

Subsequently they were transferred to a polythene igloo and placed on wire mesh benches 100 to 150 mm above the floor. This procedure maintained hygiene, promoted air pruning of root systems, and insulated them from the cold ground temperature over winter.

Electric fan heaters within the igloos maintained a minimum air temperature of 10°C during winter, enabling the plants to carry through in good condition ready for potting on into 150 mm pots in August. Igloos were of double skin construction giving extra protection from extreme cold conditions.

After potting on, the plants were grown on in the igloos and by early October some of the better developed plants were suitable for moving on into 200 mm pots. The remainder of the crop was ready for sale in late October to early November and the 200 mm pot size saleable by December. Regular fortnightly sprayings for fungal control was carried out during winter and spring with alternate applications of Rovral® (iprodione) and Aliette®.

Hibiscus require high nitrogen levels during spring and summer to attain maximum growth, therefore a weekly or fortnightly liquid feeding programme was essential.

This method of propagation has enabled *H. rosa-sinensis* to be propagated during autumn and winter ready for sale in spring, with a high degree of success.

VEGETATIVE PROPAGATION OF HYACINTH

JOHN H. COLWELL

*Little Acre Wholesale Nursery
11 St. Georges Avenue
Montrose, Victoria 3765*

The hyacinth (*Hyacinthus orientalis*) is a member of the Liliaceae family and is a native of the Mediterranean and Asia Minor. It is called the Dutch hyacinth and is a true bulb. Bulbs are highly modified underground structures which are made up of swollen leaf bases. These tissues hold food reserves which are used for the growth of the plant.

Except for the specialist bulb producers, few people have any knowledge of hyacinth propagation. Only a few books on propagation carry any reference to them, and their morphology is not well understood.

The main areas of bulb production in Australia are Victoria, New South Wales, and South Australia. Hyacinths are produced for use as pot plants and for the home garden.

In Australia they bloom in late winter and early spring (August to September), but this period may be extended by cold storage treatment. The range of colours is white, yellow, orange, red, pink, mauve, and blue. Flowering height is about 20 cm.

Harvest. Hyacinth bulbs are harvested when the foliage turns yellow. They are dried rapidly after harvest to ensure that losses from fungi do not occur.

Storage. Bulbs are best stored at 23 to 30°C. Storage below this leads to a stunting of flowers.

In New South Wales and South Australia producers prefer natural drying but in Victoria, where climatic conditions are usually more humid, artificial drying methods are used.

Propagation. Only the very best quality bulbs should be used for propagation. Bulbs 17 to 19 cm in circumference are used, as smaller bulbs produce stunted plants.

Hygiene, as with all propagation, is of prime importance. Bulbs are surface-treated with sodium hypochlorite, using 150 mls of 13% solution to 50 litres of water. The bulbs are dipped in this solution for two minutes. All tools and surfaces are also cleaned and surfaces sterilised with methylated spirits. The floors and trays are washed with Biogram®, using a 1% solution.

If a nematode treatment is necessary the hot water treatment used can cause much physical damage to the flowers, so it is much better to carry out this treatment at propagation time, as discussed later.

Two methods are used for the propagation of hyacinth. One involves cutting or scooping out of the basal plate with a curved blade or a blade type drill set in the bench. When using the latter, great care should be taken when placing the bulbs over the blades. The aim of this method is to expose the scale leaves so that adventitious bulblets may develop.

The second and most used method, is called scoring. This is done by making three deep cuts into the basal plate of the bulb so as to cut the growing point and so stop the flower from developing. For this method a block of wood with a three-bladed tool set into it is used. This allows for a greater output, but again care must be taken when pushing the bulb down onto the blades.

Some propagators cut "V" sections instead of straight cuts. This leads to somewhat larger bulblets forming than with the straight cuts.

With both of these methods the aftercare is the same, although the number of bulblets produced is different.

Scooped bulbs may get 50 to 70 bulblets but they will take 4 to 5 years to produce a flowering sized bulb. This method is usually only used for the production of a new cultivar.

