to spontaneous combustion so it should never be stored where it creates a danger to buildings and property.

Many New Zealand nurseries are now using radiata pine bark. A number of large Auckland nurseries are now using pine bark 100%, and enthusiastically extol its virtues. I have seen cuttings and seeds being propagated in it very satisfactorily. In conjunction with our experiences with pine bark, I can only say that we believe it to be an excellent growing medium, far superior to anything else we have used — subject to the addition of the correct nutrients for the crop being produced.

CONTAINER PRODUCTION OF ASPARAGUS SEEDLINGS

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Interest in asparagus (*Asparagus officinalis*) growing has increased rapidly in New Zealand in the last few years. In the Waikato alone, the area in asparagus has grown from 16 hectares in 1978 to over 700 in 1982. This had led to an increasing demand by growers for planting material. Traditionally, the supply of asparagus plants has been met by growers or specialist nurserymen spring-sowing seed in a prepared nursery bed using a precision sower such as the Stanhay. Late in the following winter, the dormant crowns are lifted, usually with a chain potato digger. The crowns are dipped in fungicide then planted out in the field, often after several weeks in cold storage. Because the open pollinated cultivars are variable in both growth habit and yield, considerable effort has been directed towards the production of more uniform and potentially higher yielding hybrids. Unfortunately, hybrid seed is more expensive than seed from open pollinated cultivars. This need to make every seed count is one of the reasons there is now increasing interest in the container production of asparagus seedlings. Other advantages of using container-grown stock over crowns include a lower risk of disease, less planting shock, increased germination percentage, and greater planning and planting flexibility for the asparagus grower.

There are probably as many ways of producing asparagus seedlings as there are growers. The following is an outline of the methods generally used at Ruakura where production is mainly to provide plant material for research purposes.

SEED GERMINATION

Generally three months is required from the time of sowing until the seedlings are ready for planting. For the usual October/November (spring) planting, seed is sown under glass in July/August (winter). Seed is treated with a suitable fungicidal dust (e.g., captan, benomyl or thiram), soaked in aerated water for 24 hours, then sown directly into containers at a depth of 5 to 10 mm. Because of the high viability of hybrid seed only one seed need be sown per container. The optimum temperature for germinating asparagus seed is between 25° and 30°C with germination below 20°C being very slow (7).

At Ruakura, after sowing the seed, the containers are placed on a hotbed under mist. Misting ensures relatively even watering, resulting in more even germination and later growth. The thermostat for the hotbed is set to supply heat when the temperature drops below 21°C. Temperatures in the glasshouse should then be kept above 16°C, with ventilation starting at 21 to 23°C (4). At Ruakura, the glasshouse is heated by fan-assisted electric heaters which switch on when the temperature drops below 17°C. The ventilation which is also fan-assisted is set to come on when the temperature reaches 25°C.

Initially, watering was carried out by a misting system controlled by an electronic timer. As the fungus disease, *Stemphylium*, soon became a problem, hand watering once a day was used as an alternative to try and keep the vegetation dry for as long as possible.

CONTAINERS

Several pot types readily available in New Zealand have been compared (2). It was found that the FH 508 paper pots and the Rootrainers (Fives) were the most suitable for raising asparagus seedlings. In Canterbury, seedlings have been produced in polystyrene trays while other nurserymen have tended to use Rootrainers. The Rootrainers have met with considerable success (5), while many growers have had problems removing seedlings intact from the polystyrene trays (3). K.J. Fisher (unpublished data) recommends that to allow unrestricted growth of the seedling, the container should be at least 7.5 cm deep with a cell volume of between 25 and 30 cm^3, and with a density in the glasshouse of approximately 1,000 plants/m^2.

We use the Ferdinand Rootrainer which forms a container 10 cm deep with 40 cm^3 capacity; however, the density at approximately 1,400 plants/m^2 is higher than that recommended by Fisher. Although the Ferdinand Rootrainer produces a smaller plant than the Fives Rootrainer (3), this is compensat-

ed for by the fact that there is production space for approximately 500 more seedlings/m^2.

POTTING MIXES

No work has yet been carried out in New Zealand on comparing the various potting mixes available. However, two mixes, loosely based on the U.C. potting mixes, are among those currently being used with reasonable success (Table 1). One is the standard compost used by Massey University (Fisher, pers. comm.), while the other is the U.K. Glasshouse Crop Research Institute (GCRI) compost used by the Levin Horticultural Research Centre (L.G. Tilbury, pers. comm.).

