Preliminary Observation on Response of Waterlogged Cotton to Different Doses of AVG Application.

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Introduction

The obvious symptoms of waterlogging response in cotton are leaf chlorosis (yellowing) and dropping squares & bolls. In addition, Huck (1970) showed that tap root growth stopped within 30 min of reducing the oxygen in the soils, and that the growing point of the root was completely dead within 3 hrs. In other plant species, these responses have been associated with the effect of ethylene, produced in response to lack of oxygen (Pratt, 1953; Jackson, 1984; 1985; Jackson & Drew, 1984; Raskin & Konde, 1984; Stead, 1985; Voesenek & Blom, 1989; Osborne, 1991;Reid & Wu, 1991; Brady & Speirs, 1991; Voesenek et al, 1992; Drew, 1997). Ethylene is known to accelerate premature senescence, defoliation and boll dehiscence in cotton (Hall et al, 1957; Krizek, 1986), but the involvement of ethylene in cotton's response to waterlogging has not been demonstrated.

AVG (aminoethoxyvinylglycine) is an inhibitor of ethylene production. It can be used to indicate the involvement of ethylene production in physiological processes. Improvements in commercial production of AVG provide an exciting opportunity to explore the importance of ethylene production in plant responses to waterlogging in the field. To achieve meaningful results, dose-response tests are necessary to establish the concentration of AVG that is high enough to inhibit ethylene formation while low enough to minimise nonspecific and possibly toxic effects to the plants from AVG itself (Jackson, 1991).

Materials & methods

To identify the appropriate rates of AVG for further experimentation, we conducted a field test last summer at Narrabri. Sicala V2i was subjected to 5 waterlogging events. AVG could only be applied only once due to the limited amount available. This was done using a hand sprayer, the day before the second waterlogging event which at the peak squaring stage. Four rates of AVG were applied, 0, half (62.5 g a.i./ha), full (125g a.i./ha) and double (250 g a.i./ha) the recommend rate of 125 g a.i./ha were used. Seed cotton yield and total bolls in 1m row were harvested at the end of the season.

Results & discussion

The total number of bolls in each of all the AVG treated plots was significantly higher than the untreated control (Fig.1A). The trend indicated that this was highest in the full AVG rate treatment followed by the half and the double rate respectively. The trend was not significant for seed cotton yield (Fig. 1B) due to high variation. The effect may be stronger if AVG was applied at each waterlogging event.

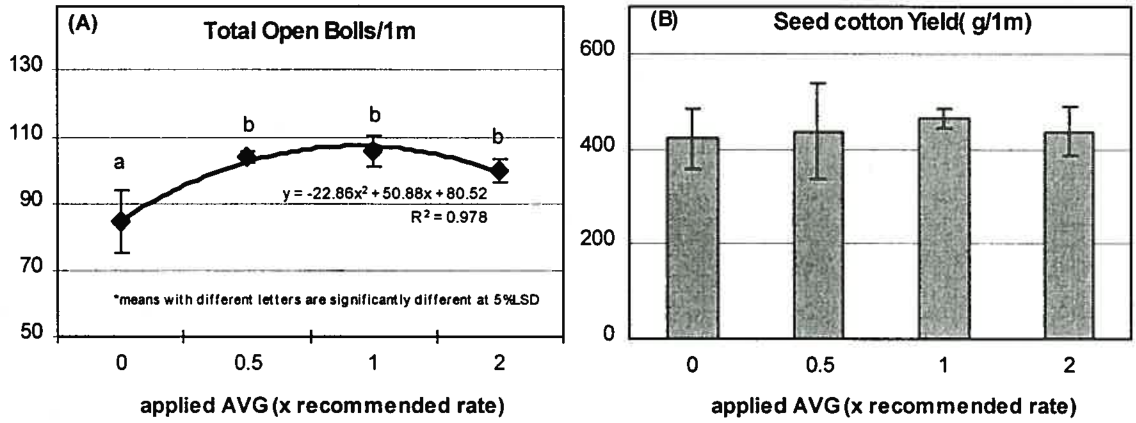

Figure1. Number of total bolls (A) and seed cotton yield (B) in 1m row of cotton from AVG dose-response experiment, 1999/00.

Conclusion

Our preliminary results show a trend for a positive response of waterlogged cotton to the application of AVG. We will repeat the experiment this year with more detail observations to understand direct involvement of ethylene in waterlogged cotton. This will provide benefits in terms of the possibility of using AVG to ameliorate damage due to waterlogging in the field, as well as providing important information to improve our understanding of waterlogging effect in cotton.

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