Modified sand topdressing at Stony Brook

Recently there appeared, in a local publication by a turf products supplier, the following admonition:

"THE OLD PRO SAYS:
In the long run, topdressing with a commercially prepared mixture can be cheaper than topdressing with sand. That's because sand can bring on long-term effects that are costly both from an agronomic and financial point of view. John Hall, Extension Turf Specialist at Virginia Polytechnic Institute, lists these potential problems with sand topdressing: (1) excessive water infiltration; (2) excessive nutrient leaching; (3) lower microbial activity; (4) hydrophobic drying; (5) lack of moisture reservoir; and (6) susceptibility to drying."

Having topdressed with sand, plus various adjuvants in minor amounts, for four years with apparently excellent results, I thought it best to stop and consider whether we were approaching the dire consequences predicted above. Our green's top soil consisted of 70 percent coarse sand, 30 percent clay soil, and 10 percent peat. It tested about 1.2 inches per hour according to the N.G.A.A. green's section procedure but not as high as that proposed by Marvin Ferguson, an enthusiastic investigator then in charge of testing. For five years we topdressed with this mixture until we listened to a discourse on sand topdressing at a University of Massachusetts Turf Conference. We were assured by several west coast operators that sand had been successfully used for upwards of ten years and therefore appeared to be good choice.

Implementing this idea, however, was difficult because the damp sand would not pass through the spreaders. It was impractical for us to dry it to make it flow reliably. We did find an easy means of drying the sand by mixing one part calcined clay, (fine Terragreen), to 5-6 parts by volume of moist sand. While we were mixing, it was found practical to incorporate other materials such as hardwood ashes, ground limestone, gypsum, iron sulphate, etc.

We did not rely solely on sandtopdressing to control thatch, however, but made a practice of dethatching one or two times during season. We used both the Scotts Proturf Aerator and the Ryan Ren-o-Thin IV, and blew off a few bushels of thatch, mowed to 5/16" and topdressed followed by a drag mat.

We have justified this practice by the following reasons, (taking our cue from the "Old Pro")

(1) "As for" excessive water infiltration," we use so little topdressing that no noticeable effect could be observed, nor would we expect any. We think sand is ideal because its primary function is to reduce thatch by inducing decomposition. When clippings and stems decompose, having an initial dry composition of perhaps 70% cellulose and 30% lignin, there is left the lignin which has a very long life. If left undiluted or not removed by drastic dethatching, the surface will become excessively spongy (less able to support traffic) and less able to transmit water. If you make a percolation test on a sample high in lignin (humus), you will find a greatly reduced rate of percolation though its total capacity for absorbed water is increased; their effects run in opposite directions.

(2) "Excessive nutrient leaching": We would agree that if large amounts of sand are used, the surface will become excessively permeable and nutrients will be lost. But if the amount of sand is held to that which is necessary to complement the build up in humus, no harm is done. That is why we do not use, nor prefer to use, the ordinary top dressing equipment. Rather, we use the kind that is more commonly used for fertilizers and granules. These are capable of spreading very evenly and in carefully controlled amounts. Calibration and actual use of our drop-type spreader showed a range of application of between one and two cu. ft. per 1,000 sq. ft. which amounts to a surface thickness of only between one and two hundredths of an inch. If this is repeated three times during the season, you can understand how little build-up there is. Of course, if there were bad holes or defects that needed to be filled, we would use the same mixture as originally used for the green's top soil.

Another factor that minimizes undesirable effects is the use of calcined clay which possesses a very high capability for absorbing water and nutrients and which has even been advocated by the manufacturer as the sole top dressing agent.

Sand for topdressing at Stony Brook is selected on the basis of a size that will infiltrate the grass leaves and not be picked up by mower blades.

(3) "Lower microbial activity": This would naturally follow with the use of an excessive amount of sand.

(4) "Hydrophobic drying": Again, this would follow the excessive use of sand.

(5) "Lack of moisture reservoir": As above.

(6) "Susceptibility to drying": As above.

Although the use of straight sand can be justified under some conditions, as the principal means of achieving satisfactory decomposition of thatch and still promoting good percolation, we now prefer to modify it with judicious amounts of:

(1) An absorbent agent, such as fine grade calcined clay, to increase its capacity to absorb water, plant food, and particularly the metal cations that possess a high attraction for clay; (cation exchange capacity.)

(2) Whatever ground limestone is needed to maintain an acceptable pH and furnish a source of calcium and magnesium.

(3) Gypsum — a source of both calcium and sulphate which not only promote decomposition of thatch but has an agglomerating effect on fine particles (will say more on this topic).

(4) Plant food, iron, etc. as may be necessary.

(5) Might consider this a means of applying fungicides and insecticides; a separate study.

It is a mistake to think that a relatively small amount of topdressing

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Golf Course by Ernest L. Kallander

The author believes that his use of sand as topdressing is successful. He prefers to apply the sand with a fertilizer spreader to insure even distribution.

would produce a separate and continuous layer. When the particles of sand, etc. infiltrate the fibrous body of thatch, a continuous layer is impossible. It is broken up by a mass of fibers. It becomes a heterogeneous mixture of sand, fibers, sand, fibers, calcium carbonate, fibers, calcium sulphate, fibers, etc. Furthermore, the effect of the gypsum, calcium sulphate, having an appreciable solubility in water, is to agglomerate fine particles into rather large agglomerates which remain distinct (promoting good percolation) until dispersed by a combination of excess water, and mechanical action (stirring or compression). I have isolated large proportions of these agglomerates, some of which are as large as one-eighth of an inch. It has been reported that humus and certain salts have a similar effect.

