

broom progeny — 'Green Shadow', 'Blue Shag', 'Sea Urchin' and 'UConn'. He is also carrying on his work with rooting of Japanese umbrella pine, *Sciadopitys verticillata*.

Probably by now many of you know who our recipient is. He is a person with a sense: A sense of purpose, A sense of dedication, A sense of service, And yes, A sense of humor, but chiefly, A sense of humility.

Friends I am deeply honored to present, in your behalf, the 1979 Award of Merit to — Sidney Waxman.

### **Thursday Morning, December 13, 1979**

The Thursday morning session convened at 8:15 a.m. with Andrew T. Klapis, Jr. serving as moderator.

## **CURRENT DEVELOPMENTS IN THE HARDY NURSERY STOCK INDUSTRY WITHIN THE UNITED KINGDOM**

A BRUCE MacDONALD

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The aim of this paper is to highlight some of the current trends and developments that have taken place within the nursery stock industry in the United Kingdom. It will be related under three main sections:

1. Contributions by the nurseryman.
2. Contributions by the research stations.
3. Contributions by the advisory (extension) service of the Ministry of Agriculture.

However, one cannot in reality look at them as isolated compartments, as many ideas have been joint efforts within two, or all three sections.

### **CONTRIBUTIONS BY THE NURSERYMAN**

**Specialization and marketing.** A major trend has been the movement of nurseries to specialize in a particular crop or production system. This was very much accelerated when the pound sterling was considerably devalued against other currencies as imports of plant material became considerably more expensive from countries such as West Germany, Denmark, France, Belgium and Holland. This encouraged the industry to become more self sufficient.

Today there are nurseries specializing in pot grown liners (young plants), producing for example, conifers, evergreen

shrubs, and clematis. This type of enterprise has been particularly attractive for young people beginning their own business. Other specialist crops include advanced nursery trees, seed raised rootstocks and amenity plants of broadleaved trees, rose rootstocks and ground cover plants. Along with this specialization has meant an overall improvement of the quality of plants being sold. Thus many items being offered for sale by the wholesale trade are both competitive in price and quality against our continental competitors.

**Marketing.** The nurseryman is now becoming much more conscious of the importance of plant promotion, good presentation and efficient marketing. The Anglia Group, a major marketing co-operative made up of five well known nurseries in East Anglia, has been the pioneer of many ideas — in particular in the promotion of sales of plants for garden centre sales. Good management, a well designed catalogue, a central marketing office and quality plants have all been important factors for their success. Other marketing co-operatives have followed suit such as the Midland Group, Fargro in West Sussex, and Greenleaf Nurseries in Northern Ireland.

National schemes for selling plants have increased with National Tree Planting Week, Horticultural Trade Association (H.T.A.) Gift Vouchers, "Buy British Trees" and "Plant of the Month", the latter organized by the Garden Centre Group of the H.T.A.

Nurserymen are employing more people to act as salesmen for selling plants. They travel in different areas of the country visiting, in particular, garden centres and local authorities.

A major outlet over the last few years for plants has been local authorities and government departments — for example the Department of the Environment. Whether these outlets will be as successful in view of the current government financial cut backs is causing concern. The publication of a "reader document" agreed with local authorities is a major step forward.

**Distribution of Nurseries.** The current size of the industry is about 16,600 acres, growing annually some 50 million container plants. The nurseries are now becoming much more diverse in their location over the country. The major increase has taken place mainly in the West Midlands and East Anglia. Kent is also a county which has increased in percentage area and contains nurseries with a great range of differing enterprises. One or two small nurseries have arisen in Western Argyll in Scotland where some financial backing has come from the Highland & Island Development Board.

Within different counties, for example Kent, Surrey, Hampshire and West Midlands, there have now formed active Nurse-

nurserymen's Discussion Groups which meet monthly in autumn and winter to discuss in detail many aspects of nursery production. During the summer months they meet to visit nurseries, research and experimental establishments. This, in turn, has assisted in the formation of Training Groups under the auspices of the Agricultural Training Board (A.T.B.). The A.T.B. has carried out excellent work in organizing proficiency tests and a wide range of short courses for employers and employees.

