

## **Abstract:**

**Nitrogen fertilization and N nutrient management are crucial components of economically successful cotton production. The efficacy of foliar N, and indeed all-foliar applications has long been debated by cotton growers and researchers. The objective of this trial was to evaluate foliar applied N for increasing cotton yields in both N deficient and N adequate cotton. The trial consisted of furrow irrigated cotton that had been affected by N stripping, that consisted of four green rows, and four yellow rows across the field. Applications commenced after cutout, and three treatments were applied every seven to ten days. Each treatment was harvested separately, and the green and yellow areas were also harvested as individual modules. A yield increase of 9.1% was observed between treated and non-treated cotton.**

## **Background:**

**N**itrogen is used by plants to manufacture proteins and nucleic acids that are used in almost all plant tissue. One of the most important proteins green plants produce is chlorophyll, the compound that allows plants to photosynthesise. Without sufficient N, cotton may become chlorotic and not photosynthesise enough to meet the demands of plant growth. Nitrogen deficient plants typically have reduced leaf area and use water poorly. These conditions could reduce growth, increase fruit shedding and decrease yield.

Cotton growers fertilize cotton with N to avoid yield loss due to N deficiency. Typically, large amounts of fertilizer are split applied, with half the required amount applied before planting, and the remainder applied just prior to first flowering. If required, foliar treatments of N are used after an irrigation. Foliar N treatments have been found to increase lint yields of cotton grown on water logged clay soils, as long as temperatures remain warm and soil N is low. (Hodgeson

and Macleod, 1998). Due to a wet winter prior to the 1998/99 season, little or no land preparation was done before the crop was planted. Generally, the crop was planted, and the land prep and fertilizer applications were commenced after the crop had emerged. Such was the case at "Brushy Park" the site for the trial. "Brushy Park" is on the Doreen lane in Wee Waa, NSW, and is owned by Mr. Jim Lennon.

## **Methods and Materials:**

**T**he field was planted with 189I pure seed on 10/10/98. Urea was applied to field at the rate of 240 Kg per Ha on 11/11/98. The Urea was applied with a Knife rig.

The striping across the field was first noticed on 23/12/98 after the second crop irrigation. The pattern across the field was four green rows in the wheel tracks, and two yellow rows on the guest rows. Soil tests were taken to determine the amount of N that was potentially available to the plant. A further 50-kg of Urea was flown on to the field on the 15/01/99, immediately before the third crop watering, with no visual effect noticed on the stripping. At this stage, a trial area was set up, that would investigate the effect on yield of Total N, and a mixture of Total N and Total Biogonic. These two foliar fertilizers were applied by air every ten days. The trial was replicated twice. Each rep was 5.04 Ha, which consisted of 2.52 ha green stripping, and 2.52 ha of yellow stripping. Petiole tests were taken after each application, oven dried, ground, and analyzed for NO<sub>3</sub> - N. In each replicate, the yellow and green areas were harvested separately. The area and seed cotton weight was noted and the yield was worked out on an assumed 37.5% turn out.

Plant Mapping, Fruit counts and Leaf Nitrogen content was also monitored.

**The Products:**

The two foliar fertilizers that were used in this trial were two products developed by Agriforce Direct Marketing. Total N is a controlled release Nitrogen foliar fertilizer. It is 35% N, of which 70% is in the form of a urea-formaldehyde. The controlled released part of Total N works by being readily absorbed by the plant, and stored in the root zone. From there it is slowly released over a period of seven to ten days. Total N has shown yield increases of up to 0.5 bales of cotton per Ha using Total N alone. (Maples, 1996)

The second product, Total Biogenic, is relatively unknown in the Cotton industry. It is primarily a N.P.K (8-3-6) fertilizer that contains numerous trace elements, and also Gibrillic Acid and Triacontanol.

**Results and Discussion:**

Results from the soil tests indicated that the green strips had 58.0 PPM N-NO<sub>3</sub> (approximately equal to a "normal" field that had been fertilized), and 31 PPM N-NO<sub>3</sub> in the yellow strips (approximately equal to a fallow block that has not been fertilized.)

Crop N uptake tests, also indicated similar results to the soil tests, with the green rows having 115 Kg/ha N (low for the time of year that the tests were taken), and the yellow rows having 60 kg/ ha N. (Again this is equal to unfertilized fallow blocks.) To obtain the maximum yield, at this time of the growing season the reading should be 140 Kg/ha N. (Rochester - 1997).

From models developed at Myall Vale CSIRO, using this data the green rows

should have yielded 8.21 bales per Ha (3.3 bales per acre), and the yellow rows should have yielded 5.2 bales per Ha (2.1 bales per acre.)

Fruit counts indicated that there was a 30% difference between the green and yellow strips, and no difference between the different treatments. The green strips yield estimates based on fruit counts were 8.4 bales per Ha (3.4 bales per acre), and the yellow strips 5.8 bales per Ha (2.4 bales per acre.)

Petiole Nitrate test did show a difference between green and yellow strips, and also between the different treatments. After applications of Total N, and Total Biogenic, petiole nitrate levels increased in both the green and yellow strips in the treated areas, but continued to decline in the control areas.

