

Effect of Surfactant Seed Coating on Ryegrass Biomass Grown in Hydrophobic Sand



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The objectives of this study were:

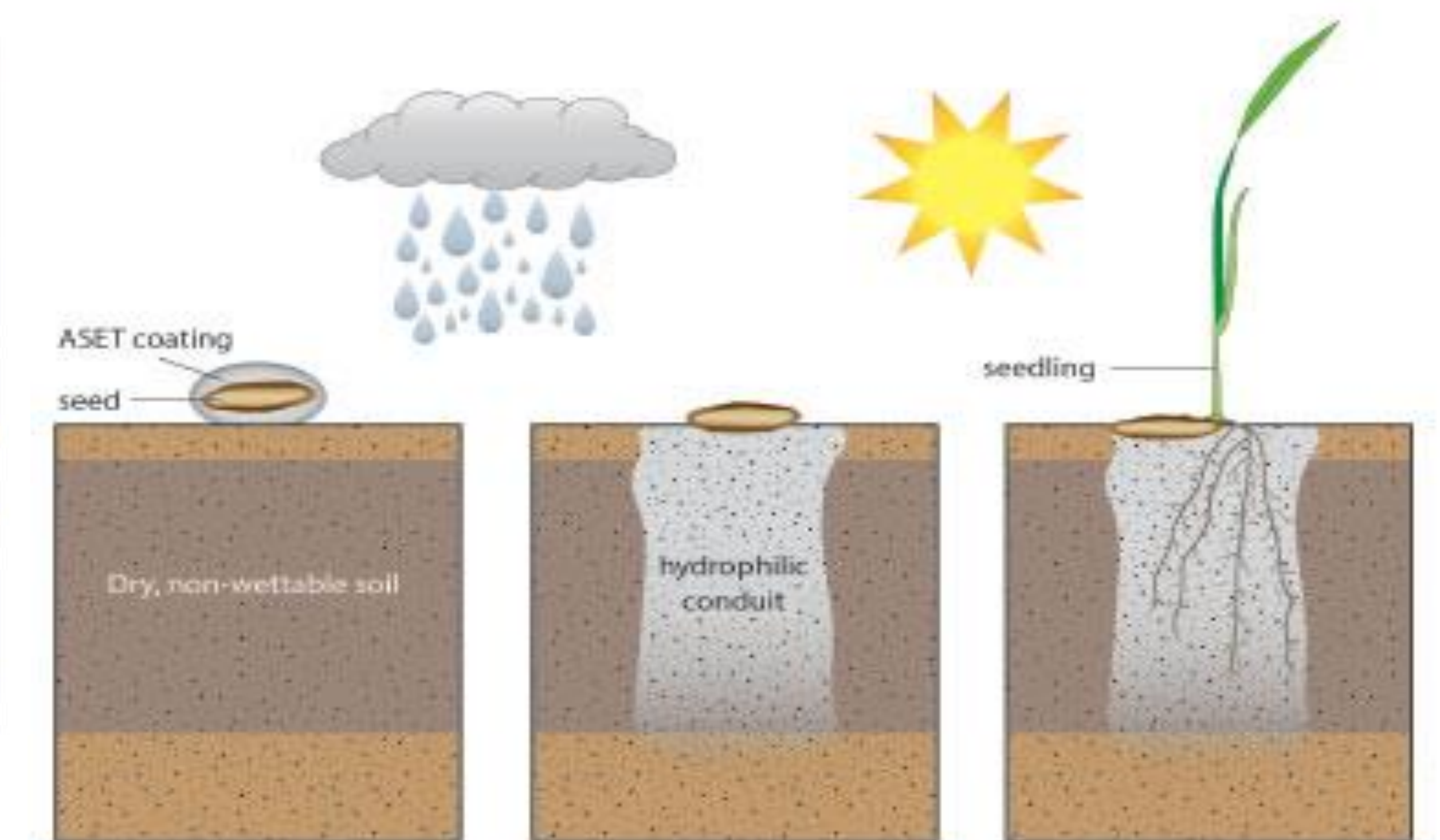
- i) to determine if surfactant seed coating reduces water repellency.
- ii) to determine if surfactant seed coating enhances seed germination and establishment in hydrophobic soils.

Materials and Methods

- Perennial Ryegrass seeds were coated with a surfactant at rates of 5 and 10% (based on seed weight).
- Coated seeds (Madsen et al, 2012) plus a control were seeded at a rate of 8 lbs / 1000 ft² in wettable greens grade sand which had a contact angle of 33.4 and hydrophobic sand which had a contact angle of 103.1.
- Pots were placed in a greenhouse and fertilized once at a rate of 1 lb N / 1000 ft² using Scotts Starter Turf Fertilizer.
- 1 hr after treatments, pots were irrigated with 1.0" of water and subsequently irrigated with 0.25" of water every other day.
- At the conclusion of the experiment above ground biomass was calculated by cutting turf at the top of the soil and weighing it.
- Water droplet penetration test (WDPT) was conducted by taking soil cores from each pot, soil was separated into top (top inch of soil) middle (second inch from top) and bottom (third inch from the top) and allowed to dry for 5 days. After drying a drop of water was placed in the soil and the time it takes the water drop to penetrate the soil was recorded.



