Growing date palms in Western Australia

By John Burt, Development Officer, South Perth

The date Phoenix dactylifera is one of the oldest cultivated tree crops. The chief commercial areas are in the Middle East and northern Africa. There is also an important industry in California, USA.

Approximately 1500 t fresh dates and 2400 t dry dates are imported per year into Australia, especially from Pakistan, USA and Israel. There is potential to develop date production in Australia, especially of high priced fresh dates.

Dates of named varieties are now being produced commercially on a small scale in Australia. There are date gardens at Alice Springs, Northern Territory, Eulo, Queensland and Gascoyne Junction, Western Australia.

Difficulties in commercial production

Research work at Gascoyne Research Station (24°53′S) in the 1960s showed that good yields of quality dates could be produced. However, dates have not been produced commercially in Western Australia for the following reasons.

Planting material

The lack of a supply of good planting material has been the biggest obstacle to commercial production.

Plants grown from seed produce fruit with variable yields and quality and are not suitable for commercial production. They also produce excess male plants.

Offshoots are slow to bulk up and the number of plants of named varieties in Australia is low.

Importation of offshoots is expensive due to the cost of plants, transport and quarantine requirements. The cost of quarantining for nine to 12 months in a nursery is high. There may be high losses with some varieties due to difficulties in establishment following the lengthy shipping time from the United States and problems with methyl bromide fumigation during quarantine. Tissue cultured plants do not require quarantine and are cheaper and easier to handle than offshoots. However, total costs of purchasing, importing and weaning of tissue cultured plants are still high.

Climate

Dates are sub-tropical. For optimum fruit maturity, they need high temperatures from flowering to fruiting, and low rainfall and low humidity during fruit ripening.

Land area

An economic date garden and processing facilities need a cropped area of 32 ha and a large amount of capital.

Time of cropping

Date offshoots take four to five years to yield their first crop and 11 years to start full production. Tissue cultural plants take seven years from the test tube to their first crop.

Labour demand

Date management requires specialised knowledge, often for each variety, and much labour. Field operations are difficult with tall palms.

Bird damage

Little corella cockatoos and silvereyes have damaged 80 per cent of crops in some years.

Plant description

The date has a single growing point. Growth is fairly slow and the maximum height is 15 to 20 m. Leaves are 3 to 7 m long and have large spines on the leaf stalks. Male and female flowers are produced on separate trees. The branched flower bunches are held in the early stages of emergency by a hard, rough sheath. Male palms normally flower slightly before the female palms.

Climate

For proper maturing of fruit, the date requires prolonged summer heat without rain or high humidity during fruit ripening. High humidity or rain during this period will result in fruit cracking, blackening and fermenting, and the development of mould.

The date will withstand extreme climatic conditions. Growth ceases below 12°C but there is no permanent injury even with freezing temperatures as low as −7°C. The average daily maximum temperatures in leading date growing countries ranges from 27 to 32°C and dates can withstand temperatures as high as 50°C.

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Tables 1 and 2 can be used to determine the suitability of areas in Western Australia for ripening dates. The tables are based on the US Department of Agriculture’s heat unit system, calculated from temperatures from flowering to harvesting. The heat units are the daily maximum temperatures (°C) minus the base temperature of 18°C.

Dates are more wind tolerant than most crops, but it is preferable to avoid cyclone-prone areas.

The most suitable areas, considering heat units and loss problems from cyclones, are in the inland Gascoyne and inland Pilbara districts. The Pilbara district would be more suitable for the Deglet Noor variety, but too much summer rainfall (about 10 mm per month) may cause problems with fruit ripening in some years.

### Table 1. Accumulated heat units for date production

<table>
<thead>
<tr>
<th>Sum of heat units (°C) from flowering to harvesting</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2000</td>
<td>No varieties ripen</td>
</tr>
<tr>
<td>2000 to 2250</td>
<td>Early varieties ripen</td>
</tr>
<tr>
<td>2250 to 2750</td>
<td>Many varieties will ripen</td>
</tr>
<tr>
<td>2750 to 3250</td>
<td>All varieties ripen; Deglet Noor of variable quality</td>
</tr>
<tr>
<td>Greater than 3250</td>
<td>All varieties ripen; Deglet Noor of top quality</td>
</tr>
</tbody>
</table>

