A PRACTICAL RESEARCH DIGEST FOR TURF MANAGERS

TURFGRASS TRENDS

Section II • Volume 11, Issue 11 • **November 2002**

www.turfgrasstrends.com

THATCH CONTROL

Researchers Seek Nonmechanical Thatch Control Plan

By Matt F. Gregg and Bert McCarty

Today's post Penncross-era bentgrasses on golf course greens show exceptional disease tolerance, superior visual qualities and superior putting characteristics.

Creeping bentgrass is the most widely used cool-season turfgrass on greens (Huang et al., 1998). Deemed as "ultra-dwarf" varieties, researchers classify these newer bentgrasses as providing uniform upright turf, narrower shoot widths and increased root biomass.

Unfortunately, due to more intensive lateral growth, most of these newer bentgrasses become thatch/mat prone compared to Penncross. Superintendents discovered that to maximize the qualities of these newer bentgrasses, a more demanding maintenance program must be incorporated into their daily cultural practices.

Defining thatch

Thatch is a tightly intermingled layer of living and dead stems, leaves and roots of grass that develops between the shoots and soil surface (Beard, 1973). Thatch is formed primarily from periodically sloughed roots, horizontal stems (stolons and rhizomes), stubble, and mature leaf sheaths and blades (Engel, 1954; Roberts and Bredakis, 1960).

Understanding that thatch is only one constituent of the organic-matter layer below the turf canopy, scientists have added another organic layer to this definition. This second layer, called mat, consists of highly decomposed organic matter intermixed with mineral soil from the profile or from topdressing. Both thatch and mat contribute to golf greens' accumulation of organic matter.

Thatch is a tightly intermingled layer of living and dead stems, leaves and roots that develops between the shoots and soil surface.

The accumulation of semi and partially decayed organic matter is known to contribute to scalping, disease and insect infestations, localized dry spots and fairy-ring occurrence.

Thatch/mat occurrence is often a result from the imbalance between accumulation and decomposition of surface organic debris (Beard, 1973). Accumulation of thatch/mat is associated when the turfgrass production rate of viable foliage exceeds its decomposition rate. When environmental and agronomic parameters favor excessive accumulation of thatch/mat, undesirable characteristics such as reductions in water infiltration, low water retention, reduced tolerance to cold temperatures and pesticide effectiveness can occur from this excessive organic layer.

A limited layer of thatch is typically desirable. A limited mat (≤ .5 inches) is desired for proper ball bounce, limiting soil temperature extremes and contributing to the durability of the golf green against foot traffic (Beard, 1973). Maintain-

AN ADVANSTAR PUBLICATION

IN THIS ISSUE

OUR SPONSORS

TABLE 1

Core cultivation equipment describing penetration depth and surface disruption

Aerifier Type	Penetration Depth (cm)	Tine/Blade Spacing (cm)	Surface Disruption
Hollow Tine	5.08-30.48	2.54-20.32	Moderate-Heavy
Slicing	5.08-20.32	10.16-30.48	None
Spiking	0.635-5.08	2.54-5.08	None
Solid Tine	5.08-40.64	2.54-20.32	Slight
Water Injection	10.16-50.18	7.62-15.24	None

SOURCE: MCCARTY & MILLER, 2002

ing this level of thatch and mat has shown a proper balance of durability and longevity to the turf surface.

Due to excessive thatch/mat accumulation associated with most newer varieties of bentgrass, superintendents are now seeking new management strategies to control this.

Understandably, superintendents have shelved many traditional cultural practices while experimenting and incorporating newer thatch/mat prevention and control techniques.

Ounce of prevention

Due to this aggressive thatch/mat layering, superintendents are looking for preventative means to maintain bentgrass greens.

For example, frequent grooming and vertical mowing are being incorporated throughout the growing season. Core aerification is still required on a routine basis and can not be eliminated or skipped. Light topdressing is typically applied on weekly or bi-weekly basis. Success is being achieved with frequent light topdressings using bagged, dry material applied through a rotary spreader. Just a few years ago, the normal practice was to use heavy, infrequent topdressing applications applied with larger machines.

