Sand As Framework of the Green

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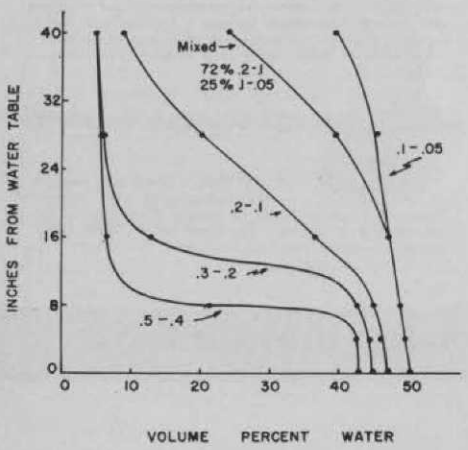
physical properties required in putting green soil appear to be a free porosity of 10 to 15 per cent developing after irrigation, a relatively high infiltration rate so that this amount of free porosity is developed soon and a retention of about 10 per cent or more available water on a volume basis. This last figure is quite arbitrary — lower values of available water may necessitate too frequent watering. A high sand content mix of proper grade of sand can be made to meet these requirements and, as will be pointed out, it is also possible to have a high water holding capacity with sand under shallow soil conditions. Sandy soil mixes do not have high retentive capacities for many plant nutrients. Fortunately, there are available many special purpose fertilizers (Nitrogen, phosphorus, potassium, calcium, magnesium and sulphate (97 gypsite and gypsum) which should make fertility management of sandy greens relatively easy.

Use of calcined (structurally stable) clay aggregates offers an alternative approach to the use of sand in putting greens. Theoretically, calcined clay aggregates could be prepared which would have a high waterholding capacity, adequate free porosity, high infiltration rates and high retentive capacity for plant nutrients.

Selection of proper grade of sand is all important if sand is to be the skeletal material in a green. The best way of properly selecting and preparing a green mix is with the aid of laboratory tests. Supts. would be saved much grief if greens were constructed to specifications. The type of tests necessary are not difficult to perform.

Fig. 1: Volume per cent moisture retained by various grades of sand as determined by height above a water table.



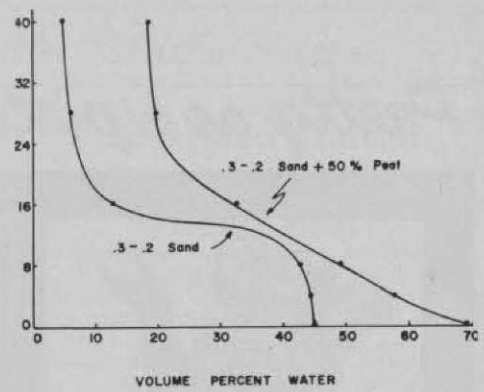


Fig. 2: Moisture cointent of 0.3-0.2 mm dia. sand and sand plus 50 per cent by volume of coarse spagnum peat as determined by height above water table.

If sand is to form the framework of the soil mix and constitute about 85 per cent of the mix, water and air relations of the mix will be strongly influenced by texture of the sand. *Fig.* 1 summarizes water retention of various grades of sand. If columns of sand were placed in a pan and wetted thoroughly at the surface so that water passed all the way through, and the bottom of the column were standing in water, the curves trace out the equilibrium moisture content of the sand at various distances from the water surface. Air space in the soil is the difference between the moisture content at water level and moisture content at any particular distance above water level. Thus, in a sand of .5 to.4 mm diameter range at about 7 to 9 ins. above water level, moisture content suddenly decreases and percentage of air space suddenly increases. Sand in the range .1 to .05 remains practically saturated with water even 40 ins. above the water table.

If soil underlying sand were impervious and excess water had to be removed by tile drainage, moisture content of the sand, after drainage ceased, would be very different than in the case where drainage occurred through the soil.

Some Important Facts

These important facts emerge from the data: Water and air proportions in sands will depend very much on whether the soil drains well or poorly under the sand. If tile drainage is used, and depth of the sand layer is about 20 ins. or less, shallow soil conditions exist and water retention of the sand is greatly increased. If shallow soil conditions prevail, water and air relations which exist following an irrigation (when drainage ceases) depend on the texture of the sand and the distance above the water table which is at tile depth.

It is apparent that proper size of sand to be used in a green mix will be dependent on depth of sand, drainage in the underlying soil as well as other considerations such as frequency o

rainfall or intensity of irrigation.

