2018 Research Report Submit to A-1 Organics

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Evaluation of Non-Manure Based, Stabilized, and Inoculated Compost (COMAND) on Disease Suppression, Thatch Reduction, Soil Health, and Overall Turf Health

Study Site Selection

The study was conducted at three experimental sites. The first site at ARDEC South was chosen to evaluate the effects of COMAND and a conventional compost product on turfgrass quality, soil water holding capacity, thatch reduction, and the potential to reduce synthetic nitrogen inputs. Three cultivars of Kentucky bluegrass (Livingston, Kenblue, and NuGlade) are planted at the ARDEC South site. Two home lawn sites with a history of necrotic ringspot (NRS) were chosen for the study. The first site is located in north Fort Collins CO, and is highly managed Kentucky bluegrass turf. The second site is located in Windsor, CO and is managed by the same landscape company. Turf at the second site is predominantly Kentucky bluegrass with several patches of tall fescue.

The study was initiated in the spring of 2018 and will continue for two years.

Cultural Practices Prior to and Throughout Duration of the Study

For the home lawn sites, turfgrass is mowed weekly at 3 inches. and clippings are returned to the stand of turf. Each site receives approximately 4 pounds of N per 1000 sq.ft per year. Half is applied as an organic N source, and half as a poly-coated slow release N source. The landscape company tries to match ET as closely as possible as published by the Northern Colorado Water Conservancy District.

For the ARDEC South site, turf is mowed weekly at 3 inches and clippings are returned to the stand. Prior to the initiation of the study, the plots had received no supplemental fertilizer for the previous three years. No supplemental fertilizer was applied at the ARDEC South site in 2018. The plots receive 1.75 inches of supplemental irrigation during the months of June, July, and August, and 0.5 to 1.0 inches of supplemental irrigation during September and October.

Treatment Application

In 2018, all of the plots at the north Fort Collins home and at ARDEC South were aerated on May 9. The plots at the Windsor location were aerated on May 25. Aeration and treatment application at the Windsor location was later due to a delay in the availability of irrigation. Plots were aerated again at all three locations, and a second set of treatments was applied on August 15. Plot size was 6' x 10' with two replications at the home lawn sites, and 4.5' x 5' at the ARDEC South site. There are a total of eight plots at each home lawn site, and twelve plots at ARDEC South. Following aeration the following treatments were applied to individually assigned plots and watered in after application with 1.25 cm of water:

- 1. COMAND compost (inoculated with microorganisms) at a rate of 0.8 yd³/1000 ft²;
- 2. A conventional compost (Class 1 without microbial inoculation) at a rate of 0.8 yd³/1000 ft²;
- 3. Quick release, nitrogen fertilizer only (Urea) at a rate of 1 lb N/1000ft²;
- 4. Control, with no fertilizer or compost applied.

Prior to aerating at each of the home lawn locations, turfgrass color, quality, and percent diseaseaffected turf were rated, while turfgrass color and overall quality were rated at ARDEC South. Additionally thatch samples were collected at each site prior to treatment application.

Data Collected

The following data were collected prior to each treatment application and then every two weeks thereafter:

- <u>Turfgrass Color</u>. Color was rated on a 1-9 scale, where 9 is dark green and 1 is brown-colored turf. Turfgrass color ratings were an estimate of how green the turf appeared and is typically primarily influenced by soil and leaf tissue nitrogen content. A rating of 6 is minimum acceptable color.
- <u>Overall Turfgrass Quality</u>. Overall quality based on color, uniformity, and density was rated on a 1-9 scale, where 1= brown turf and 9 is lush, dark green turf. A rating of 6 is minimum acceptable quality.
- <u>% Disease- Affected Turf</u>. The plots were evaluated for the presence of disease using two methods. The first method was to visually evaluate the plots and estimate the straight percentage of each plot affected by disease. Another rating scale used by plant pathologists to rate disease pressure is the Horsfall-Barrat scale. Using the Horsfall-Barrat scale, plots receive a number from 1-12, which corresponds to a range in the percentage of disease present. The Horsfall-Barrat scale is as follows:

| 1= | No disease | 7= | 50-75% |
|----|------------|-----|---------|
| 2= | 0-3% | 8= | 75-87% |
| 3= | 3-6% | 9= | 87-94% |
| 4= | 6-12% | 10= | 94-97% |
| 5= | 12-25% | 11= | 97-100% |
| 6= | 25-50% | 12= | 100% |

- <u>Thatch Depth</u>. Thatch samples were collected monthly using a ¾" diameter soil probe. Five samples were taken from each plot to a depth of 7 cm. The amount of uncompressed thatch present for each core was measured.
- <u>Gravimetric soil moisture content during dry-down</u>. Gravimetric soil water content was measured by collecting soil cores at two depths (0-6" and 6-12") one, two, and 14 days after applying 2.0" of water to thoroughly wet the rootzone of the plots. Moist soil cores were sealed in plastic bags and weighed, placed in a forced air drying oven at 105 degrees F, and weighed again. Gravimetric soil moisture content was calculated by dividing the mass of moist soil cores by the mass of dry soil cores.

