The Bermudagrass Stunt Mite

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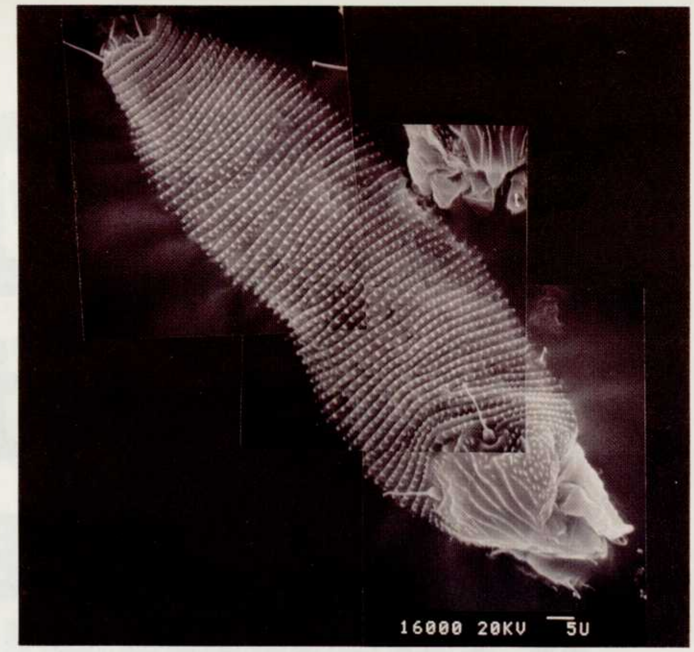

Figure 1. The bermudagrass stunt mite at extremely high magnification with the scanning electron microscope. (Photo courtesy of Dr. H. L. Cromroy, University of Florida, Gainesville.)

Bermudagrass, Cynodon spp. is widely used for sport turf throughout the southern half of the United States and much of the tropical and subtropical regions of the world. In Florida alone, the 728 golf courses in 1982 maintained approximately 69,200 acres according to current University of Florida estimates.

The bermudagrass stunt mite, Aceria cynodeniensis (Hassan) Kiefer, (Fig. 1) is an important pest of bermudagrass. It is particularly a problem on golf turf in Florida and recreational turf throughout the southern states. This mite is probably native to Australia, where bermudagrass has become a naturalized plant; but now is widespread, occurring in New Zealand, North Africa, and North America (14). The host-specific eriophyrid mite was first found infesting bermudagrass lawns in Phoenix, Arizona in 1959 (22) and soon spread to California, Nevada, New Mexico, Texas, Georgia, Alabama, and Florida (8). It was first reported in Florida in 1962 at Patrick Air Force Base, Cocoa Beach, and Opa Locka (13). Now the Mite has been found throughout Florida.

DESCRIPTION AND DEVELOPMENT

Bermudagrass stunt mites are whitish-cream in color, wormlike in shape (Fig. 1) and 165-210^{4} (about 1/125 inch) in length. A 10-power hand lens is inadequate to see this mite without a vivid imagination. Microscopic examination at 30-50 power is needed.

The eggs are laid under the leaf sheath. After hatching they pass through two larval stages before molting as adults. All life stages are found together under the leaf sheath, and there may be a few to a hundred or more mites with numerous eggs under a single leaf sheath. Butler (8) observed the period required for development from egg hatching to adults to take 5-6 days. The life cycle is probably within the range of 7-10 days, depending upon the temperature.

DAMAGE

Bermudagrass damaged by this host-specific eriophyrid mite first exhibits a slight yellowing of the tips of the grass blades followed by a shortening of the internodes producing a rosetted and tufted growth or witch's-broom effect (Fig. 2) When an infestation is severe, there is almost no green growth from the grass and the tufts become a mass of large knots which die causing brown, thin areas in the turf (Fig. 3). These dead or heavily damaged areas often become infested with weeds, thus creating other management problems.

CHEMICAL CONTROL

Over 49 intoxicants (insecticides and miticides) have been evaluated in field experiments for control of the the bermudagrass stunt mite. Experiments were conducted in Arizona by Dr. George Butler and associates (3, 5, 7, 9, 11,) from 1961 through 1965 and more recently in Florida from 1971 to the present by Dr. James Reinert and Dr. Harvey Cromroy (17, 18, 19). The chemicals evaluated and their level of effectiveness are given in Table 1. Only nine intoxicants have provided any control in these tests. In recent field experiments (1981-1982) UC-55248 and Vydate® have provided excellent results in Florida (Fig. 4). Vydate may be the only new candidate for EPA labelling, however, since development of UC—55248 has been terminated by the manufacturer. The addition of a wetting agent to the spray tank mix has improved the level of control produced in these field experiments.

