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# BERMUDAGRASS STUNT MITE AND ITS CONTROL IN FLORIDA[1]

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*Abstract.* **The bermudagrass stunt mite,** Aceria cynodoniensis **(Hassan) Keifer, is a serious pest of most bermudagrass,** Cynodon **spp. Of the 21 chemicals evaluated, only diazinon, UC-55248, and carbophenothion provided control of the mite. All would require repeat applications. Populations were reduced and regrowth of rosetted terminals was visible in the plots at 3 weeks following treatments of the 3 chemicals. Total mites per infested terminal and regrowth within the treated plots or of the rosetted terminal were satisfactory measures of chemical efficacy.**

Bermudagrass, *Cynodon* spp., is utilized as residential and recreational turf through the southern half of the United States and much of the tropical and subtropical regions of the world. Over 2.5 million ha are cultivated in the United States from southeast Virginia to Florida and westward to Arizona and California (15). In Florida alone, the 512 golf courses in 1974 maintained over 20,000 ha of bermudagrass at a cost of $50 million (14).

The bermudagrass stunt mite, *Aceria cynodoniensis* (Hassan) Kiefer, is an important pest of bermudagrass. It is particularly a problem on golf turf in southern Florida and in residential yards in Texas (1, W. B. Knoop, Tx. Agric. Ext. Serv., Dallas, personal communication). This eriophyid mite was first found infesting bermudagrass lawns in Phoenix, AZ, in 1959 and soon spread to California, Nevada, New Mexico, Texas, Georgia, and Florida (8). First reports of the mite in Florida were in 1962 at Patrick Air Force Base, Cocoa Beach, and Opa Locka (13). Now the mite has been found throughout Florida.

Bermudagrass damaged by this host specific eriophyid exhibits shortened internodes producing a typical rosetting and tufted growth or 'witch's broom' effect. Of the bermudagrass cultivars grown in Florida ('Common', 'Everglades No. 1', 'Bayshore', FB-137, 'Ormond', 'St. Lucie' 'Tifdwarf', 'Tiffine', 'Tifgreen', 'Tiflawn', and 'Tifway') all have been reported as susceptible hosts of the bermudagrass stunt mite except for Tifdwarf (2, 4, 6, 9, 16, 19). A resistant "Common" type bermudagrass accession (FB-119) was recognized (19), and is being developed for release in Florida.

Reports by Butler (3, 5, 7, 9, 10, 11, 12) in Arizona showed diazinon to be the most effective control for this mite in Arizona and experiments have confirmed this in Florida (17). One golf course in Miami spent $25,000 for bermudagrass mite control in 1974 and an additional $17,000 the next year. Several golf course superintendents in south Florida 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. Several materials have been evaluated for bermudagrass stunt mite control in Florida and the results of these tests are summarized here. Also, several methods of evaluating mite control have been tried, and their potential for evaluating mite control is compared.

## Materials and Methods

Eleven chemicals were evaluated in Experiment 1 for control of the bermudagrass stunt mite on heavily rosetted FB-137 (No Mow) bermudagrass at a sod farm in Palm Beach County. The infested turf was divided into 2.3 $m^2$ (5 x 5 ft) plots with a 0.9 m wide untreated buffer zone around each plot. Populations were sampled by removing 3 plugs (2.54 cm diam.) from each plot and determining the percentage of rosetted terminals per plug in the laboratory. Rosettes from these plugs were also examined for regrowth when the 3 week samples were taken. Mite populations were also evaluated by peeling back leaves from 3 infested terminals per plot and estimating the mite population on a scale of 0-9 (0 = no mites and 9 = a heavy population). Plots were blocked in 4 replicates based on the percentage of rosetted terminals in the pretreatment samples, and treatments were randomized within each replicate.

Twelve chemicals which provided significant control of another eriophyid mite (18) were evaluated in Experiment 2 on a golf course tee of Ormond bermudagrass with ca. 64% of the turf showing rosettes from bermudagrass stunt mite. The tee was divided into 1 x 1 m plots each separated on 2-4 sides by a 0.6 m buffer zone. Populations were evaluated by removing 5 rosettes per plot and visually evaluating the percentage of the grass in each plot that was rosetted. Samples were placed in plastic bags, taken to the laboratory where mites were counted on 1 terminal from each of the 5 rosettes by peeling all the leaves from the rosette and counting the total mites present with the aid of a dissecting microscope. Plots were assigned to 4 replicates according to the pretreatment mite counts and treatments were randomized within each replicate. The final counts were done as a double blind with the counter not knowing the sample treatments to eliminate any bias.

Tables 1-2 give formulations and rates for each chemical evaluated. Granular materials were dispersed with a hand shaker and washed into the turf with 7.6 liters of water per plot. All other materials were mixed with 0.95 liter (Experiment 1) or 1 liter (Experiment 2) of water per plot and sprayed on the grass with a compressed-air sprayer.

Chemical names of the compounds used in the tests which do not have common names are: UC-55248 [3-(2-ethylhexanoyloxy)-5, 5-dimethyl-2-(2-methylthenyl)-2-cyclohenen-1-one]; and MBR-6168 [2, 4-dimethyl-1, 3-dithiolane-2-carboxaldehyde 0-(methyl carbamyl)-oxime].

Bermudagrass stunt mite populations were re-evaluated at 3 weeks after treatment in both experiments. Data were analyzed by analysis of variance and means separated by Duncan's multiple range test.

