Research Report

An Evaluation of
Finer Perlite Grades

PERLITE
PLANT GUIDE

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Perlite Gradation and Peat/Perlite Mixtures

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Tradition has dictated the use of medium or coarse grades of perlite in propagating media and in planter mixes. Peat moss is a common component in both types of mixes. Using several grades of perlite, in varying proportions with peat moss, provides an opportunity to compare the suitability of different perlite grades for horticultural use.

Tests were conducted using three different grades of perlite: fine, medium and coarse. Fine grades of horticultural perlite usually are smaller than 18 mesh (1 mm) in size and fall largely in the USDA's sand classification range of coarse and very coarse; coarse grades of horticultural perlite are usually larger than 18 mesh (1 mm) and often larger than 10 mesh (2 mm) and can fall in the USDA's sand classification range of fine gravel.

Tests of peat/perlite mixtures were carried out in 1974 and repeated in 1977. Of coarse, the peat moss source was different for each series of tests. As a result of differences in peat moss quality, all data are not completely comparable but do indicate general trends.

Lowest Wet Bulk Density With Perlite Coarse Grades

Both perlite and peat moss are known to be light in weight with dry bulk density values in the range 4.1 to 8.6 lb./ft.^{3} (80-140 kg/m^3). The higher the proportion of peat moss, the lower the dry bulk density.

Since the grower or user is normally working with moist material, wet bulk densities are of more practical interest. Lightweight growing media in containers are much less expensive to handle and ship.

The lowest wet bulk density obtained is 23.3 lb./ft.^{3} (373 kg/m^3) for 25% peat and 75% coarse perlite. The highest value is 38.1 lb./ft.^{3} (611 kg/m^3) or am mixture of 75% peat and 25% fine perlite.

The difference between the average dry bulk density and average wet bulk density is 26.1 lb./ft^3. (418 kg/m^3) or slightly more than 3 gals. of water per ft.^{3} (400 l/m^3) of mix.

To fully appreciate the wet density values of these mixtures, it should be noted that wet bulk densities of soils and sands run well over 100 lb./ft.^{3} (1600 kg/m^3).

Different proportions of perlite to peat had the least amount of influence with the finer grades of perlite, whereas higher proportions of coarse perlite consistently lowered the wet bulk density of the mix. It therefore appears that the finer grades of perlite have water holding capacities similar to peat moss, and coarser grades of perlite provide more aeration and have lower water holding capacities.

Absence of Air or Water is Injurious

In any growing medium, the space not occupied by solids constitutes pore space which is utilized partially for holding water and partially to provide air so plant roots can function normally. An absence of either is injurious to the growing plant.

The higher the total porosity, the greater the potential to provide water and air. The smaller the pores, the greater the water retention and the lower the air supply. Conversely, the larger the pores, the less water is retained and the greater the amount of air space in the mixture.

Peat moss is well known for high porosity and perlite has a similar property. The effect of perlite grade is one of increasing porosity as the gradation becomes coarser. Differences in peat/perlite mixes are not large but are consistent in this respect.

Another consistent trend is for total porosity to increase modestly as the proportion of peat moss increases regardless of perlite grade. Differences are not great but indicate slightly higher total porosity for the peat mosses used compared to the perlite sources.

Moisture Retention is Substantial

The quantity of water held in a growing medium is best measured on a volume percentage basis. In testing, the lowest water retention was found in the mixtures of 75% coarse perlite and 25% peat, and the highest water retention occurred in mixes with 25% fine perlite and 75% peat.

The general trend is for moisture retention to decline as perlite fractions become coarser and to increase as peat moss fractions increase. Overall, the differences are not of high magnitude and the quantity of water held in all cases is substantial compared to sand or soil.

Oxygen is Essential

After saturating a growing medium with water and after drainage has ceased, there will be a portion of the total pore space occupied by air. This is the "free porosity" or "air space after drainage". Since oxygen is essential to healthy root activity, it is important that this value be of sufficient magnitude. In field soils, values of 5% or more are usually considered favorable. In container media, values of 15% to 25% are desirable.

In the tests that were conducted, the lowest free porosity was 21% for the mixes with 75% fine perlite and 25% peat moss, and the highest was 46.1% for the mixes with 75% coarse perlite and 25% peat.

The finer grades of perlite do not consistently affect the free porosity when peat moss fractions are high. The coarser grades of perlite produce extra high free porosity when the proportion of perlite is high and this value declines as the proportion of peat moss increases.

Since all values are in the 15% or higher range, it must be concluded that no problems from inadequate aeration would be expected in any of the blends tested. This suggests that the best mix would be that with the highest water holding capacity. The exception would be in propagation where high mist frequency might require a maximum free porosity and minimum moisture retention. Under these circumstances, the best compromise might be to use 100% coarse perlite as the propagating medium.

Summary and Conclusions

Perlite and peat moss have physical properties in the same order of magnitude. Perlite however, can be produced uniformly whereas peat moss is likely to vary. Low density media can be produced with all grades of perlite and peat moss in any desired proportions. Highest moisture retention occurs with the finest perlite grades which is comparable to peat moss in this property. Coarser perlite grades have proportionally lower moisture retention and higher free porosity compared to peat moss. Aeration characteristics are excellent for all grades of perlite/peat moss mixtures and for all component mixes. These data confirm what most growers have known for many years -- peat moss/ perlite combinations provide outstanding physical properties for propagation and growing media.

In 1974 and 1977 when these tests were conducted what may not have been appreciated by many growers was the practicality of using finer and finer grades for many horticultural applications and mix designs - nor could anyone have anticipated the successful use of 100% fine perlite as is being done in several commercial operations in the world.