DELTAPINE VARIETIES

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COTTON BREEDER

DELTAPINE AUSTRALIA

Delta and Pine Land Company from Scott, Mississippi, U.S.A. has had a long and distinguished career within the Australian Cotton Industry. This commitment has been strengthened with the establishment of the wholly owned subsidiary, Deltapine Australia Pty. Ltd. This Australian operation consists of a Cotton Seed Conditioning Plant at Narromine, N.S.W. and a Cotton Plant Breeding program located at Goondiwindi, Qld.

As the Cotton Breeder for Deltapine Australia this presentation will concentrate on the breeding program and aim to cover the following

- The performance of Deltapine Varieties in 1991/92
- The specific factors Deltapine is breeding for in Australia
- The future

Delta and Pine Land Co. began it's involvement with the Australian Cotton Industry in the 1970's. Varieties released by Delta and Pine in the U.S.A. or advanced crossbreds from the American breeding programs were introduced into Australia. After an initial seed increase period these lines were tested in replicated strip trials across a range of environments. Material with successful yield and fibre results were then released as varieties onto the Australian market. A natural succession of varieties has resulted with the current varieties being DP 90 and DP 891. The Deltapine Australia breeding program will continue to test the very best material from the five cotton

breeding programs operated by Delta and Pine in America. In addition, we will breed and develop new varieties here in Australia.

The variety performance testing program consists of two sections, the strip trial evaluation tests conducted by our marketing partners Pioneer Hi-Bred Seeds and Seed and Grain Sales Pty. Ltd. and our own plant breeding advanced crossbreds trials.

The strip trial program was co-ordinated by Jacques Malan. Trials were grown in all cotton growing regions. Results of these trials were sent to all growers in the Trial Results Handbook. DP 90, once again, was the consistent performer in 1991/92 as it has been for several years. In addition two new lines 891 and 902 provided consistent results. DP 891 has subsequently been released as a second variety for 1992/93. Much of the concern with DP 90 is the absence of Bacterial Blight resistance. In some areas in 1991/92, hail or sand blasting followed by rainfall and humidity, allowed blight to develop and under these "ideal" disease conditions it can be a problem. However the trial results indicate that DP 90 is still a consistently high yielding variety even when some level of blight infection is present. Bacterial blight resistance is however being incorporated into these varieties.

Advanced crossbred trials were conducted at three sites in 1991/92, these sites being Goondiwindi, Darling Downs (Brookstead) and Narrabri. The lines tested in these trials have all been bred by Delta and Pine in America and introduced into Australia. Although the trials were planted in November the

results have indicated that several lines may have potential in Australia. There is a wide range of maturity times, plant types and fibre quality amongst the lines tested. The best lines will be further evaluated in 1992/93 in an expanded trial program including Emerald and Warren. Depending on seed availability some lines also will be tested in strip trials. Bacterial Blight will be incorporated into these promising lines concurrently with testing in trials.

The main thrust of our work in 1991/92 has been the development of our own breeding and selection material. Any type of Plant Breeding requires the generation, selection and testing of a wide range of genetic diversity.

The generation of genetic diversity is achieved by making controlled, artificial cross pollinations between different plants. The aim is to mix the positive characters from these different plants into one new plant.

The selection of genetic diversity is relatively easy for visual characters such as leaf type, but much more complex for characters such as yield. This is further influenced by whether the character involved is mainly genetically or environmentally controlled. A large number of characters can be selected in the cotton plant and an even wider range of combination is possible. The selection process is aimed at selecting a superior combination of characters. The aims of our selection program and the importance placed on different characters will depend on the level of genetic versus environmental influence. Environmental influences include weather and management practices.

While total yield is certainly very largely related to a plant's genetics, yield

consistency is more related to environmental factors. Yield is a function of many factors such as boll size, boll weight, turnout and lint yield, picking efficiency, storm resistance and plant maturity. A selection which is consistently high yielding will be preferred unless a variety is being bred for other specific requirements.

Fibre quality characteristics are mainly genetically controlled, although individual components of fibre quality can vary due to environmental influences. Fibre strength is a characteristic predominantly controlled by plant genetics, whereas uniformity is controlled less by variety and to a large degree by management. The changing requirements of marketers and spinners will also influence fibre quality selection criteria.

Disease resistance characters can be either completely genetically controlled or environmentally influenced depending on the type of disease. Bacterial Blight resistance is genetically controlled and easily screened in the field. Priority in selection is being given to incorporating resistance to this disease into both our breeding program and introduced material from the American programs. This past season our first criteria in all our selection work was for this character.

Verticillium wilt is a much more complex disease and the level of genetic control is much more difficult to identify. Selection for resistance to this disease is a longer term aim of our program and we hope to establish a suitable disease nursery for this work. The increasing incidence of the disease indicates it requires greater attention. A disease such as this may

require the development of specialty varieties. Other diseases such as Alternaria, Seedling diseases and Boll rots are largely environmentally influenced and even more difficult to evaluate and select. Visual assessments will be made each year on these characters.

Insect resistance can be achieved through host plant resistance mechanisms or more recently through genetic engineering. Host plant resistance is achieved by selecting genetically controlled plant agronomic characters such as leaf type, glabrous plant types, bract types or levels of chemicals (tannins or gossypol) in the plant. Selection for these characters has often meant a trade off for yield or fibre quality. Some of these characters also offer additional benefits to the plant such as better light penetration into the canopy or better fibre grades. Characters which offer multiple benefits will be more likely to be selected.

Much greater potential for insect resistance is offered through genetic engineering and Deltapine is actively involved in developing this method of insect control. We are already involved in work with the Bt gene for resistance to Helicoverpa species. This resistance offers tremendous advantages to cotton production providing it is used and managed correctly.

The cotton micro-climate covers such characters as light efficiency, leaf size and shape, leaf orientation, plant heights, length of fruiting branches, position of first fruiting branch, fruiting pattern, erectness of plants and plant maturity. These characters are genetically controlled, but can also be significantly influenced by the environment, particularly agronomic

management. A range of all these characters exist in all selections and the number of possible combinations is enormous. The aim is to incorporate the best combination of these characters with yield, fibre quality and disease and insect resistance. Different combinations will be required for different environments and specialty varieties may need to be developed for narrow row 30" cultivation versus standard 40" rows and shorter season growing regions.

Other future work within our breeding program will include resistance to both glysophate and sulfonylurea herbicides, breeding for shorter season varieties as this offers great scope for the expansion of the Australian cotton industry and the possible future development of hybrid cotton varieties which potentially offer significant yield increases through hybrid vigour.

I am sure you can understand from all this that the challenges in cotton breeding are enormous and varied. Delta and Pine Land Company has played a very significant role in the development of the Australian Cotton Industry. This role is set to continue through the establishment of Deltapine Australia. We have set ourselves some very tough goals over the next few years, but I am sure that with the strength that Delta and Pine has in America and the continued access to the benefits of their research and breeding material, we will develop a breeding program here in Australia that offers significant benefits to the whole industry and that the success and support Delta and Pine has received, in Australia, in the past will continue and grow. We look forward to the day when as a major research program in Australia we can

make a significant contribution to the industry and in return be eligible for funding support through your bale levy and Cotton Research and Development Corporation.

I would like to close by thanking all our trial co-operators for their help, assistance and patience in our establishment year. I am pleased to be part of a tremendous and professional industry and appreciate any comments which will help us to ensure our research effort achieves it's maximum potential.