Use of Seed Agglomeration Technology for Enhancing Seedling Emergence in the Presence of Physical Soil Crust

Investigators:
Matthew Madsen
Kirk Davies
Tony Svejcar
Jason Williams

USDA ARS
PHYSICAL SOIL CRUST

- Primarily formed by raindrops dispersing aggregates and detaching soil particles
- Smaller particles are washed into spaces between the remaining larger fragments, where they occlude soil surface pores
- As drying takes place, surface tension pulls the components together, forming a closely-packed layer with little porosity.

Brady and Weil, 2004
MANAGEMENT PRACTICES TO IMPROVE SEEDLING EMERGENCE

- While these approaches may work in agronomic systems, or locally intensive restoration projects, they are typically not practical for the re-vegetation of mangalifera, due to the large land areas and the few locations that are suitably managed through regulating emergence.
**Objective:** Determine if seedling emergence of perennial bunchgrass species can be improved by agglomerating multiple seeds into a single pellet.

**Hypothesis:** Agglomerating multiple seeds together within a single pellet will improve seedling emergence, in comparison to single coated seeds, and non-coated seeds, by having seedlings collectively generating sufficient force to penetrate through the soil crust.
SEED COATING

- Coating was performed using a RP14DB rotostat seed coater by BraceWorks Automation and Electric (Lloydminster, SK)
Randomized block split-plot design, with five replications. Subplots consisted of 0.2 m$^2$ containers that were filled with either clay-loam or sand soil. In separate rows we sowed bluebunch wheatgrass seeds that were either: 1) uncoated (control), 2) coated, and 3) agglomerated.
SIMULATED RAINFALL

- During the first watering, 15 mm of water was applied using an oscillating-arm rainfall simulator, with an application intensity of 24.7 mm·hr⁻¹ (2 year storm).

- Over the remainder of the study, pots were watered using a fine mist sprayer with total amount delivered equal to the average monthly amount of spring precipitation (26 mm).

(Meyer and Harmon 1979).
SOIL WATER CONTENT AND CRUST STRENGTH

Graphs showing soil water content (%) and penetration resistance (MPa) over days from seeding for clay and sand. The wilting point is indicated by a dashed line.
DENSITY

Clay

viability 214 (plants m²)

Seedling density (plants m²)

- control
- single
- agglomeration

Days from seeding

0  5  10  15  20  25
DENSITY

Sand

viability 214 (plants m\(^2\))

Seedling density (plants m\(^2\))

- control
- single
- agglomeration

Days from seeding

0  5  10  15  20  25

0  50  100  150  200  250