A Witch´s Brew of Troubles with the Bermudagrass Mite

Bermudagrass stunt mites are an increasing turfgrass problem at golf facilities with bermudagrass fairways and roughs.

BY JUANG–HORNG "JC" CHONG

Image 1. Infestation by the bermudagrass mite stunts stem growth in common and hybrid bermudagrass, causing the characteristic "witch's broom" symptom in stem (left) and the entire tuft (right). (Photos courtesy of J.-H. Chong, Clemson University, and Maria Tomaso-Peterson, Mississippi State University.)

As an entomologist and extension specialist, I usually have recommendations (if not solutions) to most insect problems. But for the past few years, the bermudagrass mite, also known as the bermudagrass stunt mite, has severely bruised my ego.

Never heard of the bermudagrass mite? Well, you are not alone. Whenever I show a picture of the typical "witch's broom" damage (Image 1) in South Carolina or Texas, I can see eyes widening and heads nodding. Many golf facilities in the southern U.S. may be infested, but few superintendents, managers, and owners recognize the damage. Many think that those bunchy stems are just mutations.

The bermudagrass mite is a species of eriophyid mite. The characteristics of the eriophyid mites, as a group, are their small size — a bermudagrass mite is about the size of the full stop, or period, at the end of this sentence — banana-shaped body, and two pairs of legs (as opposed to four pairs on typical mites and three pairs on typical

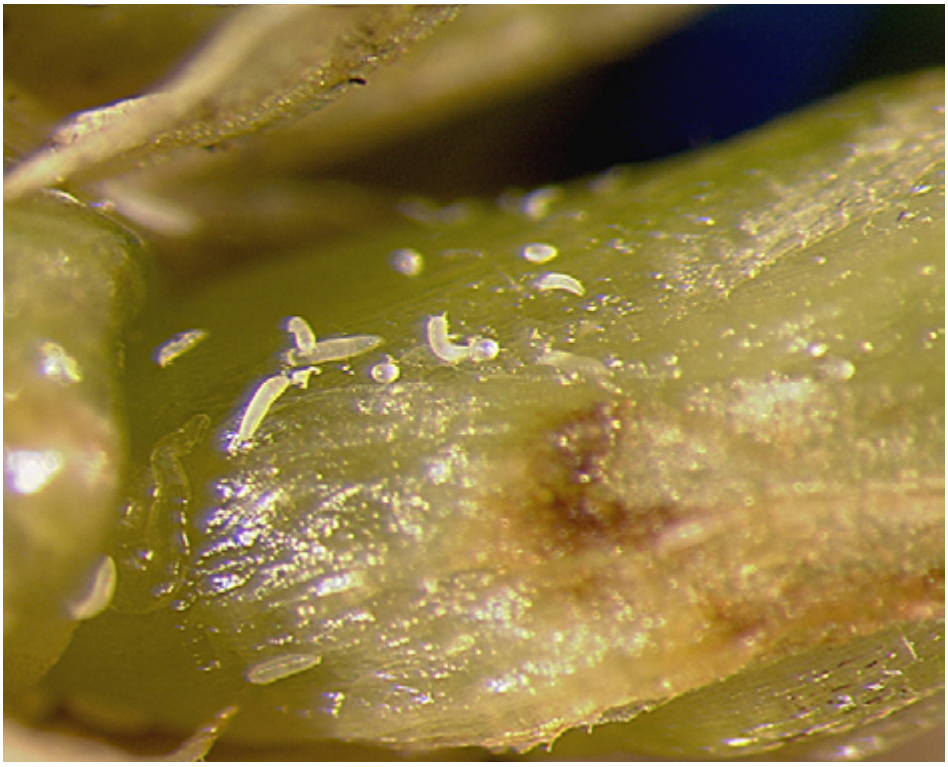

Image 2. Adult bermudagrass mites are tiny, with a banana-shaped body, two pairs of legs, and a whitish cream or translucent color. Eggs are oval and translucent. (Photo courtesy of David Shetlar, The Ohio State University.)

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Image 3. As stunting and death of stems and stolons continue, the turf fails to recover from the damage and bare spots begin to appear. The stunted tufts are quite noticeable. (Photo courtesy: Maria Tomaso-Peterson, Mississippi State University.)

insects). The bermudagrass mite is whitish cream in color or translucent, as seen in Image 2. A large number feed under the leaf sheath, causing stunted internodes and a typical witch's broom symptom (Image 1). Because of their small size, color, and habit of feeding under the leaf sheath, individual bermudagrass mites are extremely difficult to see even with a hand lens. The witch's broom damage is a more reliable diagnostic characteristic.

A few years may pass before the number of witch's brooms reaches a noticeable level. The witch's broom formation is permanent, and the infestation causes the stunted stolons even under higher fertilization and irrigation levels. Over time, turfgrass stems and stolons die. The stunting and death of stems and stolons leave behind bare spots (Image 3), which continue to expand and coalesce as more stems and stolons are stunted and killed (Image 4). The end result is a large patch of bare soil or weeds. The damage appears to be most severe on slopes and at the edges of bunkers, indicating a correlation between the severity of damage and soil dryness at a particular spot.

