Optimising polyacrylamide (PAM) spray application to mitigate soil splash and capping

Traditional leafy green production contributes to soil structural degradation:

Retailer-driven industry requires up to six crop cycles per year on Coriander

Multiple tillage operations per crop cycle oxidise the SOM

Bare soil is exposed to 2-3 high intensity irrigation events

Light soils susceptible to splash detachment and crusting

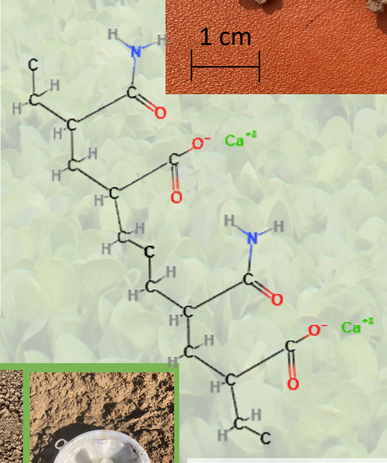
Soil crust, poor emergence, water use inefficiency, splash contamination

Aims and Objectives:

Implement and test a innovative spray application PAM to optimise emergence homogeneity and yield, reduce splash contamination and improve system resilience and economic viability of leafy green crops.

Materials:

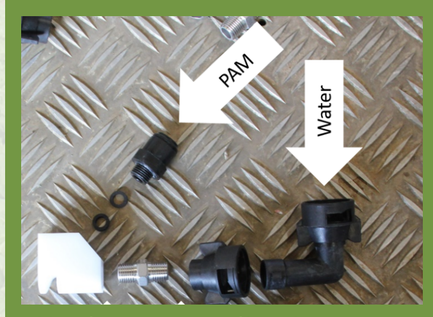
Anionic polyacrylamides:
-Long linear molecules with a carbon backbone
-Multiple negative surface charges
-Interaction through extra-molecular bonds with soil colloids



Splash detachment before and after the first irrigation

Methods:

Novel dual-fluid nozzle



Single PAM application event pre-emergence

Three Replicated Field Trials

Polymeric Film (Coriander):
PAM at 120 kg ha^{-1} reduces the soil crust impedance to crop emergence.

Enhanced Cation Bridging (Spinach):
PAM combined with bridging cations (Ca^{++}) reduces soil crust impedance and facilitates emergence homogeneity at lower (80 kg ha-1) application rates

Reduced Irrigation (Spinach):
PAM application reduces soil crust impedance allowing pre-emergence irrigation to be omitted.

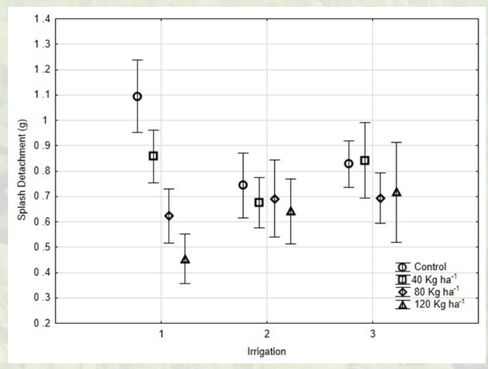
Metrics

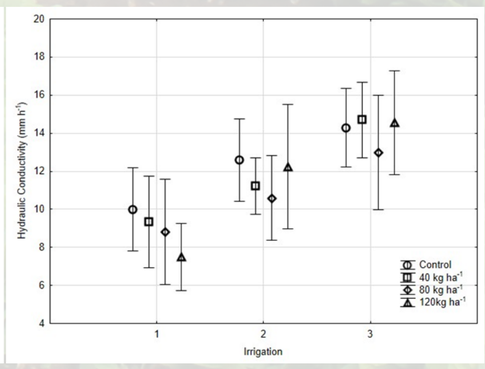
Soil-related:
-Splash Detachment
-Hydraulic conductivity (HC)
-Soil moisture

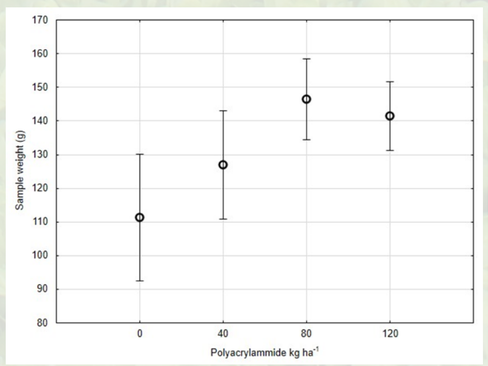
Crop-related
-Emergence
-Stand establishment
-Yield: quantity + quality

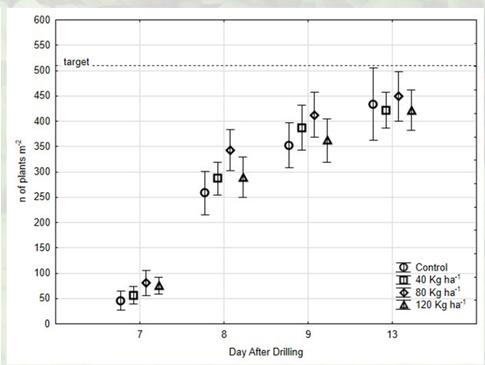
Key Findings:

Coriander Case Study:
-PAM stabilises the soil surface, reduces splash detachment and crusting
-HC decreases at higher PAM application rates without impacting soil moisture in the seedbed
-Emergence is quicker in PAM-treated plots, and results in higher yields
-These results are similar to the other two trials on spinach









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