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## Results and Discussion

Table 1 gives the results of Experiment 1. Bermudagrass stunt mite populations on the infested terminals were very high in all plots before treatments, however they were significantly reduced at 3 weeks by both diazinon and carbophenothion with mite ratings of 2.0 and 6.2, respectively. Diazinon provided the best control. When the percentage of rosetted terminals before and 3 weeks after treatments were compared, none of the treatments improved the turf quality as compared to the untreated check plots. However, when the percentage of rosetted terminals that exhibited new growth, in the 3-week samples was compared, diazinon and carbophenothion were again significantly better and showed considerable regrowth and recovery as compared to the other treatments.

Table 1. Evaluation of chemicals for control of bermudagrass stunt mite on bermudagrass treated 20 April 1971 (4 replicates).[z]

| Chemical | Rate kg AI/ha | Mite rating[y] 3 wk | % Mite rosetted terminals: Difference between 0 wk-3 wk | % Mite rosetted terminals: With new growth at 3 wk |
|---|---|---|---|---|
| Diazinon 4 EC | 4.48 | 2.0 a | 20.4 a | 39.2 a |
| Carbophenothion 4 EC | 11.2 | 6.2 b | 11.2 ab | 24.8 a |
| Metalkamate 10 G | 16.8 | 9.0 c | 5.3 bc | 1.2 b |
| Acephate 75 S | 5.6 | 9.0 c | 11.1 ab | 4.8 b |
| Acephate 75 S | 11.2 | 9.0 c | 8.1 abc | 5.0 b |
| Propyl thiopyrophosphate 1.3 EC | 8.18 | 9.0 c | 0.0 c | 2.0 b |
| Fonofos 10 G | 3.36 | 9.0 c | 4.6 bc | 6.5 b |
| Bromophos 10 G | 11.2 | 9.0 c | 12.9 ab | 1.3 b |
| Chlorpyrifos 2 EC | 1.12 | 9.0 c | 10.0 abc | 2.3 b |
| MBR-6168 10 G | 8.96 | 8.1 c | 12.1 ab | 1.9 b |
| Ethoprop 10 G | 8.96 | 9.0 c | 3.9 bc | 3.3 b |
| Untreated Check | 0 | 9.0 c | 12.9 ab | 7.8 b |

[z]Means in a column not followed by the same letter are significantly different (P = 0.05) by Duncan's multiple range test.
[y]Mites were rated on rosetted terminals: 0 = no mites, 9 = very heavy population.

Results of Experiment 2 are summarized in Table 2. Diazinon and UC-55248 significantly reduced mite populations when they were evaluated 3 weeks after treatments were applied. Visual recovery of the test plots was not evident at 3 weeks, but by 6 weeks, plots treated with both diazinon and UC-55248 showed significant reduction of rosetted turf and the grass was recovering with regrowth from the rosetted terminals. Some recovery was also apparent in the plots treated with oxamyl.

Only 3 of the 21 chemicals evaluated, diazinon, UC-55248, and carbophenothion, showed significant control of the bermudagrass stunt mite. Control with UC-55248 was very encouraging, since it was effective at a much lower rate than diazinon which is currently being used to control this mite. It is apparent from these experiments that at least a second application of any of the 3 chemicals will be necessary to obtain good control of the mite.

These experiments showed that several methods can be used to evaluate chemical efficacy on the bermudagrass stunt mite. Total counts of the mites per infested terminal provided a good measure of control, but this method requires many hours of tedious microscopic examination of plant material. Comparing the percentage of rosettes showing regrowth was also used and provided a good measure of chemical efficacy at 3 weeks post application. Visual evaluations of the plots for percentage of infested grass also served as an acceptable means of evaluating control but differences were not readily apparent until 6 weeks after treatment. The latter method was facilitated also because of the close height-of-cut of the grass on the tee; this method may have been very difficult if the grass was maintained higher. Actual mite counts are probably the most reliable method for evaluating bermudagrass stunt mite control under all turf maintenance conditions even though they are the most laborious.

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Table 2. Evaluation of chemicals for control of bermudagrass stunt mite on bermudagrass treated 12 March 1981 (4 replicates).[z]

| Chemical | Rate kg AI/ha | Weeks Posttreatment: Mites/Terminal 0 | Mites/Terminal 3 wk[y] | % of plot area with rosettes 0 | % of plot area with rosettes 3 wk | % of plot area with rosettes 6 wk |
|---|---|---|---|---|---|---|
| UC-55248-4 EC | 1.12 | 93 | 65 a | 68 | 75 a | 42 a |
| Diazinon 4 EC | 4.48 | 99 | 69 a | 71 | 69 a | 50 a |
| Oxamyl 2 EC | 1.12 | 94 | 107 b | 61 | 73 a | 67 ab |
| Dialifor 4 EC | 1.12 | 93 | 114 b | 74 | 85 a | 86 b |
| Chlorbenzilate 4 EC | 0.56 | 96 | 125 b | 61 | 95 a | 89 b |
| Dicofol 18.5 EC | 1.12 | 99 | 127 b | 68 | 89 a | 78 b |
| Bromopropylate 2 EC | 0.56 | 96 | 127 b | 73 | 84 a | 87 b |
| Fenbutatin-oxide 50 WP | 0.56 | 99 | 128 b | 45 | 75 a | 85 b |
| Diflubenzuron 25 WP | 0.56 | 97 | 130 b | 73 | 89 a | 82 b |
| Propargite 30 WP | 0.56 | 99 | 131 b | 68 | 88 a | 85 b |
| Cyhexatin 50 WP | 0.56 | 92 | 151 c | 39 | 81 a | 86 b |
| Dioxathion 8 EC | 1.12 | 97 | 163 c | 48 | 85 a | 77 b |
| Untreated Check | 0 | 94 | 120 b | 78 | 80 a | 88 b |

[z]Means in a column not followed by the same letter are significantly different (P = 0.05) by Duncan's multiple range test.
[y]Populations greater than 200 were recorded as 200.

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