£2/ 100 sq. yds.) is sprayed over the ground. We were told that it was essential that there were no undulations in the top surface of the soil prior to applying Vinamul 8114 — sold by Vinyl Products Ltd., Mill Lane, Carshalton, Surrey. The total cost for this sterilisation treatment was £4/ 100 sq. yds.

During the course of the afternoon we were able to view an interesting display of machinery used in the production of herbaceous plants. Maurice Prichard explained the particular merits of the machinery, such as the modified 5-row Accord planting machine, which could be used for both live and dormant material, and the Vicon Rotaspa which is preferred to a rotavator on light sandy soils as it prevents panning.

Planting distances are orientated to the bed system of production, which makes subsequent operations earier. Herbicide applications was essential for efficient production, and lenacil (Venzar) at 2 lbs/ acre is effectively used.

During the day a variety of production systems were seen which were geared to produce high quality plants. We all departed with a wealth of information and were extremely grateful for the warm reception given to us by Adrian and Alan Bloom, together with their colleagues.

RECENT DEVELOPMENTS IN PROPAGATION BLOCKS

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The most important factors which have stimulated the development of propagation blocks manufactured from synthetic materials are:—

1. It is possible to develop propagation blocks with properties which are reproducible.
2. It is possible to develop blocks with known air-water ratios,

which wet readily, and which hold their water content.

3. It is possible to develop blocks which have been conditioned to stimulate root development, and which contain plant nutrients.
4. Once rooting has started in the blocks, it is possible either to transfer them into larger blocks, or to potting-on composts with minumum root disturbance.

A number of manufactured propagation blocks have been marketed. They can be categorised into four main groups:—

1. Those based on polyurethane foam:—

   (a) Nutri-Foam was manufactured by the Dow Chemical Co. of America. It contained plant nutrients in the form of ion exchange complexes. It has now been withdrawn from the market because of difficulties experienced in use.

   (b) Baystrat is a development of Nutri-Foam and is manufactured by Bayers of Germany.

   (c) Rack-Substrate was developed by Rack of Germany, and is marketed by Hartmann International GmbH. It is manufactured from scrap polyurethane foam shreds, and contains admixed shredded peat.

2. Those based on foamed urea-formaldehyde. These blocks suffer from the disadvantage that when manufactured they are hydrophobic (i.e. cannot be wetted), and require treatment with surfacants before use. When so treated the foams tend to collapse, and the blocks waterlog readily. Although the principle of production is attractive because they can be produced by the grower himself, using a foaming machine, nevertheless they are not likely to be as effective as those made from other raw materials.
3. Those based on padded and modified cellulosic fibres, for example BR-8 manufactured by the American Can Co., U S.A. We understand that these blocks are no longer manufactured.
4. Those based on mineral fibres, 'rockwool'; for example, Grodan, developed by Mosegard of Denmark, and evaluated by Bovre of the Hornum Research Station of Denmark.

Certain of these products tend to disintegrate when saturated, that is, they have poor wet strength; others showed evidence of waterlogging when exposed to a watering regime and therefore suffer from minimal air contents when wetted. Others, particularly those based on polyurethane, showed marked drainage leading to a moisture gradient from the surface to the base when the wetted blocks were allowed to stand for relatively short periods of time.

The basic problem with this type of block is that the foam membrane has not been conditioned to accept water, and therefore sheds the surface water rapidly.

Van Elk of Boskoop (1) has compared the rooting performance of many species of plant cuttings in peat-sand mixtures, BR-8 and Baystrat. He concluded that Baystrat was not as effective as BR-8, and root development within the blocks was poor. He also compared BR-8, Grodan and Baystrat under double glass and under mist Although under double glass, Grodan was nearly as effective as BR-8, and certainly considerably more effective than Baystrat; both Grodan and Baystrat were inferior to BR-8 under mist, using cuttings of five species of plants.

Bϕvre (2) has reported on his own results comparing propagation tests using sphagnum-sand mixtures in various types of pots and four types of propagation blocks. He confirmed the findings of Van Elk that Grodan appeared to be superior to Baystrat when used with his particular species of cuttings. The main problem associated with the use of Baystrat appears to be the non-acceptance of water by the polyurethane membrane. (Table 1).

As a generalisation, the modified cellulosic fibre blocks appear to be more effective than those made from mineral fibre. These, in turn, appear to be better than the foamed polyurethane blocks. Unfortunately the quality of roots developed in the modified cellulosic blocks are not always as good as those formed in the more conventional peat-based, soil-less composts. Even when rooting is good, as Orum and Wilde (3) have observed "The most serious problem in the use of these blocks is the matter of timing. Cuttings rooted in the blocks must be potted or containerised before roots from adjacent blocks become interlocked or the blocks become ruptured by root pressure".

We have been investigating new types of materials for use in the manufacture of propagation blocks which will overcome the problems associated with the types of blocks now manufactured, and which will meet the four important factors noted in the first section of this report. One of the most promising approaches appears to be in the use of phenol-formaldehyde foam systems. We became interested in the use of such foams during the investigations into a much larger project which included the development of a new type of floral grade foam. We discovered that not only could we modify the ratio of large to small pores in the foam, thus enabling us to vary the water-air relationship, but we could vary the water acceptance of the foam membrane at will. In a further project we have been having a close look at the sequence of biochemical events leading to root initiation including the use of growth regulators to stimulate root development We have been investigating not only the possibility of using the lessons learnt in this work to the develop-

ment of new synthetic rooting hormones, but also to the development of the new type propagation blocks.

We have had some evidence from Bovre's work that certain types of phenol-formaldehyde foams did not appear to present toxicological problems in the rooting of cuttings. This was confirmed in the modified phenol-formaldehyde foam blocks, free of nutrients and growth promoting substances, which have been evaluated at the Pershore College of Horticulture.[1] We were surprised at the rooting performances in these blocks. Having established that there do not appear to be problems of phytotoxicity, various nutritional and growth factors have been introduced into the blocks, and most promising results have been achieved. We will be reporting further on this work when all the results have been assembled.

LITERATURE CITED

1. Information supplied to us by B.C.M. Van Elk during our visit to the Research Station for Arboriculture, Boskoop, Holland in 1971.
2. Bϕvre, O. 1972. *Statens Forsϕgsvirksomhed i Plantekulture 74,* (9th March).
3 Orum, P., and Wilde, J., 1971. *The Plant Propagator,* 17 (3):5.

QUESTION BOX

JOHN GAGGINI: Could Mr. Purcell elaborate on *Hamamelis mollis* budding? What percentage take did he get?

G.B. PURCELL: The stocks were *H. virginiana* which came from the U.S.A. Budded in August with traditional 'T' cut with the wood removed from the bud. The time of budding varies with the availability of the budwood which can be as late as October; you will still get a good take so long as the sap is still rising in the stock. The percentage in 1970 with 250 stocks was about 90%. The varieties were 'Jelena' *Hamamelis x intermedia* 'Jelena'), *H. mollis* 'Pallida', 'Gold Crest' and a variety we call 'New Red'. In 1971 we budded about 150 stocks with about the same take, and this year we hope to do about 200. I would like to obtain 20 or so *Distylium racemosum* stocks in the next month or so to try budding them and to compare the results.

G.B. PURCELL: Is it not true that there is a big demand for standard Japanese maples in variety, but that the trade has not shown the ability to produce a good quality product?

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[1]These were exhibited at the Conference.