**Plant Introductions.** The British climate, although very unpredictable, does enable gardeners to grow a very wide range of plants. Many of the nurserymen are extremely good plantmen and have a great specialist knowledge on different groups of plants — for example rhododendrons, alpines, dwarf conifers, trees, and clematis. The nursery industry is going through a phase of introducing "new plants" to the public. Some of these plants have been grown for many years but given little publicity of their potential; however, others are new in that they have been bred within the United Kingdom or imported from abroad.

Groups of plants which have been imported and given considerable publicity for retail sales by Blooms Nurseries, Diss, Norfolk, are the ornamental *Phormium* from New Zealand, and the prostrate forms of *Juniperus* from North America. Greenleaf Nurseries have widely promoted the golden forms of *Cupressocyparis* × *leylandii* bred in Northern Ireland and the fire-blight resistant *Pyracantha* from North America. Some famous nursery names have introduced plants in England to the trade; for example, Hilliers near Winchester with *Sorbus* 'Sunshine', *Hamamelis vernalis* 'Sandra' and *Daphne bholua* 'Ghurka'.

At nurserymen's conferences more lectures are being given by curators of famous British Gardens, such as the Royal Horticultural Society's Gardens at Wisley and Savill Gardens near Windsor, and the Hillier Arboretum near Romsey.

**Stock Plants.** Nurserymen have now become strongly aware of the importance of correctly named, well-maintained stock plants of the best clones. Greater attention is being given to pruning techniques and replacement programmes to obtain benefits from disease-free juvenile material.

One particular aspect which has interested Hadlow College is the techniques of growing stock plants under the protection of polyethylene and woven plastic. This is used for high value deciduous plants such as *Acer*, azalea, *Hamamelis* and *Magnolia* because cutting material is available earlier in the season and over a longer period in the correct condition, and to achieve greater success in percentage take. This, in turn, gives a much greater chance for successful overwintering of the subsequent young plants.

**Propagation facilities.** Facilities for propagation have undergone the following changes:

1. Simplification
2. Reduction of energy inputs — for example, insulation
3. Intensification of number of cuttings being rooted
4. Sophistication with automated controls
5. Reduction of handling by nursery operators
6. Direct rooting.

I would now like to take three recent innovations for discussion.

*Temperature controllers for basal heat.* A very accurate system for temperature control is now available from Nobel Engineering Ltd. Worthing, Sussex. This is basically an on/off proportional controller with 4 or 6 thermocouple sensors. One sets the desired temperature for the cuttings or grafts on a dial. The sensors then record on a dial the average temperature over the bed. It also quickly ensures a response should the temperature drop below the desired level. This system gives greater efficiency compared with the traditional rod thermostats.

*Sonar Mist.* Standing misting equipment gives a water droplet of a relatively large size, often giving an excess of water. Nozzles are closely spaced often causing overlap of misting spray patterns in addition to a drip problem underneath the nozzle itself.

A misting nozzle (sonicore nozzle) made to suppress dust in the asbestos and fibreglass industry has been modified in Sweden for use in plant propagation, and is now creating considerable interest. The principle is that compressed air energizes an ultrasonic resonator which, in turn, breaks up water into very small droplets to give a "hanging effect". Amongst the advantages include a smaller head of water, very uniform cover and a reduced number of nozzles. Also the air supply operates a spring-loaded valve so after each misting burst, there is no drip. The system, available from Ultrasonics Ltd., Shipley, Yorkshire, is currently being installed in two English nurseries.

*Panels for Providing Basal Heat.* A very modern half-acre propagation unit has just recently been constructed at Notcutts Nurseries, Woodbridge, Suffolk. It was designed by the consulting firm of Sheard & Fawcett in conjunction with the management team at Notcutts. The basal heat is provided by hollow extruded polypropylene panels developed by Robinsons of Winchester and I.C.I. Plastics Division. These panels were initially developed for heating swimming pools to circulate water heated by solar energy. In the propagation unit they are joined together with a heater at either end to cover the floor. The materials used for the floor base are 2" thick polystyrene sheets which are

laid on polyethylene. On top of the polystyrene is placed the panels over which is placed capillary matting. The cutting trays are then placed onto the matting. The water in this case is heated by a gas boiler.

**Mechanization.** Nurseries are becoming strongly aware of the need for mechanization. Specialist machinery is being obtained in two ways — firstly, importation of machines from France, Holland, West Germany, Denmark and Belgium through agents within the United Kingdom and, secondly, by nurserymen adapting and constructing their own.

