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COTTON RESEARCH COUNCIL

FINAL REPORT

DAQ20 GENOTYPE ENVIRONMENT ANALYSES of COTTON CULTIVAR TRIALS

Objectives:

To conduct a critical examination of the ACCT data from 1974/75 to 1985/86 and to learn more about the relative behaviour of cultivars over the testing sites and the effectiveness of location to evaluate cultivar differences.

Reports:

The report of Williams and van Ewijk on their statistical analysis of the data is attached.

The report of Lawrence and DeLacy on their numerical classification analysis is also attached. This report was discussed at a meeting in Narrabri in July '87 arranged by the Cotton Research Council.

Summary:

In the first six years of trials, 74/75 to 79/80, grouping of environments by geographical locations is more pronounced than grouping the environments by years. This would suggest that separate breeding programs are required for different geographical areas, namely (1) Namoi and Macquarie and (2) Central Queensland. However, this conclusion may not be relevant in 1987 because in the early trial years, most of the genotypes being evaluated were of USA origin and not particularly well adapted to Australian environments.

In contrast, the last few years of trials mostly included advanced breeding selections from the CSIRO breeding program which were better adapted to Australian environments. In the last three years of trials, 83/84 to 85/86, grouping of environments by years is definitely more pronounced than grouping environments by geographical location. This suggests that only one breeding program is required for irrigated cotton in Australia.

Within the next one to two years, advanced breeding selections developed by Qld DPI at Biloela will be available for inclusion in these trials. Perhaps this will alter the conclusions about the number of cotton breeding regions in Australia.

The number of locations required for yield testing could be reduced. Some locations, in particular darling downs and west namoi, are very useful for differentiating between genotype response to environments; whereas, other environments, boggabilla, myall vale, moomin creek, st. george, moree, do not contribute to the separation of genotypes. Therefore, the current set of eleven test locations, could be reduced to six locations, darling downs, west namoi, warren, biloela, theodore, and emerald. These locations basically cover the geographical diversity of cotton areas in Australia.

Early generation testing of breeding lines can only be carried out at a maximum of three sites. This analysis of genotype environment interaction suggests the best three sites are (1) one site in NSW, (2) Darling Downs, (3) either Biloela or Emerald in central Queensland.

To gain a better understanding about the grouping of environments, it may be useful to relate these groups to an independent measure of environments such as day-degrees. The pattern analysis has identified a number of specific environments, eg. darling downs in 80/81, 81/82, and 84/85, which don't fit the normal genotype-environment patterns expected from examining either locations or years independently. The growing conditions of these environments should be examined carefully to try and gain a better biological understanding why these environments are different from the normal. Automatic climatic recorders have now been installed at all ACCT sites.

The number of locations required for evaluating fibre quality could certainly be reduced. Fibre length has no genotype-environment interaction, and fibre strength and micronaire have a small genotype-environment interaction, hence these traits could be evaluated at 3-4 locations maximum.

The pattern analysis can easily be run on future data sets and the classification of genotypes and environments compared to results from previous years.