### Table 2. Accumulated heat units at selected sites in Western Australia, from 1 September to 15 March

<table>
<thead>
<tr>
<th>Site</th>
<th>Heat units (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perth*</td>
<td>1500</td>
</tr>
<tr>
<td>Geraldton*</td>
<td>1975</td>
</tr>
<tr>
<td>Carnarvon (Gascoyne Research Station)*</td>
<td>2450</td>
</tr>
<tr>
<td>Wiluna*</td>
<td>3050</td>
</tr>
<tr>
<td>Mundiwindi*</td>
<td>3300</td>
</tr>
<tr>
<td>Marble Bar*</td>
<td>4300</td>
</tr>
<tr>
<td>Port Hedland*</td>
<td>3480</td>
</tr>
<tr>
<td>Broome*</td>
<td>3200</td>
</tr>
<tr>
<td>Kununurra (AGWEST Office)</td>
<td>3900</td>
</tr>
</tbody>
</table>

* Bureau of Meteorology location.

### Soils

Dates may be grown on a wide variety of soils that have a minimum depth of 1.5 to 2.0 m.

The date will grow in soils containing more alkali or salts than many other plants will tolerate, but yields and quality are reduced under saline conditions.

### Propagation by offshoots

Propagation of named varieties is traditionally by offshoots, which arise from the base of the palm. Dates produce a total of only 8 to 25 offshoots, usually over the first five to ten years of growth. They are heavy (10 to 35 kg), expensive to transport and are often difficult to establish when transplanted, especially when obtained from overseas. Diameter of the base of the offshoot should be 20 to 35 cm.

Leave offshoots on the parent palm for three to four years before detaching them. The base of the offshoot should be kept in contact with moist soil for at least a year before cutting to promote rooting while it is attached to the main palm. Cut the offshoot from the parent palm with a large chisel; this requires care and much labour.

Permission must be granted by the Chief Quarantine Office, ACT, (02) 6272 4998, before offshoots may be imported.

### Planting offshoots

Remove the lower leaves and retain 10 to 12 young leaves around the bud. Tie the young leaves close together with heavy twine and shorten them by two-thirds of their length.

The best time for planting is late spring. Plant at a spacing of 9 x 9 m, with 119 female palms and four male palms per hectare.

### Propagation by tissue culture

Tissue culture offers a ready means of importing plants. Tissue cultured plants are available from England and must then be carefully nurtured in a nursery until they are ready for planting in the field. This may take up to two years and losses may be high. Dates from this source of propagation have fruited satisfactorily in Australia. Tissue cultured plants may mature at the same time as plants grown from offshoots.

### Varieties

Commercial varieties may be classified into soft and semi-dry types. The soft type has a lower sugar content than the semi-dry type and must be well cured and stored under refrigeration. The semi-dry types may be stored at ambient temperatures, providing they are properly cured.

In California, the late season, semi-dry date Deglet Noor is the most important variety. Barhee is a soft (when mature) late season variety, which is in demand for exporting to Arabian countries in the early khalal stage when it is hard and crunchy. Medjool is a soft, early season variety which has excellent flavour and is the best variety in the Northern Territory.

### Watering

The date is drought resistant. However, for maximum yields and quality, 25,000 to 30,000 kl/hectare per year from rainfall plus irrigation (low level sprinklers or trickle irrigation) is needed.

Dates withstand waterlogged conditions better than most plants and grow well with their roots in running water or in soils with a high watertable.

Dates will tolerate water with up to 6000 mg/L total soluble salts but yields and quality are greatly increased with water which has less than 1000 mg/L total soluble salts. Salinities should generally not exceed 2000 mg/L.
Weed control
Desiccant type (contact) herbicides based on paraquat/diquat are suitable for controlling weeds under date palms. Donkeys may be used for browsing of weeds in Israel.

Fertilising
There is little information on fertilising of date palms on a wide range of soils in Western Australia. In Carnarvon, up to 5 kg of urea, applied in October each year, to mature palms, gave good growth and yields.

The use of compost at up to 50 m³/ha would be useful to supply organic matter, add nutrients and help to retain moisture in the soil.

In most countries, palms respond to nitrogen fertiliser, but may not always respond to phosphorus and potassium.

John Carpenter of the USA has suggested 235 g of urea per palm in year 1, increasing to 500 g of urea in year 5 and 2000 g from year 10 onwards. The rate of phosphorus should be 125 g of double superphosphate per palm in year 1 increasing to a maximum of 250 g of double superphosphate for year 2 onwards. The rate of potassium should be 113 g of sulphate of potash per palm increasing to 565 g from year 2 onwards.