Scored bulbs give 20 to 30 bulblets which only take three years to produce flower-sized bulbs. Using this method, bulbs are into production more quickly.

After cutting, bulbs are placed in slatted trays in a dark room, which has been sterilised for the common pathogens. The temperature is kept at 21°C for one week and then gradually increased to 30°C over a few weeks. Humidity is important and is maintained between 80 and 85%. These conditions are maintained for a period of 10 weeks while the bulblets form.

The humidity is then gradually lowered to 50% over the next week in readiness for planting out.

Planting out. The bulbs are ready for planting out in late autumn (early May). The soil used is a good, friable well-drained type which has been enriched with 50 to 80 M³ of chicken manure per hectre or 3 tonnes of blood and bone meal per hectare.

Newly propagated bulbs are planted at a depth of 12 cm in rows or using a block system.

All bulbs are lifted each year and graded. In the second year they are treated for nematodes.

Large bulbs are planted 15 to the metre, and small bulbs up to 60 to the metre run. Large bulbs should be planted by hand and must be planted upright at a depth of 12 to 15 cm, or flower quality is affected.

Diseases and pests. Hyacinth, like many other plants, have a range of diseases and pests that can cause losses in production. The following affect production in Australia.

Yellow Disease. This is a bacterial rot — *Xanthomonas hyacinthi* — and causes a yellow ooze to form and the bulbs decay. If the bulbs are infected before planting they produce no plant above the ground. When the bulbs are cut open the yellow ooze exudes from the centre. Infected plants will have yellow and brown stripes on the stem and flowers.

This disease is spread by wet conditions. Staff should never be allowed to work on the crop when the foliage is wet.

To control Yellow Rot, rogue very carefully and spray affected areas with formalin. Heat treatment is very precise and dangerous. Bulbs are treated at 37.5 to 38°C for four weeks to kill the bacteria in the bulbs.

Soft Rot. This is a bacterial disease (*Erwinia carotovora*). It.

was first noted on carrots but is found in many ornamentals with large or modified stems or tubers. Wet conditions and high nitrogen levels are responsible for the build up of this disease. The visual symptoms are stunted growth at flowering time, followed by yellowing and drying of the leaf tips. Bulbs decay, and the organism spreads rapidly causing the collapse of the scale leaves into a dirty white smelly mass. The odor can be detected by those working the bulb store.

Only stored bulbs should be saved. These should be treated with mercuric chloride after harvesting of the bulbs. If the disease is found when working on propagating material in the dark room, the infected bulbs can be removed and placed in high light areas. Chloroplasts are produced and when the bulbs are in this condition the disease is retarded, so the bulblets can continue to develop. When these are planted there is no sign of the disease on the bulb.

Other minor diseases have been found on Hyacinth bulbs; these include; *Sclerotinia*; *Botrytis*; *Penicillium* bulb rot; and *Pythium*.

Nematodes. *Nematodes* are responsible for losses in bulbs and cause the problem known as Ring disease. They feed on the scale leaves and this can be seen when an infected bulb is cut open. Foliage and flowers become distorted. *Nematodes* can be controlled by a hot water treatment using water at 43 to 44°C for four hours, followed by rapid cooling and drying. This treatment also rids the bulbs of eelworm.

GRAFTING OF *EUCALYPTUS FICIFOLIA*

FRED VAN ALLMEN

Fitzroy Nurseries

GPO Box 126

Rockhampton, Queensland

When horticulturists from the East Coast of Australia saw the brilliant red flowers of the Western Australia *Eucalyptus ficifolia* they had to take this tree back with them, only to find that *Phytophthora cinnamomi* attacked the roots. Because of the desirable flowers, horticulturists have patiently tried various methods of propagating this difficult plant.

The flowers on mature trees grown from seed vary widely in colour from white to deep red. Selections of good red flower colour variants have been made and grafted onto *E. ficifolia* rootstock, but these have proved unsuccessful as these low-rainfall trees die in the heavier soils and high rainfall of the East Coast.