Cotton Research and Development Corporation

Final Report

Project CSP 142C

Phosphorus and Potassium Nutrition of cotton

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1. **Outline the background to the project.**

   Previously funded projects investigated K nutrition of cotton specifically, hence interactions with other nutrients (excluding the other cations sodium, magnesium and calcium) were not investigated. This research will assist in removing the confusion that exists with the interaction of P and K and their contributions to the Premature Senescence (PS) syndrome. Previous research which focused on K nutrition did not include assessment of the P status of soil or plants.

2. **List the project objectives and the extent to which these have been achieved.**

   a) refine recommendations for application of P and K fertilizers using soil and plant tissue testing

   b) determine effectiveness of soil and foliar applications of P and K fertilizers

   c) identify nutritional factors other than K involved in premature senescence

3. **Progress.**

   During the past two years, we have attempted to recruit a competent scientist to undertake this research, but have failed to identify suitable applicants in Australia and overseas in two rounds of advertisements. In July 2001, CSIRO advertised in the national press for a post-doctoral scientist (CSIRO level 4) to be appointed to this position. No suitably qualified scientists applied for this position.

   In December 2001, the position was readvertised, this time for an Experimental Scientist (CSIRO level 4). Again, no suitably qualified scientists were identified. Adam Kay of CRDC was involved in these interviews.

   CSIRO believes this to be a valuable project to undertake. Phosphorus and potassium nutrition is becoming more important in cotton crops. This research would enable better management of soil fertility and crop nutrition to avoid the problems associated with deficiencies of these two nutrients.

   With the agreement of the CRDC (Guy Roth – 22 Nov 2002), we arranged a two-month visit from Assoc. Prof. Glen Harris from University of Georgia, USA who has considerable expertise in soil fertility and cotton nutrition. During this time, some experimental work was undertaken and the need for and direction of this research was reviewed. A review of the literature pertaining to P and K nutrition of cotton will be forwarded to CRDC when completed in 2003.

4. **Future research plans.**

A new project proposal (Nutritional constraints to efficient cotton production) has been supported by CRDC that will follow on from project CRC19C (Identification and remediation of nutritional stresses in cotton). This new project will take on much of the research that was to be done in project CSP142C (Phosphorus and potassium nutrition of cotton).

Further, a substantial amount of time and research will be undertaken by Ms Kylie Dodd as part of her PhD program "The Impact of Soil Sodicity on Cotton Cropping Systems" sponsored by UNE, CRDC and CRC. Ian Rochester is a co-supervisor of this project. Considerable collaboration exists between these two projects.

5. Future Research Priorities.

This list was formulated by Glen Harris and Ian Rochester (March 2003)

Premature senescence

- Determine the explicit role of K in premature senescence.
- Utilization of foliar K, with and without soil applied K.
- Role of K in alleviating cotton diseases (Fusarium, Alternaria, Verticillium, black root rot)
    - in fields with known disease history.
    - in greenhouse experiments, using inoculated soil.
- Role of soil compaction, waterlogging and cool/cloudy weather on premature senescence
- Collect seeds from affected vs. unaffected plants (within variety screening).
- Is premature senescence a symptom of K deficiency brought about by soil sodicity?

Soil sodicity effects on cotton nutrition

- Greenhouse amelioration study on sodic soils - lime, gypsum and sulfuric acid?
- Effect of organic matter on soil sodicity.
- Interaction of K and Na in plant and on crop yield.
- Interaction of K and P in sodic and non-sodic soils.
- To wheat extent is P and K nutrition of cotton compromised by soil sodicity?

Summary

The cotton industry spends about $8M on P fertilizers and about $5M of K fertilizers. This indicates the extent of recognised P and K deficiency. It is envisaged that many cotton-growing soils are nearing deficient status, as continual cotton cropping quickly depletes these nutrients. Identification of these soils through soil and plant testing and formulation of improved

fertilizer management practices will avoid nutrient deficiencies that reduce the productivity and profitability of cotton cropping.

Inadequate P and K nutrition are responsible for substantial losses of yield and profitability in cotton farming. Deficencies of both nutrients have been linked with the premature senescence syndrome, although confusion arises between the importance and the interactions of these two nutrients.

Previous research has indicated levels of available soil P at which response to P fertilizer is expected and P fertilizer recommendations for maintaining levels of soil P to adequate crop P nutrition. Similarly, research has been conducted on the association between K nutrition and premature. However, the influence of soil sodicity on the P and K nutrion of cotton has now been recognised and a significant effort is required to determine its importance and economic relevance to production.