Overall, a preventative thatch/mat approach will lessen a green's downtime when compared to a curative approach, which is often more destructive.

Minimal destruction

The turfgrass industry is currently exploring new biological and mechanical approaches for nondestructive thatch/mat control. Alternatives in decreasing thatch/mat production and its removal are of interest. Superintendents would like to find a remedy that would allow minimal surface disruption, but still be an effective and efficient tool in preventing accumulation.

Due to excessive thatch/mat accumulation on most newer bentgrasses, superintendents need new management strategies for control.

As mentioned, topdressing is the practice of applying a thin layer of sand to the turf surface. The newly applied sand is then incorporated into the dense turf canopy by a light brushing or irrigation. Recognized as the most effective practice in controlling thatch, topdressing works by improving the microenvironment for microbial thatch decomposition (Ledeborer and Skogley, 1967).

Light, frequent grooming is also a recent advancement in vertical mowing (McCarty, 2001). A grooming unit is commonly attached to the front of a walk mower or riding triplex unit, and the blades mimic shallow vertical mowing. The overall objective is to insert the miniature blades into the turf canopy to slightly raise the leaf blade, where it can be removed by mowing. This innovative approach allows periodic thinning of the

TABLE 2

Aerification tine size diameter and hole spacing effects on the turf surface area displacement

Tine Diameter (in.)	Tine Hole Spacing (in.)	No. of Holes per sq. ft.	Surface Area Impacted per Tine (sq. in.)	Surface Area Displacement (%)	No. of Aerifications Needed to Impact 20% of Surface Area
1/4(.025)	1 x 1	144	0.049	4.9	4
	1.25 x 1. 25	92		3.1	6.5
	1 x 2	72		2.5	8
	2 x 2	36		1.2	16.7
	2.5 x 2.5	23		0.8	25
3/8 (0.375)	1 x 1	144	0.110	11	1.8
	1.25 x 1.25	92		7.1	2.8
	1 x 2	72		5.5	3.6
	2 x 2	36		2.76	7
1/2(0.50)	1 x 1	144	0.196	19.6	1
	1.25 x 1.25	72		9.8	2
	1 x 2	36		4.9	4
	2 x 2	23		3.1	6.5
5/8 (0.625)	1 x 1	144	0.307	30.7	0.7
	1.25 x 1.25	72		15.3	1.3
	1 x 2	36		7.7	2.6
	1 x 2	23		4.9	4
	5 x 5	5.8		1.2	0.8
3/4(0.75)	2.5 x 2.5	23	0.44	7.1	2.8
	5 x 5	5.8		1.8	11
1 (1)	5 x 5	5.8	0.79	3.16	6.5

