PERLITE FOR PROPAGATION

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There is one fact to remember, and that is — that the roots of plants absorb many times their volume of air. In addition to this, one of the plant growth regulators is biosynthesised, in part, in the roots and then translocated up the plant to the leaves. This being so, it is obvious that a good root system is very important to the well being of the plant.

There has been a lot said in the press, and by various people involved in the commercial aspects of compost manufacture, about the characteristics of the additives recommended. Many of the claims made for particular groups of additives have been exagerrated and I cannot help but feel that the horticultural industry and also the amateur grower, have been exposed to gimmickry.

GRITS

All additives used in the compost industry can be classified by their particle size and also by their surface contours. These two characteristics affect their water holding capacity, the level of aeration contributed to the compost, as well as the drainage characteristics of the compost. There are many grits on the market varying from the smooth contoured quartz or silver sand to the rough surfaced coarse granite sold in Guernsey as "Growrite." The thickness of the film of water around the surface of the grits, at similar particle size, is about the same. The water holding capacity of the grits is, therefore, dependent on the roughness or smoothness of the surface. The water holding capacity of the silver sand we tested was about 100 kg. of water per cubic metre, but the water holding capacity of the very rough surfaced "Growrite" was about 300 kg. of water per cubic metre. This difference in water holding capacity was due entirely to the surface contours. The particle size range under test was passing a ¼ inch mesh and retained on a 10 mesh BSS (−6mm+1.7mm).

A further factor which affects significantly the water holding capacity is the particle size. As the particle size decreases, the volume of the film of water in relation to the volume of the grit increases and, therefore, the water holding capacity increases. When the particle size is less than about 60 mesh BSS (250 micron), the film of water around a grit particle coalesces, and a state of waterlogging is reached. It is possible to achieve a very wide range of water holding capacity for a given grit by merely varying the particle range of the material. As a generalization the drainage characteristics of a grit of given particle size increases with the surface roughness of the material.

POLYSTYRENE

Polystyrene chips and spheres have been used for potting composts. Because of its honey-combed cellular structure polystyrene is a most effective heat insulator and the material, therefore, has advantages over grit for root development. Unfortunately, with regard to water holding capacity, the water holding capacity of the spheres and chips cannot be calculated from the particle size because the surface tends to repel water. The water holding capacity of spheres passing a ¼ inch mesh and retained on a 10 mesh BSS (−6 + 1.7mm) is only about 20 kg. of water per cubic metre. This low water holding capacity coupled with its low density presents problems of mixing with peat.

PERLITE

Formation. Perlite has a similar cellular structure to polystyrene but it can be wetted readily with water. It also has a higher density. Unlike polystyrene it can be mixed readily with peat. I first came across perlite when we attended the IPPS Conference at St. Paul, Minnesota, U.S.A., a few years ago. We were taken to many large nurseries in different parts of America and, as a layman, one of the surprising features was the large quantities of perlite used, especially by the propagator. As a result of this trip I decided to learn more of this material.

Perlite is quarried from old volcanic lava beds. During the early stages of cooling, water entrapped in the lava evaporates leaving a crust of a highly porous pumice-like material. Below this crust there are a number of layers of cooled minerals containing variable amounts of entrapped water. The perlite ore is quarried from one such layer or strata. The high density rock is then crushed, graded, and then heated to about 1,000°C. The entrapped water vaporises, and the heated granule expands. The particle formed has a glass-like skin, covering what is in effect a glass foam. About 98% of the volume of the particle is air entrapped in a closed cellular structure. The surface of the particle is rough and similar in contour to "Growrite" granite grit. The water holding capacity of a perlite particle is similar to that of "Growrite" of similar particle size.

Properties. When the perlite skin has been fragmented by crushing, the cellular structure is exposed. The water holding capacity of the fragmented particle can be as high as 850 kg. of water per cubic metre. One of the interesting characteristics of fragmented perlite is that it facilitates moisture movement of water into partly dried peat fibre. There is an advantage in incorporating a small proportion of fine perlite into a perlite used for the production of peat-perlite composts. For propagation composts, the perlite used should be substantially free from fines. We have now made available a fines-reduced coarse perlite. One of the most important properties of perlite as an additive for propagation composts is the thermal insulation characteristics of the material. Because of the high air content of the particle its insulation characteristics are similar to those of the urea-formaldehyde foams used in cavity walls to insulate a house. There is evidence that the root hairs of plant subjects are attracted to the surface of the Perlite granule. The perlite appears to bond on to the roots and this perlite-root relationship appears to promote massive secondary root growth. Peat-perlite mixtures have now been used very successfully as propagation composts; it has been shown by many propagators, both in the U.K. and in the United States, that cuttings of many plant subjects can be rooted more successfully and quicker in such mixes than in peat-grit composts. We attribute this success to the aeration and heat insulation properties of the perlite particle. Perlite also appears to stabilise or help in the stabilisation, of the compost temperature, and evidence has accrued which indicates that the bottom heat required by many cuttings can be reduced by the incorporation of perlite into the propagation compost.

APPLICATIONS

FUCHSIAS. In a simple comparative trial the cultivar 'Flirtation Waltz', was half rooted in a proprietary peat/sand compost, and the other half in a mix of five parts of perlite to one part of peat, both with bottom heat of 65°F and an ambient night temperature of 50°F. The cuttings were evaluated after one month, and those in the perlite mix all had improved root systems and 60% of them were "massive", in comparison with the peat/sand compost cuttings.