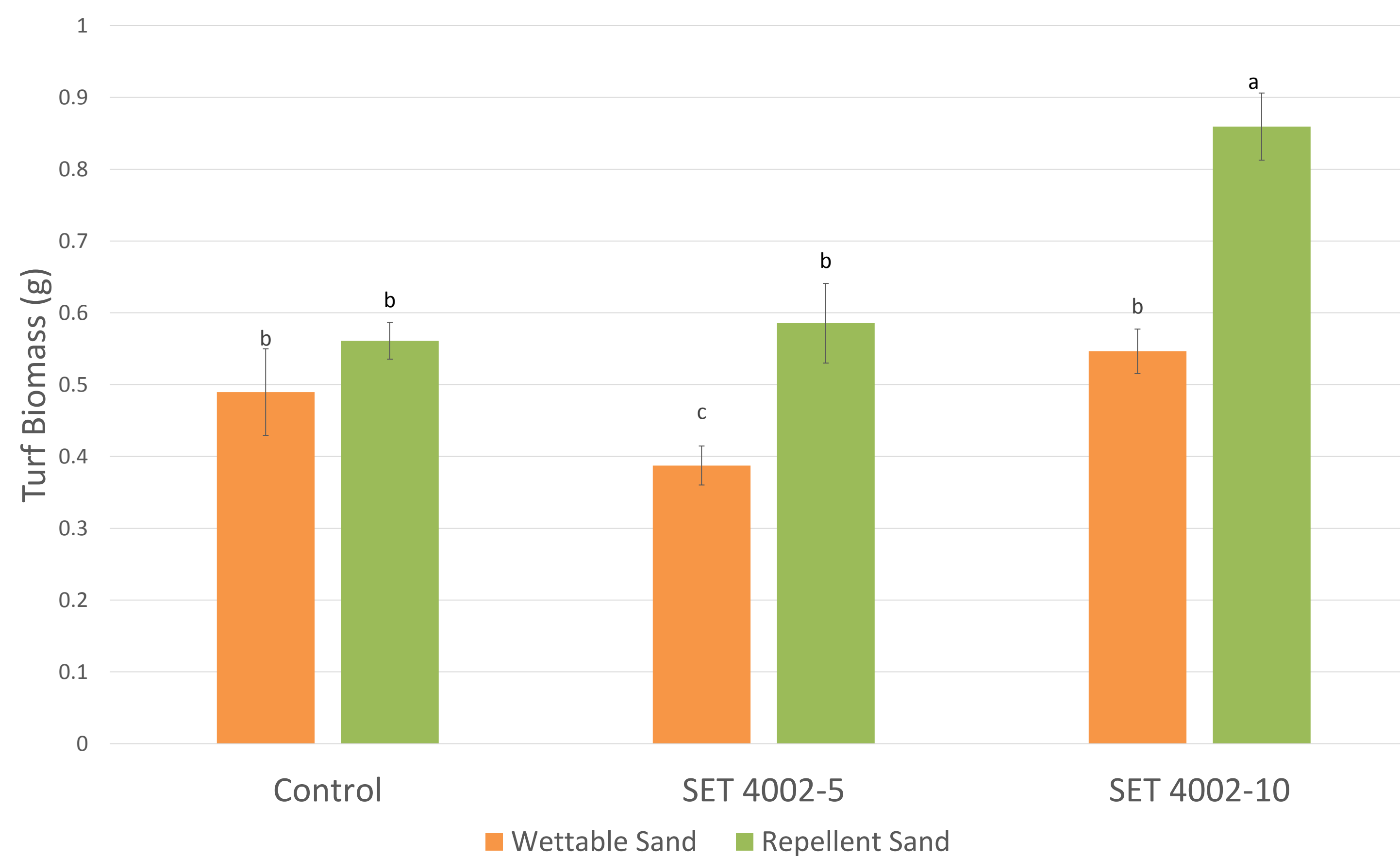
Photos courtesy of Matthew Madsen (Madsen et al, 2012)



Moisture releases the surfactant in the special coating. The surfactant then creates a protective hydrophilic conduit out and down from the seed. This conduit holds the moisture long enough for the seed to germinate and the seedling to establish.