**Imported Machinery.** Standard models of planting and undercutting machinery has now been imported over a number of years from Egedal in Denmark. However, an interesting development has been the formation of a firm in Surrey named M.J. Farthing. This company specializes in potting machines (Meyer) from West Germany, in addition to a very wide range of items from Holland. Two machines are worthy of further comment.

Firstly, the Damcon Lifter from Opheusden in Holland has become popular since its introduction in 1978. It is a hydraulically operated lifter with the aim of selecting individual trees within the row. The frame is laid with a horizontal position and twin hydraulic rams move the 'U' shaped undercutting blade into the soil beneath the tree selected for lifting. There is also a depth adjuster and the blade may be vibrated by a hydraulic motor. There is a clamp which holds the tree and a shaker to remove excess soil.

Another example is the Amtac root balling and wrapping machine. This is powered by a tractor power takeoff or a single phase electric motor. The principle is that the operator holds a balled plant in the machine and an elastic netting is wrapped tightly around it.

A machine widely used on some continental nurseries is the B.45 tractor from Bobard S.A. in France. During 1979 two of these tractors were purchased by English nurserymen. It was initially designed for vineyard work. It has an 8 ft clearance and can straddle 2 rows of trees. The tractor is extremely versatile with its 2 drive wheels independently steered. Implements are rear, mid or front mounted. It can work on slopes by altering its clearance height on one side to give stability. In addition, one may adjust the width of the straddle in order to accommodate varying row widths and it has a turning circle of 360° within its own length. The attachments include levelling blades, disc harrows, lifters, root pruners, spraying and fertilizer distributors. There is an electronic sensor which can direct hoeblades so weeds may be removed right up to the tree stem.

**British Machinery.** A potting machine designed and built

by Dorrell Bros. at Bransford, Worcester has created considerable interest. The machine achieves a rate of 1,400 per hour on 2½" pots using 3 operators. One advantage of this machine is that blockages are nearly eliminated as an upper horizontal conveyor completes a closed circuit of moving compost.

The specialist fruit tree rootstock producer, J. Savage of Marden, Kent, has designed two interesting items. One is a machine for automatically removing layers from stool beds. After the soil has been removed from the stools by an offset plough, a power takeoff driven machine with a revolving saw blade severs the layers at the desired height. A second machine is designed to incorporate liquid soil sterilants to a considerable depth using a plow to open up the depth of soil.

Another machine is now available called the Pepler Reel-master which automatically winds up the polyethylene used for field sterilization. It is powered by an hydraulic motor powered by the tractor.

#### DEVELOPMENTS WITHIN RESEARCH

**East Malling Research Station — East Malling, Kent.** Recommendations for research are made by the Joint Consultative Organization. This is a joint committee made up of growers, and research and extension officers. This has resulted in an increase in government support for nurserymen and amongst these priorities, propagation is foremost. Evidence of the weight given to this is the formation of a Plant Propagation Department at East Malling Research Station, headed by Dr. B.H. Howard. There propagation problems of fruit and ornamental trees are tackled in a three point program, as follows:

(1) *Physiological Aspects of Rooting.* Attempts are made to understand the internal mechanisms of plants which are responsible for marked improvements or failures of rooting. Information gained in this way provides the basis for establishing the general principles which are so necessary when dealing with large numbers of species. Examples of their work include studies on how to precondition shoots, while still on the stock plant to root more readily when subsequently taken as cuttings. At present, they are exploiting the well known etiolation effect by covering hedges before bud burst with black polythene tents and finding that the resulting cuttings root much more readily than when they grow normally.

Investigations of differences in rooting due to the position of the shoot on the stock plant also provides the basis for physiological studies and indicates how stock plants should be managed.

Seasonal changes in rooting of cuttings are well known to nurserymen and their cause often investigated. A study by an American postgraduate student working in the Plant Propagation Department at East Malling has given some very convincing evidence of the involvement of cofactors in the sap which increase in spring and which further supports the view, that rooting in winter cuttings is not determined by the increase in spring bud activity, as has often been argued.

(2) *The Need to Select for Rooting Ability.* The attitude at East Malling is to put selections for good rootability high on their priority list because it overcomes the need to develop detailed and costly propagation procedures. One is convinced of the merits of this approach on seeing such products of their breeding program as the cherry rootstock, 'Colt', which produces pre-formed roots while still on the stock plant and hence needs no further inputs. Selections within this hybrid family between *Prunus avium* and *Prunus pseudocerasus* have been shown to be particularly suitable for raising good quality flowering cherry trees with thick trunks.

