SYNTHETIC PROPAGATION BLOCKS

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During the past three years, we, at the Pershore College of Horticulture, have been evaluating various types of commercially available synthetic propagation blocks for the rooting of cuttings exposed to intermittent mist. To date all the types we have tested suffer from serious limitations. Most of the commercially available blocks have since been withdrawn from the market.

Many propagators feel that the principle of using synthetic blocks is a sound one, and it is my intention to try and assess what we have learned during our investigations, and with our knowledge of the known variables, to attempt to predict where we should go from here.

Perhaps the main advantage of using propagation blocks lies in the ability to pot up plants without root disturbance and therefore growth checks. In practically every trial we have undertaken, establishment using the blocks was better, and plants were often larger and more well established at the end of the growing season. A few plants were planted out directly from the mist bench into the open ground with no apparent check. For example *Rubus tricolor* and *Lamium galeobdolon* 'Variegatum', rooted in the prototype block SILVA-FOAM, were inserted in the blocks in the 7th July this year, planted on the 17th July and are now, on the 20th August, growing away strongly. This was only a small scale trial, but the method does seem promising.

Synthetic blocks are sterile, light in weight, and can be transferred from one place to another. Because they are manufactured articles they are reproducible in their physical and chemical characteristics. Their use avoids the need to prepare composts

Donald Cook at the last G.B. & I. Regional I.P.P.S. Conference, held at Myerscough Hall, reviewed — using slides — the development and properties of synthetic blocks. I summarise the information given.

Three main types of materials have been used·

1. Blocks which are based on foamed polyurethane.

   One of the first examples is "Nutri-foam" which was developed by Dow Chemicals and marketed by the Nutri-foam Corporation. These blocks were based on flexible foams which, because of their pore characteristics, tended to suffer from surface water drainage, and saturation at the base of the blocks. The cell wall membranes were also difficult to penetrate by the roots.

"Baystraat" is also included in this group. Root penetration was good but these blocks suffered from excessive surface water drainage, leaving the tops of the blocks dry, and the base too wet. Cuttings of quite a number of species rooted well in "Baystraat", including *Prunus incisa* and many of the quick-rooting species, such as the *Hebe*.

"Rack Substraat", again developed in Germany, is based on shredded polyurethane admixed with peat and then annealed into sheets of flexible foam resembling the Nisula-type rolls about 4 cms. wide.

This material has a high density and is difficult to wet. Leaf wilt occurred rapidly.

2. An interesting product known as "BR-8" was developed by the American Can Company of America. It consisted of cellulose pulp fibres held together by synthetic adhesives. These blocks are characterised by rapid water uptake leading to near saturation of the block. The basic problem with such blocks is that it can only be used with plants requiring near saturation conditions for propagation. In common with many other types of blocks it has been withdrawn from the market.
3. A third group is based on mineral wool which is manufactured from a fused mixture of sand, carbon and chalk. The fibres are held together by a binding agent such as the phenolic resins.

The best known commercially available type was developed in Denmark and is called "Grodan". In our opinion this product has no particular advantage over sphagnum peat except that it is easier to use These blocks absorb large volumes of water and, when wetted, approach near saturation. The blocks have a low wet strength and, to retain the integrity of the block, they are frequently enclosed in a skin of polyethylene Unless so coated, delamination of the fibres can present a problem. Moss grows readily on the surface of the blocks.