SOURCE: MCCARTY & MILLER, 2002

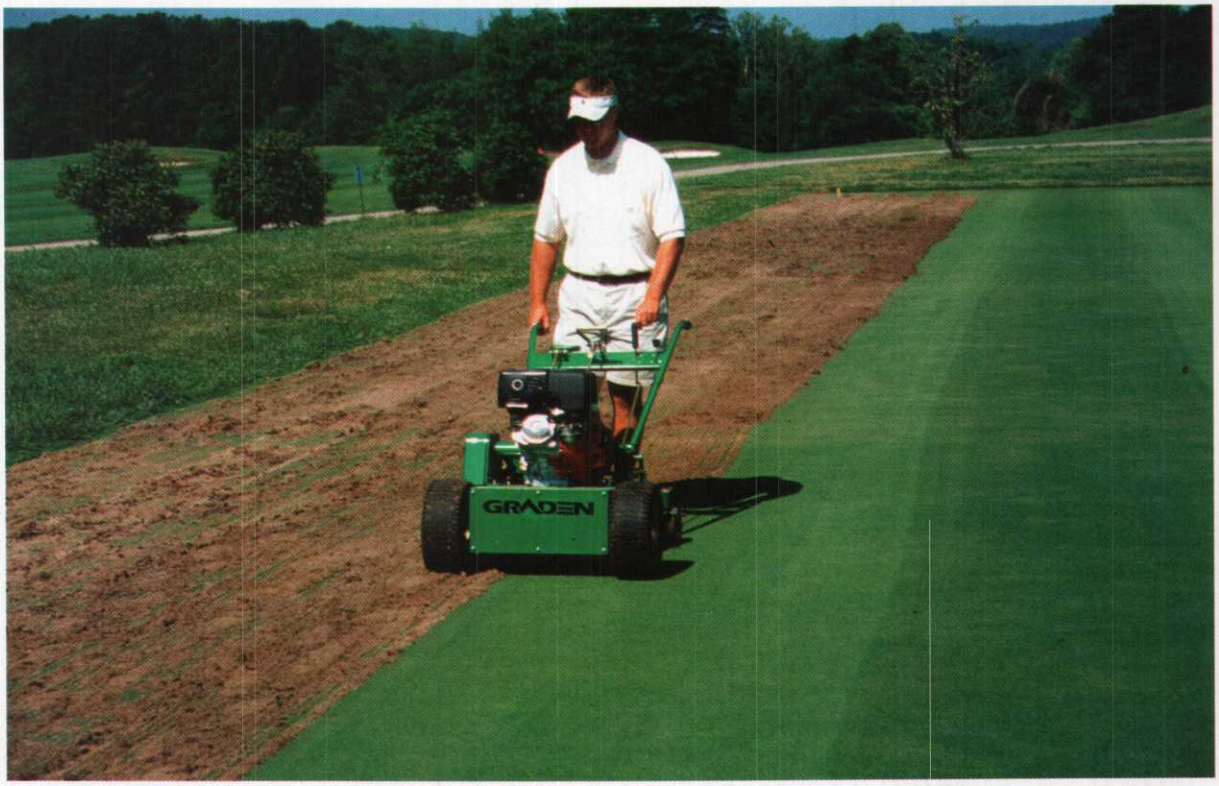
Grooming is neither as radical nor aggressive as vertical mowing and thus may be incorporated on a more frequent basis.

dense turf canopy and assists with topdressing, as well as water and nutrient penetration into the soil below.

Grooming is neither as radical nor aggressive as vertical mowing and thus may be incorporated on a more frequent basis. From the player's standpoint, grooming does not affect the trueness of ball roll as severely as vertical mowing.

A modified approach to grooming is the advent of brushing. Using a putting-green brush weekly or several times weekly is known to reduce grain from steady lateral growth. Power rotary brushing units (or more commonly fixed, straight stiff brushes) are placed in front of the mower blade. Brushing raises the leaf tissue. which is removed by mowing.

Common mechanical practices for removing thatch/mat include core cultivation or aerification, vertical mowing or ver-



Soil cultivation is currently the best way to remove thatch.

ticutting. Although effective, these practices are more disruptive to the playing surface.

Soil cultivation, aerification or coring is the removal of small cores or plugs of soil with grass from the turf surface, leaving a hole in the sod (McCarty, 2001). Coring or aerification equipment can be divided into the following categories: core cultivation, aerification, solid or hollow tine cultivation, water injection and deep-surface cultivation (Table 1).

Soil cultivation by core cultivation has many beneficial effects on turf. Effects may lead to thatch/mat control, less surface compaction, improved uniformity for water infiltration and increased surface aeration and rooting (Carrow et al., 1987; Dunn et al., 1995; Ledeborer and Skogley, 1967; Shildrick, 1985; White and Dickens, 1984).

Situations of improved biological conditions are also promoted through core aerification, where core cultivation provides available oxygen for soil organisms. Those organisms, in turn, help break down thatch naturally (McCarty, 2001).