Diazinon is the standard recommended treatment for this eriophyid mite (21). A treatment rate of 4 lb. active ingredient per acre (4.8g/ha) with a second application at the same rate applied 7-10 days later is required for control. One golf course in Miami, Florida spent $25,000 for bermudagrass stunt mite control in 1974 and an additional $17,000 the following year. Several golf course superin-

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Figure 2. Bermudagrass injured by bermudagrass stunt mite. A. (above) Early infestation. B. (below) Early damage showing shortened leaves and reduced internode length. C. (bottom) Late stage damage.

Figure 4. Test plots on an "Ormond" bermudagrass tee severely infested with bermudagrass stunt mites.

Figure 3. Apron and slopes of a green showing bermudagrass stunt mite injury.

Figure 5. (Left) Greenhouse experiment to evaluate several bermudagrass genotypes for resistance to the bermudagrass stunt mite.

Figure 6. (Below) Bermudagrass stunt mite damage around base of tree. Areas around trees, shrubs and other obstacles on the golf course are often missed when pesticides are used.

HOST-RESISTANT cultivars should be used whenever possible and practical, not only for this pest, but for other insects, mites, plant pathogens, and nematodes. All major turfgrasses lack certain desirable characteristics, including pest resistance, and breeding for insect resistance is impeded by the lack of research funds, personnel, and adequate methods of screening germplasm. Entomologists, nematologists, plant pathologists, and turfgrass breeders need to join forces in developing new varieties of turfgrass resistant to one or more of the major pest problems.

Damage by the bermudagrass stunt mite can best be prevented by several management practices. First, correct identification of the pest is necessary. Quite often the turf damage is the result of combined infestations of several turf pests. Nematodes and bermudagrass scale are often present in bermudagrass that has been damaged by stunt mites, and they may have contributed significantly to the turf damage. Moreover, when bermudagrass is under stress from either lack of water, nematodes, bermudagrass scale, or other turf pests, it is less able to withstand the mites and, therefore, more vulnerable. Soil with poor water-holding capacity may also be a contributing factor.

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tendents in south Floirda estimated a cost of $6,000 to $9,000 per 18-hole golf course for chemicals and additional fertilizer (no labor or equipment costs included) to control bermudagrass stunt mite damage in 1981 (1).

Diazinon cannot be depended upon solely, since repeat applications are required, yearly treatment costs are high, pesticide resistant mite populations may develop, and poor control with diazinon is often reported. Alternate means of control must be considered including the use of host resistant cultivars and proper selection of cultural practices.

HOST RESISTANT CULTIVARS

A good alternative to chemical control is to develop varieties of bermudagrass that are resistant to the bermudagrass stunt mite. Cultivars have been evaluated for mite susceptibility under field conditions by Baltensperger (2) and Butler (4, 6, 9) in ARizona, and in the greenhouse by Johnson (15) and Reinert et al. (20) in Florida. Of the 108 genotypes evaluated most were severely damaged, but several appeared to be resistant while others showed some damage. Cultivars and their response to this mite are presented in Table 2. Most of the commonly grown cultivars are susceptible to damage; 'Tifdwarf' and 'Midiron' are the only two cultivars which did not show mite damage in lab and field experiments. FB-119, a mite resistan "common" type bermudagrass selection is being developed for release by the Florida Agriculture Experiment Station. In laboratory and field tests, FB-119 was completely resistant to the bermudagrass stunt mite (Fig. 5).

When bermudagrass is treated with insecticides to control this mite, the second application 7-10 days later is very important to control the young mites which hatch from eggs present during the first treatment. Thorough treatment of the whole infested area is important. Often turf areas around trees, shrubbery, and other obstructions, around sand traps and bunkers, or along canals and lakes are not treated. These areas that are missed will act as reservoir areas for mites to reinfest the whole golf course. Treatment with hand equipment or a spray hose attachment may be necessary for these areas. Fig. 6 shows an area around the base of a tree on a golf course where the bermudagrass has been severely damaged approximately a year after the 'Ormond' bermudagrass on the course has been treated with diazinon. Damage showed up here first because of the added water stress due to the shallow roots of the tree and the residual population of mites that were left in the untreated oval area around the base of the tree. Canal, stream, and lake banks also harbor residual mite populations but the damage does not show up as well since there is no added water stress in these areas (Fig. 7).

Mites can easily spread from an infested area. Like most eriophyid mites, the bermudagrass stunt mite can be carried by the wind. They are also capable of hitching a ride on other insects present in the bermudagrass. They can probably be moved by armyworms, webworms, and leafhoppers, and have been observed attached to more crickets that have recently flown from an infested area (Reinert, unpublished data). They are also easily

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dispersed in grass clippings. Mowers cut the rosettes and scatter the infested grass over wide areas of healthy turf. The infested grass springs can also be blown by the wind. Tires on equipment, even golf carts and golf shoes, may serve as a vehicle of spread since the infested grass would drop off from time to time.

