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Authors

Broadbent, P.
Bevington, K.
Fraser, L.
et al.

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Behavior of *Citrus macrophylla* as a rootstock for Eureka Lemon in Trials in New South Wales

Patricia Broadbent, K. Bevington, L. Fraser,
and B. Freeman

Lemon production in New South Wales (N.S.W.) is centered mostly in the Central Coast region approximately 60 to 120 km north of Sydney. Inland conditions are favorable for lemon production but coastal lemons produce a number of crops yearly and, overall, command higher prices.

The lack of a suitable rootstock for replant situations with Eureka lemons led to a series of trials aimed at rootstock evaluation. The trials described commenced in 1961 to evaluate *Citrus macrophylla* Wester, a rootstock described as popular in California in the 1960's (Burns and Lee, 1967).

MATERIALS AND METHODS

Seedlings of rough lemon and *C. macrophylla*, Alemow, were raised in open seed beds and lined out in the nursery at the Horticultural Research Station at Narara in 1961. They were selected for uniformity and budded with Lambert nucellar Eureka lemon (accession no. 2013) in 1963. The resultant trees were planted on research stations at three geographically separated sites in N.S.W.: Somersby (coastal), a few km from Narara; Yanco (Murrumbidgee Irrigation Area); and Dareton (Lower Murray) on a 6.7 x 6.7 m spacing. Yield and butt circumference were recorded at each site. Canopy surface areas were calculated from tree height and width (Serfontein and Catling, 1968).

RESULTS AND DISCUSSION

Tree used in these three trials were raised at Narara where seedlings were presumably infected with aphid-borne tristeza virus in the seed beds. *Toxoptera citricida* Kirk. is common in nurseries on the coast. The nucellar Eureka

lemon scion also carried a mild-moderate strain of tristeza virus, as evidenced by indexing on West Indian lime seedlings.

Tristeza has severely debilitated lemon trees on *C. macrophylla* rootstocks, similar to those described in California (Burns, 1967). Most tristeza-infected trees on *C. macrophylla* rootstock are considerably stunted and sparsely foliated (fig. 1). Affected rootstocks show distinctive pitting of the wood as described by Calavan *et al.* (1968). Variations observed in the type and severity of pitting possibly indicate strain differences. The pits are predominantly narrow, numerous and often saw-toothed. Scion overgrowth is variable and the butts are sometimes fluted with deeply grooved or mildly distorted as described by Calavan *et al.* (1968). Gum deposition is seasonal.

At Somersby, all trees on *C. macrophylla* grew poorly from the outset. Stocks were heavily pitted with some variation in severity corresponding with variation in tree size. Similar results were obtained at Yanco where tree size and cropping were better than at Somersby (figs. 2, 3 and 4). Quality tests at Yanco have indicated that trees on *C. macrophylla* produced fruit with a slightly higher acid content than fruit from trees on rough lemon, while juice content and soluble solids were similar for both (Cox *et al.*, 1971).

Appearance of trees on *C. macrophylla* at Dareton was better than at Yanco and production was initially good considering tree size. More recently, yield has declined and trees on both rough lemon and *C. macrophylla* have tended to alternate bearing (fig. 2), possibly in response to seasons of unusually high spring and autumn rainfall. In the