The principle of selection is also applied to seedling populations of ornamental species in order to find plants with the capacity to root and so forms the basis of producing clones. In this way clonal rootstocks, as tree on their own roots, can be produced to give more uniform stocks of plants that at present are produced on seedlings. An example is the selection of clones of *Tilia* × *europaea* and *Tilia cordata* on the basis of their rooting ability by winter cuttings. This work has now reached the stage of raising maiden linden trees on clonal rootstocks for the first time, emulating East Malling's work over many years with clonal apple rootstocks — a development of considerable interest to the nurseryman.

(3) *Technical Improvements to Produce Simple Propagation Methods.* Dr. B.H. Howard has fully reported at previous IPPS Conferences the techniques of chip budding. This is now an accepted and well used technique in Britain for the production of high quality fruit and ornamental trees.

Wounding of winter hardwood cuttings for the heated bin (callus or Garner bin) has been studied recently using the M.27 apple rootstock. Different wounding techniques were used at the base of the cutting with the aim of increasing root number and improve subsequent establishment in the field. Two incision wounds, some 2.0 cm in length proved superior. Anatomical studies of the stem base showed that within the additional callus, a cambium formed. It was observed that the developing roots were formed in association with a typical cambial growth which forms in the wound callus.

Cutting source, time of collection, IBA response and compost conditions are all considered under the heading of "techniques" and evidence of how reliable techniques can be developed when the correct inputs are brought together can be seen from the regular stands of cherry, plum quince and apple cuttings.

**Long Ashton Research Station — Bristol.** Mainly as a result of pressure from the nursery stock industry a clonal selection scheme for ornamental trees and shrubs is now under way. This scheme is centered at Long Ashton Research Station. With the increasing number of plant introductions, nurserymen are very much aware of the confusion of correct nomenclature of plants sold, but it is intended to involve educational colleges such as Hadlow, Merrist Wood, and Pershore for plant collections of different genera.

The aim of the scheme is that clonal selection will increase the uniformity, compatibility, and overall attractiveness of plants. Where feasible it is planned to develop virus-free material. The initial plants selected for the scheme have come from 8 to 12 different sources and these have been planted for assessment at Long Ashton. Plants included so far are: *Malus floribunda*, *Potentilla fruticosa* 'Tangerine', *Daphne* × *burkwoodii* 'Somerset', *Ceanothus* × *veitchianus* and *Forsythia* × *intermedia* 'Lynwood'.

The variation of material supplied can be illustrated with *Cornus alba* 'Spaethii', where only one source was correctly named, the remaining being the more vigorous *Cornus alba* 'Gouchaultii'. It is planned to release early next year the best clones of 4 different plants. These may be identified by having the letters L.S. followed by a number, after the latin name.

Nurserymen are now much more aware of the benefits to both crop quality and fuel costs, by providing windbreaks. Long Ashton, with its renowned collection of *Salix*, has been a major source of reference and ideas. The publication of K.G. Scott entitled, "Living Windbreaks — their Establishment, Maintenance and Effectiveness", together with the Ministry of Agriculture booklet on "Windbreaks" provides valuable information to the nurseryman on living and artificial windbreak material. Three widely planted windbreaks in Britain are now *Alnus cordata*, *Salix* 'Bowles Hybrid' and × *Cupressocyparis leylandii*. Also Long Ashton has found *Nothofagus procera* promising with a growth rate twice as fast as *Fagus sylvatica*.

**Glasshouse Crops Research Institute — Rustington.** Recently a new nursery stock laboratory has been built where work is now headed by Dr. K. Loach. Work has been directed toward fundamental research on the relationship between water



stress of the cutting and its ability to root using different propagation systems. Results have shown the benefits for rooting cuttings during the winter months under polyethylene, while mist is preferable during the summer.

The ease of rooting and initial growth rates using 8 clones of  $\times$  *Cupressocyparis leylandii* are being studied. Early results showed that the widely grown 'Clone 2' within the nursery trade is not the best for ease of rooting, speed of growth and attractiveness.

