



SYSTEMIC INDUCED RESISTANCE IN COTTON

by

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A thesis submitted to the Faculty of Agriculture,
the University of Sydney, in fulfilment
of the requirements for the degree of

Doctor of Philosophy

June 1997



ABSTRACT

This thesis assessed the effectiveness of a formulation of a chemical activator in bringing about systemic resistance to diseases in cotton in the light of reports of its action in other plants.

In experiments conducted under glasshouse conditions using the pathogen, *Alternaria macrospora*, CGA41396 (consisting of 25% 2,6-dichloroisonicotinic acid (INA) and 75% wettable powder (WP) formulation material) or water as a control was applied to the cotyledons of cotton (*Gossypium* spp.) cvs. Siokra 1-4 and Pima S7. Decreases in the numbers of lesions formed on the first and second leaves of cotton plants treated with CGA41396 were observed in some experiments following challenge-inoculation with an *A. macrospora* spore suspension, 5×10^5 spores/ml. In some experiments, fewer lesions were formed on the leaves of cotton seedlings that had been treated with the WP formulation.

Field experiments were conducted at Bourke and Moree, NSW, during the 95/96 cotton-growing season on *G. hirsutum* cv. CS50 and *G. barbadense* cv. Pima S7 respectively. Mature cotton plants were untreated or had the entire foliage treated with CGA41396 or the WP formulation following natural *Alternaria* outbreaks in the fields. Lower percentage leaf areas covered with *Alternaria* lesions were observed on mainstem leaves 9, 10 and 11 in the CGA41396 treated plants in the Bourke experiment. No significant reductions in percentage leaf area covered with lesions were observed in the Moree experiment.

In glasshouse experiments using a vascular wilt, caused by *Verticillium dahliae*, CGA41396, the WP formulation or water as a control were applied to the entire foliage of 5 to 6 week old cotton plants or as a soil drench. Disease severity, based on foliar symptoms, was not significantly



reduced statistically in plants treated with CGA41396 or the WP formulation prior to challenge-inoculation with *V. dahliae*.

During the 94/95 and 95/96 cotton-growing seasons field experiments were conducted at Narrabri, NSW, in soil infested with *V. dahliae*. Significantly lower disease severity was observed in mature cotton plants cv. Siokra 1-4 that had the entire foliage sprayed with CGA41396 or had CGA41396 applied as a soil drench compared with the untreated plants in the 94/95 and 95/96 seasons. In the 95/96 season disease severity was significantly lower in cv. Sicala V2 plants that had been treated with CGA41396 as a foliar spray or soil drench compared with untreated plants. Siokra 1-4 plants treated with the WP formulation as a foliar spray or soil drench in the 95/96 season had significantly lower disease severity than untreated plants.

No reductions in the severity of disease caused by *Thielaviopsis basicola* were observed in cotton cv. Siokra 1-4, grown under controlled conditions, following foliar or soil application of CGA41396 or the WP formulation.

Increased activity of the pathogenesis-related protein, β -1,3 glucanase, a marker for SIR in plants, was observed in the second leaves 24 h, 48 h and 120 h after foliar treatment of the first leaves with CGA41396 or the WP formulation or soil drench with CGA41396. β -1,3 glucanase activity was also higher in most experiments in the growing points, upper and lower stem sections and roots 3, 7 and 14 days after foliar application of CGA41396 or the WP formulation to the first leaves or a soil drench with CGA41396.

β -1,3 glucanase activity increased in the first and second leaves of cotton seedlings 3, 7 and 14 days after application of the individual components of CGA41396 to the cotyledons. The greatest activity was



observed in cotton seedlings treated with the known active ingredient in CGA41396, 2,6-dichloroisonicotinic acid (INA).

100
50
30
50
(M...)

success
Australia
cotton
Pakistan
D...
of cotton (B...)
cotton culture
the other 35
Upland culture
New South W...
10%, the other
(Crowling, 1996)