It is recommended that nutrient analyses are made of the soil and irrigation water, plus one to two analyses of the youngest mature leaves. This will enable some adjustments to the fertiliser program and provide information on nutrients that are deficient or toxic. Some of the suggested nutrients in the programs in this publication may be deleted or reduced, if it is obvious that they are sufficiently high in the irrigation water and soil, including sources from compost.

Pruning
In August and prior to pollination, remove all dead or partly dead leaves.

Remove the spines from the leaf stalks next to the developing flowers before pollination. This makes it easier to pollinate flowers and handle the fruit bunches.

Remove surplus offshoots as soon as possible, when palms are small.

Pests and diseases
Ripening bunches of existing plantings in Western Australia have been slightly damaged by ants, plant-sucking bugs and dried fruit (nitidulid) beetles.

Care must be taken not to introduce the Parlatoria Scale from overseas or the Northern Territory.

The fruit is susceptible to severe damage from birds and the roots may be damaged by root knot nematodes. Bunch covers may reduce damage from birds, or expensive bird netting may be needed to exclude birds.

False smut disease may attack the leaves, but it is not of major importance.

Pollination
Dates are wind-pollinated and are not pollinated by insects. Successful wind pollination can occur where male palms are close to female palms, but yields and quality are inferior compared with hand-pollination, which is the accepted method in commercial date production.

One male palm should supply enough pollen to hand-pollinate 40 to 50 female palms.

Pollen from different males can affect the size of fruit, size of seed and time of ripening, but has no effect on flavour. Selection of suitable male palms is therefore important and these should be propagated from vigorous male plants.

The female palms are ready for pollination two or three days after the female flowers open. In Carnarvon, date palms flower from the end of July to the beginning of October.

The best method of pollination is to shake pollen over the female flowers every four days, either by hand or with a mechanical pollinator.

Pollen that is not used immediately should be dried carefully. It may then be kept for two to three months at normal room temperatures.

Bunch management
Hydraulic ladders are needed for management and harvesting of tall trees.

Thin fruit in spring to increase fruit size, improve the quality, prevent delayed ripening of dates, reduce the weight of the fruit bunches and ensure adequate flowering in the following year. Commercially, fruit is thinned by reducing the number of bunches and by thinning within the bunch.

Thin bunches when the fruit is about 6 mm in diameter. Thin by reducing either the number of fruits per strand or the number of strands. Remove between 50 to 75 per cent of flowers from each bunch.

Remove small bunches at the time of bunch thinning. As a guide, thin young palms to one bunch per 10 leaves, five to nine year old palms to one bunch per eight leaves and mature palms to one bunch per six leaves.

At the same time as thinning, pull down the bunches through the leaves and tie the fruit stalk to the mid-rib of one of the lower leaves. This prevents scarring of the fruit and supports the bunch as its weight increases.

Cover the bunches with wire cages covered with hessian to give some protection from bird damage.

Harvesting
Knowledge of the correct time for harvesting may only be obtained by experience with each variety. Dates were harvested at Gascoyne Research Station, Carnarvon, from February to April. With some varieties, fruit is picked individually when it ripens on the bunch, while with others, the bunches are picked entire.

The stages of fruit maturity are as follows:

• Khalal – the fruit changes from green to yellow or red. The flesh is crisp and sweet, but not all varieties are edible at this stage.
• Rutab – the fruit may have further changed colour to brown. The fruit may be fully soft at this stage.
• Tamar – the fruit is fully mature and has a low moisture content and will store for a long time.

Soft varieties are cut when 33 per cent of the fruit on a bunch are in the succulent, translucent (rutab) stage.

**Yields**

At Gascoyne Research Station, between six and 14 bearing bunches per palm were harvested each year. Bunches ranged from 3 to 20 kg in weight on individual palms and yields from 10 to 20 t per hectare. The heaviest yields were obtained when palms were 12 to 15 years old.

In California, average yields are 90 to 135 kg per palm and trees will bear for up to 40 years.

**Processing**

Processing of dates requires expensive equipment and experience in handling each variety. Operations may include fumigation against insects, cleaning, grading, artificial ripening, dehydration, packing and storing.

**References**