In the past the manufacturers, have tended to produce a foam which will absorb water rapidly and can be penetrated by the stem of the cutting, or have pre-made holes for the insertion of the cutting. Because of the high rate and level of water absorption the blocks tend to suffer from near saturation. The manufacturers have ignored the findings of the propagators that, as a generalisation, there is no one compost system which is suitable for all plants, and for successful propagation there is a need to vary the peat-grit or peat-perlite ratios according to the water-air requirements of the plant. Because of this the manufacturers have tended to overclaim the advantages of their products and brought the principle of using blocks under suspicion. Just as variable grit-peat mixtures are required for different plants, so if propagation blocks are to be adopted as standard practice by the propagator, the blocks should be so manufactured as to be made available having different water-air ratios. For example many propagators root certain plants such as *Daphne cneorum* in pure grit having a low water and a high air content. This plant will just not propagate successfully in a block maintained at near saturation by intermittent mist. Some conifers need more air available to their developing roots than most cotoneasters and so on. One of the problems therefore in developing propagation blocks, which has not been recognised by most manufacturers, is the development of blocks having a higher air-water ratio without making the pore-spaces too large. With large voids the base of the cutting or the root hairs may be suspended in air.

Another important factor is good root penetration. We have found that a cutting is less likely to succeed in tough-membraned blocks if, as in the potentillas and some ericaceous subjects, the very fine root systems have to force their way through the membranes. On the other hand, *Viburnum* x *bodantense* with its strong, vigorous rooting system can often succeed in blocks because it can break through the membrane.

The pH is, of course, important with some species. A good wet strength is also important, and the block should keep its integrity when wet. It is an advantage if the block can contain root activators and nutrients as it is not always convenient to liquid feed at the correct time

The blocks should obviously be porous and readily wetted by capillary or by mist and they should be able to retain the moisture to the plant requirements.

The blocks with which we have had the most success to date is the pehnolic foam type known as 'Silva-Foam', under development by Silva-Development Ltd. of Pontefract, Yorkshire. I understand that these blocks are to be developed further before they are marketed. The object behind the development of these blocks is to try and tailor-make the blocks according to the requirements of the plant. I understand from Donald Cook that this could involve 5 moisture ranges and 2 pH variables making 10 types of blocks, covering as far as it is possible the water-air and pH requirements of the plants. Consideration is also being given to the inclusion of root activators and nutrients in the blocks. This may take longer to produce propagation systems which are sufficiently advanced to market with confidence.

We have examined three prototypes of "Silva-Foam" having varying water-holding capacities from 550, 620 and 690 kg./cu. m. and having an adjusted pH of about 7.0. In further trials, the blocks will be adjusted to pH ranges of 4.0-4.5 and 5.5-6.5. The disadvantage of using blocks of pH 7 at Pershore is due to the hard water we have to irrigate our plants. This can quite clearly exaggerate the pH effect on rooting to the detriment of the test. It should be emphasised that the blocks we have tested were prototypes to establish whether or not the make up of the blocks could cause phytotoxity to the plants. The water-holding capacities, even of the coarse blocks, were known to be considerably higher than those of the grit-peat composts we normally use for propagation, or use in our controls when evaluating new systems. Sphagnum peat, by way of example, has a water holding capacity under intermittent mist of about 620 kg./cu. m. A 50:50 grit-peat compost has a water holding capacity of about 340, and grit of about 70 kg./cu. m., when exposed to intermittent mist.

In one trial using *Garrya elliptica* and *Viburnum tinus*, good results comparable with the controls were achieved. The Garryas propagated in the compost died after potting, as no special after care was given.Those propagated in the blocks established well. *Chamaecyparis lawsoniana* 'Stardust' did not show as good a rooting response in the blocks when compared with that achieved in the compost but the cuttings which rooted in the blocks developed better plants, when potted on, than the controls. *Viburnum* x *bodnantense* rooted 100% in all treatments, whereas *Betula nigra* and *Daphne cneorum* failed to root in the blocks. These failures were probably due to the known excessively high water content of the blocks; the rooting responses in the controls were about 90%

We have established that many plants will propagate successfully and pot on well when rooted in synthetic blocks. Other plants will not do as well or fail. This does not condemn the principle of using blocks to propagate; it does mean, however, that failures assume significant importance because, from these failures, we can assist in the development of blocks which will eventually cover the whole spectrum of propagation from cuttings.