

THE AIMS OF THE HIGH QUALITY BREEDING PROGRAMME

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The high-quality cotton variety Namcala and its predecessor Hopicala have traditionally been grown on small percentages of the Australian acreage (mainly in NSW) as an alternative to the high yielding varieties such as Deltapine smooth leaf, Deltapine 16 and recently Deltapine 61.

In 6 seasons of large scale CSD trials (data kindly supplied by Richard Lesky) Namcala yielded on average only 91% that of Deltapine 61. As a result of this yield penalty the high-quality proportion of the cotton area since 1969 has been small and usually less than 10% (Figure 1).

In addition to the yield disadvantage, data of the last 5 seasons shows that Namcala consistently has a lower lint percentage and is a half to one grade lower as a result of its hairy leaves and large, fragmentary bracts. Namcala yields tend to fluctuate more than those of DP61 and Namcala is more susceptible to bacterial blight (Figure 2). However, Namcala does produce higher quality lint than the high yielding Deltapine types as measured by the three important fibre characteristics of length, strength and fineness (Stelometer, Pressley and micronaire respectively) (Figure 3). As a result Namcala lint often commands a substantial premium because of its suitability for fine spinning and blending. Another plus is that Namcala has greater tolerance to verticillium wilt which, in certain locations and seasons, can be very damaging.

Although the home consumption of Namcala-type lint is small the overseas market is almost unlimited. The world's spinning industries are currently moving away from traditional ring spinning towards new faster technologies, such as rotor spinning, and these new processes place higher demands on the cotton fibres. The main demand is for higher fibre strength, although length and fineness are also important.

So given all these considerations it was decided two years ago to begin an additional breeding programme at Narrabri to develop a replacement for Namcala. The aim of the programme is to produce varieties with the characteristics laid out in Table 1. These aims are not unique and other

cotton breeders around the world are pursuing a similar goal. However, all these breeders have to cope with one major genetic obstacle, which incidentally occurs with many other crop species; the payoff between quality and quantity. The fibre characteristics strength and length, while being positively correlated themselves, are strongly negatively correlated with the components of yield, particularly lint percentage. The implications of this are that attempts to improve yield tend to lower quality and visa versa. The situation, however, is far from hopeless and the negative association between the genetic control of yield and fibre quality can and is being broken.

The new variety Deltapine 90 goes part-way to this objective since it combines better strength (although well below Namcala) with a high yield. We can learn something from its history. The variety took 19 years to breed (a long time even in plant breeding terms) and was selected from a very unexpected source. These facts indicate that our hybridization work must encompass as large a range of germplasm as possible and that we must handle vast numbers of samples to have a reasonable chance of success. We are utilizing a large range of genetic material as sources of the genes required to synthesise new varieties (Table 3). Our efforts have been made considerably more efficient by the acquisition of a Spinlab High-Volume Quality Testing Machine located at CSIRO Division of Textile Industries, Geelong. While we do not underestimate the task at hand we are confident of success and preliminary results from last season's observation plots are encouraging.

Until a specifically bred high-quality variety is available Dr. Thomson and Mr. Reid have been undertaking intravarietal selection as an interim measure. Their efforts have been rewarded by the isolation of the selection Namcala 830 which has Namcala quality plus improved yield.

As well as our conventional breeding techniques we are experimenting with: a) a number of genetic techniques to speed up the production and isolation of pure breeding lines from segregating material: b) the incorporation of certain species of wild cotton with desirable characteristics into our gene pool: and c) the production of novel genetic variation by chemical and radiation treatment.

In summary we are aiming to create a disease free variety which produces strict middling, 36/32 inch, 105 000 Pressley cotton well before the year 2000.

Table 1

Desirable characteristics of any Namcala replacement variety:

- a) High seed cotton yield and high lint percentage
- b) Bacterial Blight resistance and verticillium wilt tolerance
- c) Smooth to glabrous leaves plus small bracts
- d) Fibre strength, length and fineness of Namcala

Other characters that must be maintained to ensure commercial success:

- e) Seed quality and seedling vigour
- f) Non-lodging and ability of easy defoliation
- g) Maturity equal to or only slightly later than DP 61
- h) Fibre extension (>5%) and uniformity ratio (>45%)

Table 2

The pool of cotton germplasm being used to supply the genes for certain characteristics required in any replacement variety for Namcala. Of course, any promising new material from our own programme or abroad is incorporated as soon as possible.