The practice of purposly making subsoil underlying a green impermeable and depending upon tile drainage for excess water removal has considerable appeal. This technique would greatly increase the water-holding capactiy of the sand. If the sand depth were 15 to 20 ins. it would not be difficult to prepare mixes having 10 or more ins. of favorable air and water relations.

Air Space Factors

Fig. 2 shows that incorporation of coarse organic material such as horticultural grade peat affects soil structure principally in the range of pore sizes which drain in the range of about 0 to 10 ins. from water level. Thus, *Fig.* 2 shows that an 0.3-0.2 mm sand would have about five per cent air space 10 ins. from a water table. If 50 per cent peat by volume had been incorporated, the air space at 10 ins. from the water table would be about 24 per cent.

Incorporation of moderate amounts of clay in sand-soil mixes will increase capacity of the mix to retain most fertilizer elements. It will increase water-holding capacity of the soil somewhat, especially if deep soil conditions exist (i. e., drainage is satisfactory underneath the sand).

Stabilize Clay Aggregates

This can be done by blending well aggregated, structurally stable clay soil in the proper amount. Use of krilium to stabilize clay aggregates is recommended. Kunze et al. consider clay contents in excess of about four per cent undesirable. In lab. tests Lunt reported infiltration rates could be maintained in excess of 1 in. per hour after compaction treatments, even if as much as 7.5 per cent krilium treated clay were present. Probably one of the principal reasons for the unsatisfactory performance of some high sand content greens has been inclusion of too much silt or clay, particularly when these fine fractions are not aggregated.

Kunze Green Mix

Kunze et al. (2) reported success with green mixtures of 8-1-1 or 8 1/2-1/2-1 sand-soil-peat mixtures. Soil used was Houston black clay. Clay contents by weight exceeding about four per cent appeared to be undesirable. This is in reasonably close agreement with other proposals. Kunze et al. also reported best growth of grass when the sand-soil-mix was composed of particles in the range of 1 to .05 mm. It is my opinion that under most conditions slightly finer grades of sand would be more desirable. The data in *Fig.* 1 show that if the subsoil is impermeable, a sand layer 16 to 20 ins. deep will provide 6 to 10 ins. of soil well aerified if sand is in the range of 0.4-0.2. If the sand layer is shallower (subsoil drainage poor, tile drained), sand should be coarser. If subsoil drainage is good, then an increase in the sand fraction from 0.2 – 0.1 mm. would be desirable. The precaution previously urged that sand mix contain not more than about 6 to 10 per cent sand, silt, or unaggregated clay in the range smaller than 0.1 mm, still applies.

Growing Turfgrass the Hard Way

By TOM MASCARO
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If I were asked what the major turf problems were, I would say that they are problems over which the supt. has little or no control. They are problems created by employees, committees and nature.

Problems created by employees would perhaps take the No. 1 place. There are many cases of improper mowing practices, improper use of equipment and improper use of fertilizers and chemicals. Most all of these are caused by misinformation or lack of competent help.

Take, for instance a golf green: Incorrect mowing can upset the most perfect greens program. Green design is changed by workmen who, rather than follow original contours, will chop straight lines in order to get done faster. Turning of the mowers is done on the green rather than on the collars, creating problems. Poorly adjusted and dull mowers on both greens and fairways create many problems.

Then we have the misuse of fertilizer. Spreaders may be incorrectly calibrated or get out of adjustment. Too much or too little fertilizer may be applied. The misuse of chemicals is quite evident, especially the weed control chemicals. Workmen who are not familiar with the potency of some of these products are left to apply them without regard to their effect on the good grasses.

The supt also is faced with watering problems. Workmen who receive careful instructions suddenly decide they know better than anyone else and apply water their own way. Areas that badly need irrigation sometimes are skipped because the man happens to be just too tired to do it.

The supt. who grows grass the hard way also is faced with players and committees. Each, in turn, has his own theory as to what is best for grass and is constantly badgering the supt. with ideas. Trees are to be planted and trees are to be removed; traps should be dug and traps should be filled; benches should be constructed and benches are an eyesore. If a club has 350 members then the supt. should mow turf at 350 different heights.

Then to top it off, the supt. is faced by acts of nature: things such as floods, lightning, wind storms, skunks and gophers, to name a few. Sometimes it's a wonder to me that about 75 per cent of the supts. don't go over the hill. They'd be justified in doing so.

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Great Lakes Bantam Tourney

The second Great Lakes Invitation Bantam tournament will be held Aug. 27-28 at the Barberton (O.) Brookside CC. Competition for both boys and girls will be held in the 10-12 and 13-15 year age brackets.