

every node; the shoot itself produces roots from its base, not from the old rhizome. Once these shoots are well-rooted, they can be cut from the old rhizome and potted on.

2. The clusters of leafy shoots at the ends of the rhizomes can be divided into single shoots and treated like ordinary cuttings; again rooting is rapid.

We are growing marram in a small area as against growing it as a field crop; it enables us to hold a large number of plants in a fairly small area. By growing marram this way we are getting a rootball that will extend below the drier top layer of sand and can carry on growing without the check that field grown plants get.

To a limited extent we have tried this method on:

1. *Spinifex* (*Spinifex hirsutus*), another coastal grass of value for sand stabilization; it responds to the same treatment but at a slower rate.
2. *Pingao* (*Desmoschoenus spiralis*) — This is a native sand dune stabilizer, It is a much more robust plant with thick stolons up to 2 cm in diameter. *Pingao* rhizomes have very close internodes and when cut into 5 to 10 cm lengths and planted vertically, many of the dormant axillary buds break and produce strong shoots. Both tip cuttings and these axillary shoots appear to be slow rooting, but more study needs to be done with this plant.

## LOOKING AT OVERSEAS NURSERIES

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The main purpose of our trip was to sell plants and to advise on how to handle and grow New Zealand plants. We travelled in U.S.A., England and France.

In America we visited some nurseries in Miami, Florida, Phoenix, Arizona, and one in Texas, plus had an opportunity of setting up a booth at the Pacific Horticultural Trade Show, Long Beach, California.

The Pacific Horticultural Trade Show was staged at Long Beach Convention Centre, about an hour's drive from Los Angeles airport. There are 677 booths representing over 365 exhibitors. The displays of horticultural products range from nursery sup-

plies, flowers, seed and fertilizer through to lawn and garden equipment, tractors and garden lighting, so it would take many hours to go through and see everything. During the show we found most people loved New Zealand plants because of the different types of foliage and the colours we have to offer.

In all nurseries they try to produce a plant with the minimal amount of effort and cost. At the nurseries I visited they potted from liners which were only about 6" high, into 1 to 2 gallon containers. In some cases I saw liners in 5 gallon containers. The containers were mainly hard plastic but some nurseries were using 1 gallon tin cans. They could buy these quite cheaply.

Growing media ranged from a John Innes compost to a very heavy peat, depending on what was readily available in each state. I think in New Zealand a lot of nurseries will go out of their way to buy peat for use as our basic ingredient, whereas they could be using sawdust or bark chips.

In one nursery they would have a turnover of plants twice a year. The first one in 5 months and the second would take 7 months, the latter requiring some cooler periods. The climate in Miami in summer is very hot and humid, almost tropical. The days we were there the daytime temperatures were around 90° to 95°F and at night between 85° to 90°F. The differential between day and night not varying very much, for approximately 7 to 8 months.

We paid a visit to the Fairchild Tropical Gardens and had a talk with the manager. He said they had been trying to grow a number of New Zealand natives, with not very good results. *Metrosideros tomentosa* had been growing for 15 years but had never flowered. Cordylines would grow for a while but eventually die. We saw a lot of *Cortaderia sellowana* growing in private gardens, looking their best in full flower. After 3 to 4 years these plants would die also.

While in Florida we met Mr. Walter Gammel who has just finished a report on the top 100 nurseries in America, the two largest nurseries in each state, and also the size of the industry in each state.

The report is done only on wholesale growers of perennial ornamental and foliage plants for sale by retailers.

The output of wholesale nurseries in the U.S.A. exceeds \$2.5 billion annually and employs over 100,000 people. The total of these nurseries combined in net worth, exceeds \$20 billion.

Two major factors were discovered in making this report.

- (1) Ten years ago 1/3 of the top 100 were not in nursery business or had only begun.
- (2) There has been a doubling in sales within the last 10

years, even when adjusted for inflation.

The top two growers in each state account for a total of \$414,125,000 sales produced on 44,668 acres. The top ten growers of the states account for \$161,000,000 sales on 8,400 acres. The top five account for approximately one half of the total U.S. production. The scale begins at (No 1) which has \$40 million in gross sales and ends at (No 100) at \$3 million gross sales.

We have all heard of Monrovia Nurseries, Azusa, California, which is No. 5 and has an approximately total gross sales of \$30 million on 600 acres. Hines Wholesale Nurseries, Inc. Santa Ana, California has approximately \$20 million gross sales on 588 acres. Mid-Western Nurseries, Inc. has approximately \$32.5 million sales on 6,000 acres but grows its plants in six states.

The largest producing state is Florida which has over 8,000 nurseries, gross sales of \$450 million, on approximately 15,000 acres. Second comes California with 1453 nurseries covering 18,000 acres with gross sales of \$400 million. Texas comes next with \$160 million.

In California the top two nurseries are: No. 1 — Jackson & Perkins Co., with approximate sales of \$35 million on 70 acres and, secondly, Monrovia Nursery with \$30 million on 600 acres. Florida's No 1 nursery is United Brands Floriculture, with sales of \$15 million on 420 acres, and No 2 is Oakdell, Inc., with sales of \$10 million on 200 acres.

