Improving the nitrogen use efficiency of cotton crops through better understanding of the role of dissolved organic N

A farm's soil is arguably its most important asset, yet it is both vulnerable to degradation and effectively a non-renewable source on relevant timescales. There has been an increasing focus on the organic matter component of soil, both from a potential carbon sequestration perspective, and from the recognition of the importance of organic matter in underpinning soil health and fertility. Organic matter has been shown to be in decline in many agricultural systems as soil processes adjust to a new equilibrium because of imposed management changes. Cotton systems are no different in this regard, and given the intrinsic link between soil organic matter and soil nitrogen, if organic matter is declining then so too is soil nitrogen. In recent years, it has become apparent that the long-held belief that nitrogen is only available to plants when in the ammonium or nitrate form is incorrect. Evidence from ecosystems as disparate as Arctic tundra and intensive subtropical sugar production strongly suggests that some forms of dissolved organic nitrogen such as peptides and free amino acids are directly accessible to plants and in some cases may consist a major portion of their nitrogen supply.

The aim of the proposed work is to quantify the uptake of dissolved organic nitrogen in different cotton varieties in high yielding systems. It addresses the following:

1. The importance of the dissolved organic nitrogen pool relative to nitrate and ammonium for cotton nutrition.
2. The impact of soil type on uptake of dissolved organic nitrogen relative to nitrate and ammonium for cotton nutrition.
3. In high yielding soils does the dissolved organic nitrogen pool influence fertiliser nitrogen use efficiency?

We will be conducting a variety by nitrogen treatment trial at IREQ in 2019-2020 which will be compared to similar trials at Narrabri and Cecil Plains.

This project outcome will improve cotton nitrogen management by determining the plant nitrogen preference (NO_3^-, NH_4^+ and DON) and how this can be managed in different crop environments. This will potentially increase productivity and reduce environment impacts through improved management.

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