AN INCREASING TURFGRASS PROBLEM

"Why are they becoming more problematic?" is a question I am asked often. The bermudagrass mite has been with us for a very long time. It is believed that it originated in Australia and spread around the world with the shipment of bermudagrass to other countries. The first case of bermudagrass mite infestation in the U.S. was reported in a lawn in Phoenix, Ariz., in 1959. In 1962, it was found in Florida. Now it is widespread in most states south of the 35° N latitude.

Historically, bermudagrass mites have only been an occasional pest of bermudagrass. The recent gain in notoriety may be the result of better education of superintendents. It also could be the result of reduced rainfall in recent years or changes in irrigation practices, as evidenced by the fact that the problem is more pronounced during dry times or in dry locations. It could be changes in rough mowing practices, because as the mowing height is raised, the damage becomes more noticeable on longer stems. It could be changes in pest management practices, because as some pesticides that have good efficacy against the bermudagrass mite are phased out or restricted, pressure is reduced on the mite population. It could be changes in bermudagrass cultivar selection. For instance, the popular fairway cultivar Tifway is very susceptible. Or, it could simply be bad timing, because as the turf ages the damage becomes more noticeable. As with most pest problems, the recent flare-up of bermudagrass mites is most likely the result of a combination of several factors.

Those unlucky few who have to manage the damaged turf soon realize there are no effective management options against the bermudagrass mite. We know so little about this pest that it is almost impossible to formulate an effective management program at the moment.

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IDENTIFICATION TIPS AND DETERMINING THRESHOLD LEVELS

The first step in any management program is to determine the causal agent of the damage. The thinning of turf can be caused by several factors, and damage by bermudagrass mite is often misdiagnosed as mutation or nematode infestation. Therefore, it is always a good idea to collect samples of live witch's brooms. Samples should be sealed in a plastic bag and sent to local extension offices or extension specialists for identification.

The next step is to determine the threshold at which management action becomes necessary. Dr. David Shetlar and Dr. Harry Niemczyk of The Ohio State University developed a sampling protocol for the bermudagrass mite. A 3- x 4-foot rectangular frame is constructed with PVC pipes. Inside the frame, strings are threaded through holes drilled into the PVC pipes at 1-foot intervals, creating 12 grids. The frame is then placed onto infested turf and the total number of witch's brooms in 10 of the 12 grids is counted. Samples should be taken once a month from every 50 feet on fairways and roughs, four frame samples from each green approach, and two frame samples from each tee bank. If four or more witch's brooms are found in each sample, a chemical control program should be initiated. If less than four damaged stems are found, then a cultural control program may be sufficient. It is not clear if the sampling protocol and threshold have been verified in the field.

Image 4. As damage continues, the bare spots expand and coalesce, creating a large area of bare soil. The damage appears to be most severe on slopes where water distribution is not even. (Photo courtesy: J.-H. Chong, Clemson University.)

CHEMICAL MANAGEMENT TIPS

There is currently no effective pesticide against the bermudagrass mite. In 2009 and 2010, I conducted field trials at a golf facility in Hilton Head Island, S.C., to evaluate the efficacy of 26 active ingredients and products, with or without a surfactant (Dyne-Amic®), against the bermudagrass mite. Many active ingredients or products were not registered for use on turfgrass but were selected because of their activity on various mite species on ornamental plants. The results were disappointing (Figure 1). Diazinon (Diazinon 4E at 1 pint per 100 gallons) reduced the number of witch's brooms by 43 percent after one application in May, followed by chlorpyrifos (Dursban Pro at 1.5 fluid ounces per 1,000 square feet) by 25 percent, abamectin (Avid 0.15EC at 0.09 fluid ounces per 1,000 square feet) by 23 percent, and dicofol (Kelthane 50 WSP at 0.366 ounces per 1,000 square feet) by 22 percent. The results were not close to 85 percent reduction, which I consider to be good efficacy.

The results from my study are surprisingly similar to those generated by Dr. George Butler (University of Arizona) and Dr. Jim Reinert (then at University of Florida) in the 1960s to 1980s and summarized by Dr. Reinert in an article published in the *USGA Green Section Record* in 1982 called The Bemudagrass Stunt Mite. The active ingredients that provided good or decent reduction in these earlier studies were Diazinon, UC-55248, oxamyl (Vydate), aldicarb (Temik), propoxur (Baygon), and chlorpyrifos (Dursban). The most effective active ingredient against the bermudagrass mite, Diazinon, has been phased out. The uses of chlorpyrifos and dicofol in golf courses have been greatly restricted. Abamectin is restricted to

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the management of nematodes on golf course putting greens.

What other chemical management options do we have? What is the efficacy of other active ingredients registered for the management of mites? The bermudagrass mite feeds deep within the leaf sheath, so would the addition of a penetrant, surfactant, or oil increase efficacy of existing pesticides? What about different types or brands of surfactants? Does a higher spray volume help penetrate the leaf sheath? How frequently do we have to repeat the application? We do not have answers to any of these questions.