A further trial at a local college was undertaken to determine the effect of peat to perlite ratio in the rooting and potting-on of fuchsia cuttings. Mixtures of perlite and a proprietary peat-based seed/cutting compost were used as follows: 100/0, 75/25, 50/50, 25/25, 0/100. Briefly the conclusions on best and worst growth were as follows:

Characteristic	Best Mix	Worst Mix	Comments
Cutting root development	100% perlite	100% Compost	50/50 Performed well
Potting root development	50/50	100% perlite 100% Compost	
Plant height	50/50		
No. of leaves	100% Compost	100% perlite	
Weight of plant	25/75	100% perlite	

The conclusions were that 100% perlite is the best rooting medium if plants are potted on as soon as rooted, but the 50/50 mix is best if they are left to grow on for any length of time. There is some evidence that the final potting compost benefits from a 25% perlite incorporation.

CARNATIONS. The British National Carnation Society recommends one part of peat to two parts of perlite (33/67) for rooting cuttings, and a 50/50 mix for potting on.

GERANIUMS & PELARGONIUMS. Some recent trials by the President of the British and European Geranium Society have shown that for rooting cuttings, a 50/50 mix of perlite with a proprietary peat-based compost reduced rooting time from 21 days to 14 days — with bottom heat at 65°F under plastic covers. A repeat trial in warmer weather showed a reduction in rooting time from 18 days to 11 days with the addition of perlite. Further benefits were observed from the addition of perlite to the potting-on compost at a rate of one part of perlite to six parts of a proprietary peat/sand compost.

CHRYSANTHEMUMS. The propagation of chrysanthemum cuttings for AYR flower production is probably the best known application of perlite in U.K. horticulture. One recently published book on chrysanthemum growing recommends a rooting medium of 40% peat and 60% perlite, but other growers use varying mixes between 25% peat/75% perlite, and 50/50. Chrysanthemum growers use large rooting benches continuously cycled every 12 to 13 weeks with steam sterilization between each crop. For this application it is important to minimise the fines content in the perlite to avoid the formation of an anerobic layer in the bottom of the rooting bench.

ERICAS. Some leading commercial heather growers are now using 50/50 peat/perlite instead of peat/grit for rooting cuttings in trays. They report generally better root growth in the peat/perlite mixes in approximately half the time previously taken with peat/grit. Alternatively they were able to switch off the bottom heating cables and achieve rooting in the same time in cold peat/perlite, compared with hot peat/grit. A further advantage is that the rooted cuttings are much lighter to despatch by road or rail.

RHODODENDRONS AND AZALEAS. A 50/50 peat/perlite mix has been shown to be satisfactory for rooting under U.K. conditions. For potting-on an 85/15 peat/perlite mix is recommended.

CONIFERS. *Cupressocyparis leylandii* 'Castlewellan' cuttings were rooted in 50/50, peat/perlite in polystyrene trays. With bench warming to 21°C under mist the cuttings which were struck on the 4th of July had visible root growth after 7 weeks, and were potted on after 12 weeks. Identical cuttings alongside in peat/sand mix showed no signs of rooting until over 10 weeks. Under these particular conditions the use of perlite gave a reduction in rooting time of approximately one third, it also gave a stronger root system which was more easily transplanted without damage to the hair root system.

FOLIAGE PLANTS. A wide range of foliage plants and ornamental shrubs are being rooted in 60/40 peat/perlite, with a reduction in rooting time and improvement in percentage take. For example, *Dieffenbachia* cuttings have been rooted in four weeks compared with six weeks in a peat-based compost.

HANGING BASKETS & PLANTERS. Perlite is being incorporated as a 1/1/1 soil/peat/perlite compost to give lightness, moisture retention, aeration and drainage while reducing the frequency of maintenance required with outdoor civic decorations.

ORCHIDS. Orchids are now widely propagated by meristem culture and the resulting plantlets are grown on in perlite/bark composts.

CONCLUSION

The main benefit of perlite is that it can be used by the grower in many different ways to control the rooting environment in order to match the requirements of different plant subjects in terms of: aeration, insulation, moisture retention, and drainage.

SOME ASPECTS OF THE PROPAGATION OF RHODODENDRON, MAHONIA, AND ILEX BY CUTTINGS

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RHODODENDRONS

Most textbooks advise using relatively thin growths, preferably without a flower bud and, indeed, for the more difficult to root cultivars this is sound advice. However, for easier rooting cultivars, such as 'Pink Pearl' 'Sappho', 'Tortoiseshell Scarlet' and 'Cunningham's White', we deliberately choose strong vigorous shoots because we find we can still obtain a high percentage of success with this type of cutting and, of course, we get a much stronger one-year-old plant for lining out. Incidentally, this is a philosophy which we use with all plants where enough material is available. The terminal bud, whether vegetative or flower, is removed to encourage bushy growth. A wound is made on each side of the base of the cutting and about four leaves are left on. In the case of large-leaved cultivars, or those which have a spreading habit, these are trimmed by as much as ½ to prevent overlapping and consequent decay in the cutting bench. A start is usually made on making cuttings during the second week of October and the job is completed about a month later.

One of the problems frequently encountered with rhododendron cuttings after insertion is deterioration of the base, even with easy rooting cultivars. In my experience, once this sets in it will usually extend all the way up the stem and the cutting is lost. There are several possible causes:

a) The main one is undoubtedly poor aeration at the base of the stem, to which rhododendrons seem particularly susceptible. This is, of course, related to the rooting medium and the air/water ratio within it. We have experimented with various combinations, such as mixtures of peat and sand, peat and grit, and peat and expanded polystyrene, but have reached the conclusion that the most satisfactory medium is pure sphagnum peat (fine grade). However, it is important that the peat should be correctly prepared; I prefer it to be fairly light and dry when the cuttings are inserted. To increase aeration at the base of the