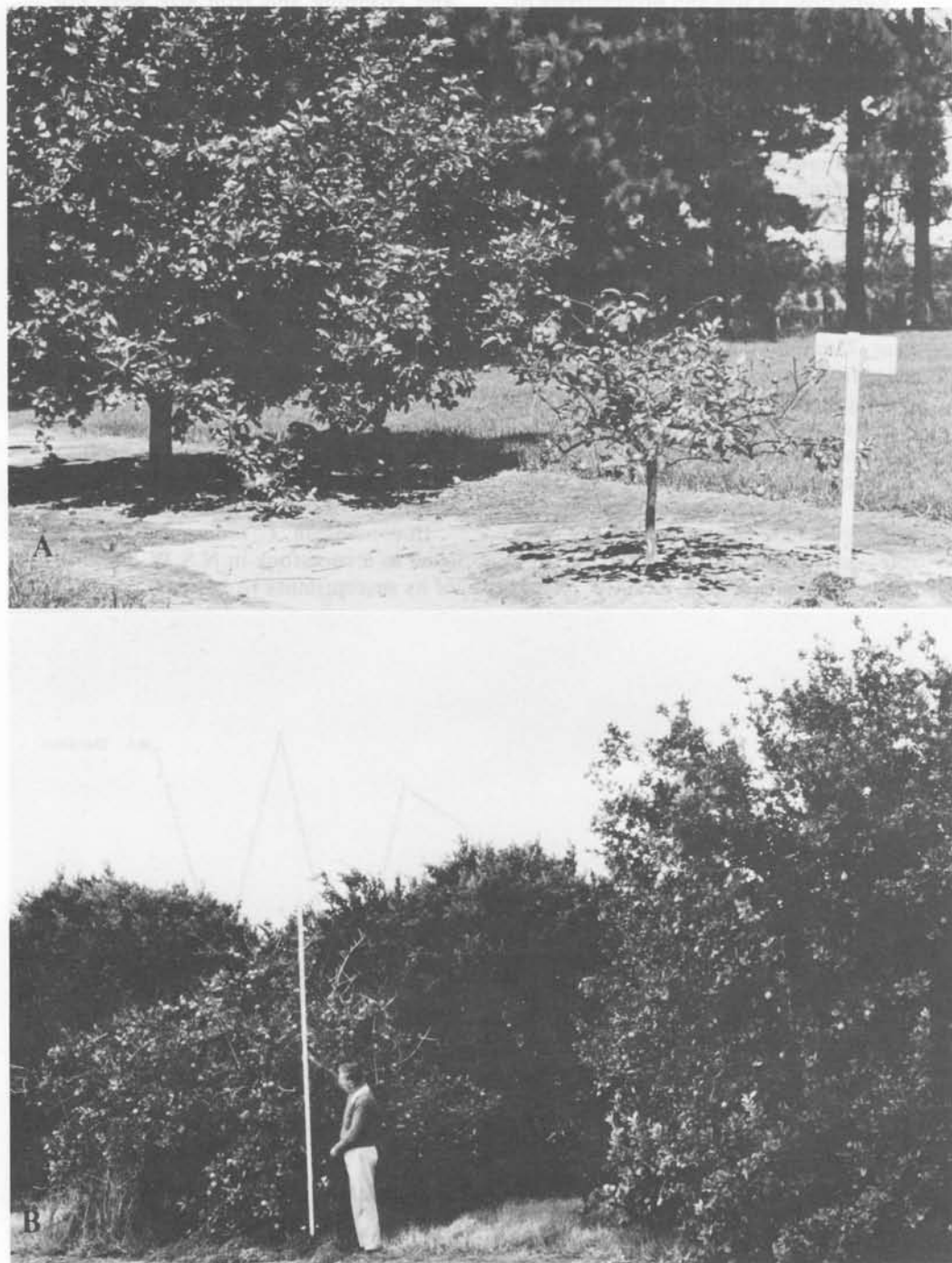


Fig. 1. (A) Nucellar Lambert Eureka lemon on rough lemon (right) and on *Citrus macrophylla* (left) at Somersby H.R.S.; (B) nucellar Lambert Eureka lemon on *C. macrophylla* (right) and on rough lemon (left) at Dareton H.R.S.

Lower Murray area there was no obvious correlation between tree size and pitting type.

Variations in size and productivity of trees on *C. macrophylla* and pitting of the *C. macrophylla* rootstocks among the three sites may be due to climatic differences, principally temperature, affecting symptom expression. Tristeza virus symptoms are known to be partially or completely suppressed by temperatures above 28°C (Roistacher *et al.*, 1974) and aphid activity is curbed by hot, dry conditions. The climate at Somersby is more equable than that at Dareton with less extreme summer heat. Comparison of the behavior of grapefruit trees carrying severe stem pitting (selection 3130) in comparable trials at Somersby and Dareton also demonstrates the apparent modifying effect of climate on tristeza (Cox *et al.*, 1976). At Somersby, no marketable grapefruit has been produced by trees infected with severe strains and the trees are very stunted and heavily pitted,

whereas at Dareton the trees were almost as large as trees infected only by mild strains, pitting is slight or absent, and cropping and fruit size were not significantly less than those of trees with mild strains.

Variability among trees at each site may have been due to variation among the tristeza virus strains with which aphids (principally *T. citricida*) infected the seedlings in the nursery at Narara Horticultural Research Station. Variability in the *C. macrophylla* stocks, i.e., the percentage of nucellar seedlings, may have occurred although Frost and Soost (1968) list *C. macrophylla*, as being polyembryonic with 99 per cent of the seedlings nucellar. In glasshouse trials with Lisbon lemon budded on *C. macrophylla*, great variation occurred in vigor of the *C. macrophylla* seedlings and in the degree of pitting shown by the stocks.

