# CONTROL OF HELMINTHOSPORIUM, SNOW MOLD, DOLLAR SPOT, SCLEROTINIA, FUSARIUM BLIGHT AND NEMATODES

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## MSU Soils Farm Helminthosporium Study

The Helminthosporium leaf spot fungicide trials were conducted on a fescue and bluegrass plot area on the MSU Soils Research Farm. The study was divided into two parts, the fungicide plots in each part being laid out in three replications of a randomized block design. Part one consisted of fungicide treatments applied on a bi-weekly schedule whereas in part two, fungicide applications were made once a month. Part one (bi-weekly) was treated on April 29, May 12, and May 27. Part two (monthly) was treated on April 29 and May 27 only.

All fungicide applications were made foliarly with a $CO_2$ small plot sprayer at a volume of approximately 40 gallons per acre. The individual plots were of 3' x 6' dimensions.

The readings in Table 1 and 2 were taken on June 8.

TABLE 1. Helminthosporium Leaf Spot Plots. Appearance Rating when the fungicides were applied every 2 weeks.

| Treatment | Rate/1000ft$^2$ | Mean | Duncans Multiple Range (5%) |
|---|---|---|---|
| RP 26019 | 3 oz | 1 | A |
| RP 26019 | 4 oz | 1 | A |
| RP 26019 | 8 oz | 1.3 | AB |
| Bromosan | 6 oz | 1.7 | AB |
| Daconil 2787 | 4 oz | 2.0 | AB |
| Acti-dione-RZ #2 | 2 oz | 3.3 | ABC |
| Acti-dione-RZ #4 | 2 oz | 3.3 | ABC |
| Daconil 2787 | 6 oz | 3.7 | ABCD |
| Acti-dione-RZ | 2 oz | 3.7 | ABCD |
| Captan | 6 oz | 3.7 | ABCD |
| Tersan 75 | 6 oz | 3.7 | ABCD |
| Tersan 75 | 4 oz | 4.0 | BCD |
| Captan | 3 oz | 5.0 | CDE |
| Acti-dione-Thiram #2 | 2 oz | 5.3 | CDEF |
| Acti-dione-Thiram #3 | 2 oz | 5.3 | CDEF |
| Acti-dione-RZ #3 | 2 oz | 5.3 | CDEF |
| Bromosan | 3 oz | 5.7 | CDEF |
| Acti-dione-Thiram #1 | 2 oz | 5.7 | CDEF |
| Acti-dione-RZ #1 | 2 oz | 6.0 | CDEF |
| Acti-dione-Thiram #4 | 2 oz | 6.3 | DEF |
| Acti-dione-Thiram | 2 oz | 7.3 | EF |
| Check | - | 8.0 | F |

NOTE: Upjohn experimentals numbered according to last digit of reference number.

1-9 Scale: 1-Best, 9-Worst

TABLE 2. Helminthosporium Leaf Spot Plots. Appearance Rating when fungicides were applied once a month.

| Treatment | Rate/1000ft$^2$ | Mean | Duncans Multiple Range (5%) |
|---|---|---|---|
| RP 26019 | 3 oz | 2.7 | A |
| Daconil 2787 | 6 oz | 3.3 | AB |
| RP 26019 | 6 oz | 3.7 | ABC |
| Daconil 2787 | 9.7 oz | 3.7 | ABC |
| RP 26019 | 12 oz | 4.3 | ABCD |
| Acti-dione-Thiram #1 | 4 oz | 5.0 | ABCDE |
| Acti-dione-Thiram #3 | 4 oz | 5.0 | ABCDE |
| Acti-dione-RZ | 4 oz | 5.0 | ABCDE |
| Daconil 2787 | 4 oz | 5.3 | ABCDE |
| Acti-dione-RZ #1 | 4 oz | 6.0 | BCDE |
| Acti-dione-RZ #4 | 4 oz | 6.0 | BCDE |
| Acti-dione-RZ #3 | 4 oz | 6.7 | CDE |
| Acti-dione-Thiram | 4 oz | 7.0 | DE |
| Check | - | 7.0 | DE |
| Acti-dione-Thiram #4 | 4 oz | 7.3 | DE |
| Acti-dione-Thiram #2 | 4 oz | 8.0 | E |

NOTE: Upjohn experimentals numbered according to last digit of reference number.

