# RWI009: Crop Canopy Management for Northern Australian Environments using Mepiquat Chloride.

The nature of northern tropical cotton production produces favourable conditions for fast and rank or excessive growth in wet season planted cotton due to the heat and high humidity. A consequence of wet season conditions often leads to extended periods of water logging and overcast weather resulting in the shedding of fruit. Add to this high nighttime temperatures leading to sterile locks and the crop is on a fast path for further rank growth. Generally, under these circumstances and particularly on crops sown in January and early February in the Ord the result would be what is often referred to as "lollipop" cotton where all the bolls are at the top of the plant and lower bolls are not retained below node 15 (and higher in extreme cases) depending on the season. To compensate for fruit losses these crops are sometimes grown out to 30+ nodes to make up the lost yield, often resulting in crops exceeding 1.8m in height. This in turn limits yield potential and can also be factor in lower micronaire and short fibre. The other downside to this, is that "tall" crops are harder to defoliate, potentially leading to more leaf trash and can also present more challenges for post crop destruction due to the increased levels of stubble.

Whilst considerable work around the use of Mepiquat Chloraide (MC) (common trade name RX 380) had been previously undertaken across the Ord Valley of Western Australia, it was identified that there was a need to continue this research as farming practices had evolved rapidly in the short history of Ord cotton production. Some of these changes in practices include planting dates, nitrogen application and variety selection – all factors that can play a contributing role in rank growth. Cotton Seed Distributors (CSD) with support from ADAMA initiated a project through CSD's research support program – The Richard Williams Initiative (RWI) to investigate MC practices across multiple planting dates in the Ord Valley. Cotton Growers Services were contracted to conduct the field work for this project.

The anticipated outcome of this project was a better understanding of plant responses in Northern Australia to MC applications with the aim to help improve canopy management and increase yields. Whilst applying this to a rapidly evolving farming environment in terms of practices and further enhancing knowledge across the extreme seasonal variations typically experienced each wet season.

The report below summarises MC research work undertaken on "Manbijim" Farm, 20km North of Kununurra in the Ord Valley during the 2024 cotton growing season. For the 2024 cotton season the Ord Valley had an 8-week planting window commencing on the 1st of February. The original plan had been to conduct two trials, one planted early February and the other planted early March. Due to extended periods of above average rainfall throughout much of February the early planted trial was abandoned as the field

had to be re-planted. The wet weather also resulted in the March trial been planted later then anticipated. Figures 1 and 2 below show the original plan for the February and March planting respectively.

| February Planting | | | | | |
|---|---|---|---|---|---|
| **Timing** | **Treat 1** | **Treat 2** | **Treat 3** | **Treat 4** | **Nil** |
| **8-10 nodes** | 40 | | 40 | | |
| | | | | | |
| **12-14 nodes** | 40 | 80 | 80 | 80 | |
| | | | | | |
| **16-18 nodes** | 40 | 40 | | | |
| | | | | | |
| **TOTAL** | 120 | 120 | 120 | 80 | |
| **Cutout 22 nodes** | 200 | 200 | 200 | 200 | 200 |
| **TOTAL** | 320 | 320 | 320 | 280 | 200 |
| *RX380 in ml | | | | | |

*Figure 1 February planting date MC trial*

| March Planting | | | | |
|---|---|---|---|---|
| **Timing** | **Treat 1** | **Treat 2** | **Treat 3** | **Nil** |
| **10-12 nodes** | 40 | | | |
| | | | | |
| **14-16 nodes** | 40 | 80 | 40 | |
| | | | | |
| **18 nodes** | | | 40 | |
| | | | | |
| **TOTAL** | 80 | 80 | 80 | 0 |
| **Cutout 22 nodes** | 200 | 200 | 200 | 200 |
| **TOTAL** | 280 | 280 | 280 | 200 |
| *RX380 in ml | | | | |

*Figure 2 March planting date MC trial*

The following report will now refer to the March planting trial. “Manbijim” field M12 was planted to Sicot 606B3F on 20th March at a rate of 10 seeds/m (100000 seeds/ha). Establishment counts after germination came to an average of 7.2 plants/m. Prior to the wet season (late 2023) a basal fertiliser blend was applied with the following:

36kg N/ha

40kg P/ha

50kg K/ha

24kg S/ha

2kg Zn/ha

Once the crop was established an additional 214kg N/ha was side dressed. This operation occurred on the 3rd of May.