Data Analysis

Data from ARDEC south and home lawns were analyzed separately. Effects of treatment, data collection time and their interaction were determined using analysis of variance according to the general linear procedure of the Statistical Analysis System. Analysis of variance test indicated that the compost treatment and data collection time interaction was not significant. Therefore, data collected overtime could be combined. Turf quality, color, and disease severity were subjected to analysis of variance using SAS to test effects of treatments overtime and within individual dates. Means were separated using a protected LSD at $P \le 0.05$.

Preliminary Results, Weeks 1-18

Home Lawn Study Sites

For each of the treatments, the average means for color, quality, disease pressure, and thatch depth are presented in Table 1.

Turfgrass Color

Turfgrass color improved after treatments were applied, although differences were not statistically significant until 4 weeks after treatment application. Overall, COMAND with an average color rating of 7.3, had the best color, with color rating significantly better than the fertilizer treatment or the control

(averages of 6.9 and 6.4, respectively) (Table 1). However, plots treated with COMAND were not significantly better than the conventional compost treatment, with an average color rating of 7.1 (Table 1).

Overall Turfgrass Quality

The results for overall turfgrass quality were similar to those for turf color. This is not surprising, since color is a major component of turfgrass quality ratings. However, significant differences in turf quality were not observed until week 9. By the time treatments were applied again in August, the quality ratings were not significantly different from one another. Over the course of the season, the quality in the plots that received COMAND, were significantly better than those receiving fertilizer alone, or the control, with average ratings of 7, 6.1, and 5.4, respectively. However, there was no significant difference between plots that received COMAND and those that received conventional compost-averages of 7 and 6.7, respectively.

It should be noted that overall quality ratings are lower than turfgrass color ratings. The reason for this is because color is only one component of overall turfgrass quality. The presence of disease would lower a quality rating.

Disease

Generally, over the summer, the amount of disease in the all of the plots decreased. This is not surprising, since the causal agent of necrotic ringspot, *Ophiosphaerella korrae*, is more active in the cool, wet conditions of spring. To further evaluate treatment effects on disease, the second set of treatments was applied on August 15.

Over the course of the season, the percentage of disease in the COMAND-treated plots (10.8%) was significantly lower than the fertilizer alone treatment (18.6), and the control (23.1%). The percentage of disease found in the COMAND plots, however, was not significantly different than the plots that received the conventional compost treatment (Table 1).

The results of the Horsfall-Barrat ratings differed, in that the amount of disease pressure was the lowest in the plots that received COMAND (average rating of 3.1), followed by conventional compost (3.9) which was not different than the fertilizer alone treatment (4.4), but better than the control (4.9).

Research has shown that necrotic ringspot occurs less frequently in turf that receives slow release nitrogen than fertilizer containing immediately available forms of nitrogen. Accordingly, one would expect to see more disease in plots receiving the fertilizer alone treatment, since Urea is a quickly available form of Nitrogen, compared to the slow release nitrogen in compost-based products.

While the plots that were treated with COMAND, had less disease than the fertilizer treatments using both methods of estimating disease, those that received conventional compost were not different than the fertilizer treatment. COMAND was only statistically different from the conventional compost when the Horsfall-Barrat scale was used.

It is interesting to note that the areas of turf outside of the study area that were affected by necrotic ringspot were worse than the formal study area toward the end of the season at both sites. At the north Fort Collins residence, this area is immediately adjacent to the west of the study plots and measures approximately 5 feet by 12 feet. On September 27, 55% of the plot was affected by disease. In Windsor, the area affected by disease is on the other side of driveway measuring approximately ten feet by ten feet. On September 27, 45% of that area was affected by disease. Statistical analysis to compare the outside areas with the plots in the study areas was not performed because the areas outside of the study were not formally included in the study, and therefore were not aerated or randomized as the other treatments were. These observations suggest that aeration plays a part in the reduction of disease severity.

Thatch

Thatch accumulates when organic matter production is greater than organic matter decomposition. One of the practices that is recommended to reduce thatch is core aeration, followed by leaving soil cores on the lawn surface to break down naturally. It is thought that the microorganisms present in soil will help to decompose thatch. In this study, significant treatment effects were first noticed in week 18, where plots that had received COMAND and conventional compost had less thatch than the plots that received fertilizer, and the control.

