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Cotton Research and Development Corporation

FINAL REPORT

"Distribution of, and insecticide resistance in Australian B-biotype *Bemisia tabaci* "

DAN 92C

February 1995 to December 1995

Dr Robin Gunning, The Tamworth Centre for Crop Improvement (067-63 1128)

NSW Agriculture

Cotton *Research and Development Corporation*

Project Title :

"Distribution of, and insecticide resistance in Australian B-biotype *Bemisia tabaci* "

Project Number: DAN 92C

Research Organisation: NSW Agriculture

Principal Researcher:
Dr Robin Gunning
Senior Research Scientist
NSW Agriculture
The Tamworth Centre for Crop Improvement
RMB 944 Calala lane, Tamworth, NSW 2340
Phone (067) 63 1128
Fax (067) 63 1222

Project Supervisor:
Mr A. J. Shaw
Program Leader (Cotton)
NSW Agriculture
Narrabri Agricultural Research Station
PMB Narrabri, NSW 2390
Phone (067) 99 1500

A final report prepared for the Cotton Research and Development Corporation

SUMMARY

INTRODUCTION

The cotton whitefly *Bemisia tabaci* is a serious pest of fibre, horticultural and ornamental crops world wide. When present in sufficient numbers, it can cause extensive damage through direct feeding, the production of large quantities of honeydew and as a vector of many viruses. A new biotype was first identified in the USA, known as the B-type or poinsettia strain Overseas, the B-type *B, tabaci* is a primary pest on cotton, other vegetable crops (curcubits, tomatoes, rock melons) and ornamentals. This strain is extremely virulent, insecticide resistant, adapts to temperate climates and has a host range of over 500 plants.

The B-type *B. tabaci* was detected, for the first time in Australia (by Dr Gunning), in October 1994 in both Darwin and Tamworth. During 1994/95, the Cotton Research and Development Corporation funded a survey to determine the current Australian distribution of B-type *B. tabaci* and its insecticide resistance status.

OBJECTIVES

1. To undertake a comprehensive survey of the Australian distribution of B. biotype *B. tabaci* .
2. To survey cotton for the presence of B, biotype *B. tabaci*
3. To develop and asses the usefulness of a field "squash test" to identify B -biotype *B. tabaci.*
4. To undertake preliminary bioassay studies to identify insecticide resistance status of this insect.

RESULTS AND DISCUSSION

B-biotype *Bemisia tabaci* is widely distributed in NSW and Queensland. While infestations are largely confined to plant nurseries, the whitefly is gradually spreading into the cotton producing areas of NSW and Queensland.

Preliminary insecticide bioassays by Dr Gunning have confirmed overseas experience, that B -type *B. tabaci* are resistant to most organophosphate, carbamate and pyrethroid insecticides (including the newer pyrethroids such as bifenthrin). As a consequence, this insect may be difficult to control. However, B- type populations appear to be susceptible to endosulfan, although resistance may easily develop.

DISCUSSION AND RECOMMENDATIONS

The spread of this whitefly is expected to result in it becoming a major cotton pest in Australia, due to insecticide resistance. Clearly, further whitefly resistance research is required to ensure that resistance is managed effectively and that cost effective control is available to minimise the danger that this insect poses to the cotton industry.

COMMUNICATION OF RESULTS

The results of this research have been comunicated in the scientific literature, conference proceedings of the Australian Entomological Society and in *The Australian Cotton Grower*.

APPENDIX

Budget:
Total funds contributed by the Cotton Research and Development Corporation 1994/94 , 1995/96 were $27,491. NSW Agriculture ($17,091) and QDPI ($10,400).

SPECIAL CONSIDERATIONS

This project was greatly assisted by the help and collaboration of F.J. Byrne, I. Denholm and A. Devonshire (all of Rothamsted Experimental Station, UK). Thanks are also due to M.E. Balfe, N.A. Coleman and B. C. Craswell (all of NSW Agriculture) for technical support.

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RESULTS AND DISCUSSION

Whitefly collections were co-ordinated in NSW by Dr Gunning and in Queensland by Mr B. Franzmann, QDPI, Toowoomba. Whitefly identifications were made by Dr Gunning and whitefly insecticide bioassays were also conducted by Dr Gunning at Tamworth.

The current distribution of B-biotype *B. tabaci* is shown in Fig. 1. The identification of all whiteflies was confirmed by electrophoresis at the Tamworth Centre for Crop Improvement. The whitefly is widely distributed in NSW (Alstonville, Wollongbah, Moree, Tamworth, Coffs Harbour, Dubbo, Richmond, Blue Mountains, Sydney, Warren, Narromine, Coonabarabran), Queensland (Cairns, Ayr, Emerald Kingaroy Dalby, Toowoomba, Bileola, Brisbane), the Darwin and Katherine areas of NT. The whitefly was also found in the ACT and Devonport in Tasmania. Infestations are largely confined to plant nurseries but the whitefly was found in 1994/95 on field pumpkins (Tamworth) and on a sunflower crop at Moree. The whitefly was not found on cotton in the 1994/95 season. However, during 1995/96, some B- type individuals were found on cotton at Emerald (November 1995) on cotton and weeds in the Macquarie Valley (December 1995) and in the Namoi Valley (Jan. 1996). Whitefly surveys on cotton, by Dr Gunning and Mr Franzmann, are continuing in NSW and Queensland, during the 1995/96 season.

AQIS investigations suggest that the B-biotype *B. tabaci* was first introduced into Australia in late 1993, via poinsettias which were legally imported from California in the United States to Coffs Harbour (NSW). Our surveys show that this whitefly is well established and widespread in eastern Australia. Eradication is not considered possible. The whitefly has not yet been detected in Victoria, South Australia or Western Australia, however it is very likely that infested plants have been sent to these states.

A "user friendly" rapid biochemical detection method to distinguish B-type *B. tabaci* in the field (from other whitefly types) was successfully developed by Dr Gunning. The method is based on increased production of esterase isoenzymes in B-type *B. tabaci*. Biochemical identification kits were produced and distributed to agriculture department quarantine officers in each state and to Mr B. Franzmann, DPI , Toowoomba. Mr Franzmann has found the kit to be very useful for rapid whitefly identifications on cotton in Queensland.

After evaluating several whitefly bioassay methods, Dr Gunning adopted the Rothamsted ,UK bioassay proceedure. Dr Gunning is undertaking this whitefly work in colaboration with the Rothamsted researchers and it is important that our bioassay data are comparable.

Preliminary insecticide bioassays by Dr Gunning have confirmed overseas experience, that B -type *B. tabaci* are resistant to most organophosphate, carbamate and pyrethroid insecticides (including the newer pyrethroids such as bifenthrin). As a consequence, this insect may be difficult to control. However, B- type populations appear to be susceptible to endosulfan, although resistance may easily develop. Toxicological, biochemical and genetic studies are continuing at Tamworth to establish the resistance profile of Australian B-biotype *B. tabaci*.

DISCUSSION AND RECOMMENDATIONS

The spread of this whitefly is expected to result in it becoming a major cotton pest in Australia, due to insecticide resistance. Clearly, further whitefly resistance research is required to ensure that resistance is managed effectively and that cost effective control is available to minimise the danger that this insect poses to the cotton industry.

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