The trial was setup as shown in figure three below. Each rep was 36 rows (36 meters wide). All MC was applied by aerial application using a swath width of 18 meters. This resulted in two passes on each rep. To represent the most even coverage, crop measurements and harvest data was taken from the middle rows of each of these reps.

| Rep 1 | | | | Rep 2 | | | Rep 3 | | | Rep 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T 1 | T3 | T2 | Control - 0 | T3 | T 1 | T2 | T2 | T3 | T 1 | T 1 | T2 | T3 |

*Figure 3 March planting trial plan*

Data collection commenced on the 12th of April and was conducted every 7 days concluding on the 23rd of July. During this time the height, nodes, top 5 node length (measured from the growing tip down 5 nodes) and nodes above white flower (NAWF) where measured. These measurements were taken from 5 plants in each rep, with the same plants used during each subsequent visit. Data has been summarised in figure 4 below.

A cut out application of 200ml of RX380 was applied on the 1st of July. First and second pass defoliations occurred on the 6th of September and 16th September respectively. The trial was picked on the 27th of September.

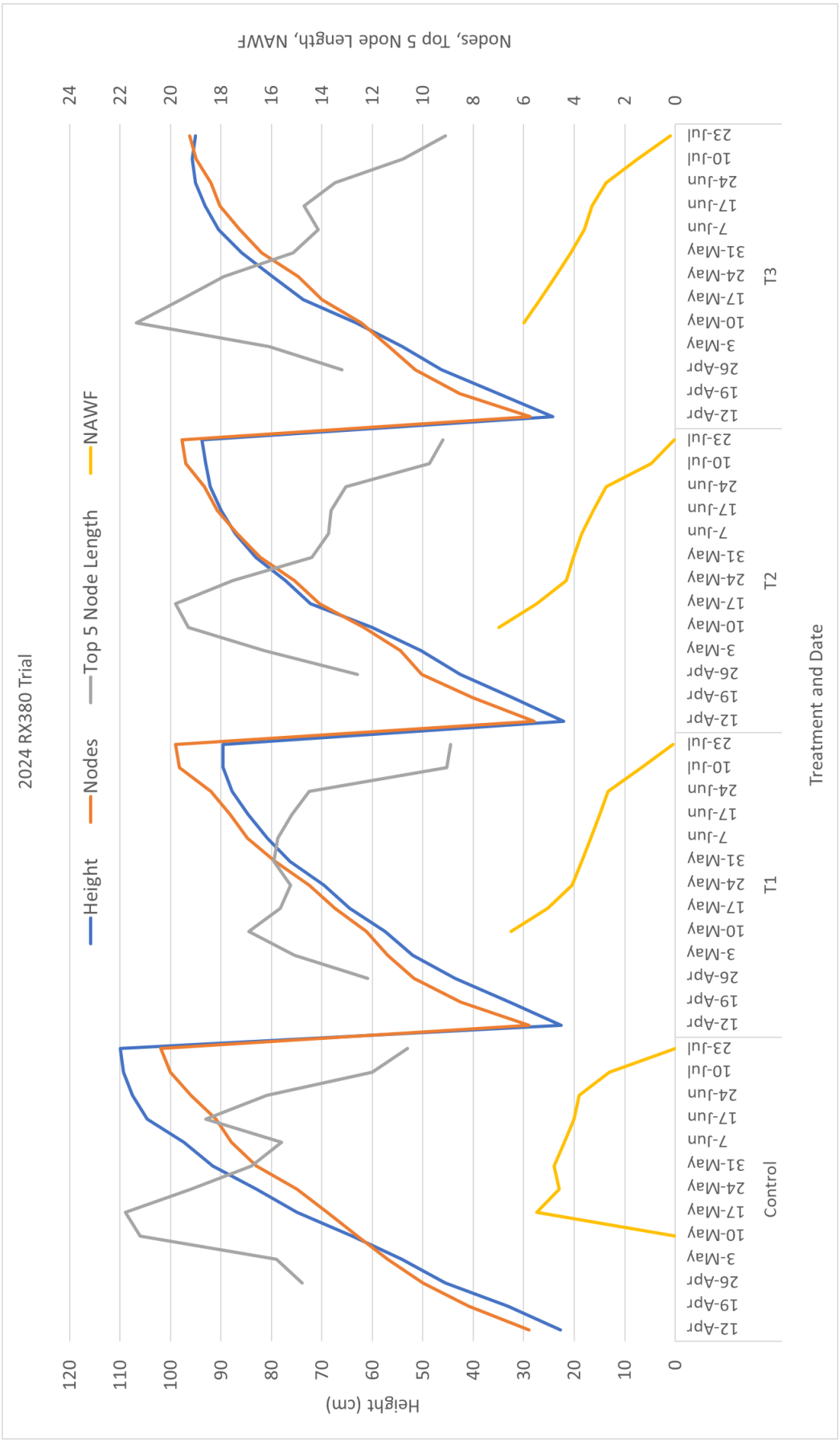


*Figure 4: Height, Nodes, Top 5 Node Length and NAWF*

Observations from crop measurements would suggest that the application of MC reduces crop height as can be seen from the control (zero MC) having a larger final height then the treatments that received MC. The control also achieved a slightly (although not significant) greater number of total nodes. Of interest in regards to the top 5 node length is that the repeated early applications of MC in treatment 1 was most successful in reducing the length of growing tip, which is where excessive or rank growth occurs from, although in the case of this trial at no stage was excessive/rank growth an issue. As expected, the control overall had a greater length on the top 5 nodes throughout the flowering period of the crop. The final observation from this trials data is the effect of MC on Nodes Above White Flower (NAWF). It would appear that the application of MC has resulted in all treatments reaching 4 NAWF (cut out) prior to the cut-out application of MC. The control however was still above 4NAWF at the cut-out application; this would have extended the flowering period and been a potential factor in final yields, although would also lead to the higher yield been obtained from higher up the plant in terms of nodes.

| Treatment | Ave yield | Turn out | Colour | Leaf | Staple | Length | Micronaire |
|---|---|---|---|---|---|---|---|
