HOW FINE IS FINE?

By Christopher L. Kerkman

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USGA specifications for putting green construction call for amendendment of the rootzone sand with finely divided organic material containing 85 percent or more organic matter. The question is, "How fine is a finely divided organic amendment?". The answer to this question has practical implications as to how the peat needs to be processed before blending with the sand.

The purpose of this short-term, greenhouse study was to observe the effects of peat fineness on simulated putting green characteristics and on creeping bentgrass establishment. These provide a basis for deciding how fine the peat should be in rootzone mixes.

EXPERIMENTAL METHODS

Canadian sphagnum peat containing 95.4% organic matter was processed into six particle sizes. The finest particle size, <0.85 mm, was obtained by grinding the peat to pass through a 20-mesh sieve. The five remaining particle sizes were prepared by hand rubbing the peat and sieving to obtain size ranges of <1 mm, 1 to 2 mm, 2 to 3.35 mm, 3.35 to 6.3 mm, and 6.3 to 12.5 mm. These correspond to mesh sizes of <18, 18 to 10, 10 to 6, 6 to 1/4 inch, and 1/4 to 1/2 inch, respectively.

FIGURE 1
Influence of peat particle size on the organic matter content of 80:20 rootzone mixes.

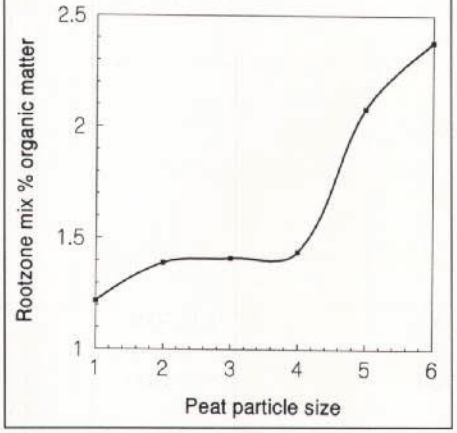
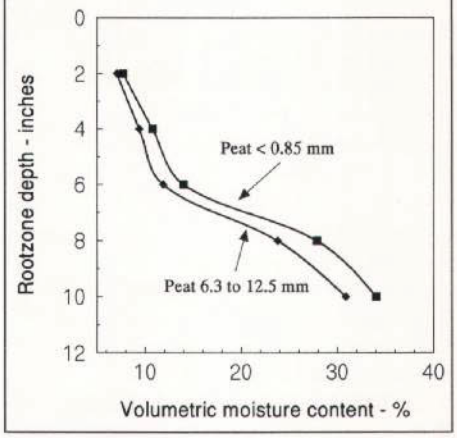


FIGURE 2
Influence of peat particle size on moisture retention in the rootzone of putting greens.



Rootzone mixes were then prepared by blending the various peat sizes with USGA specification sand at an 80:20 (v/v) ratio. The sand and peat were measured by hand-packing them into a container of known volume. The rootzone mixes were packed into 6-inch diameter PVC cylinders 15 inches in height containing 3 inches of pea gravel.

These simulated putting greens received a starter fertilizer application and were seeded with 'Putter' creeping bentgrass at the rate of 2.0 lb/M of pure live seed. Once established, the bentgrass was clipped every 2 to 3 days at a 0.5-inch height. The greens were fertilized with complete fertilizer every two weeks at the rate of 0.2 lb N/M.

OBSERVATIONS

Putting Green Characteristics

Peat particle size had an effect on the organic matter content of the rootzone mixes. As long as the particle size remained less than 3.35mm (peat particle size #4), the rootzone mix organic matter content was fairly constant (Fig.1). As peat particle size was increased to greater than 3.35mm (6 mesh), percent organic matter content of the rootzone mix increased sharply and nearly doubled. The reason for this is the presence in the larger size ranges of peat particles in their original, highly compacted state. This led to more peat per unit volume as compared to the smaller size ranges where the original peat particles were completely disrupted and, for this reason, the peat was "fluffier".

Several weeks into the study a Time Domain Reflectometer was used to measure volumetric water content at different depths in the putting greens. The effect of peat particle size on moisture retention was slight, even when examined for the two extremes in particle size (Fig.2). All other treatments fell between these two extremes.

At the end of the study, water saturated flow rates were measured for all of the putting greens. As shown in fig-

FIGURE 3
Influence of peat particle size on the saturated flow rates of sand putting greens.

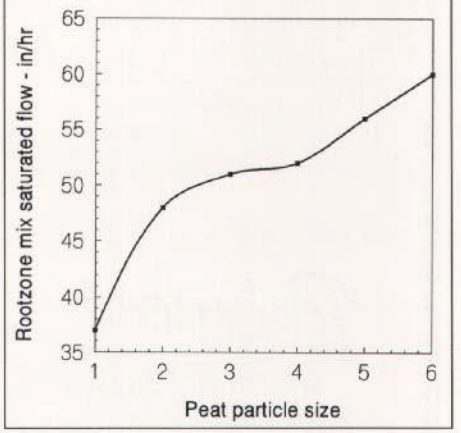


FIGURE 4
Influence of peat particle size on creeping bentgrass emergence rates.