The Pathology Department has been studying the control during the propagation stages of *Phytophthora* sp. on conifers and rhododendrons. This soil-borne organism is still very much a problem within Britain. Control has been directed to dips or drenches of cuttings. Two promising fungicides are Furaxyl (Fongarid) and a May & Baker compound, numbered LS 74-783. As zoospores have been found in the irrigation tanks, a control using chlorination and ultra violet irradiation has been effective.

A further line of work is the effects of photoperiodic lighting and gibberellin sprays on *Rhododendron* and *Picea* plants to extend the natural growing season and reduce the period of dormancy between flushes of growth.

#### CONTRIBUTIONS BY THE MINISTRY OF AGRICULTURE ADVISORY SERVICE (A.D.A.S)

Recent developments carried out by A.D.A.S. — Ministry of Agriculture/Extension service is centered at their Experimental Horticultural Stations (E.H.S.), but there is also a considerable amount of work done on nurseryman's holdings. This work is largely based at Efford E.H.S. by Miss M. Scott, while nationally by A.R. Carter and B.J.W. Morgan. The major topics for review are as follows:

**Reduction of Heating Costs.** Three techniques were found to reduce heating costs during propagation:

1. A reduction of up to 25% could be achieved by insulating the propagation beds. The technique is to use expanded 2.5 cm thick polystyrene sheets which are wrapped in polyethylene, then placed along the sides and back of the bed.
2. The installation of a secondhand boiler and pipework to heat water, instead of heating by electricity. The beds could also be insulated as previously described.
3. The application of basal heat during daylight hours only. Although the rate of rooting of cuttings was slightly slower with some plants, only about  $\frac{1}{3}$  of the amount of electricity was used.

**Rose Rootstock Production.** Each year a large number of rose rootstocks are imported into Britain from West Germany, Denmark and Holland. The major rootstock used is *Rosa dumetorum* — 5 to 8 mm grade. Research by Dr. Blundel at the University of North Wales, experimentation by A.D.A.S., combined with strong nurseryman involvement has now combined to give British raised rootstocks sold under the name of "Bristocks Limited." Meticulous studies into hip collection, seed extraction, pre-sowing treatment to the seed, soil sterilization, precision mechanical sowing, weed, pest and disease control, mechanical harvesting and finally grading-out, have lead to provide high quality stocks for sale to rose growers.

A vital operation is the presowing treatment based on acid digestion followed by two different temperature regimes. The seed is soaked for approximately 50 minutes in 95% concentrated sulphuric acid. The seed is then given a warm, moist stratification for 30 days at 24°C (75°F) followed by cold moist stratification for 12 weeks at 4° to 5°C (39° to 41° F).

**Rose Propagation by Budding.** A mechanical aid designed initially for bench-budding rose rootstocks using unskilled labor was developed by L. Pettifer at the University of North Wales. It is called a "budding gun", and operates on the principle that the bud is removed from the scion wood as a "core" containing the bud and a sliver of wood, and is then retained in the gun. The bark is next cut and lifted by blades at the end of the gun with the final stage being when the bud is released between the two flaps of bark. One then ties in as for conventional budding.

**Capillary Irrigation.** Overhead irrigation is the major technique on both the continent and North America but, in Britain, capillary irrigation is widely used. A standard design formulated by the A.D.A.S. for an outdoor constant stock is available for nurserymen. The aim is to provide an adequate water reserve in the summer combined with adequate drainage during the winter. Basically a 5 cm depth of sand is placed over 500 gauge black polyethylene attached to side boards on the perimeter of the bed. Facilities are also constructed to allow for drainage of excess water. Water is applied to the sand by either bi-wall tubing, seep hose, drip nozzles or micro-tubes.

Synthetic matting materials as an alternative to sand have created considerable interest. Their advantage is that they give a more flexible system, are lighter in weight, more effective on slopes, and cleaner for retail sale. Work at Efford E.H.S. has been to evaluate the performance of the different synthetic materials. They are made from different materials, for example, compressed wool shoddy, acrylic waste fibres, polyester and nylon fabric; the material found suitable for outdoor container

stock was Lantor 4.H — made from waste wool, nylon and acrylic fibres as non-woven felts.

To prove accuracy of water control an instrument called the "Water Bug" may be used. This was invented by F. Richardson, Flowering Plants Limited, Buckingham. This reacts to changes in moisture content of the substance so one can operate it either on a dry or wet regime.