ARDEC South Study Site

For each of the treatments, the average means for color, quality, and thatch depth are presented in Table 2. Gravimetric soil moisture means during dry- down are presented in Table 3.

Turfgrass Color

Significant differences in color were noted sooner after treatment application at the ARDEC South site compared to the home lawn sites. Significant differences in turfgrass color were first noted two and a half weeks after treatments were applied. The relatively short amount of time that passed before differences were observed is likely due to the fact that the plots had not received any supplemental fertilization for three years prior to the initiation of this study. Differences were not significant after 11 weeks.

Data for the season (until treatments were applied again in August) showed that plots that received COMAND had the best color and was significantly better than the other treatments.

Turfgrass Quality

Overall turfgrass quality ratings showed that plots that received COMAND had significantly better quality than all of the other treatments. These differences were also first observed two and a half weeks after treatments were applied.

Thatch

Significant differences in thatch depth were first noted seven weeks after the initiation of the study. The greatest amount of thatch was observed in the plots that received fertilizer (mean 1.6 cm), and the least amount of thatch was found in the Control plots (mean 0.7 cm.). Although plots that received Compost (mean 1.25 cm) had slightly more thatch than those that received COMAND (mean 0.9 cm.), the difference was not significant. The means for the Control plots and those that received COMAND were not significantly different from each other.

Gravimetric Soil Moisture

There were no differences in gravimetric soil moisture during dry-down at either sampling depth.

Summary

In summary, our findings to date indicate that:

1. For the home lawn sites, over the course of the season (May to Mid-August) COMAND- treated plots had significantly better color and quality than the plots that received fertilizer and the control plots, but were not statistically different than the compost treated plots.

2. At the ARDEC South site, over the course of the season, COMAND- treated plots had significantly better color and quality than all other treatments.

3. For the home lawn sites, generally, COMAND--treated plots had less disease than the other plotsalthough these differences were not always statistically significant. When estimating the straight percentage of disease, there was no difference between COMAND-treated plots and compost-treated plots, but when the Horsfall- Barrat rating was used, there was a significant difference between COMMAND and conventional compost treatments.

4. At the end of each month, the COMAND treated plots at the home lawn sites had less thatch than the other plots. Differences were only significant 18 weeks after treatments were applied, where COMAND treated plots had less thatch than the fertilizer treatment and the control, but not significantly less than the thatch depth in the compost treated plots.

5. Thatch depth in the COMAND- treated plots at ARDEC South were not significantly different than those that received compost. The least amount of thatch was observed in Control plots, which were not significantly different than COMAND-treated plots.

6. There were no differences in gravimetric soil moisture between treatments during dry-down.

Table 1. Season-long averages for color, quality, percentage of disease, Horsfall-Barrat rating, and thatch depth as affected by four different treatments at the home lawn study sites.

| Treatment | Color | Quality | Horsfall- Barrat Rating | % Disease | Thatch Depth (cm.) |
|------------|--------|---------|-------------------------|-----------|--------------------|
| | | | | | |
| COMAND | 7.3 A* | 7.0 A | 3.1 A | 10.8 A | 1.5 A |
| Compost | 7.1 AB | 6.7 A | 3.9 B | 14.2 AB | 1.8 AB |
| Fertilizer | 6.9 B | 6.1 B | 4.4 BC | 18.6 BC | 2.0 B |
| Control | 6.4 C | 5.4 C | 4.9 C | 23.1 C | 1.9 AB |

• Means followed by the same letter are not statistically different.

Table 2. Season-long averages for color, quality, and thatch depth as affected by four different treatments at ARDEC South study site.

| Treatment | Color | Quality | Thatch Depth (cm.) |
|------------|-------|---------|--------------------|
| | | | |
| COMAND | 6.9 A | 6.9 A | 0.9 BC |
| Compost | 6.5 B | 6.4 B | 1.3 AB |
| Fertilizer | 6.4 B | 6.2 B | 1.6 A |
| Control | 6.0 C | 5.9 C | 0.7 C |

Table 3. Gravimetric soil moisture content averages during dry-down as affected by four different treatments at ARDEC South study site.

| Treatment | Og 0-6 Inch Depth | Og 6-12" Depth |
|------------|--------------------------|----------------|
| | | |
| COMAND | 0.24 A | 0.24 A |
| Compost | 0.22 A | 0.22 A |
| Fertilizer | 0.24 A | 0.28 A |
| Control | 0.25 A | 0.24 A |