Turfgrass research review

By Dr. James B. Beard

Investigations into the nature of thatch and methods of its decomposition.
F.B. Ledeboer and C.R. Skogley. 1967. Agronomy Journal. 59(4):320-323 (from the Department of Agronomy and Mechanized Agriculture, University of Rhode Island, Kingston, Rhode Island 92881).

The physical composition of thatch from a twenty year old velvet bentgrass turf which had not been topdressed was examined. The thatch was two inches thick. Leaf remnants were found only in the surface layers which indicates that the soft tissue was rapidly decomposed. The lower three-fourths of the thatch layer was composed of vascular strands and the nodes of bentgrass stolons, especially if the nodes had rooted and formed new crown tissue. When a similar thatched turf which had received topdressing was examined, the degree of decomposition of thatch in the lower layers was more advanced. Live bentgrass roots were concentrated in the upper portion of the thatch with only a few extending through the two inches of thatch and into the soil.

Field experiments were conducted to evaluate methods of biologically stimulating thatch decay. The experiments were conducted on a 15 year-old velvet bentgrass putting green turf.

Three treatments: (a) a June application of calcium in the form of dolomitic limestone, (b) three fertilization programs and (c) weekly applications of a sucrose solution, were made in all possible combinations. After four months, the calcium, sucrose, and fertilization treatments in all combinations showed no effect on rate of thatch breakdown. Sucrose decreased visual turfgrass quality ratings, fertilization increased quality, and calcium treatments had no visible effect on quality. Fertilization decreased the incidence of dollar spot disease, whereas sucrose caused an increase in the disease.

Comments—Thatch is defined as accumulation of undecomposed organic matter which builds up between the soil surface and the turf or green vegetation. Thatch is undesirable because it (a) enhances disease activity, (b) restricts rooting, (c) decreases tolerance to adversities such as drought, heat, cold, or disease, (d) causes scalping on greens and (e) restricts water movement when dry, causing localized dry spots. Turfmen who switch from weak, low management bentgrasses to the newer more vigorous varieties should be on the look-out for potential thatch problems. The more vigorous bentgrass varieties such as Toronto and Penncross will thatch if management practices are not adjusted to minimize this potential problem.

Thatch is a problem which develops over an extended period of time and is best controlled by a long-term, preventative program. As yet, there is no easy short-term solution available for achieving control of an existing thatch problem. Mechanical control by vertical renovation and removal can be used but is costly, time consuming, and, most important of all, disrupts play, especially if extensive thatch accumulation has occured.

Long-term management factors which enhance microorganism activity and the resulting thatch decay include: (1) Adequate oxygen levels for decomposition of the organic matter. This is achieved by a well structured or coarse textured, well drained soil as well as by mechanical aeration as it is needed. (2) A near neutral or slightly acid pH level in the thatch and adjacent soil. A pH level near 7.0 is the most favorable for decay of organic matter by microorganisms. (3) Topdressing which enhances decomposition by providing a more favorable microenvironment. The topdressing can also serve as a supplemental source of microorganisms and should be similar to the existing soil. Any significant variations in particle size will create layers which can impair the proper water and air movement needed for good rooting. (4) Avoiding overstimulation of vegetative growth.

Physiological and color aspects of turfgrasses with fall and winter nitrogen.
A.J. Powell, R.E. Blaser and R.E. Schmidt. 1967. Agronomy Journal. 59:303-307. (From the Department of Agronomy, Virginia Polytechnic Institute, Blacksburg, Virginia, 24061).

The effects of fall and winter nitrogen fertilization on turfgrass color, shoot growth, carbohydrate level and net photosynthesis were investigated. Various nitrogen rates and times of application were made during the winter of 1965-66 to an established Cohancey creeping bentgrass putting green, a Kentucky 31 tall fescue sod and a newly established Penncross creeping bentgrass putting green. The latter was located at Martinsville, Virginia, and the other two at Blacksburg, Virginia.

The monthly nitrogen treatments

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involved one pound of actual nitrogen per 1,000 square feet as ammonium nitrate applied in (a) October only, (b) Oct. and Dec., (c) Oct., Dec., and Feb., (d) Oct., Nov., Dec., Jan. and Feb. and two pounds of actual nitrogen applied in (e) January only and (f) in Oct., Nov., Dec., Jan., Feb.

The results showed that turfgrass color increased as the nitrogen fertility level was increased. However, no measurable growth occurred from December to March. Quantitative carbohydrate measurements indicated that the level increased slowly until January and then decreased until late spring. Carbohydrate accumulation was generally higher with low than with high nitrogen fertilization rates. Determinations of the net photosynthetic rate showed that photosynthesis is operative under certain winter conditions including (a) an unfrozen soil the night before and (b) a relatively high daytime temperature. Nitrogen fertilization increased the photosynthetic and respiration rates.

Based on these results, the authors concluded that liberal late fall and winter nitrogen fertilization does not seriously reduce the soluble carbohydrate level of creeping bentgrass and tall fescue. This was attributed to low temperatures impairing top growth much more than photosynthesis. Thus, desirable turfgrass color was achieved in winter in Virginia without adverse physiological changes.

Comments—These results indicate that late fall and winter nitrogen fertilization can be effective in maintaining a desirable green turfgrass color during the winter period in Virginia. However, how widely this practice can be utilized in other winter climates is yet to be determined. Research in Michigan and Ohio indicates that heavy, late fall nitrogen fertilization causes a decrease in the low temperature hardiness of turfgrasses, especially annual bluegrass, tall fescue, red fescue and the ryegrasses. These regions are more prone to direct low temperature kill because of the occurrence of (a) greater crown tissue hydration and (b) lower surface soil temperatures. □