RURAL INDUSTRY RESEARCH FUNDS

FINAL REPORT

Authorised Body: COTTON RESEARCH COUNCIL

Project Number: DAN 26L

Project Title: DISEASES OF COTTON

Field of Research: Crop Protection - Diseases Field Code: 3-2

Organisation: NSW Agriculture & Fisheries
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Project Commenced	Project Completed
1-7-86	30-6-89

Project Objectives:

(i) To evaluate procedures which may be used to reduce or eliminate the bacterial blight pathogen from cotton planting seed.

(ii) To monitor the races of the bacterial blight pathogen that are present in Australian cotton growing areas and the stability of the blight resistance present in the cultivars Siokra and Sicala.

(iii) To collect field data on the effect of permanent bed systems, centre pivot and drip irrigation, dryland cropping, rotation crops etc, on the development of diseases of cotton.

(iv) To develop and/or evaluate control strategies for those diseases of cotton which can significantly limit or reduce cotton yield and/or lint quality.

SUMMARY

Disease Surveys.

*The incidence of bacterial blight on seedlings early in the season has declined dramatically and this has been reflected in recent seasons by lower levels of blight on bolls prior to harvest.

*The incidence of verticillium wilt in the area between Narrabri and Merah North in the Namoi Valley has increased significantly over the last five seasons. Survey results indicate (i) a positive relationship between repeated cotton cultivation and the incidence of verticillium wilt (ii) that rotations being used in the Namoi Valley are having little effect on the incidence of the disease and (iii) there is no clear relationship between the amount of debris from a previous cotton crop and the incidence of verticillium wilt.

*Phytophthora boll rot was widespread in the 1987/88 season in association with heavy rainfall in late February and March 1988.

*Black root rot was recorded for the first time in Australia and has now been detected at four sites.

*Significant populations of plant parasitic nematodes were not detected in irrigated cotton soils with a long history of cultivation.

*Alternaria leaf spot was recorded for the first time in commercial cotton fields in New South Wales.

*Premature senescence has been observed in many commercial crops. Some evidence suggests that the condition results from a natural relocation of nutrients from the growing point of the plant to the developing bolls.

Seed scheme to reduce blight infestation of planting seed

*There has been a substantial reduction in the level of bacterial blight infestation of planting seed.

*Assessments of blight incidence have been used as a criterion for rejecting pure seed crops.

*Blight susceptible lines in C.S.D. nurseries have been sprayed with Kocide to prevent/reduce the development of blight epidemics.

*Preliminary results indicated that using a bactericide in picker water may reduce the dispersal of the blight pathogen during picking and ginning.

*An experiment showed that the level of seed infestation declined more rapidly if seed was stored delinted than if stored fuzzy.

*Quarantine conditions have been changed to include intermittent misting of seedlings during the first 3 to 4 weeks of growth and two applications of "Kocide" to control epiphytic populations of the blight pathogen on resistant hosts.

*The dangers of contamination of second-hand machinery being imported into Australia were noted.

Bacterial blight race identification

*All 67 collections of bacterial blight from major production areas of New South Wales and Queensland were identified as race 18.

Establishment of a verticillium nursery

*The application of gin trash, over fertilizing, late planting, frequent irrigation and the use of a low plant stand resulted in 93-95% incidence of verticillium wilt in the nursery.

Field experiments

*No fungicide seed treatments were significantly better than Terraclor. All insecticide treatments increased seedling vigour and improved plant stand in the 1988/89 experiment.

*In-furrow fungicides granules had no effect on stand establishment when mixed with covering soil, but significantly increased stand when placed in with the seed.

*72% of plants within plots became infected with bacterial blight within 7 weeks of inoculating a single plant in the centre of the plot.

*The susceptibility of cotton bolls to bacterial blight decreased with increasing maturity.

*Potassium nitrate was ineffective as a foliar spray for the control of bacterial blight of cotton. The addition of an antibiotic did not improve the efficacy of "Kocide" for the control of bacterial blight of cotton.

*Yield of cotton is most severely affected by verticillium wilt when infection occurs mid season.

*Deltapine 90, Siokra and Sicala are similar in their reaction to alternaria leaf spot and all are more resistant to the disease than the cultivar Pima.

BENEFITS OF RESEARCH

*Co-operation with Cotton Seed Distributors in conducting the annual seed treatment trials has improved the value and precision of these experiments. The use of "Nearest neighbour" designs, a cone seeder for planting, assessment of stand and vigour and full statistical analysis has allowed a more effective evaluation of current and potential seed treatments.

*Plant quarantine stations in Brisbane and Sydney have now adopted the methods used at Narrabri ARS to detect blight infestation of seeds. These methods, which include frequent misting and high temperatures followed by applications of copper hydroxide have been adopted in order to reduce the possibility of introducing new races of the blight pathogen into Australia.

*Investigations at Narrabri showed that second-hand farm and processing equipment imported from overseas is frequently contaminated with soil and crop debris which can potentially be a means of introducing diseases and pests not yet present in Australia. Industry groups are now taking extra precautions to have imported second-hand machinery more effectively cleaned prior to arrival in Australia.

*Efforts in association with Cotton Seed Distributors Ltd of Wee Waa have resulted in substantial reductions in the level of bacterial blight seed infestation in Deltapine cultivars.

*CSIRO plant breeders are now using the verticillium nursery which was established as part of the pathology programme as a site for comparing the relative tolerance or susceptibility of selected cotton lines to infection by *Verticillium* sp..

*Experiments showed that blight infested leaves could be collected, air-dried, ground to a powder and stored as a source of blight inoculum for field experiments in the subsequent year. CSIRO plant breeders have adopted this procedure.

DIFFICULTIES ENCOUNTERED

Some difficulties were encountered with the resignation of Miss Karyl-Lee West, Technical Officer and the delays associated with re-filling the position between December 1987 and February 1988.

The very wet conditions at harvest in the 1987/88 and 1988/89 season made it impossible to evaluate the efficacy of adding a bactericide to picker water as a method of reducing blight contamination of seed during picking and ginning (see detailed final report).

RECOMMENDATIONS FOR FURTHER RESEARCH

(i)It is important to continue to identify those races of the blight pathogen present on the susceptible Deltapine cultivars in Australia and to also monitor the level of blight present in seed.

(ii)Two biocontrol seed treatments have recently been registered for the control of seedling diseases of cotton in the U.S.A. Australian and U.S. studies have found evidence to suggest that the soil inhabiting fungus, *Talaromyces* sp. may be effective as a biocontrol agent for *Verticillium dahliae.* Other biocontrol agents for verticillium wilt control are also being evaluated in California with encouraging results. The potential use of biocontrol agents for disease control in Australia needs to be considered.

(iii)Plant establishment and early season vigour are of major concern to growers. Seedling disease pathogens acting either alone or in combination with insect activity or herbicide damage cause considerable losses. Field evaluation of seed treatments, in furrow treatments and cultural practices to reduce the losses from seedling diseases is necessary.

(iv)In recent seasons raking and burning of crop debris has become more common. The potential value of this practice for reducing carry-over of verticillium inoculum in infested debris should be investigated.

NOTE:

These recommendations are currently being implemented under the new project DAN 48L "Diseases of Cotton" which commenced in July 1989.

PUBLICATIONS ARISING

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