Table 1. Potting mixes and fertilizers used for growing asparagus seedlings.

Massey University mix (50:50 peat/sand)	G.C.R.I. mix (75:25 peat/sand)
Fertilizer/m^3	
1500 g Osmocote 1500 g superphosphate 1500 g lime 3000 g dolomite lime plus trace elements	2500 g Osmocote 1350 g superphosphate 2030 g lime 2030 g dolomite lime 680 g potassium nitrate 490 g calcium ammonium nitrate plus trace elements mix

At Ruakura, the GCRI mix has been used, with pumice being substituted for sand. One problem that has arisen at Ruakura from using peat and pumice in the potting mix is that the mix contains no mycorrhizal fungi. As asparagus grows much more quickly when inoculated with mycorrhizal fungi, it is important that this be achieved as soon as possible. Generally, inoculation would occur in the field after planting out. However, in areas where the soil has been sterilised (as has occurred at Ruakura) or where it is common practice to deep plough prior to planting and thus bury topsoil and mycorrhizal fungi out of reach of newly planted seedlings, inoculation may be delayed or not occur at all. Powell (6) recommends collecting soil from underneath a vigorous patch of clover (*Trifolium* spp.) and incorporating this into the peat/pumice mix. Fortunately, the mycorrhizal fungi are not host specific and the fungi associated with clover will readily form a symbiotic relationship with the asparagus. Approximately 50 g of soil inoculum per litre of potting mix is recommended. The addition of soil to the mix increases the buffering and cation exchange capacity of the potting mix but may also increase the risk of introducing disease.

SPRAYING SCHEDULE

As a general hygiene practice the glasshouses are routinely sprayed with fungicide once every 10 days and with the insecticide Attack (pirimiphos-methyl and permethrin) and the miticide, Plictran (cyhexatin), when necessary. Sumisclex (procymidone), Rovral (metalaxyl), and Benlate (benomyl) are the fungicides used, with these being sprayed alternately, so that each spray is used once every 30 days. Despite these fungicide applications, we have still had problems with infection and eventual death of some seedlings from the disease *Stemphyliuym* (needle blight). We have managed to control this by an additional spraying of Difolatan (captafol) once every 7 to 10 days.

If the seedlings have not been planted out before 3 months, we also apply a foliar application of Nitrophoska. This contains N, P, K, Mg, Mn, B, Cu, Zn, Mo, and Co, and is given once every 7 days until the plants leave the nursery.

HARDENING OFF

When the seedlings are about 20 cm high and have several upright stems they are hardened-off outside for at least two weeks. This is usually done under the protection of a shadehouse.

SEEDLING PERFORMANCE AFTER PLANTING

Seedling transplants have not yet been grown extensively in New Zealand and, of those crops that have been established, no production figures are available at this time. Overseas research comparing asparagus crown and seedling transplants have not been very enlightening, with results often being contradictory (1,8). The main advantage to the grower of planting containerised seedlings will probably be greater planning and planting flexibility rather than an increase in asparagus spear production.

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GLOMERELLA CINGULATA ON CAMELLIAS AND THE IMPLICATION FOR PLANT EXPORTS

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INTRODUCTION

In June, 1982, United Kingdom (UK) plant health authorities reported to New Zealand that many camellia plants imported from New Zealand over the previous few weeks were suffering from leaf blotch, leaf drop, stem dieback, and in extreme cases, death.

The causal organism was identified as *Glomerella cingulata* (Stone.) Spauld. and v. Schrenk (con. stat. *Colletotrichum gloeosporioides* Penz.). U.K. authorities contended that a new "camellia strain" of *G. cingulata* had been introduced from New Zealand with camellia plants and that this strain was capable of causing similar effects to that described by Ngo Huy Can, *et al.* (4) in USA.

Glomerella cingulata had not previously been recorded as causing disease of camellias in New Zealand, where it is generally regarded as a ubiquitous secondary pathogen commonly associated with tip dieback of plants (e.g. *Citrus* spp.) especially following winter injury, but important as a fruit rot organism (e.g. causing bitter rot of apples (3).

G. cingulata has been reported as a pathogen of camellia in USA (1) and Australia (2).

PATHOGENICITY TESTS

Field observations in UK had indicated that infection was prevalent on *Camellia* cvs. Donation and Debbie, although it was not confined to these cultivars. For this reason, *Camellia* cv. Donation was selected for use in the pathogenicity tests, which were undertaken as follows: