//COMBATTING ANTHRACNOSE

Topdressing versus anthracnose

A look at the best topdressing practices for preventing anthracnose in annual bluegrass.

By James A. Murphy, Ph.D., James Hempfling, Ruying Wang, and Bruce B. Clarke, Ph.D.

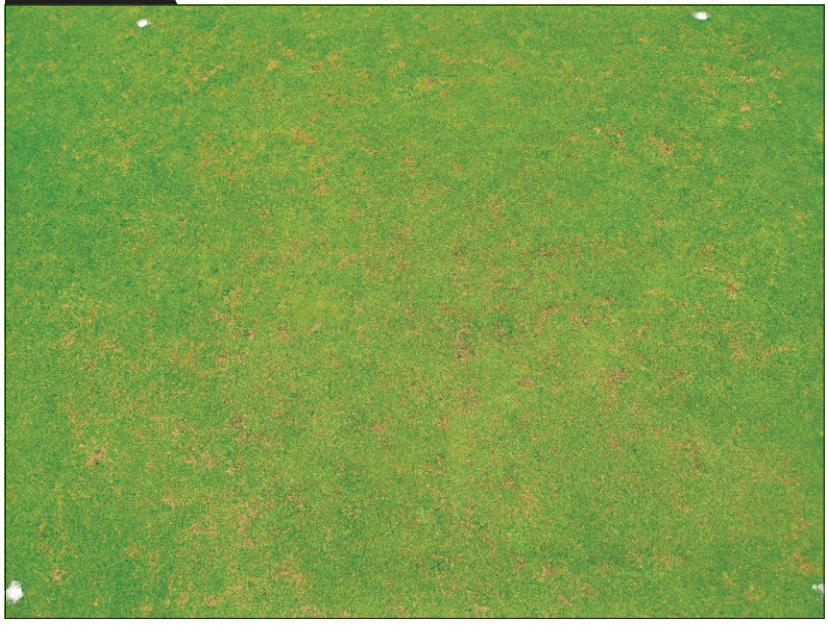
Anthracnose, caused by the fungal pathogen *Colletotrichum cereale,* can be a devastating disease of annual bluegrass (*Poa annua*) putting greens in temperate climates throughout the world. The pathogen lives in diseased plant tissues and on organic residues in the thatch and usually infects older senescing leaves and tillers, although younger plant tissues can be infected. The disease can be observed at any time of year as either a foliar blight or a basal rot of crown tissue, but is generally most destructive during the hot, humid conditions of summer. Symptoms of the disease often start as a "firing" of individual leaves (a change from green to a yellow-orange leaf color) that can progress to death of tillers and crowns and eventually severe thinning of the turf.

USGA
Research provided and funded by USGA.

Anthracnose is often more severe on turf that is challenged by extremes in soil water, low nitrogen fertility and above optimal temperatures. Optimum conditions for pathogen development include temperatures between 77 to 91° F and long periods, 12 hours or more, of leaf wetness. Spores are easily dispersed by splashing raindrops and maintenance equipment. Reduced light intensity is thought to also favor disease development. Thus, warm, overcast and excessively wet or dry soil conditions can encourage development of this disease.

Research has shown that damage from anthracnose will be more severe on turf that is stressed by drought, low nitrogen fertility and low mowing. Mechanical injury from play and cultural practices is often speculated as a factor involved with outbreaks of anthracnose. However, factors that are likely to physically injure turf (for example, foot traffic, light-weight rolling, brushing and double-cutting) have not increased anthracnose severity in our research trials. The effect of vertical cutting on anthracnose is less clear, but research findings suggest that this practice may not be as problematic as once feared (Hempfling et al., 2012; Inguagiato et al., 2008).

FIGURE 1



In this untreated check plot 44 percent of the plot area was thinned by anthracnose (image captured on June 6th, 2010).

REDUCING THATCH

Survival of the *C. cereale* in the soil is heavily dependent on environmental conditions. Cool temperatures favor survival of the pathogen on plant debris in the thatch but the fungus may be a poor competitor with other soil organisms when plant residues are limited. Thus, management practices to reduce thatch may be a useful strategy for suppressing anthracnose.

The practice of topdressing putting greens, believed to be invented by

Old Tom Morris at St. Andrews Golf Course in Scotland, has been practiced with increasing frequency since the 1970s. Modification of thatch to reduce disease severity is one widely stated objective of topdressing putting greens. However, many have speculated that the incorporation of topdressing sand causes abrasion of plant tissues and these wounds increase the infection of the plant by the anthracnose pathogen.