1-9 Scale: 1-Best, 9-Worst

Results: Helminthosporium Leaf Spot

Every two weeks: The treatments which gave significant control over the untreated check were RP 26019, 3 oz, 4 oz, + 8 oz; Bromosan 6 oz; Daconil 2787 4 oz, + 6 oz; Acti-dione-RZ Experimental $2, 4 oz; Acti-dione-RZ 2 oz; Captan 6 oz; and Tersan 75 6 oz. The RP 26019 is still the most outstanding fungicide we have ever tested for the control of Helminthosporium vagans. It should also be pointed out that Bromosan, which is a combination of a systemic fungicide (thiophanate) and a contact fungicide (Thiram), gave superior control compared to the contact Tersan 75 (active ingredient - Thiram) even though thiophanate by itself tends to increase the amount of Helminthosporium disease. Similar results have been observed before. (See 1974 and 1975 research reports.)

Once a month: RP 26019 3 oz + 6 oz and Daconil 2787 6 oz + 9.7 oz gave significant control when compared to the untreated check. The control was not as effective as when they were applied every two weeks, but it demonstrated that some control can be obtained even with monthly applications.

## Fusarium Blight Study

The 1976 Fusarium blight study was conducted at the Northfield condominium complex in Troy, Michigan on irrigated Fusarium-infested Merion Kentucky bluegrass turf. The plots were of 6' x 10' and replicated three times in a randomized block design. The turf was maintained at a two inch height of cut.

This study consisted of fungicides, wetting agents and nematicides. All treatments were applied on July 23 with the fungicide and wetting agent plots receiving a second treatment on August 6. Application of both fungicides and wetting agents was accomplished with an Ortho hose jar applicator, while the

nematicides were applied with a 3' Scotts drop-type spreader. All treatments were drenched into the root zone with one-half inch of water immediately after application.

The readings in Table 3 were taken on August 26.

TABLE 3. Northfield Fusarium Blight Study. Number of rings after treatment.

| Treatment | Rate/1000ft$^2$ | I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| Cleary's 3336 | 4 oz | 0 | 0 | 0 | 0 | A |
| Cleary's 3336 | 8 oz | 0 | 0 | 0 | 0 | A |
| Tersan 1991 | 4 oz | 0 | 0 | 0 | 0 | A |
| Tersan 1991 + Hydro-Wet | 4 oz + 8 oz | 0 | 0 | 0 | 0 | A |
| Tersan 1991 + Aqua-Gro | 8 oz + 8 oz | 0 | 0 | 0 | 0 | A |
| Dasinat* | 3 lb. | 0 | 0 | 0 | 0 | A |
| CG 12223(20G)* | 10 lb ai/A | 0 | 0 | 0 | 0 | A |
| Tersan 1991 | 8 oz | 0 | .5 | 0 | .2 | A |
| Fungo | 4 oz | 1 | 0 | 0 | .3 | A |
| Fungo | 8 oz | 1 | 0 | 0 | .3 | A |
| RP 26019 | 8 oz | 0 | 0 | 0 | .3 | A |
| Tersan 1991 + Hydro-Wet | 8 oz + 8 oz | 0 | 1 | 0 | .3 | A |
| Tersan 1991 + Aqua-Gro | 4 oz + 8 oz | 1 | 0 | 0 | .3 | A |
| UC 21865* | 10 lb ai/A | 0 | 1 | 0 | .3 | A |
| Aqua-Gro | 8 oz | 0 | 0 | 1 | .3 | A |
| CG 12223(20G)* | 15 lb ai/A | .5 | 0 | 1 | .5 | A |
| Hydro-Wet | 8 oz | 2 | .5 | 0 | .8 | AB |
| CG 12223(4E)* | 15 lb ai/A | 1.5 | 1 | 0 | .8 | AB |
| EL 222 | 3 oz | 1 | 0 | 0 | 1 | AB |
| UC 21865* | 5 lb ai/A | 3 | 0 | 0 | 2.2 | AB |
| Check | - | 4 | 1.5 | 1 | 3.2 | BC |
| EL 222 | 6 oz | 2 | 5.5 | 2 | 3.2 | C |

* applied once only.