CULTURAL MANAGEMENT TIPS

One of the biggest obstacles to developing an effective management program is our lack of understanding of bermudagrass mite biology. The complete life cycle from egg to adult is five to 10 days, and it is faster with higher temperatures. Each female produces a dozen eggs. The population is usually active in late spring and summer. However, the location and life stage in which the bermudagrass mite overwinters, as well as the timing of the population emerging from overwintering and beginning to cause turfgrass damage, are not known. Not knowing its biology, it is difficult to determine the timing of pesticide applications to get ahead of the population and damage.

Because damage is most noticeable on longer stems, lowering mowing height may help remove many infested stems. It is possible that scalping, in addition to vacuuming of clippings, may remove most of the infested stems. A higher fertilization and irrigation level after scalping may allow recovery of infected turf. Even when scalping is not used, an increased irrigation volume may help lightly infested turf outgrow some damage. Fertilization can also be a double-edged sword. On one hand, fertilization can promote growth and recovery. On the other hand, higher nitrogen levels have been linked to larger and more damaging populations of mites.

It is also important to remember that the bermudagrass mite spreads within a golf course by hitching a ride on clippings. Therefore, sanitation of mowing equipment after working in an infested area is crucial in delaying the spread. Blowing clippings after mowing can also spread populations to other turf areas. There are no experimental or even anecdotal data to suggest that any of the cultural control tactics work.

ADDITIONAL RESEARCH NEEDS

Host plant resistance presents the most promising aspect of bermudagrass mite management. The bermudagrass mite attacks only common and hybrid bermudagrass. Therefore, for a severely infested golf course, replanting with zoysiagrass or other suitable turfgrass species may be a good, if costly, alternative. Bermudagrass cultivars vary in their susceptibility to the bermudagrass mite. As summarized in 1982 by Dr. Reinert in The Bemudagrass Stunt Mite, some of the popular cultivars, such as Tifway, TifEagle, and common bermudagrass, are susceptible, while Tifdwarf, TifSport, Franklin, and Midiron provide good resistance. Bermudagrass putting greens are not an issue for bermudagrass mite damage. The ultra-low mowing height on greens makes it uninhabitable for the bermudagrass mite. It is time to conduct new research to evaluate the potential of newer bermudagrass cultivars, such as Celebration, which has a more aggressive growth habit, to resist or outgrow mite damage.

CONCLUSION

We have not made much progress in managing the bermudagrass mite in the past three decades. In fact, we may have taken a few steps backward with the phasing out of several effective pesticides, a continuing ignorance of the bermudagrass mite's biology and the efficacy of new active ingredients, and the lack of development of resistant bermudagrass cultivars and management practices. This witches' brew of problems demands more attention and resources from the golf industry. I am a firm believer that as great as the challenge may be, our drive and ingenuity can help us find a way out of the trouble.

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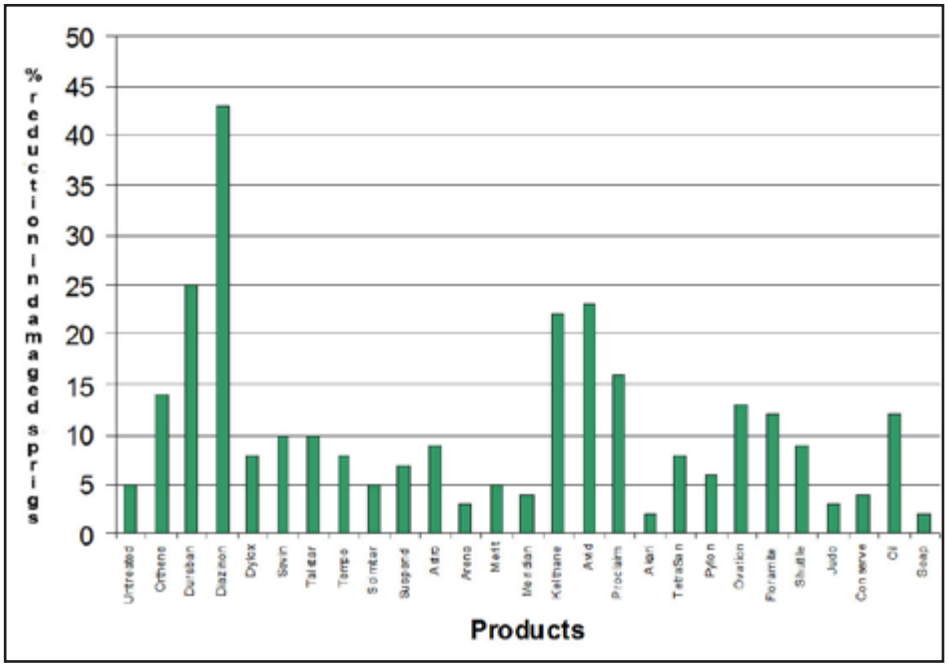

Figure 1. The percent reduction in the number of "witch's brooms" one month after one application of selected insecticides and miticides at a golf course in Hilton Head Island, S.C., in 2009.

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