Aerification assists in soil replacement when combined with topdressing, thus providing healthy soil micro-organism activity below the turf surface.

The dark thatch layer inhibits water flow.

The primary objective of core cultivation is to relieve soil compaction, improve atmospheric release of toxic gases, improve surface drainage and mechanically remove the accumulation of organic matter within the top inches of golf green (Table 2).

An existing mechanical practice that has taken a new twist is vertical mowing or verticutting. Aside from the removal of unwanted thatch/mat, this mechanical method stimulates new tissue growth because it severs rhizomes and stolons.

Manufacturers have developed such "surgical-grade" vertical mowers because the

TABLE 3

Turf surface impact by vertical mowing blade widths

Vertical Mower Blade Width (in.)	Spacing (in.)	Surface Area Impacted (%)	No. of Vertical Mowings Needed to Impact 25% of Surface Area
5/64-inch	0.5	15.6	1.6
	1	7.8	3.2
9/64-inch	0.5	28	0.9
	1	14.1	1.8

SOURCE: MCCARTY & MILLER, 2002

Mechanical practices equate to downtime.

slices/grooves produced are clean and precise and can vary in depth and width (Table 3).

Solution for the future

Superintendents would like to adopt non-destructive practices where playability and putting-speed uniformity would not decrease. Such practices may include 'light' topdressing, grooming and brushing. The outcome of these agronomic practices would increase the growing environment and enhance playability for these newer varieties of bentgrass.

When research eventually reports positive results for biological thatch/mat control products, manufacturers may serve an important role in this industry with the development of such an effective product. A positive outcome of such a product would allow playability not to be affected and serve as a key asset in controlling the persistent thatch/mat problem. However, current research provides no such alternative.

Overall, superintendents must continue to practice the traditional destructive agronomic practices to deliver the consistency and quality demanded by today's newer bentgrass cultivars.

Gregg is a graduate assistant and Bert McCarty is a professor of turfgrass at Clemson University, Clemson, S.C.

REFERENCES

Beard, J.B. 1973. *Turfgrass: Science and Culture.* Prentice-Hall, Englewood Cliffs, N.J.

Carrow, R.N., B.J. Johnson, and R.E. Burns. 1987. "Thatch and quality on Tifway bermudagrass turf in relation to fertility and cultivation." *Agronomy Journal.* 79:524-530.

Dunn, J.H., D.D. Minner, B.F. Fresenburg, S.S. Bughrara, and C.H. Honstrater. 1995. "Influence of core aerification, topdressing, and nitrogen on mat, roots and quality of 'Meyer' Zoysiagrass." *Agronomy Journal.* 87:891-894.

Engel, R.E. 1954. "Thatch on turf and its control." *Golf Course Rep.* 22:12.

Huang, B., X. Liu, and J.D. Fry. 1998. "Shoot physiological response of two bentgrass cultivars to high temperature and poor soil aeration." *Crop Science.* 38:1219-1224.

Ledeborer, F.B. and C.R. Skogley. 1967. "Investigations into the nature of thatch and methods for its decomposition." *Agronomy Journal.* 59:320-323.

McCarty, L.B. 2001. *Best Golf Course Management Practices.* Prentice–Hall, Upper Saddle River, N.J.

McCarty, L.B. and G. Miller. 2002. *Managing Bermudagrass Turf.* Sleeping Bear Press. Ann Arbor Press. Chelsea, Mich.

Roberts, E.C. and E.J. Bredakis. 1960. "What, why and how of turfgrass root development." *Golf Course Reporter.* 28:13-24.

Shildrick, J.P. 1985. "Thatch: A review with special reference to U.K. golf courses." *Journal Sports Turf Research Institute.* 61:8-25.

White, R.H. and R. Dickens. 1984. "Thatch accumulation in bermudagrass as influenced by cultural practices." *Agronomy Journal.* 76:19-22.