Results: Fusarium Blight

Table 3 shows that Cleary's 3336 at 4 and 8 oz., Tersan 1991 at 8 and 4 oz., Tersan 1991 at 4 and 8 oz. with 8 oz. of Hydro-Wet and Aqua-Gro, Dasinat at 3 lbs., CG 12223(20G) at 10 and 15 lbs ai/A, Fungo at 4 and 8 oz., RP 26019 at 8 oz., UC 21865 at 10 lbs ai/A, and Aqua-Gro at 8 oz./1000ft$^2$ rates all gave significant control compared to the untreated check.

Conclusions:

Many fungicides and nematicides can help control Fusarium blight when combined with a good watering program consisting of light, frequent waterings. The effect of the fungicides is a direct one, acting on the Fusaria fungi that are involved in the disease. The effect of the nematicides and wetting agents is probably indirect.

They act in different ways to prevent drought stress from occurring which is the key to symptom development. The nematicides act indirectly by killing the nematodes that predispose the plants to infection by Fusarium and damage the root systems of plants already infected. The study was conducted on a heavy clay soil and the wetting agent Aqua-Gro probably allowed better moisture penetration into the heavy soil allowing deeper root penetration, thereby reducing drought stress.

## Sclerotinia Dollar Spot Study

The Sclerotinia dollar spot (Sclerotinia homeocarpa) study was conducted on the MSU Crop Science Research Farm on an intensively maintained Toronto bentgrass green. The plots were laid out in three replications in a randomized block design. The dollar spot infestation was allowed to spread freely until the first applications were made on August 11. All fungicide applications were made foliarly with a $CO_2$ small-plot sprayer at a volume of about 40 gallons/acre. Subsequent applications were made on a bi-weekly basis on August 27 and September 14.

Readings in Table 4 were taken on September 14.

TABLE 4. MSU Crop Science Field Laboratory Dollar Spot Study.

| Treatment | Rate/1000ft$^2$ | Number of Spots I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| RP 26019 | 1/2 oz | 0 | 0 | 0 | 0 | A |
| Tersan 1991 | 1/2 oz | 0 | 0 | 0 | 0 | A |
| Tersan 1991 | 1 oz | 0 | 0 | 0 | 0 | A |
| Acti-dione Thiram #4 | 2 oz | 0 | 0 | 0 | 0 | A |
| Acti-dione-RZ #1 | 2 oz | 0 | 0 | 0 | 0 | A |
| Bromosan | 3 oz | 0 | 0 | 0 | 0 | A |
| RP 26019 | 2 oz | 0 | 0 | 0 | 0 | A |
| RP 26019 | 1 oz | 1 | 0 | 0 | .3 | A |
| Acti-dione Thiram | 2 oz | 0 | 1 | 0 | .3 | A |
| Acti-dione Thiram #2 | 2 oz | 1 | 0 | 0 | .3 | A |
| Acti-dione-RZ #4 | 2 oz | 0 | 0 | 1 | .3 | A |
| EL 222 | .4 oz | 0 | 0 | 1 | .3 | A |
| Fungo | 1 oz | 1 | 0 | 0 | .3 | A |
| Daconil 2787 | 6 oz | 0 | 0 | 1 | .3 | A |
| Cleary's 3336 | 1 oz | 0 | 2 | 0 | .7 | A |
| Acti-dione Thiram #1 | 2 oz | 0 | 0 | 2 | .7 | A |
| Acti-dione Thiram #3 | 2 oz | 0 | 3 | 0 | 1 | A |
| Acti-dione-RZ #2 | 2 oz | 2 | 2 | 0 | 1 | |
| Acti-dione-RZ | 2 oz | 2 | 2 | 0 | 1.3 | A |
| EL 222 | .8 oz | 5 | 0 | 0 | 1.7 | A |
| Acti-dione-RZ #3 | 2 oz | 5 | 0 | 0 | 1.7 | A |
| Thiram (Flo) | 6 oz | 0 | 0 | 7 | 2.3 | A |
| Check | - | 0 | 22 | 6 | 9.3 | AB |
| Maneb-Zineb | 8 oz | 0 | 37 | 1 | 12.7 | B |

Results: Dollar Spot. M.S.U. Crop Science Field Laboratory.
Table 4 shows that while there was not severe disease pressure, all the materials tested control dollar spot when compared to the untreated check except Maneb-Zineb at 8 oz.

Note: Upjohn experimentals on chart are numbered according to the last digit of reference number on label.

## Benzimidazole-Resistant Dollar Spot Study

The benzimidazole-resistant dollar spot study was conducted on the MSU Soils Farm Research area on an intensively maintained bentgrass green infested with a benzimidazole-resistant strain of Sclerotinia homeocarpa.