Results

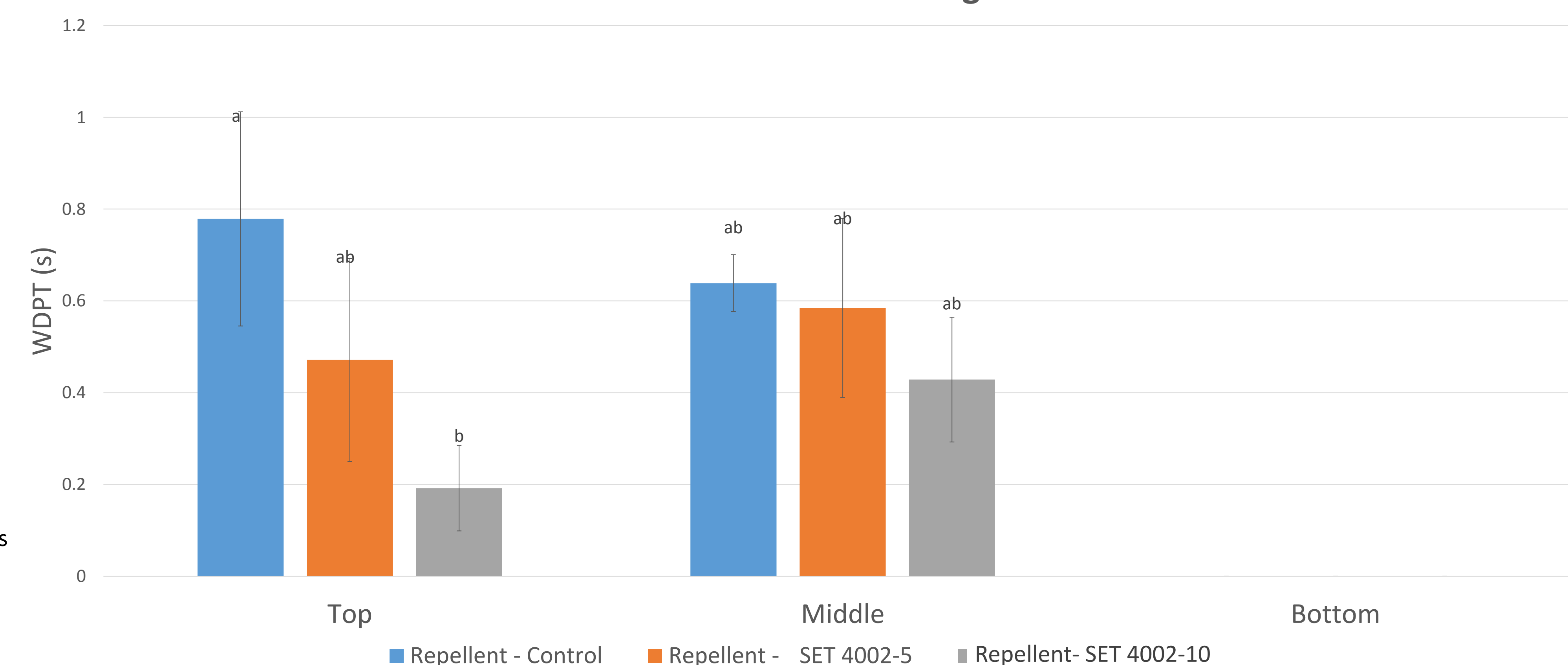
Above Ground Biomass of Perennial Ryegrass Biomass



Graph 1: Seeds coated with SET 4002 loaded at 10% by weight show significantly higher biomass in hydrophobic sand. Above ground biomass was clipped, weighed then dried for 48 hours at 101° then reweighed.

Graph 2. Effect of seed coating on WDPT (water droplet penetration test) at 3 depths, Top (top 1"), Middle (second inch from top) and Bottom (third inch from top). Note: WDP is measured by dropping one drop of water on the soil surface and measuring the time (seconds) it takes to fully penetrate the soil.

Effect of Surfactant Seed Coating on WDPT



Discussion

- In hydrophobic sand, SET 4002-10% significantly increased Perennial Ryegrass biomass.
 - The results suggest, that SET 4002-10% is washed off the seed decreasing hydrophobicity and allowing for increased water infiltration and availability around the root zone. This confirms research previously reported by Madsen et al (2012) in rangeland species.
 - In hydrophobic sand, SET 4002-5% and SET 4002-10% resulted in a significantly lower ($p < 0.05$) time for water droplet penetration than untreated seeds, decreasing the sand's hydrophobicity.
- Seed coatings do not show negative effects on visual ratings of turf.
- No treatment effects were observed for the wettable greens grade sand.

Conclusion

- Seed coated with surfactants decreased hydrophobicity of the hydrophobic sand, thus allowing more uniform water distribution in the root zone promoting increases in seedling biomass.
- Surfactant seed coating reduces hydrophobicity allowing water to penetrate water repellent soil faster.

References:

Madsen, M., Kostka, S., Inouye, A., & Zvirzdin, D. (2012). Postfire Restoration of Soil Hydrology and Wildland Vegetation Using Surfactant Seed Coating Technology. *Rangeland Ecology and Management*, 65(3).