

EXOTIC TROPICAL AND SUB-TROPICAL FRUITS AND NUTS AND THE AUSTRALIAN PLANT PROPAGATOR

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Relative importance of the tropical and sub-tropical fruit industries in Australia. Apart from the banana (*Musa* spp.) and the pineapple (*Ananas comosus*), there are few tropical or sub-tropical species that could be considered major horticultural crops in Australia. Compared with those of the temperate areas of Australia they are very minor (Table 1). However, the area of exotic tree fruit production is rapidly expanding in a period when horticultural plantings are either static or contracting. Exotic tree fruits may never rival the grape or citrus industries in size, but they will have an increasingly important role in Australian horticulture. Perhaps more importantly, however, they will add considerable variety to our fruit diet.

Table 1. Fruit Statistics for Australia, 1981-82.

	Area in 1000 hectares	Production in 1000 tons	Value in \$1000
Grapes	68.3	886	211.4
Citrus	27.5	477	113.6
Pome fruits	27.3	404	152.2
Stone fruits	22.1	118	78.4
Nuts	7.7	3.1	9.3
Banana	8.7	130	60.4
Pineapple	6.4	126	21.5
Macadamia	2.9	1.4	N.A.
Avocado	2.3	2.4	N.A.
Mango	1.1	2.3	N.A.

Source: Australian Bureau of Statistics, 1983

Fruits with potential for expansion. There is a group of fruits that are known to the Australian consumer, and for which there is considerable scope for further market development. Included in this category are the avocado (*Persea americana*), macadamia (*Macadamia integrifolia*), mango (*Mangifera indica*), litchi (*Litchi chinensis*), custard apple and relatives (*Annona* spp.) and cashew (*Anacardium occidentale*). Some of these fruits have a limited season of market availability which can be expanded by growing cultivars in areas of different times of maturity or by growing cultivars with different seasons of maturity in the same area. The times of fruit maturity (Figure 1) of the mango cultivars Sabre, Carrie, Kensington, Valencia Pride, Haden, Irwin and Zill for the locations Darwin

(Northern Territory), Bowen and Walkamin (Queensland) illustrate this point (9)

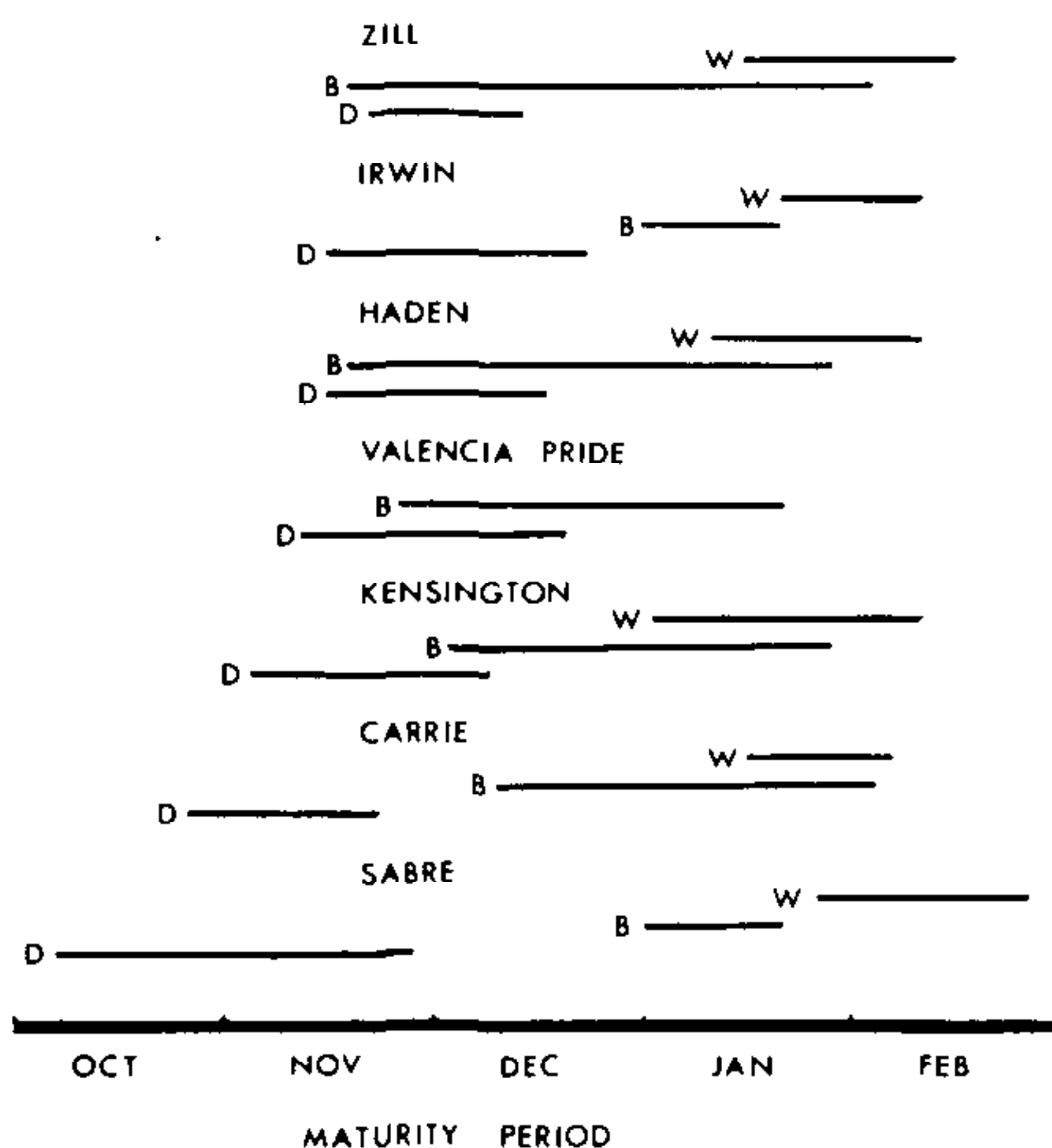


Figure 1. A comparison of the spring and summer maturity seasons for the mango cultivars Sabre, Carrie, Kensington, Valencia Pride, Haden, Irwin, and Zill grown at Darwin (D), Bowen (B) and Walkamin (W).