A problem with capillary irrigation is the rooting through from the container into the sand or matting and the formation of algae, moss, and liverworts on the surface. The material, Gloquot, manufactured by Wykamol of Winchester, may be sprayed at 5½ fluid oz/sq ft of bed to overcome this. Investigations are currently being carried out with this and other materials to prevent rooting through from cutting trays (flats) into the propagation bench.

**Weed Control in Container-Grown Plants.** Annual weeds such as *Cardamine hirsuta*, *Epilobum*, and *Poa annua* are a major problem for the nurseryman. Experimentation has led to chemicals being used on a routine basis. The problem area is with young stock grown under glass or polyethylene. The two major chemicals used are chloroxuron (Tenoran) and simazine. Chloroxuron is applied at the rate of 1½ oz. in 6 gallons of water per 1000 sq ft of bed surface every 6 to 8 weeks, ensuring the foliage is washed off immediately with pure water after spraying to reduce the risk of leaf scorch. This chemical also controls algae, moss, and liverworts, but is not very effective against *Poa annua*. Simazine is applied every 9 to 10 weeks at the rate of 1 oz in 6 gallons of water per 1000 sq ft of bed surface. There is less risk of leaf scorch, and it controls *Poa annua*, but has the disadvantage in that more plants are susceptible to it and its failure to control moss, algae, and liverworts.

Currently trials are in progress using "herbicide cocktails", one aim being to give control of a wider weed spectrum. Mixtures include chloroxuron and diphenamid (Enid) and chloroxuron with simazine. A prototype herbicide applicator is currently being developed by A.D.A.S. at Winchester, where one is able to adjust the boom for the height and width of a growing structure.

**Chemicals to Regulate Plant Growth.** Following the work using chlormequat (Cycocel) to assist bud initiation on camellia, work has been extended to investigate dikegulac-sodium (Atrinal). Here the aim is to compare the number of axillary shoots as well as bud initiation. For camellia best results seem to be with 0.1% Atrinal applied at the "rabbit ear" stage of new growth. Studies have been extended to *Ilex*, *Rhododendron*, *Clematis*, *Erica*, and *Berberis*. At Hadlow College we have

found it effective on quick growing deciduous plants under glass such as *Spiraea* and *Ceratostigma*. The correct application rate and stage of plant development are vital when using dikegulac-sodium. Investigations using this chemical have been reported in past issues of the IPPS Proceedings.

Other items of importance include comparisons of different polyethylene and woven plastics for container plant production. Also the formulation of standard peat and sand growing media using slow release fertilizers; this has been one of the most important items of work over the last decade. The nurseryman is now very interested in bark as an alternative to peat, the latter now being difficult to obtain.

#### APPENDIX

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##### RESEARCH STATIONS.

Dr. Brian H. Howard,  
Head of Plant Propagation  
Department,  
East Malling Research Station,  
East Malling, Kent.  
The Director,  
Long Ashton Research Station,  
University of Bristol,  
Long Ashton, Bristol,  
Gloucestershire

Dr. Keith Loach,  
Glasshouse Crops Research Institute,  
Worthing Road, Rustington,  
Littlehampton, Sussex.  
The Director,  
The National Institute of Agricultural  
Engineering,  
Silsoe, Bedfordshire.

##### MINISTRY OF AGRICULTURE ADVISORY/EXTENSION SERVICE — EXPERIMENTAL HORTICULTURE STATIONS AND ADVISORS.

Miss Margaret Scott,  
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Arthur R. Carter,  
National Nursery Stock Advisor,  
Ministry of Agriculture,  
Coley Park, Reading, Berkshire.  
Brian J.W. Morgan,  
South East National Stock Advisor,  
Ministry of Agriculture,  
Coley Park, Reading, Berkshire.

##### PROPAGATION FACILITIES.

George E. Sheard,  
Fawcett & Sheard Ltd.,  
Engineering and Horticultural  
Committee,  
35, Broad Street, Wokingham,  
Berkshire. RG11 1AN.  
S.R. Freeman,  
Nobel Engineering Ltd.,  
Clare Works, Woods Way,  
Mulberry Industrial Estate,  
Goring-by-Sea, Worthing, SUSSEX.  
BN12 4QY.

Managing Director,  
Robinsons Developments Ltd.,  
Solar Heating Engineers,  
Robinson House,  
Winnall Industrial Estate,  
Winchester SO23 8LH.  
Ultrasonics Ltd.,  
Sonimist,  
Otley Road, Shipley, Yorkshire, BD18  
2BN.