| T1 | 11.03 | 40% | 21 | 1 | 37 | 1.16 | 4.3 |
| T2 | 10.49 | 38% | 21 | 2 | 38 | 1.18 | 4.3 |
| T3 | 10.82 | 39% | 21 | 2 | 37 | 1.15 | 4.3 |
| Control | 11.17 | 41% | 21 | 2 | 36 | 1.13 | 4.2 |

*Table 1: Summary of ginning and classing results.*

Yield data, as summarised in table 1 above, might suggest that the zero MC (control) came out on top in regard to yield. This may suggest that in the context of a later planting date MC may be a factor in limiting yield potential although it should be noted that the control was not replicated and at no point did it become “rank”, which is to be expected on late planting dates. A fairer comparison is the control (11.17 bales/ha) against rep 1 in treatment 1 (11.27 bales/ha). Statistical analysis found no difference between treatments 1 and 3 but did find a statistically significant difference for treatment 2. Treatment 1 yielded well suggesting that the lower rates applied early (before or at first flower) can help manage excessive growth whilst maintaining yield. Treatment 2 having the lowest yield, may suggest that higher rates applied at flowering can slow plant development and thus impact on yield.

Classing data (summarised in table 1 above) reveals little variation between the treatments and as such little can be drawn from this in regards to rates and timing of MC on the quality characteristics of cotton. The only observation from this data is that the control did receive slightly shorter fibre and lower micronaire (although still outside the range of any discounts). Whilst the control isn’t a replicated data set is does correlate to what has been previously experienced from “taller” (rank) crops where late bolls contribute to shorter fibre and lower micronaire (although this has also been observed

in later planting dates as well), but due to the limited data is not conclusive in the case of this trial.

In summary it would appear that late planted crops will generally have less issues with rank or excessive growth and as such some caution should be applied to the use of higher rates of MC applied later in the crop, i.e. flowering onwards. In the context of crop height whilst maintaining yield, it could be suggested that early applications of lower rates (40ml) MC prior to 10-12 nodes with a follow up application within 14 days may be a better strategy then similar or higher rates applied from early flowering onwards. Future trials would ideally be aimed at earlier planting dates to better asses the management of these crops through the use of MC.

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