.	15.2	41.9	21.3
2003	P	F	JACK	l	33	3	49.6	.	12.8	42.3	21.6
2003	P	F	BASS	c	36	3	.	.	16.6	42.0	21.2
2003	W	D	BASS	c	1	1	1564.9	41.8	14.4	40.4	20.5
2003	W	D	CORC	c	5	1	1737.3	46.4	16.7	41.6	19.4
2003	W	D	JACK	c	8	1	1437.1	38.4	13.8	39.5	20.0
2003	W	D	WM82	c	10	1	1378.9	36.8	17.0	39.9	19.0
2003	W	D	CORC	c	15	2	1496.9	40.0	15.2	39.6	20.0
2003	W	D	JACK	c	18	2	1596.6	42.6	13.7	37.8	20.0
2003	W	D	BASS	c	21	2	1601.2	42.8	13.5	40.1	19.0
2003	W	D	WM82	c	24	2	1564.9	41.8	16.5	40.5	19.0
2003	W	D	WM82	c	26	3	1546.7	41.3	17.4	40.4	19.0
2003	W	D	CORC	c	30	3	1036.6	27.7	16.4	41.5	18.8
2003	W	D	JACK	c	31	3	1469.6	39.2	14.0	40.8	18.7
2003	W	D	BASS	c	36	3	1583.0	42.3	14.1	39.6	19.6
2003	W	D	BASS	e	2	1	1310.0	35.0	13.3	40.3	19.2
2003	W	D	CORC	e	6	1	1297.3	34.6	15.6	40.9	18.5
2003	W	D	JACK	e	9	1	1043.3	27.9	12.3	39.1	19.7

2003	W	D	WM82	e	12	1	1016.0	27.1	16.4	40.5	21.6
2003	W	D	CORC	e	13	2	1451.5	38.8	15.8	40.3	19.5
2003	W	D	JACK	e	16	2	1070.5	28.6	12.9	38.6	19.8
2003	W	D	BASS	e	20	2	1174.8	31.4	12.5	39.2	19.6
2003	W	D	WM82	e	22	2	1342.6	35.8	15.8	39.6	20.1
2003	W	D	WM82	e	25	3	1106.8	29.6	16.0	40.2	19.4
2003	W	D	CORC	e	28	3	1356.2	36.2	15.9	42.0	17.9
2003	W	D	JACK	e	33	3	1233.8	32.9	12.7	40.4	20.2
2003	W	D	BASS	e	35	3	1279.1	34.2	13.0	39.4	19.5
2003	W	D	BASS	l	3	1	1283.7	34.3	13.6	40.3	21.3
2003	W	D	CORC	l	4	1	.	.	16.8	41.1	18.3
2003	W	D	JACK	l	7	1	1024.1	27.3	12.9	40.4	18.0
2003	W	D	WM82	l	11	1	1251.9	33.4	15.6	40.5	19.1
2003	W	D	CORC	l	14	2	1846.1	49.3	17.2	41.4	18.5
2003	W	D	JACK	l	17	2	1088.7	29.1	13.0	39.6	19.4
2003	W	D	BASS	l	19	2	1233.8	32.9	12.1	38.6	19.9
2003	W	D	WM82	l	23	2	1134.0	30.3	15.1	39.7	19.5
2003	W	D	WM82	l	27	3	1456.0	38.9	15.2	41.2	18.7
2003	W	D	CORC	l	29	3	1288.2	34.4	15.8	41.9	18.8
2003	W	D	JACK	l	32	3	1233.8	32.9	13.2	40.7	18.5
2003	W	D	BASS	l	34	3	1324.5	35.4	12.6	39.8	19.2
2003	W	F	CORC	e	3	1	846.2	22.6	14.0	41.3	20.7
2003	W	F	JACK	e	5	1	367.7	9.8	13.3	40.6	21.3
2003	W	F	BASS	e	7	1	1434.2	38.3	12.7	41.6	20.7
2003	W	F	WM82	e	12	1	941.7	25.1	14.7	42.3	19.8
2003	W	F	JACK	e	13	2	1271.4	33.9	12.7	41.7	20.1
2003	W	F	BASS	e	16	2	1083.6	28.9	11.3	40.2	20.7
2003	W	F	WM82	e	20	2	1258.8	33.6	14.0	40.6	20.7
2003	W	F	CORC	e	23	2	1661.9	44.4	12.0	42.1	20.1
2003	W	F	BASS	e	27	3	1491.2	39.8	14.1	43.1	19.4
2003	W	F	WM82	e	29	3	1885.1	50.3	14.2	41.9	20.6
2003	W	F	CORC	e	32	3	1220.9	32.6	10.9	41.2	19.8
2003	W	F	JACK	e	35	3	1624.4	43.4	12.4	42.0	20.9
2003	W	F	CORC	l	1	1	565.6	15.1	13.4	40.4	20.8
2003	W	F	JACK	l	6	1	423.8	11.3	12.5	41.0	20.6
2003	W	F	BASS	l	9	1	1563.7	41.8	13.7	40.7	21.5
2003	W	F	WM82	l	10	1	.	.	15.9	43.1	19.6
2003	W	F	JACK	l	14	2	1718.2	45.9	14.0	41.8	20.8
2003	W	F	BASS	l	17	2	1559.7	41.6	12.3	41.4	21.1
2003	W	F	WM82	l	19	2	1528.8	40.8	15.2	41.8	20.6
2003	W	F	CORC	l	24	2	558.4	14.9	10.8	40.9	20.1
2003	W	F	BASS	l	26	3	1677.9	44.8	15.1	42.3	21.0
2003	W	F	WM82	l	30	3	1326.7	35.4	12.4	40.8	20.7
2003	W	F	CORC	l	33	3	1749.5	46.7	12.5	41.7	20.7
2003	W	F	JACK	l	34	3	1161.8	31.0	10.9	39.6	21.2
2003	W	F	CORC	c	2	1	768.2	20.5	15.9	40.8	21.1
2003	W	F	JACK	l	4	1	366.4	9.8	12.4	39.8	21.9
2003	W	F	BASS	l	8	1	1440.2	38.5	11.9	41.4	20.3
2003	W	F	WM82	l	11	1	.	.	13.1	40.9	20.3
2003	W	F	JACK	e	15	2	1799.0	48.0	15.0	41.6	21.0
2003	W	F	BASS	c	18	2	1258.1	33.6	12.8	41.7	20.6
2003	W	F	WM82	e	21	2	1539.5	41.1	15.8	41.1	20.5
2003	W	F	CORC	c	22	2	1633.4	43.6	12.5	42.0	20.4
2003	W	F	BASS	l	25	3	537.6	14.4	12.8	40.8	21.0
2003	W	F	WM82	e	28	3	1955.5	52.2	14.2	41.7	21.3
2003	W	F	CORC	c	31	3	1686.2	45.0	12.6	42.4	19.9
2003	W	F	JACK	c	36	3	1521.5	40.6	12.2	44.2	21.2

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