



Optimising nitrogen and water interactions in cotton

By better understanding how to optimise nitrogen (N) supply to cotton crops from organic matter in soil, this two-year project, led by the University of Southern Queensland, aims to build cotton grower's confidence to change current practices in applied N fertiliser rates. Nitrogen mineralisation is dynamic and difficult to predict because microbial activity, responsible for mineralising soil organic N into plant available forms, is reactive to the extent of soil drying between irrigation or rainfall events.

The Research Questions

- How do N fertiliser formulations and wet-dry cycles affect within-season patterns of mineral N and dissolved organic N in the soil?
- How well can a rapid soil test, based on water extraction, quantify the pool of potentially available organic N?

Methodology

In the second and final year, two research trial plots have been established in overhead irrigated paddocks on a commercial cotton farm in Jondaryan (Queensland).

Key project activities at the trial sites include:

- Two fertiliser treatments (urea and DMPP-treated urea) and a zero-N control applied in 4 replicated plots;
- Soil samples taken from inside and outside 300 mm depth root-exclusion tubes after significant wetting events; and
- Field-moist soil analysed after sampling for water and KCl-extractable mineral N, and water-extractable total dissolved N.

Project achievements

- Monitoring of concentration and form of N sampled from within and outside root exclusion tubes placed within the fertiliser band was completed for the 2016/17 cotton season at both experimental sites. Soil samples were subject to chemical analyses and experimental data from the season was statistically analysed.
- Extension: Experimental results were presented at the Australian Association of Cotton Scientist Conference in Canberra in August 2017 and as a partner in the *2018 CottonInfo Optimising Irrigation and Nitrogen Researchers Tour*.

Initial outcomes

- DMPP-treated urea significantly increased the concentration of ammonium-N recovered from soil samples from within the tubes. Throughout the season, nitrate-N concentrations were consistently higher for the standard urea treatment.
- No consistent yield benefits were observed with the use of N fertilisers treated with nitrification inhibitors. Low response to DMPP-treated urea may be explained by preferential uptake of nitrate. Further work into the physiology and mechanisms of NH_4/NO_3 uptake by cotton, as affected by fertiliser formulation, is therefore required.



Pictured: Lachlan Naas, Cotton Farmer, Jondaryan, QLD.



Application of fertiliser to the experimental plots & root exclusion tubes.

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