The study was divided into two parts. Part one consisting of weekly fungicide applications and part two, consisting of bi-weekly fungicide applications. Both parts 1 and 2 were laid out in three repetitions of a randomized block design.

The entire study was applied on August 4, following extensive infestation by the dollar spot organism. Subsequent treatments were applied to part one on a weekly basis on August 10, 16, 24 and September 2. Subsequent treatments were applied to part two on a bi-weekly basis on August 16 and September 2. All treatments were applied foliarly with a $CO_2$ small-plot sprayer at a volume of 40 gallons/acre.

The readings in Tables 5 and 6 were taken on September 20.

TABLE 5. MSU Soils Farm Benzimidazole Resistant (BR) Dollar Spot Treated Weekly - Number of Spots

| Treatment | Rate/1000ft$^2$ | I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| Daconil 2787 | 6 oz | 0 | 0 | 0 | 0 | A |
| Daconil 2787 + Exhalt | 3 oz + 1pt/100 gal | 0 | 0 | 0 | 0 | A |
| Daconil 2787 + Exhalt | 3 oz + 1pt/100 gal | 0 | 0 | 0 | 0 | A |
| Acti-dione Thiram | 1 oz | 0 | 0 | 0 | 0 | A |
| Acti-dione Thiram | 2 oz | 0 | 0 | 0 | 0 | A |
| Acti-dione Thiram + Exhalt | 2 oz + 1pt/100 gal | 0 | 0 | 0 | 0 | A |
| EL 222 | 2 oz | 0 | 0 | 0 | 0 | A |
| RP 26019 | 2 oz | 0 | 0 | 0 | 0 | A |
| Tersan 75 + Exhalt | 6 oz + 1pt/100 gal | 0 | 0 | 2 | .7 | A |
| Daconil 2787 | 3 oz | 0 | 4 | 0 | 1.3 | A |
| Acti-dione Thiram + Exhlat | 1 oz + 1pt/100 gal | 0 | 8 | 0 | 2.7 | A |
| Tersan 75 | 6 oz | 0 | 0 | 10 | 3.3 | A |
| Tersan 75 | 3 oz | 0 | 20 | 10 | 10 | A |
| Tersan 75 + Exhalt | 3 oz + 1pt/100 gal | 0 | 6 | 25 | 10.3 | A |
| Check | - | 10 | 95 | 90 | 65 | B |

TABLE 6. MSU Soils Farm Benzimidazole (BR) Resistant Dollar Spot Treated Bi-Weekly - Number of Spots

| Treatment | Rate/1000ft$^2$ | I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| Daconil 2787 + Exhalt | 3 oz + 1pt/100 gal | 0 | 0 | 0 | 0 | A |
| RP 26019 | 2 oz | 0 | 0 | 0 | 0 | A |
| Daconil 2787 + Exhalt | 6 oz + 1pt/100 gal | 0 | 10 | 0 | 3.3 | A |
| Acti-dione Thiram + Exhalt | 2 oz + 1pt/100 gal | 0 | 10 | 0 | 3.3 | A |
| EL 222 | 2 oz | 5 | 15 | 0 | 6.7 | A |
| Daconil 2787 | 6 oz | 0 | 21 | 0 | 7 | A |
| Daconil 2787 | 3 oz | 1 | 0 | 20 | 7 | A |
| Acti-dione Thiram | 1 oz | 35 | 8 | 13 | 18.7 | A |
| Acti-dione Thiram | 2 oz | 2 | 11 | 50 | 21 | A |
| Tersan 75 | 6 oz | 75 | 3 | 0 | 26 | A |
| Acti-dione Thiram + Exhalt | 1 oz + 1pt/100 gal | 20 | 80 | 7 | 35.7 | A |
| Check | | 10 | 95 | 90 | 65.0 | AB |
| Tersan 75 + Exhalt | 6 oz + 1pt/100 gal | 35 | 70 | 100 | 68.3 | AB |
| Tersan 75 + Exhalt | 3 oz + 1pt/100 gal | 10 | 95 | 90 | 153.3 | BC |
| Tersan 1991 | 1 oz | 125 | 300 | 125 | 183.3 | C |

Results: Benzimidazole Resistant (BR) Dollar Spot
MSU Soils Farm

When the fungicides were applied on a weekly basis, all the fungicides gave significant control of the BR dollar spot when compared to the untreated control, (Table 5).