<u>Varieties</u>	<u>Origin</u>	<u>Desirable characteristics</u>
Tamcot SP37	USA	Bacterial Blight resistance
Albar	Africa }	Bacterial Blight resistance and good quality
Reha P279	Africa }	
Namcala	Australia }	Quality and verticillium wilt tolerance
Namcala 830	Australia }	
Acala C-1	USA }	
Acala 1517-77	USA }	
Deltapine 61	USA	Yield
SICOT 2	Australia	Glabrous leaf and stem
N74-367	Australia	Yield, slightly better strength, okra leaf shape, earliness and blight resistance
Deltapine 90	USA	Yield and improved strength

Figure 1

Percentages of the total Australian cotton acreage sown to the high-quality and the high-yielding type cottons, represented by Hopicala/Namcala and Deltapine SL/DP16/DP61 respectively. Figures are based on seed sales from CSD (data kindly supplied by R.A. Allaway). D (solid line) = Deltapine SL + DP16 + DP61, N (pecked line) = Hopicala + Namcala.

Figure 2

The average lint percentages, seed cotton yields (bales/ha) and grades from large scale CSD trials over a number of seasons for the varieties DP 61 and Namcala. The number of locations contributing to each value varies from 4 to 13 (data kindly supplied by R. Lesky of CSD). D (solid line) = DP61, N (pecked line) = Namcala.

Figure 3

The average Stelometer (32nds inch), Pressley (,000 lbs/sq.inch) and micronaire values from large scale CSD trials over a number of seasons for the varieties DP61 and Namcala. The number of locations contributing to each value varies from 4 to 13 (data kindly supplied by R. Lesky of CSD). D (solid line) = DP61, N (pecked line) = Namcala.

FIGURE 1

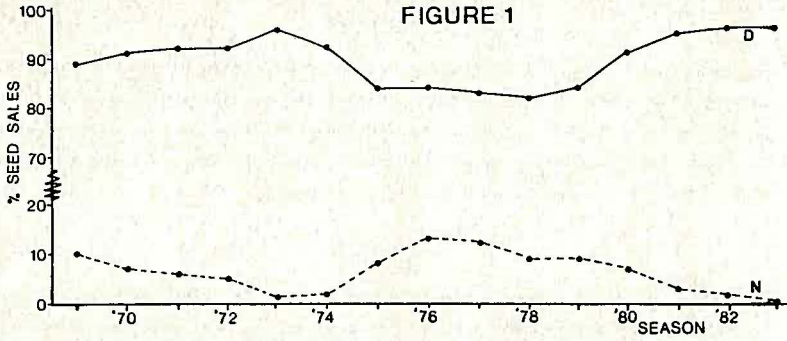


FIGURE 2

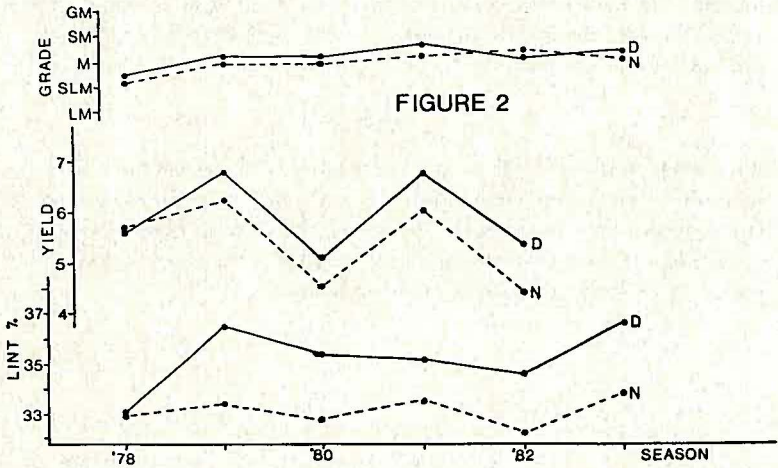


FIGURE 3