I have mainly talked about two states as these are the two biggest producing states in America and I had the chance to see a few nurseries in both states. This report was published in the Nursery Business magazine. Two years ago Mr. Walter Gammel was commissioned to undertake this project.

In Texas we visited one large nursery, George Plecters Nurseries. He's a grower of large palms and a large range of trees and shrubs. He does most of his own propagation but does buy in some liners of palms. Palms were grown in the open ground for a period varying between 3 years to 10 years. I saw two-year-old Cycads about 12" high, Washingtonia's 3 years old between 3 and 4 ft. They were really beautiful. They would lift these palms and containerize them and sell them 4 months later. The heights of some of them ranged from 3 ft to 10 ft. Once potted they would recover under shade houses.

In England we travelled nearly 2000 miles, seeing nurseries from as far north as Leeds to the southwest and southeast of England. I would say their propagation methods are done as simply as possible. Throughout England and France I found they are propagating conifers using cold frames mostly. In some nurseries they sterilized the soil. Cuttings are set into soil and covered with plastic. The cuttings would root and grow for one year, then

these liners are either planted in the open ground, or containerized. Some are sold as liners.

In other nurseries, conifer cuttings were rooted under glass or tunnel houses. Once rooted, they were potted up into tubes and then placed under cold frames to grow through their winter. They were taken out in the spring and grown through to the next autumn when they were sold.

In one nursery in England they had just completed building a new propagation house. It was 100 × 30 ft tunnel house. They used 3 inch galvanized piping in three sections, each section having a curve which when put together made the hoop. These were approximately 6 ft apart along the length, held together by a common ridge at the top. For additional support for the polythene covering, thin gauge wire was strung from end to end every two ft. They were using clear polythene which was expected to last for approximately 3 to 4 years.

Inside, four raised sand beds were made, running the length of the house. For the mist system they had galvanized piping running parallel two feet above the propagating beds. Mist nozzles were placed every two feet. The nozzles put out a fine spray giving a coverage of 4 ft. They planted their cuttings in wooden trays filled with sand and were getting excellent results.

At Bloom's Nurseries in Diss, Norfolk, they were producing most of their plants in one large glasshouse. Here they had their mist lines above head height. It certainly keeps the floor and bed areas free of any plumbing and the occasional knocking and breaking off of mist nozzles.

They were producing approximately 750,000 conifers, 300,000 heaths, 100,000 alpiners and 100,000 ferns.

Conifers root in plastic trays in approximately 8 to 12 weeks on bottom heat, using Seradix No 3 hormone. Heaths are propagated in Speedling propagating trays, approximately 200 per tray and the alpiners are propagated in wooden trays.

One nursery in France which attracted my attention was Andre Briant Nurseries near D'Anjou. They had 12 people in propagation, 15 in containers and 20 people planting and sowing in the open ground, making a total of 47. The nursery was situated on 104 acres: 44½ acres in field grown liners, 2½ acres in seed bed production, 15 acres in stock beds, and 1¼ acres for propagation under tunnel and glass houses. The rest were uncultivated.

They had a turnover in 1979/80 of 4½ million plants, worth approximately \$2,200,000. Some liners were exported to England and Holland.

Soil medium used was mainly 70% *Pinus pinaster* bark chips

and 30% peat. At the time I was there they were doing experiments with different grades of bark chips. For potting they use a potting machine doing 10,000 rooted cutting per day with three people. Liners were potted into 12 cm round pots. The main types of plants which they grew were *Cotoneaster* species, conifers, *Pyracantha* species, and a lot of *Thuja plicata* 'Atrovirens,' which were 18 months old when sold.

Cuttings of *Thuja plicata* 'Atrovirens' were taken in May, making a 4 in. long cutting. These were placed under mist, with no bottom heat in a tunnel house. In October, 5 months later, the rooted cuttings were potted in 12 cm round tubes using a bark growing medium. The potted liners were staged tightly in trays and placed under shade in cold frames. In March/April, the liners were then placed in moulded polystyrene trays that would hold approximately 30 tubes, each plant having equal spacing. These plants were grown outside in beds until October, by which time they had reached a height of 18 to 20 inches; they were then ready to be sold.

## **PROPAGATION — GETTING STARTED**

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When I joined our nursery venture in late 1976, it consisted of a modest retail and an expanding wholesale division. At this time the propagation was confined to budding and grafting of assorted fruits and deciduous ornamentals in both open ground and containers.

With my interest in the broad area of plant propagation, we decided to gradually supplement our bought-in liner requirements with our own stock.

Initially we began with quick seed lines plus autumn-set cuttings but in 1979 we set up a primitive yet effective mist facility at the end of one of our polythene growing houses. A partition wall was built and covered with plastic and access to the mist room was through this.

The existing base of drainage metal was overlaid with pumice sand to a depth of about 5 cm. Mains water was ducted along an outside fence by 12 mm alkathene pipe and connected to a 12 mm solenoid valve, on the inside wall, above the mist line level.

The mist lines are 12 mm rigid PVC and the mist nozzles (Aquatron brass MK II 1/8" base) tapped directly into the pipes