Research Report

PERLITE VS. POLYSTYRENE

PERLITE PLANT GUIDE

The Perlite Institute Inc.
1924 North Second Street
Harrisburg, PA 17102 USA
tel. 717-238-9723 fax. 717-238-9985
Email: info@perlite.org

PERLITE VS. POLYSTYRENE IN POTTING MIXES

by
O.A. Matkin
Director
Soil and Plant Laboratory, Inc.
Santa Ana, California

Recently, some growers have tried using polystyrene beads or foam as a replacement for perlite. This plastic aggregate does have an appearance similar in color and particle size to perlite. Since the purpose of an amendment is to improve physical properties, we conducted studies to compare the two forms of polystyrene with the standard horticultural grade perlite.

Steaming

Many commercial growers steam their soils prior to use in order to eliminate possible disease, insect, and weed problems. Perlite shows no physical change in this treatment but polystyrene "melted down" to about 10 percent of its original volume when subjected to typical steaming conditions. If used in mixes, steaming should occur before blending in the polystyrene.

Amendment Comparisons

"...POLYSTYRENE 'MELTED DOWN' TO ABOUT 10% OF ITS ORIGINAL VOLUME WHEN SUBJECTED TO TYPICAL STEAMING CONDITIONS..."

In data obtained (table 1), perlite showed a water retention of 23 percent of the total pore space. With

polystyrene beads the water occupied only 5 percent of the pore space and with polystyrene foam only 4 percent.

The requirement for low density varies with grower requirements for shipping and handling. When it is considered that soil dry weight ranges from 60 to 80 lbs. per cubic foot, perlite is very lightweight and polystyrene is extremely lightweight. Indeed, it is easy to float the polystyrene out of containers by water or exposure to strong air currents. Wetting the polystyrene does not help too much because it doesn't hold enough water to increase its density appreciably.

Table 1 -- Pure Amendment Comparisons

	Perlite	Polystyrene Beads	Polystyrene Foam
Total pore space, vol.%	76.7	44.4	49.7
Water retention, fl. oz./gal	22.8	2.7	2.8
Dry bulk density, lbs.ft.^{3}	6.8	0.6	1.4
Wet bulk density, lbs.ft.^{3}	17.9	1.9	2.8

A total porosity (pore space) of 70 to 80 percent is usually desirable for this type amendment. Water retention should not exceed 50 percent of pore space but should be significant.

Typical Planting Mixes

Since these amendments are only used in pure form for propagation, the evaluation of their usefulness should necessarily be viewed from the standpoint of their effect on a growing medium. Peat moss/ amendment combinations are frequently used as growing and propagating media.

In media comprised of peat and amendment (table 2), the pore space is consistently greater in perlite blends as compared to polystyrene blends. Water retention is not grossly different in the various blends until the proportion of amendment becomes predominant as in the 1 peat/2 amendment mixtures. In this case, the perlite blend holds 50 to 60 percent more water.

Dry bulk density of peat/polystyrene mixes are consistently lower than peat/perlite mixes. When wet densities are measured the same trend is noted. However, wet bulk densities are not greatly different until the mixes are comprised of a high proportion of amendment. In the 1 peat/2 amendment mixes the perlite preparation is more than 70 percent heavier than the polystyrene preparations due to the amount of water retained. When one considers a wet sandy loam weighing over 100 lbs. per cubic foot, it is obvious these mixes are all very light in weight.

Other Container Mixes

A variety of soil mix formulations are used for container growing. Several of these were tested to ascertain the performance of perlite and polystyrene amendments.

A peat/sand/amendment formula typical of those used for woody plants was studied. The perlite formulations provided higher total porosity, higher moisture retention, higher free porosity and higher dry and wet bulk densities.

A typical Western U.S. pot plant mix is fir bark/peat/amendment. Perlite produces higher total porosity, water retention and wet bulk density compared to the two forms of polystyrene.

A mix of soil/peat/amendment is commonly used in the Midwest and Eastern U.S. The perlite mix exhibits highest total porosity, water retention, free porosity and both dry and wet bulk densities when compared to polystyrene mixes.

"...PERLITE ENHANCES TOTAL POROSITY AND MOISTURE RETENTION TO A GREATER EXTENT THAN POLYSTYRENE."

Conclusions

Physical blending of polystyrene is a problem due to its extreme low density and nonwetability. In addition, perlite enhances total porosity and moisture retention to a greater extent than polystyrene. Dry bulk densities are lower in polystyrene mixes than in perlite mixes but differences are not great. Wet bulk densities are lower in polystyrene mixes due primarily to low moisture retention of polystyrene. Polystyrene should not be steamed because of loss of volume and structure. Soil mix pore space is the key factor in determining the quality of a soil mix. This space provides moisture holding capacity, oxygen supply for roots and space for root development. Since polystyrene products as tested here detract from rather than enhance these properties, their use in growing media must be considered counter productive.

Table 2 -- Physical Characteristics of Peat Moss Amendment Mixtures

Mix Proportions	2 Peat: 1 Amendment			1 Peat: 1 Amendment			1 Peat: 2 Amendment		
Amendment Used	Perlite	Beads	Foam	Perlite	Beads	Foam	Perlite	Beads	Foam
Total pore space,	73.5	66.9	68.5	66.4	61.3	63.3	70.6	55.5	62.1
vol.%	59	48.5	47.1	47.6	42.9	48.3	51.2	32.8	31.6
Water retention, fl.	7	4.5	4.6	7.6	3.7	4	8	3	3
oz.gal.	35	28	28	31	25	28	33	19	19
Dry bulk density									
Wet bulk density									