



Influence of Compost Amendment on Shear Properties of Topsoils Used in Highway Slopes



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Introduction

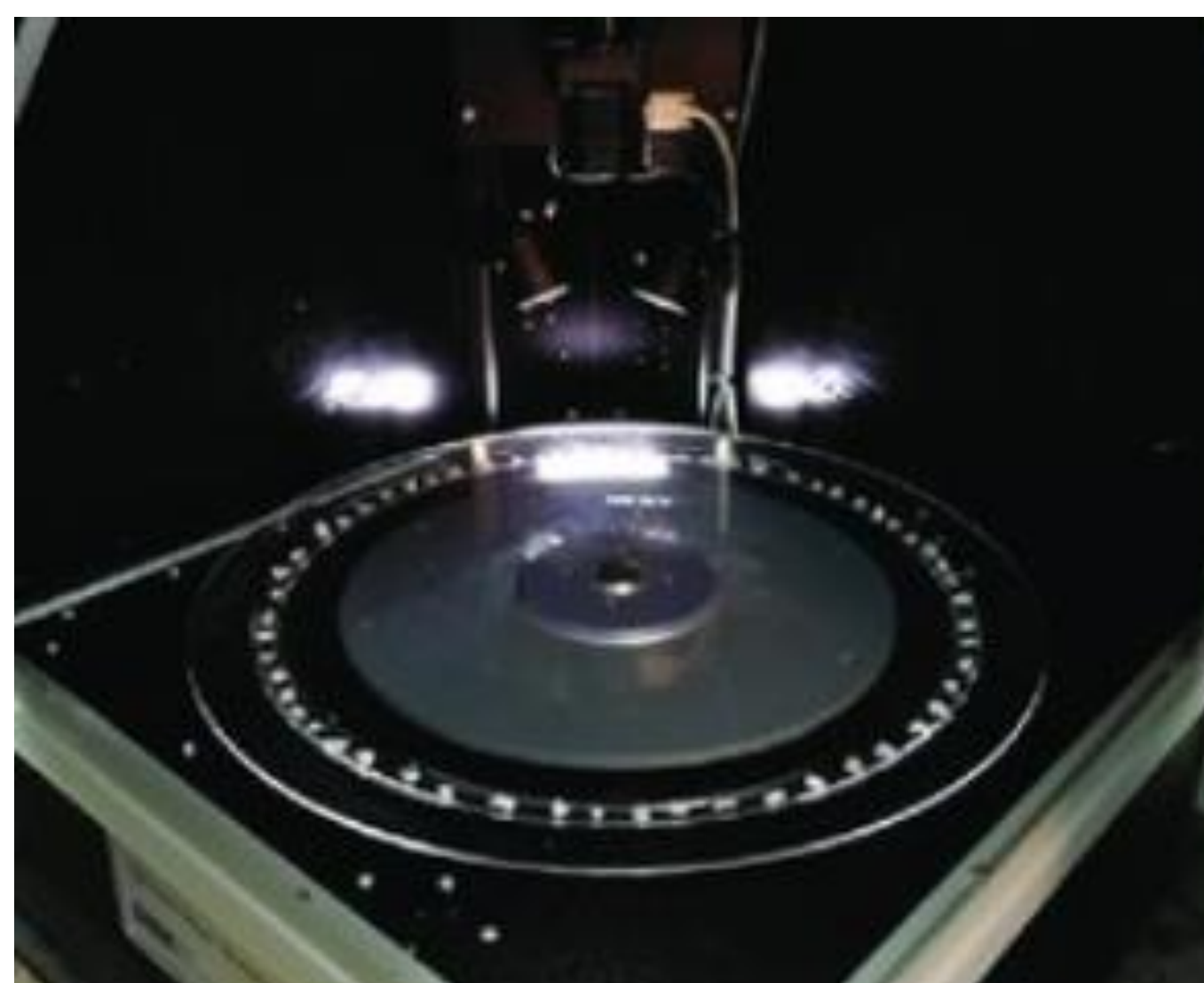
- The topsoil on highway slopes can be susceptible to erosion
- If blended with compost materials, may potentially yield vegetation that reinforces the strength of the soil

Research Questions

- Can compost addition decrease topsoil erosion?
- Do the shapes of the compost particles effect the erosion decrease?
- What shape parameters are more likely to cause erosion decrease?

Materials and Methods

- Two composts, biosolids and Leafgro, were blended with local topsoil to create four mixtures
- **Direct shear tests** were performed on pure topsoil, composts and the mixtures
- **Image analysis** was conducted with the Aggregate Image Measurement System pictured below to define the shape parameters



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Addition of **compost** increases the **shear strength** of topsoil due to compost shape parameters.



What are Shape Parameters?