In conclusion, *C. macrophylla* is not used as a rootstock in N.S.W. because of its susceptibility to tristeza.

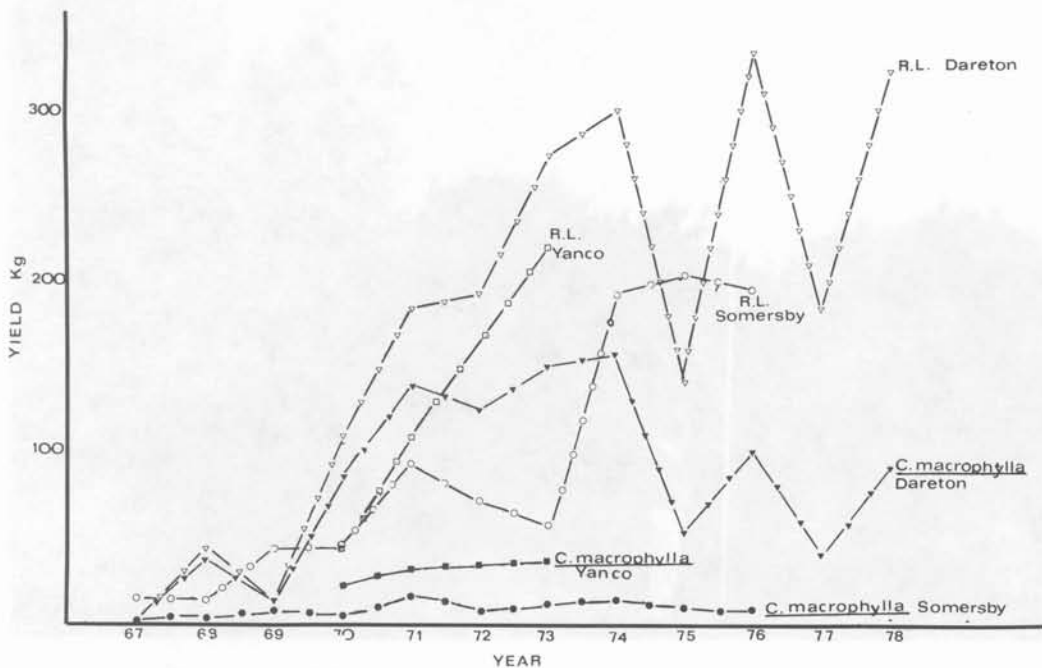


Fig. 2. Yield of Eureka lemon trees on rough lemon (R.L.) and *C. macrophylla* stocks at three sites.

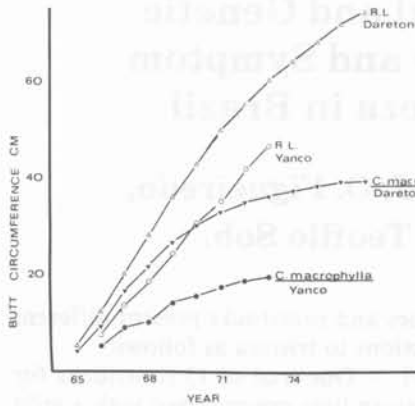


Fig. 3. Butt circumference measurements of Eureka lemon trees on rough lemon (R.L.) and *C. macrophylla* stocks at two sites.

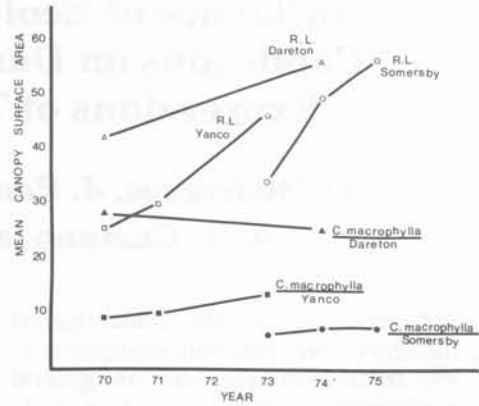


Fig. 4. Mean canopy surface areas of Eureka lemon trees on rough lemon (R.L.) and *C. macrophylla* stocks at three sites.

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