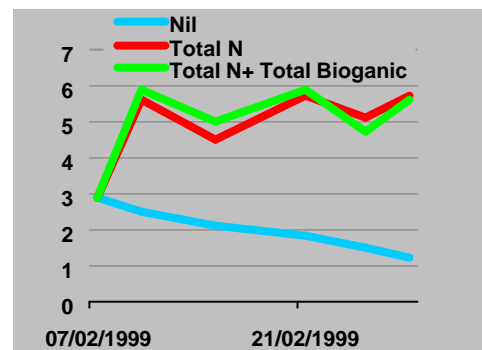


Figure 1. Petiole Nitrate Levels in Green Strips, in g / Kg

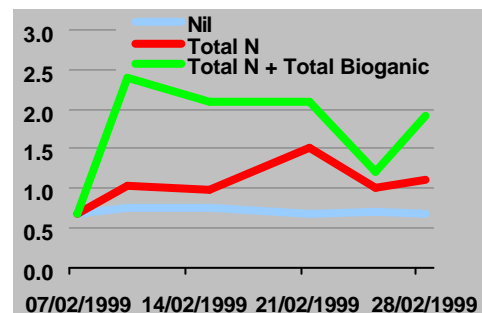


Figure 2. Petiole Nitrate Levels in Yellow Strips, in g / Kg

An increase in seed cotton yield was also observed in the treated areas across the trial, the nil treated control area yielded 8.43 bales per Ha (3.41 Bales per acre.), while the area treated with Total N yielded 8.95 Bales per Ha (3.62 Bales per acre.) The area that

was treated with the Total N and Total Bioganic mixture yielded 9.2 Bales per acre. There was also an increase in the yield between the various treatments and the yellow and green strips. In all cases, the green strips had a higher yield than the yellow strips.

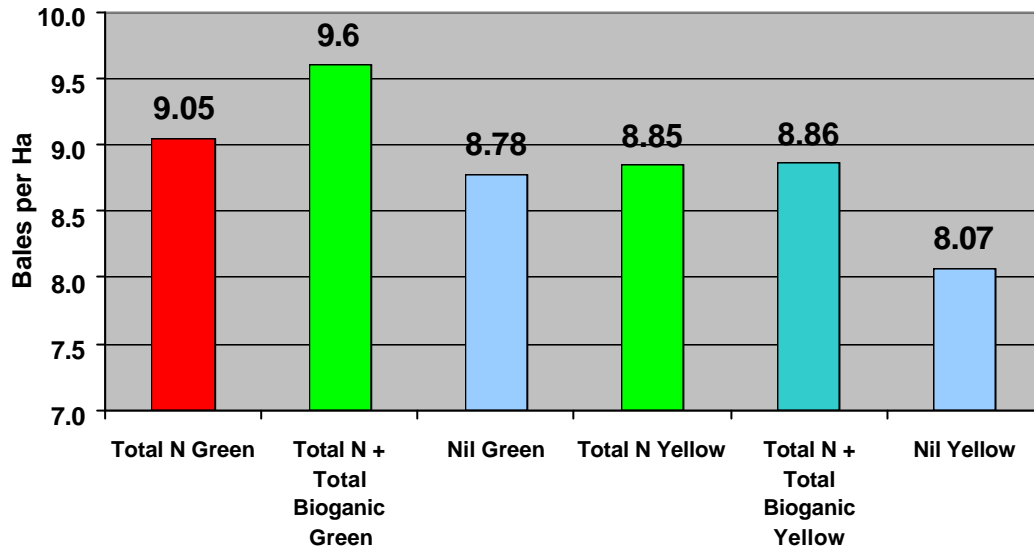


Figure 3. Yield Difference between Treatments and Green and Yellow Strips.

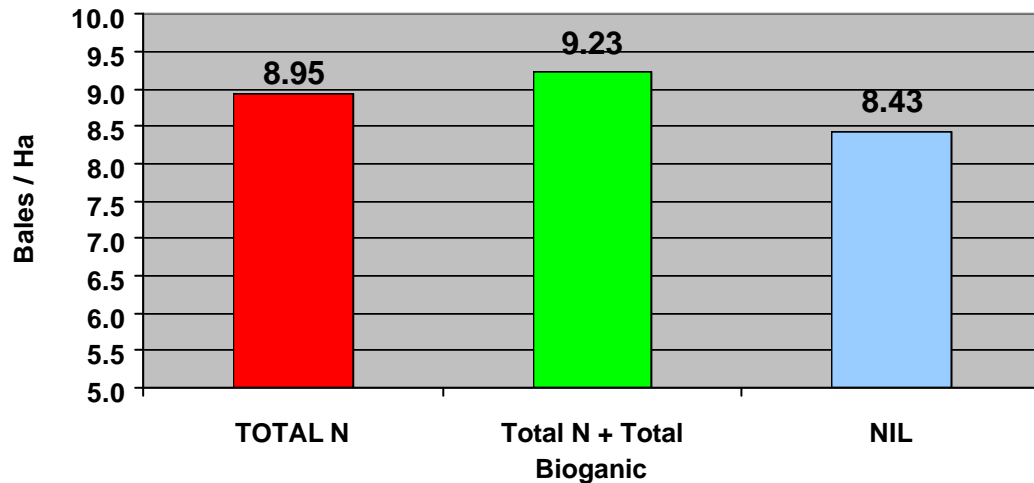


Figure 4. Yield Difference between the different Treatments

**Conclusion:**

Foliar applications of Total N and mixtures of Total N and Total Bioganic increase Petiole Nitrate levels in Cotton. This is translated into increased yield. In Nitrogen sufficient cotton, over three applications, a yield increase of 0.27 Bales per Ha was

observed between the Total N and the nil treated control. The addition of Total Bioganic to this mixture then increased this yield by 0.82 Bales per Ha. This is an increase in profit of \$73.50 per Ha for the Total N, and

\$303 per Ha for the mixture of Total N and Total Bioganic.

In N deficient Cotton, applications of Total N increased the yield by 0.78 bales per Ha. The mixture of Total N and Total Bioganic had no effect on yield. The increased profit from applications of Total N is \$339.

As fruit counts showed no difference between treatments after application the increase in yield came from foliar applications increasing the development and maturity of the bolls.

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