MAT VERSUS THATCH

Our initial studies of topdressing found that frequent topdressing (cumulative amount of 800 to 1,600 pounds of sand per 1,000 sq. ft.) during the summer substantially reduced anthracnose severity (Figure 1 and 2). We hypothesize that the reason for disease reduction is due to the formation of a well-developed mat layer rather than a thatch layer at the surface of the turf. A mat layer is a more desirable growth medium for plants than thatch.

Annual bluegrass plants growing in our topdressed plots had deeply buried crowns and much larger, longer leaf sheaths than plants growing in non-topdressed plots. Plant crowns buried and growing in a mat layer are better protected from extreme fluctuations in temperature and soil water during the summer when anthracnose disease pressure is highest compared to crowns growing in thatch.

A mat layer developed from sand topdressing also provides greater physical support and anchoring of grass plants by adding new soil (sand) particles that surround tillers, crowns and adventitious roots, ultimately encouraging better shoot vigor. Moreover, a firmer turf surface improves tolerance to mowing by maintaining a more consistent (higher) effective height of cut, reducing the tendency for mower scalp, especially under wet conditions and low bench settings.

Not surprisingly, higher mowing heights have been shown to decrease anthracnose severity on annual bluegrass. As mentioned above, the anthracnose pathogen survives on dead organic matter (as a saprophyte) in thatch when environmental conditions are unfavorable for disease development. Thus, the burying and dilution of disease inoculum with sand topdressing is another plausible mechanism for disease suppression.

FIGURE 2

Disease severity was only 10 percent in this plot which was topdressed in two split applications totaling 8 cu. ft. per 1,000 sq. ft. of sand during the spring and biweekly with 1 cu. ft. per 1,000 sq. ft. of sand during the summer (image captured on June 6th, 2010).

HEAVY AND LIGHT TOPDRESSING

Topdressing at a cumulative intensity of 800 to 1,600 pounds of sand per 1,000 sq. ft. during the summer is an expensive and laborious practice that will interfere with mowing and play for several days after the application. More typically, topdressing programs on golf courses apply less topdressing sand during the summer than the rates used to reduce anthracnose severity in our initial studies. Large topdressing rates are commonly applied in conjunction with hollow tine cultivation during periods of low play (for example, spring and fall). These large volume topdressing applications are then supplemented with much lighter and, to varying degrees, more frequent applications of topdressing sand during the playing season.

Such programs are generally less expensive to implement and less disruptive to play than a program that would apply a greater proportion of the total annual sand application during the peak playing season. We are currently evaluating 1) whether topdressing applied during the autumn or spring affects anthracnose severity and more specifically, 2) whether autumn or spring topdressing alters the effect of lower-rate summer topdressing on this disease (Figure 3 and 4). From this work it appears that large volume topdressing in the spring is more effective at suppressing anthracnose than topdressing applied in the fall.

OTHER FACTORS

Superintendents have expressed concern about the potential adverse

Continued on page 32

PHOTOS BY: JAMES HEMPFLING

FIGURE 3

Graduate student Ruying Wang applies sand topdressing to research plots.

PHOTO BY: JAMES HEMPFLING

Continued from page 31

effects of sand particle shape and foot traffic over recently applied topdressing sand on anthracnose severity. Our study of sand shape on anthracnose found that both sub-angular and round topdressing sand reduce the disease; in fact, sub-angular sand occasionally reduced disease more than round sand, although the difference was very slight. Thus, the shape of topdressing sand does not appear to be a concern with respect to anthracnose disease (Inguagiato et al., 2013).

We have also studied the effect of daily foot traffic on annual bluegrass. To our surprise, topdressing every week during the summer reduced disease severity even under conditions of intense daily foot traffic (Murphy et al., 2010; Roberts et al., 2010). In fact, the best turf quality in this study occurred on plots treated with sand and foot traffic.

During the first year of many of our topdressing trials we have observed small increases in disease severity; however, these initial increases in disease severity dissipated within a week or two as more topdressing sand was applied during the trials. This initial increase in disease could be due to wounding of crowns that were not yet protected by a mat layer developed from routine topdressing. A threshold (minimum) amount of sand is probably needed before the benefits of sand topdressing (i.e., formation of a mat layer) can be seen in the form of reduced anthracnose disease and improved turf quality. Observations of greater anthracnose severity on golf course putting greens after topdressing may be an indication that the program is insufficient (cumulative sand rate is too low) to reduce anthracnose severity.