There is another group of exotic fruits that are virtually unknown in the Australian marketplace, but some of them have excellent potential for development for Australian and export markets. These are the rambutan (*Nephelium lappaceum*), mangosteen (*Garcinia mangostana*), sapodilla (*Manilkara zapota*), carambola (*Averrhoa carambola*), jackfruit (*Artocarpus heterophyllus*), durian (*Durio zibethinus*) and duku or langsats (*Lansium domesticum*).

Present status of these fruits. Many of the species mentioned above were introduced into tropical Australia when this area was first settled last century. The director of the Darwin Botanic Gardens, Maurice Holtze, introduced a large number of agricultural and horticultural species in his search for suitable crops for the Northern Territory (2). His report to the South Australian Government of 1887 stated that the mango, cashew, sapodilla, and other fruits were growing well and seemed suited to the environment. However for various reasons these fruits did not develop commercially. In the last 10 years there has been an increased awareness of the horticultural potential of some of these tropical fruits and a large number of superior cultivars have been imported from overseas by governmental authorities and private individuals.

These cultivars have been released, are being propagated in increasing numbers, and are slowly becoming commercially available.

Associated with these introduction programs are experimental assessments of the cultivars in several areas of tropical Australia. Recommendations for commercial planting will emerge from these trials, but often growers and propagators use their judgement and make calculated decisions before all performance data is collected.

Propagation peculiarities of some of these fruits species. Many tropical fruits have recalcitrant seeds with a very short storage life. The rambutan, jackfruit, and durian have a viability of only a few weeks if stored under ideal conditions and much less if not stored properly (8), as many who have collected seeds in Asia for importation to Australia have found.

Polyembryony is the condition where a seed contains several asexual embryos as well as a sexual embryo, but the sexual embryo is usually weak or suppressed (5). Mango cultivars of Indo-China origin are usually polyembryonic while those of Indian origin are usually monoembryonic. The major Australian cultivar 'Kensington', or 'Bowen Special' is polyembryonic and is usually planted as seedlings which come "true-to-type".

Other species produce apomictic seedlings without fertilization, e.g. the duku (3) and mangosteen (7).

Trees of male and female sex (dioecy) are another frustration of the horticulturist. Seedling rambutans may be female, male or hermaphrodite (10). Superior clonal selections are hermaphrodite. Some member of the *Euphorbiaceae* family also exhibit dioecy.

Vegetative Propagation. Vegetative propagation is essential to: maintain superior clones, hasten the time to fruiting, and reduce tree size and modify the growth habit of the tree.

Propagation practices used in other countries for these species range from the simplest form of harvesting fruits and nuts from native trees in the forests (Brazil nuts (*Bertholletia excelsa*) in South America and durian in Indonesia), to sophisticated techniques such as approach grafting, multiple grafting, and inarching practices that are used in some Asian countries, in addition to grafting and budding. However, these countries often have access to cheap labour, and although we can learn much from them, the propagation technology may not be directly transposed to Australia and may need some adaptation to suit our situation.

Tissue culture is often seen as the answer to all plant propagation problems. Successful tissue culture of woody perennial species is difficult, but a considerable number of researchers are working on this problem and future success is certain.

Propagation Problems of Tropical Fruits. A major problem in the propagation of tropical tree fruits is lack of information on rootstocks. Other, more developed horticultural species have rootstocks for disease resistance, salt exclusion, and size control but this information is lacking for most tropical tree fruits. Also, the disease status of rootstocks and scions (particularly viruses and viroids) is poorly understood. It is often assumed that there are no virus diseases of these species but they probably exist and have yet to be found. A clone of rambutan (R₃) which exhibited some dwarf characteristics has recently been shown to have a virus disease (A.R. Shaari, personal communication).

The avocado as an example. The avocado is probably the most understood of the tropical and sub-tropical tree fruits but this has only occurred in recent years.

Mother-plantings of rootstock source trees and scion-budwood source trees have been indexed for freedom from sunblotch disease and then registered as part of a viroid-tested tree registration programme (Australian Avocado Growers' Federation 1980). Nursery plants propagated using this disease-free material are identified for rootstock and scion source.

Clonal avocado rootstocks are commercially available from some California nurseries. Avocado cuttings are difficult to root, but a system of etiolation increases rooting success (6). The technique is lengthy and expensive but a double graft system using a "nurse-seedling" was developed which facilitated the production of clonal rootstocks in commercial quantities (4).

CONCLUSIONS

The tropical fruit and nut species described in this paper should develop as the avocado has done in recent years.

Specialised nurserymen must use the latest propagation technology to benefit the development of new horticultural industries in tropical areas.

Mother plantings of superior material (improved performance and disease-free) need to be established, and propagation systems, developed from overseas experience and adapted to Australian conditions, should produce quality plants which will form the foundation of the tropical fruit industry in Australia.

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