Proper fertilization and even high rates of fertilizer applied with ample water can allow the bermudagrass to outgrow bermudagrass stunt mites. Rosettes and other symptoms will be present but no loss of stand will occur because the grass apparently is growing faster than the mites can kill it.

Host resistant cultivars should be used whenever possible to eliminate or at least lessen the potential of injury.

In conclusion, the turf manager can, through good management practices and the use of host resistant cultivars, reduce the potential of injury by the bermudagrass stunt mite. When populations reach damaging levels, they can be controlled with chemcial treatment.

Toxicants evaluated for bermudagrass stunt mite control and their effectiveness(a).

Toxicant (b)	*Response in field test (c).*	
	Arizona	*Florida*
Diazinon	+++	+++
UC-55248d		+++
Vydate® (oxamyl)		+++
Temik® (aldicard)		+++
Baygon® (propoxur)	++	---
Banol® (carbanolate)	+	
Dursban® (chlorpyrifos)	++	---
Nemacur® (phenamiphos)		+
Trithion®		+
Acaraben®		---
Acarol® (bromopropylate)		---
Akton®		---
Aspon® (propyl thiopyrophate)		---
Azodrin® (monocrotophos)		---
Brofene®		---
Bux® (metalkamate)		---
Captan	---	
Carzol® (formetanate)		---
Cygon® (dimethoate)	---	
Dasanit® (fensulfothion)		---
DDT	---	
Delnav®		---
Dibrome® (naled)	---	
Dimilin® (diflubenzuron)		---
Di-Syston® (disulfoton)	---	---
Dyfonate® (fonofos)		---
Dylox®		---
Ethion	---	
Eradex® (thioquinox)	---	
Folcid® (captafol)	---	
GS13005 (methidathion)	---	
Kelthane® (dicofol)	---	---
Korlan®	---	
Lindane	---	
Malathion	---	
Metasystox-R®		
Mocap®		---
Morestan® (quinomethionate)	---	
Omite® (propargite)		---
Orthene® (acephate)		---
Phostex®	---	
Phictran® (cyhexatin)		---
Sulfur	---	
Tedion® (tetradifon)	---	
Thiodan® (endosulfan)	---	
Tirpate®		---
Torak® (dialifor)		---
Vendex® (fenbutatin-oxide)		---
Zectran® (mexacarbate)	---	

a) A summary of published papers by Butler (3, 5, 7, 9); Butler et al. (10, 11, 12); Johnson (15); Reinert (17); and Reinert and Cromroy (18, 19).
b) Trade name (common name).
c) (+++) = good control; (++) = control, but not in all tests; (+) = poor control; (-) = no control.
d) UC-55248, 3-(2-ethylhexanoyloxy) - 5, 5-dimethyl-2 (2-methylthenyl)-2-cyclohenen-1-one.
e) Akton®, 0, 0-diethyl 0 -[2-chloro-1-(2, 5-dichlorophenyl) vinyl] phosphorthioate.
f) Phostex®, mixture of bis (dialkyloxyphosphinothioyl) disulfides (alkyl ratios 75% ethyl, 25% isopropyl).
g) Tirpate®, 2, 4-dimethyl-1, 3-dithiolane-2-carboxaldehyde 0-(methylcarbamoxl) oxime.

Response of bermudagrass cultivars to bermudagrass stunt mite (a).

Cultivar	*Response (b)*
'Bayshore' (Gene Tift)	**SS**
'Everglades No. 1'	**SS**
FB-119(c) (Franklin)	**R**
FB 137 (No Mow)	**SS**
'Midiron' (P16)	**R**
'Midmo' (S-16)	**S**
'Midway' (E1)	**S**
'Oklan'	**U**
'Ormond'	**SS**
'Pee Dee'	**U**
'Royal Cape'	**S**
'Santa Ana'	**U**
'St. Lucie'	**SS**
'Sunturf'	**SS**
'Texturf 1F'	**SS**
'Texturf 10'	**SS**

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Cultivar	Response (b)
'Tifdwarf'	R
'Tiffine'	SS
'Tifgreen'	SS
'Tiflawn'	SS
'Tifway'	S
'Tifway II'	U
'Tufcote'	SS
'U-3'	S
Uganda	S
'Vamont'	U
Common	SS

a) Summary of published papers by Blatensperger (2), Butler (4, 6, 9), Johnson (15), Juska and Hanson (16), and Reinert et al. (20).

b) R = resistant, S = susceptible and showing some damage, SS = very susceptible with rosetting and severe damage, U = unevaluated, cultivar has not been tested.

c) FB-119, a cultivar soon to be released by the Florida Agriculture Experiment Station.

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