CONCLUSION

In our trials, the overall benefits of topdressing have far outweighed any potential negative effects related to abrasion and wounding. A common recommendation for topdressing is to match the sand rate and frequency of application to the growth of the turf (thatch accumulation) so that sand filters through the leaf canopy and incorporates into thatch to maintain a non-layered growing medium that does not interfere with mowing or play.

Our research is indicating that this approach to topdressing is consistent with best management practices for anthracnose disease suppression. The greatest growth of leaf canopy and thatch accumulation occurs sometime in the spring and fall for cool-season grasses such as annual bluegrass, typically when nitrogen fertilizer is applied and irrigation or rain occurs. Relatively large amounts of sand should be applied during the spring and fall to match greater amounts of shoot growth and thatch accumulation. As growth slows during the summer, much smaller amounts of sand should be applied. The frequency of topdressing can also be adjusted during the summer to match growth.

To avoid falling behind the growth rate on well-fertilized vigorous turf, a weekly application frequency may be needed when very low rates (< 50 lbs. per 1,000 sq. ft.) of topdressing sand are applied.

Our current research is focused on evaluating a combination of best management practices (BMPs) such as topdressing, nitrogen fertility, mowing with varying rates and frequencies of fungicide application. Early indications are that implementing BMPs on

FIGURE 4

Graduate student James Hempfling brushes in sand after a topdressing application.

PHOTO BY: RUYING WANG

golf course putting greens can dramatically reduce the fungicide rates needed to control this disease, or allow superintendents to extend the intervals between applications resulting in significant savings while maintaining acceptable turfgrass quality and ball roll distance (green speed). However, additional research is needed to confirm these findings.

Acknowledgements

We would like to thank the United States Golf Association, the Tri-State Research Foundation, and the Golf Course Superintendents Associations of America and New Jersey for financial support of this project.

James A. Murphy, Ph.D., James Hempfling, Ruying Wang, and Bruce B. Clarke, Ph.D. are in the Department of Plant Biology and Pathology at Rutgers University. Jim Murphy, Ph.D. is an Extension Specialist in Turfgrass Management, James Hempfling and Ruying Wang are graduate students and Bruce Clarke, Ph.D. is an Extension Specialist in Turfgrass Pathology. Dr. Murphy can be contacted at murphy@aesop.rutgers.edu for more information.

References

Hempfling, James W., Murphy, James A., and Clarke, Bruce B. 2012. Effect of scarification depth on anthracnose disease of annual bluegrass putting green turf. Proceedings of the Twenty-First Annual Rutgers Turfgrass Symposium. p. 38.

Inguagiato, John C., Murphy, James A., and Clarke, Bruce B. 2013. Topdressing sand, particle shape and incorporation effects on anthracnose severity of an annual bluegrass putting green. International Turfgrass Society Research Journal. 12:127-133.

Inguagiato, John C., Murphy, James A., and Clarke, Bruce B. 2008. Anthracnose severity on annual bluegrass influenced by nitrogen fertilization, growth regulators, and verticutting. Crop Science. 48:1595-1607.

Murphy, James A., Clarke, Bruce B., Roberts, Joseph A., Schmid, Charles J., and Hempfling, James W. 2010. Developing best management practices for anthracnose disease on annual bluegrass putting green turf. 2010 Turfgrass and Environmental Research Summary. p. 2.

Roberts, Joseph A., Murphy, James A., and Clarke, Bruce B. 2010. Anthracnose severity of annual bluegrass putting green turf as affected by golf shoe foot traffic and sand topdressing. Proceedings of the Nineteenth Annual Rutgers Turfgrass Symposium. p. 49.

Ad Index

Companies featured in this issue

ADVERTISER	PAGE
Air-O-Lator	23
AMVAC	11
Control Solutions	3, 13
Cushman	7
e-par USA	17
FMC Corp	1
GenNext	CV4
Greenjacket	25
Grigg Bros.	15
J2 Golf Marketing	24
Jacobsen	CV2
PBI/Gordon	5
Spectrum Tech	CV3
Standard Golf	4