When the fungicides were applied on a bi-weekly basis, all of the treatments gave significant control compared to Tersan 75 at 3 oz with Exhalt at 1 pt/100 gal and Tersan 1991 at 1 oz. Many fungicides rank higher than the untreated check, although this control was not statistically significant. (Table 6.)

Conclusions:

Many fungicides can be used against the benzimidazole resistant (BR) strain of the dollar spot fungus. Fungicides that cannot be used against this strain are: Tersan 1991, Fungo 50, Cleary's 3336, Spot Kleen, Mertect 140 and Tobaz. (See 1974 and 1975 Michigan State Turfgrass Fungicide Report.)

## Maple Lanes Nematicide Study

The nematicide studies were conducted on a heavily infested Toronto bentgrass practice green on the Maple Lanes Golf Course in Warren, Michigan.

The study was laid out in three repetitions of a randomized block design. Nematode counts were determined for each plot prior to the application of nematicides and subsequent nematode counts were made one month after application to determine the degree of control being obtained with each material. The two species of turf-pathogenic nematodes which were present in problematic numbers were the ring nematode (Criconemoides spp.) and the stunt nematode (Tylenchorhynchus spp.).

The plot area was sampled and treated on July 28, the granular nematicides being applied with a 3' Scotts drop-type spreader and the wettable powders and emulsifiable concentrates being applied with a 3' $CO_2$ small-plot sprayer. All treatments were irrigated into the root zone immediately after application. The plots were then sampled and nematode counts determined for the ring and stunt nematodes one month later, on August 26.

TABLE 7. Maple Lanes Nematode Study
% reduction - Tylenchorhynchus (Stunt) nematode

| Treatment | Rate/1000ft$^2$ | I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| Nemacur | 3 lb. | 97.1 | 93.2 | 91.5 | 93.5 | A |
| UC21865(wp) | 5 lb ai/A | 60.43 | 66.7 | 54.3 | 60.5 | A |
| CGA12223(20G) | 10 lb ai/A | 84.2 | 74.1 | 0 | 52.7 | A |
| Dasinat | 3 lb. | 21.2 | 49.5 | 44.5 | 38.4 | A |
| UC21865(wp) | 10 lb ai/A | 88 | 5.3 | 20.2 | 37.8 | A |
| CGA12223(20G) | 15 lb ai/A | 45.3 | 74.1 | -16.4 | 34.3 | A |
| CGA12223(4E) | 15 lb ai/A | -116.4 | 78.3 | - 1.2 | -13.1 | A |
| Check | - | -289.5 | -251 | 14.8 | -175.2 | B |

TABLE 8. Maple Lanes Nematode Study
% reduction - Criconemoides (Ring) nematode

| Treatment | Rate/1000ft$^2$ | I | II | III | AVE | (DMR) |
|---|---|---|---|---|---|---|
| Nemacur | 3 lb. | 100 | 88.1 | 80.5 | 89.5 | A |
| CGA12223(20G) | 15 lb ai/A | 61.6 | 68.9 | 82.7 | 71.1 | A |
| CGA12223(20G) | 10 lb ai/A | 70.6 | 27.3 | 48.5 | 48.8 | A |
| CGA12223(4E) | 15 lb ai/A | 31.8 | 7.7 | 89.8 | 43.1 | A |
| UC21865(wp) | 5 lb ai/A | -109.8 | 10.8 | -15.6 | -38.2 | A |
| Dasinat | 3 lb. | -700 | 6.6 | -102.8 | -265.4 | A |
| Check | - | -937.5 | 56.7 | -78.6 | -319.8 | A |
| UC21865(wp) | 10 lb ai/A | -214.4 | -40 | -920 | -391.5 | A |

Results: Nematode Study Maple Lane Golf Club, Warren, Michigan

Table 7 shows that all the nematicides gave a significant reduction in the percentage of stunt nematodes compared to the untreated check. All the nematicides except CG 12223(4E) gave a net reduction in the percent of stunt nematodes after treatment when compared to the counts prior to treatment.

Table 8 shows Nemacur, CGA 12223 (20G) at the 15 and 10 lbs ai/A rate, and CGA 12223(4E) at the 15 lb ai/A rate all gave a positive reduction in the percentage of ring nematodes present after treatment.