I have relied on selecting a sand on two chief bases. Sand:

(1) should not contain too many large particles for they will not infiltrate the grass leaves, and will be picked up and ground by the mower blades.

(2) should have a very high permeability, upwards of 500 inches per hour when done by the method prescribed by the Green's Section of U.S.G.A.

If there is access to screens, and sufficient knowledge to interpret the results, a good estimate of a satisfactory percolation can be predicted. But the percolation test can be made without expensive screens. A good approximation can be made with only a tin can perforated at the bottom and an inverted bottle. Moreover, with a percolation test of 500 or so we are not after the precision provided by laboratory equipment designed to measure accurately only a few inches of water per hour. Moreover, there is an excellent chance that whatever fines there are will be agglomerated.

While I have specified "upwards of 500 inches" we have used sands as low as 63, a practice that can be justified by the following considerations:

Let us assume that we have a fairly well drained green's soil having a permeability of (a) 1.0, according to the procedure given by Musser p. 328 Turf Management; and (b) 2.0 according to a procedure written by Ferguson et al. In engineering terms, these values are relative to Fluidity which is the inverse of Viscosity. If our sand has a value of 60, at a 3" depth, and our actual depth is 0.1", (a rather heavy application) then the value for the sand is 60 X 3 over 0.1 equals 1800. Since the resultant Viscosity is the sum of the soil and the sand the results are:

$$\text{(a)}\quad Rv = \frac{1}{1.0} + \frac{1}{1800} = 1.0005$$

Which show how little the sand has affected the Fluidity (Permeability)

$$\text{(b)}\quad Rv = \frac{1}{2.0} + \frac{1}{1800} = 0.5005$$

and again, the Permeability has been effected to a negligible degree.

It is because of the above factors that many operators have used ordinary soil for top dressing and have not been able to discern any effect on the green's receptivity to water even though the soil has perhaps 100 times the resistance to permeation of sand. The key here is the relatively thin layer.

In order to measure the effectiveness of various drying agents on the ability of the top dressing to pass through the openings of our spreader, the angle of slip was measured; various amounts of drying agent were mixed with the sand and the angle of slip measured. This is the angle with horizontal that is made by a smooth cone. Without detailing all the data, it was found that a satisfactory angle, about 25 degrees, was achieved with 23 percent (by volume) of calcined clay, 20 percent fine vermiculite, and 23 percent dry peat. No amount of perlite sufficed. Apparently the particles of sand adheres too strongly to the perlite. The use of peat did not appear practical since the angle of slip was very variable depending on the degree of mechanical agitation given the mixture, and the addition of peat would further slow percolation; why add something like that when we were trying to dilute?

I have never found a sand commonly sold for brick masons that did not satisfy; probably because it is always washed. □

Bibliography

(1) *Permeability of various grades of sand and peat and mixtures of these with soil and vermiculite,* by William L. Garmon, Asst. Prof. of Soils, Cornell University, USGA Journ & Turf Mgt. April 1952.

In part: "Peat, when compacted . . . becomes almost impervious. A vermiculite-soil-sand mixture, 1-1-1 ratio, showed higher permeability and more resistance to compaction than a peat-soil-sand mixture, 1-1-1 ratio.

(2) *Soil Modification — Practices with Putting Green Soils* by Marvin N. Ferguson, USGA Green Section.

In part: With respect to a mix with very fine sand and silt) "it will be necessary to reduce the peat a great deal to insure adequate infiltration and percolation."

(3) **Soils** by Marvin N. Ferguson, Nat. Res. Cood., USGA Green Section.

(4) *Minimizing Compaction in Putting Greens* by O. R. Lunt, Dept. of Irr. and Soils, University of Cal., USGA Journ & Turf Mgt. Sept. 1956.

In part: "Lack of oxygen (due to compaction) is major factor in limiting growth to shallow depths" — resulting in necessity for frequent aeration and irrigation.

(5) *Principles for Any Green* by Wayne Morgan, Kellogg Supply Co., Wilmington, Cal. Turf Bull. Spring 1970.

In part: Roots do not grow when it is too dry nor too wet. They grow only when there is a favorable soil nutrient, air-moisture relationship. Such a relationship is possible when there is excessive compaction (as evidenced by the necessity for frequent aeration)."

(6) *Sand Topdressing of Greens* by Ray Knapp, Tuckaway CC, Milwaukee, Wisc.

This report indicated use of about 30 cu. ft. per 1000 sq. ft. per year, which is about 15 times as much as we use. Yet Knapp reports:

a. eliminates thatch
b. no aerating or dethatching
c. graininess eliminated
d. putting faster, less foot printing
e. no abrasive action on leaf or mower
f. less fungicide needed
g. need to replace phosphorous because of its lose (I can't understand why)

(7) *The Effects of Compaction on Golf Mixtures* by Kunze, J. B., Ferguson, M. H., and Page, J. D., USGA Jr., Vol. X No. 6 Nov. 1957.

(8) *Thatch — A Luxury We Can Do Without* by Richard L. Duble, Turf Grass Times, Sept.-Oct. 1976.