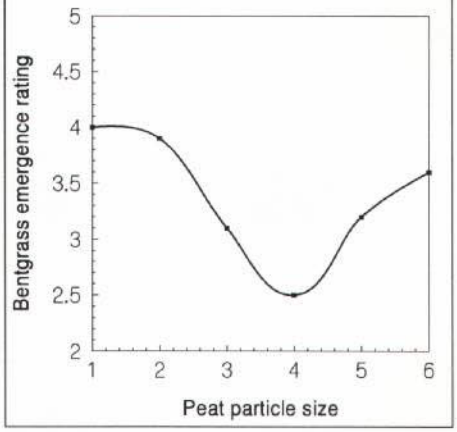


FIGURE 6
Influence of peat particle size on creeping bentgrass stand uniformity.

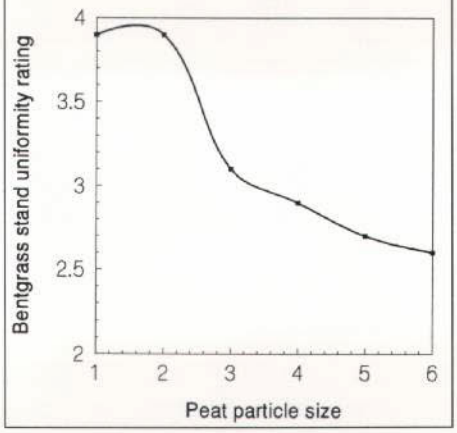
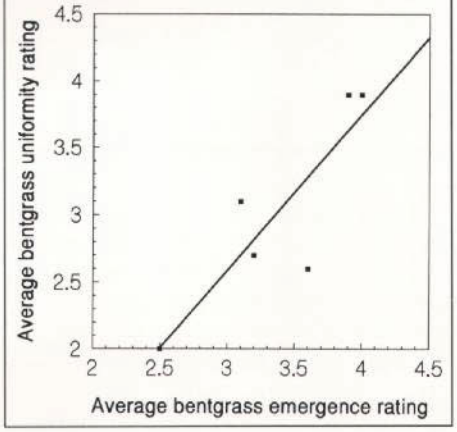


FIGURE 7
Relationship between creeping bentgrass emergence rates and stand uniformity.



ure 3, there were substantial differences associated with the different peat particle sizes. The lowest flow rate of 37 in/hr was achieved with the <0.85mm peat. Saturated flow rates increased nearly linearly with increasing peat particle size.

Bentgrass Characteristics

Bentgrass emergence was rated on a daily basis for the first five days following seedling appearance. Rate of emergence was observed to be highest for the two finest peat particle sizes (Fig. 4). There were no perceptible differences between the <0.85 mm and the <1.0 mm particle sizes. Further increases in peat particle size first led to a decrease in bentgrass emergence rate and then to an increase. The reason for the increased emergence rate at the two largest peat particle sizes is not known.

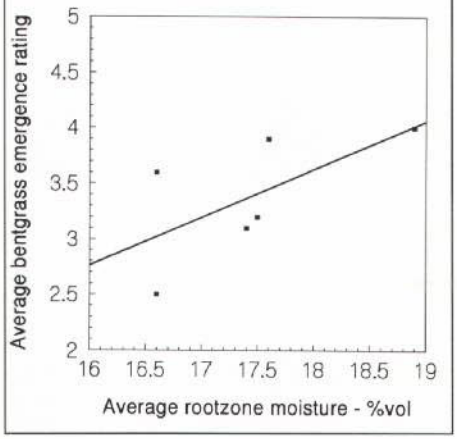
The anticipation was that emergence rate would be a function of the amount of water retained in seed zone. This was found to not be true. Rather, the bentgrass emergence rates seemed to relate better to the average moisture content of the entire rootzone (Fig. 5). However, the relationship was not very strong. There may have been several reasons for this. One is the fact that the moisture measurements taken reflect averages for rootzone depth increments of approximately two inches. They do not reflect uniformity of moisture over short horizontal distances within the proximity of the bentgrass seeds. This uniformity in moisture may have been considerably higher the finer the peat particle size. Additionally, the surfaces of the greens were kept moist through frequent watering during the emergence period and peat particle size had very little effect on average moisture in the top two inches of the greens.

Peat particle size had to be <1.0 mm to obtain maximum bentgrass stand uniformity (Fig. 6). Stand uniformity declined rapidly when the peat particle size was increased to more than 1.0 mm.

Of all the factors studied, the one that best related to bentgrass stand uniformity was emergence rate (Fig. 7). Uniformity declined rapidly when the peat particle size exceeded 1.0 mm.

Bentgrass clipping weights reflected a dependence on peat particle size. Considerably less clippings were produced when the peat particle size was less than 1.0 mm than at larger sizes (Fig. 8). This is thought to be a consequence of differences in bentgrass stand uniformity. At the larger peat particle sizes, the stand was not uniform. In patches of low density, the bentgrass leaves were decidedly wider and had a much faster extension rate than in patches of high stand density. The net result was higher clipping weights and a very uneven appearance to the greens.

FIGURE 5
Relationship between rootzone moisture as influenced by peat particle size and creeping bentgrass emergence rates.



SUMMARY

The results of this greenhouse study indicate that organic amendment particle size has a significant effect on the initial quality of bentgrass putting greens. High quality greens result from rapid and uniform bentgrass emergence. To achieve this, the particle size of the organic amendment need be 1.0 mm or less.

FIGURE 8
Influence of peat particle size on creeping bentgrass clipping weights.