GROWING STRUCTURES AND CLADDING MATERIAL.

Michael Rochs,  
Clovis Lande Associates Ltd.,  
Gaza Trading Estate,  
Hildenborough,  
Tonbridge, Kent. TN11 8PL.

PARTIAL SOIL STERILANTS — 'BASAMID'.

B.A.S.F. United Kingdom Ltd.,  
Agrochemical Division,  
Lady Lane, Hadleigh, Ipswich,  
Suffolk, IP7 66Q.

Available in Canada from:  
Plant Products,  
Bramalea, Ontario.

MACHINERY.

Potting Machines, undercutting, lifting and spraying equipment.

John B. Edmonds (Valeford Potter)  
Dorrell Bros.  
Bransford, Worcestershire.

Undercutting and Lifting Equipment from the Netherlands.

J. Van Dam B.V.  
Damcon and Van Dam Lifters,  
Postbus 15, Opheusden, Netherlands  
Polybob Tractor from France.

Bobard S.A.  
17, Rue de Reon,  
21200 Beaune, FRANCE.

(United Kingdom Agent:)  
Heygates Machinery Ltd.,  
Bugbrouke Mills,  
Northampton.

SPECIALIST UNITED KINGDOM MANUFACTURER and importer of  
machinery for nursery stock.

M.J. Farthing,  
M.J.F. Ltd.,  
2, Summers Road,  
Farncombe, Godalming,  
Surrey, GU7 3BA.

SPECIALIST DANISH NURSERY STOCK MACHINERY.

Egedal Maskinfabrik,  
Egebjerg,  
8,700, Horsens, Demnark.

(United Kingdom Agent)  
Ernest Parsons,  
E.P. Nursery Machines,  
Station Road,  
Plumtree, Nottingham.

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GUS MEHLQUIST: What was the role of the acetone you mentioned in your first paper?

BRUCE MacDONALD: The idea came from East Malling and we have found it very successful with hollies. The acetone dissolves the IBA in the talc rooting powder and promotes better rooting. This has only been an observation with us.

DAVID SHAFER: You mention Blazamid in your talk. Would you comment on the relative merits of it versus methyl bromide.

BRUCE MacDONALD: Blazamid is cheaper, half the price of methyl bromide. Because it is a granular material we do not

need a contractor for application as with methyl bromide. Blazamid, however, does not provide the same degree of disease control and turn around time is 3 to 4 weeks.

PETER VERMEULEN: Would you comment on the use of encapsulated fertilizers in combination with capillary watering?

BRUCE MacDONALD: There is certainly less chance of salt buildup with overhead watering than with capillary watering. Rain should help to remove excess salts if they do build up, or overhead watering can be used to remove the salts. Top dressing with fertilizer, however, is generally useless with capillary watering because the top soil layer is often dry.

HUGH STEAVENSON: What is the trend in England on the use of the polythene bag as a growing container?

BRUCE MacDONALD: The trend is back to rigid pots. Transport factors, labor and handling costs, and potting machines have influenced the trend.

JIM WELLS: Blazamid is not available in the U.S.; however, Vapam is very similar and equal to it.

JIM WELLS: Do you see any trends occurring in the size of plants being grown in containers?

BRUCE MacDONALD: We are seeing a development to larger containers for trees and large conifers. At the same time there is also a trend towards smaller containers for young plants and the mass market outlets.

## **PROPAGATION OF ACER CAMPESTRE, A. PLATANOIDES, A. RUBRUM, AND A. GINNALA BY CUTTINGS**

DOUGLAS J. CHAPMAN

*The Dow Gardens  
Midland, Michigan 48640*

This survey-study was initiated to determine if *Acer campestre*, *A. platanoides*, *A. rubrum*, and *A. ginnala* could be propagated by cuttings and grown using accelerated growth techniques, as developed by Hanover et al (7), to produce a 3 to 4 foot plant in one season. During the past decade Davidson (3), Schwab (9), and others have noted continual graft incompatibility within the cultivars of *A. rubrum*. Presently, it hasn't been determined if this incompatibility is pathologically or physiologically induced or is due to a provenance response of the stock (personal conversation with Davidson (3)).

Softwood cuttings were used in this study so that the plants could be grown on using accelerated growth techniques after propagation (6,7,8,10). It was felt that juvenility moves ac-