

Optimising the management of poultry litter in Australian cotton production

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Abstract

A field experiment was conducted to evaluate the comparative effectiveness of poultry litter (PL), urea-N and the integrated use of both in changing nutrient uptake, yield and lint quality of cotton grown in southern NSW, Australia. Poultry litter was applied at 4, 8 and 16 t/ha, integrated with urea-N to provide matched available N. In season N can be fully met using PL either alone or in combination with urea-N. PL amended treatments significantly increased 2nd season lint yield above mineral fertilizer. Nutrient uptake and lint quality were not affected by fertilizer-N source.

Keywords: poultry litter, cotton, urea-N

1. Introduction

A rapidly expanding poultry production industry with associated PL is located in close proximity to high yielding irrigated cotton in the Murrumbidgee Valley of south eastern Australia. Estimates indicate that PL generated in the district annually, contain about 3000 tonnes of plant available N, sufficient to support 12,000 ha of cotton production. Industry research has shown optimal economic fertilizer N rates are 220-250 kg N/ha (Rochester, 2010) and extension is focussed on improving N use efficiency (NUE) for environmental protection. However, cotton growers are typically applying 250-350 kg urea N/ha in addition to ad hoc amounts of PL for longer term soil sustainability. The plant available nutrients that PL contains is ignored due to product and performance variability. This study has examined how PL may substitute for urea-N to optimise yield, lint quality, N efficiency and soil health. The data will be used to validate calculators that farmers can use for confident inclusion of available nutrients contained in manure for high yielding cotton nutrient budgets.

2. Methods

Field trials have been conducted over two years (2017-2019) on commercial farms in the vicinity of Griffith, NSW, Australia on a clay loam soil type (Table 1). The treatments are described in Table 1.

Table 1. Source of N (kg N/ha) in cotton trial.

	Mineral Fertilizer-N		
	2017_18	2018-19	Total 2017-19
Control	15	90	105
Low N	153	138	291
Standard N	176	299	476
4t/ha PL	153	238	391
8t/ha PL	153	184	337
16t/ha PL	15	90	105

3. Results

3.1 Yield

Over the two years, a total of 21.6-22.5 bales/ha were produced in chicken litter amended plots compared with 20.9 bales/ha in equivalent-N urea only plots, or a 6% yield benefit. In the first year, there was insignificant yield

increase according to poultry litter amendment compared with mineral fertilizer. By the second year, at 16t/ha amendment, upper yields of 11.7 bales/ha in litter applied soils compared with 10.0 bales/ha in the urea-N only fertilizer programme which were significantly ($p=0.09$) different (Figure 1).

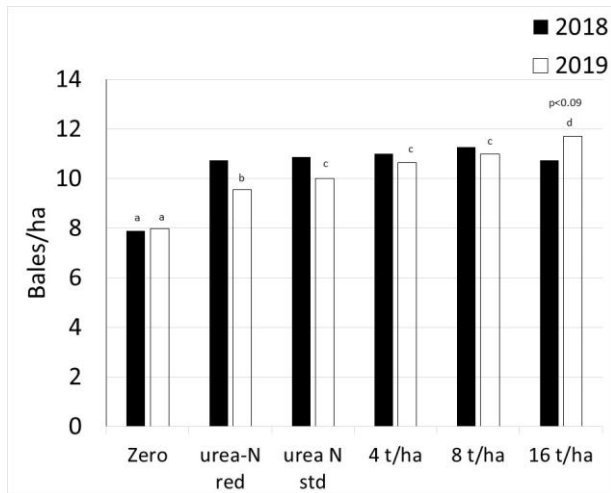


Fig. 1: Cotton yield data according to poultry litter amendment.

4. Conclusion

- Poultry litter supplied adequate available in season nitrogen for high-yielding cotton, either alone at appropriate rates or by topping-up nutrient requirements with inorganic fertiliser.
- Lint yield increased by 6% in PL-amended soils compared with matched inorganic N fertiliser alone, over two years of back to back cotton.
- Yield decline occurred in mineral only fertilizer treatments but not in PL treatments in the second successive year of cotton.

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References

Rochester I J 2010 Assessing internal crop nitrogen use efficiency in high yielding irrigated cotton. *Nut. Cycl. Agroecosystems*. **90** 147-156.