Parameter	Definition	Visual Representation
Angularity	Angle of orientation of the edge points	
Form 2D	Change in Radius throughout particle	
Texture	Grain Size and Roughness of particle	
Sphericity	How close particle shape is to a sphere	
Flatness	Ratio of the particle thickness and width	
Elongation	Ratio of the particle thickness and length	

Note: Taken from Bagheri, G., & Bonadonna, C. (2016). On the drag of freely falling non-spherical particles.

Results

Friction Angle v. Angularity

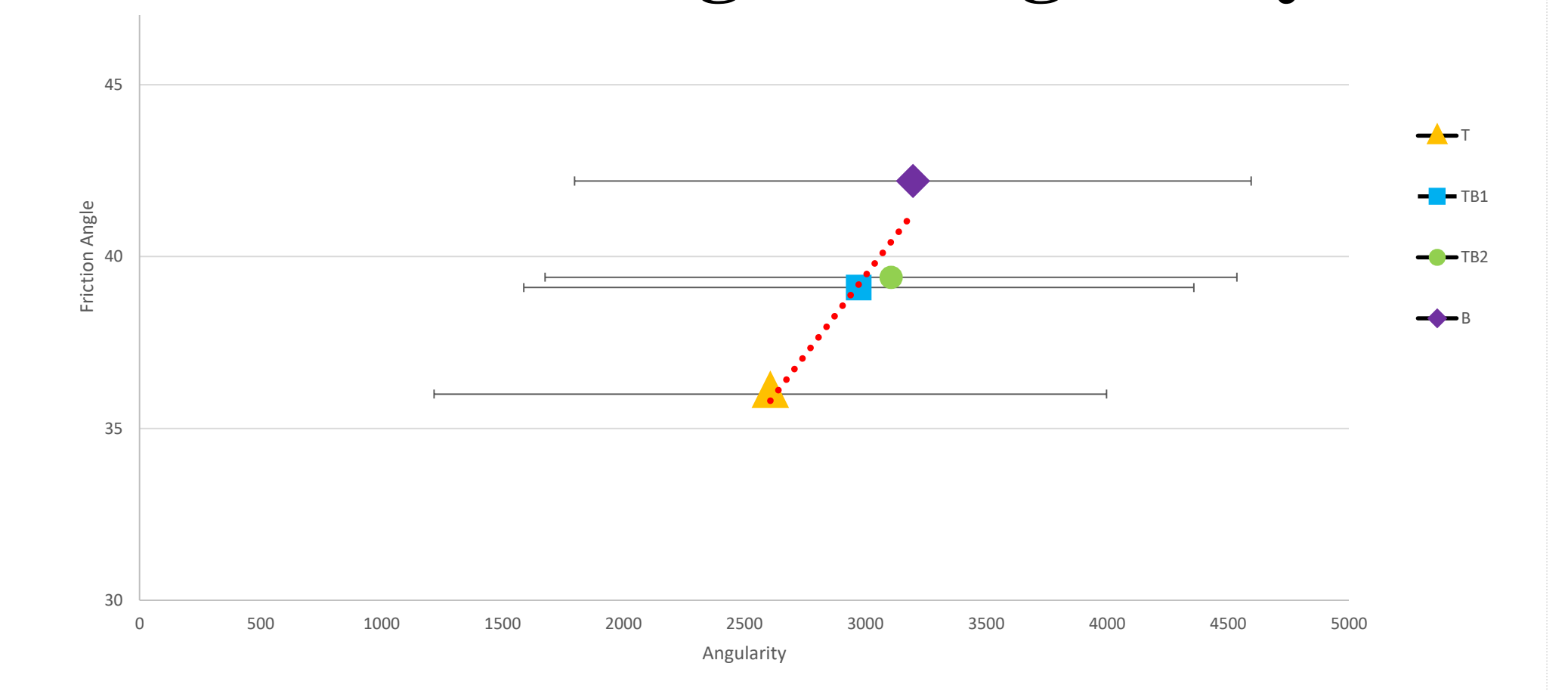


Figure 3: Biosolids angularity v. friction angle shows high correlation with R^2 of 0.8977. Leafgro displayed R^2 of 0.891.

Friction Angle v. Form 2D

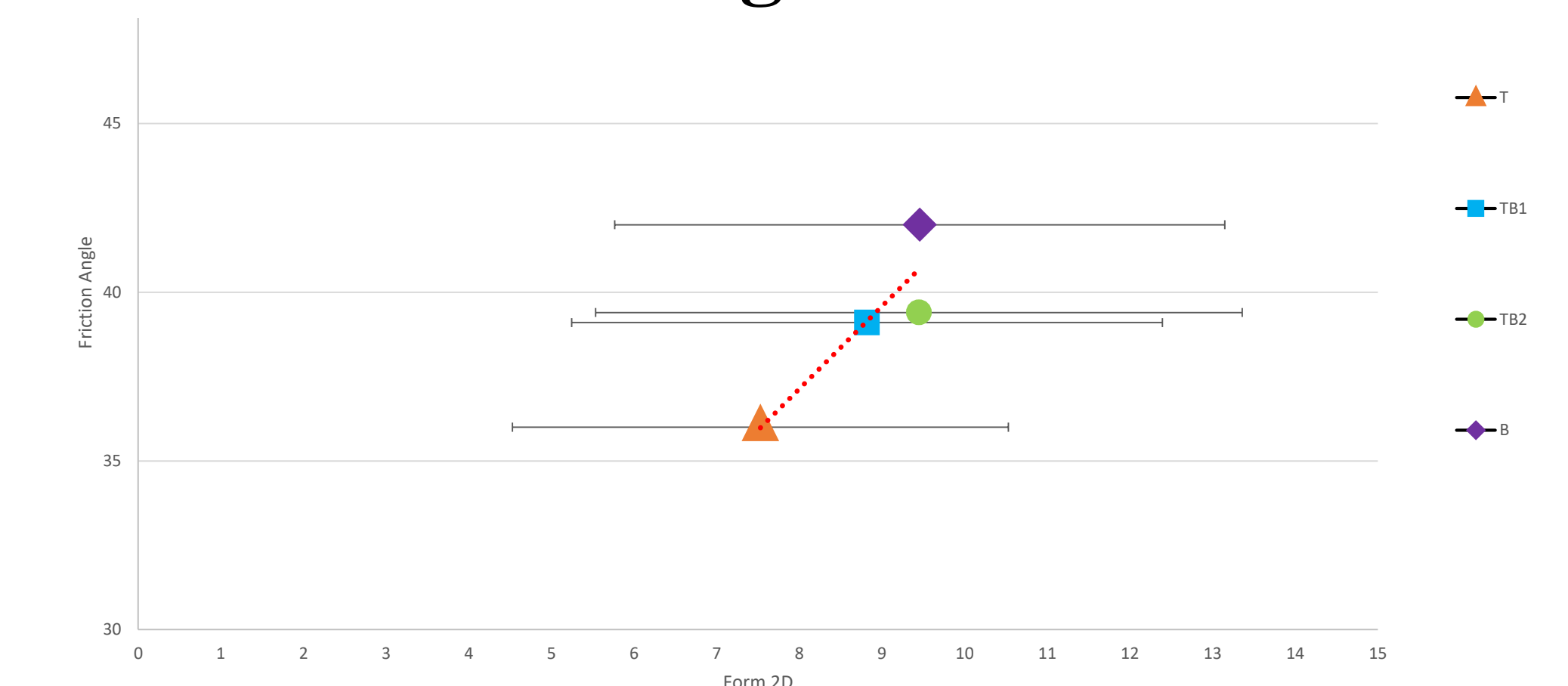
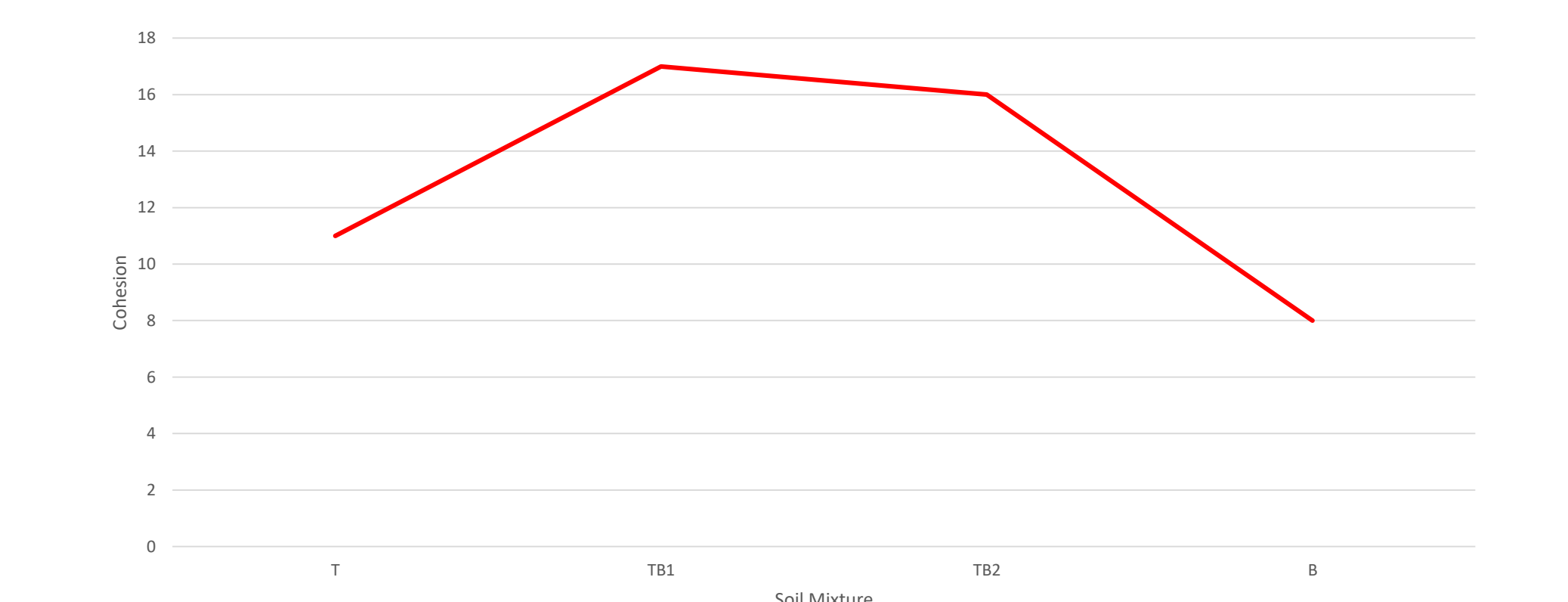
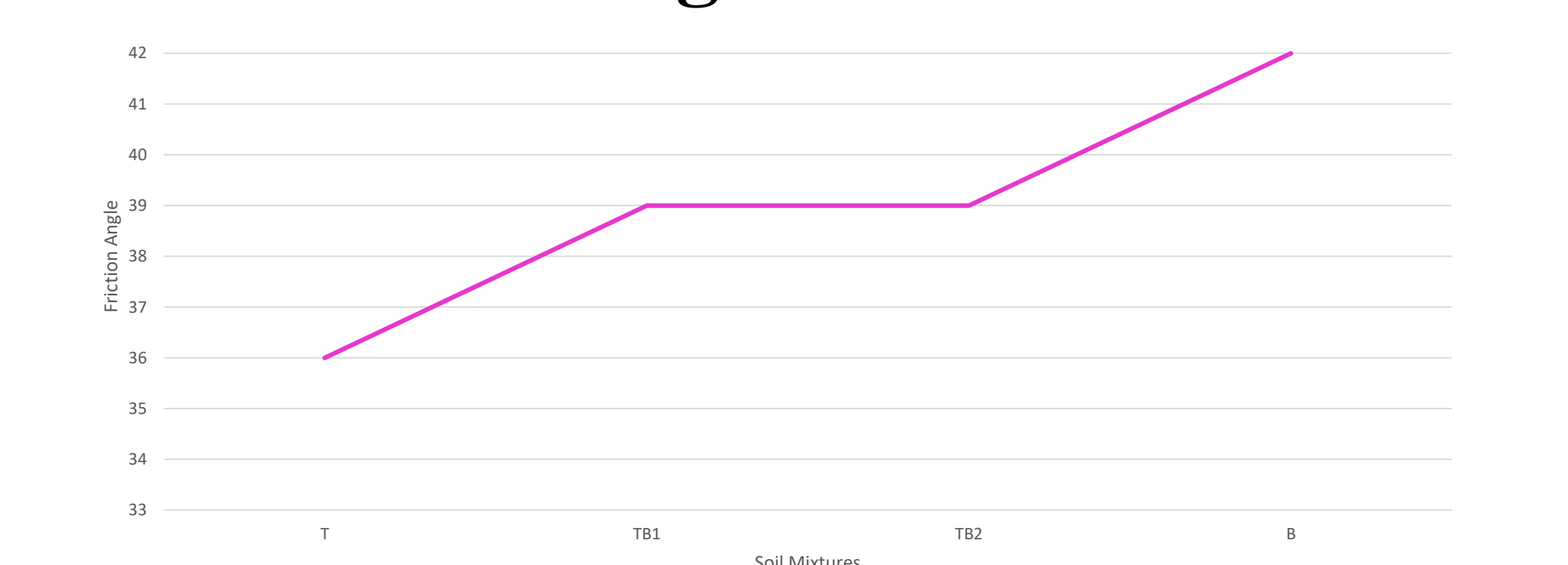


Figure 4: Biosolids Form2D v. friction angle shows high correlation with R^2 of 0.8164. Leafgro displayed R^2 of 0.9381.

Cohesion v. Soil Mixtures



Friction Angle v. Soil Mixtures



Discussion

- Effective friction angle and effective cohesion values of soil mixtures were higher than that of topsoil