

## **Final Report**

### **Effect of environmental modifications on the germination and development of Kentucky bluegrass and perennial ryegrass seed in early spring**

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Abstract: Commercial pesticide applicators use more pre-emergent herbicide on turfgrass in New York State than any other pesticide. One IPM goal is to find alternatives to chemical herbicides for lawns. This goal can be met by increasing turfgrass density, since a denser lawn will naturally crowd out weeds. Overseeding in the autumn has recently been demonstrated to improve turfgrass density, but similar efforts in spring have not been successful, due to lack of seed hydration and/or low soil temperatures. This research found that mat, compost and geotextile treatments greatly increased the speed of germination and cover development in perennial ryegrass, and that mat treatments did likewise for Kentucky bluegrass.

Background and Justification: Turfgrasses cover 3.4 million acres in New York State (1). Each year, commercial turfgrass managers and homeowners apply pre-emergent herbicide to turfgrass to decrease infestations of annual weeds, including crabgrass. Among commercial pesticide applicators, pendimethalin, a pre-emergent herbicide for lawns, is the most highly used pesticide (by weight) in New York, with over 2 million pounds applied in 2004 (2). Homeowners do not report their usage, but the total amount of pre-emergent would be significantly higher if their contribution was known. Clearly, any IPM practice that reduces this tremendous herbicide use would be welcome.

Dr. Frank Rossi at Cornell University has demonstrated that high rates of perennial ryegrass seed, applied repetitively in autumn, can dramatically increase turfgrass density on sports fields (3). This concept has been demonstrated by David Chinery and other Cornell Cooperative Extension educators (including Amy Ivy in Clinton County and Rick Harper in Westchester County). As an adjunct to this concept, Chinery has repeated these studies in early spring for three growing seasons (unpublished data), with the idea that if turfgrass density can be increased dramatically in spring, the need for pre-emergent herbicide could be reduced. Instead of applying herbicide, professional turfgrass managers and homeowners could apply seed, with little to no impact on the greater environment. This would provide an IPM alternative strategy to herbicides for weed management.

In a 2007 study, Chinery examined the performance of various cultural practices to germination for perennial ryegrass. This study, in 2008, repeated the perennial ryegrass trials and also examined Kentucky bluegrass. The cultural practices studied include:

1. Use of dark colored compost. It is well documented that dark colored soil increases in temperature faster than light colored soil. Seed germination response to soil color, modified by compost, will be examined.
2. Use of geotextile. Geotextiles have been used for many years in the commercial vegetable industry to modify temperatures in the field. This project will investigate using this product in a turfgrass setting.
3. Use of a germination mat. This product is applied over the seedbed, is left in place as the seed germinates, and then decomposes.
4. Use of paper mulch. This product is applied over the seedbed, is left in place as the seed germinates, and then decomposes.

Objectives:

1. To quantify the influence of compost, geotextile, mat, and mulch material on the rate of perennial ryegrass and Kentucky bluegrass seed germination
2. To quantify the influence of compost, geotextile, mat and mulch material on perennial ryegrass and Kentucky bluegrass seedling density
3. To evaluate this project and share it with various turfgrass audiences

Procedures:

1. A test site at Cornell University's Agronomy Research Farm in Valatie, NY, was used for this study.
2. Perennial ryegrass was seeded at a rate of 6 pounds per thousand square feet. Kentucky bluegrass was seeded at a rate of 4 pounds per thousand square feet.
3. Plots were seeded on April 8, 2008. All plots received a starter fertilizer applied at the recommended rate at the time of seeding.

4. The following five treatments were constructed for both Kentucky bluegrass and perennial ryegrass:

Check	Seed applied once to bare soil
Compost	Seed applied once with one application of compost (1/4" depth) on top
Geotextile	Seed applied once then covered with geotextile
Mulch	Seed applied once and covered with mulch
Mat	Seed applied once and covered with mat

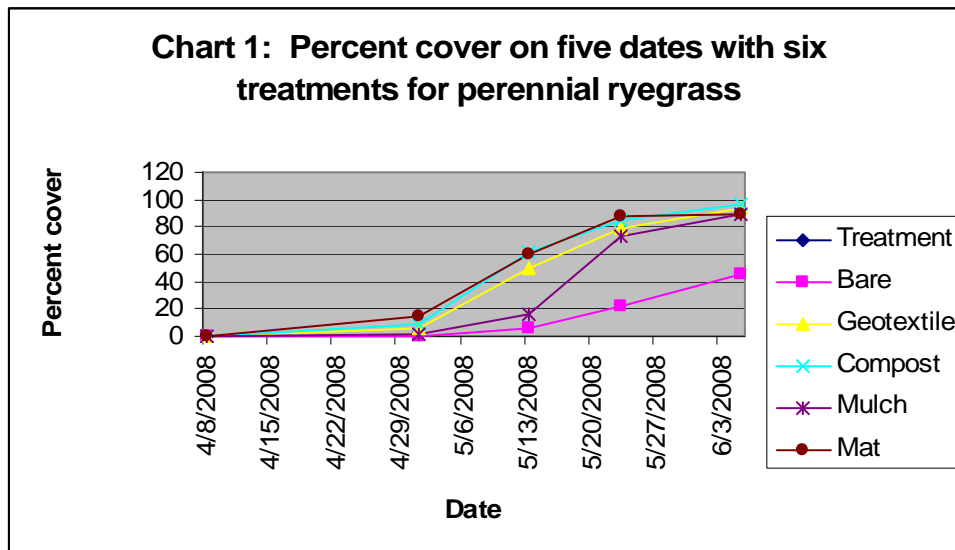
5. The compost used was Vafei Brand. The geotextile was Reemay Garden Blanket. The mulch was Vigoro Ultra Turf Seed Starting Mulch. The mat was Pennington Seed Starter Mat.
6. Each treatment was replicated three times.
7. Germination rate and density were evaluated.

Results for Perennial Ryegrass: Observations were made on the perennial ryegrass plots on April 28, May 1, May 13, May 23 and June 5. Data for these plots is in Table 1.

Table 1. Average percent cover on five dates for ten treatments for perennial ryegrass

	<u>4/28</u>	<u>5/1</u>	<u>5/13</u>	<u>5/23</u>	<u>6/5</u>
Treatment	Percent Cover				
Bare	0.0	0.3	6.0	21.7	45.0
Geotextile	0.0	5.3	50.0	78.3	94.3
Compost	0.0	8.7	61.7	85.0	96.0
Mulch	0.0	1.2	16.7	73.3	89.3
Mat	0.0	15.3	60.0	88.3	90.0

Conditions were extremely dry and there was no rain from April 8 to April 28, with only sporadic rain thereafter. The quickest rate of germination was seen in the mat plots, followed by the compost and geotextile plots, all of which were at least 50% covered with new seedlings by May 13. Germination was much slower in the mulch and bare check plots, which had only 16.7% and 6.0% cover, respectively, on May 13. All plots had similar cover (89 to 96%) by June 5 except for the bare check plots, which had only 45% cover by that date. This data is shown graphically in Chart 1 below.



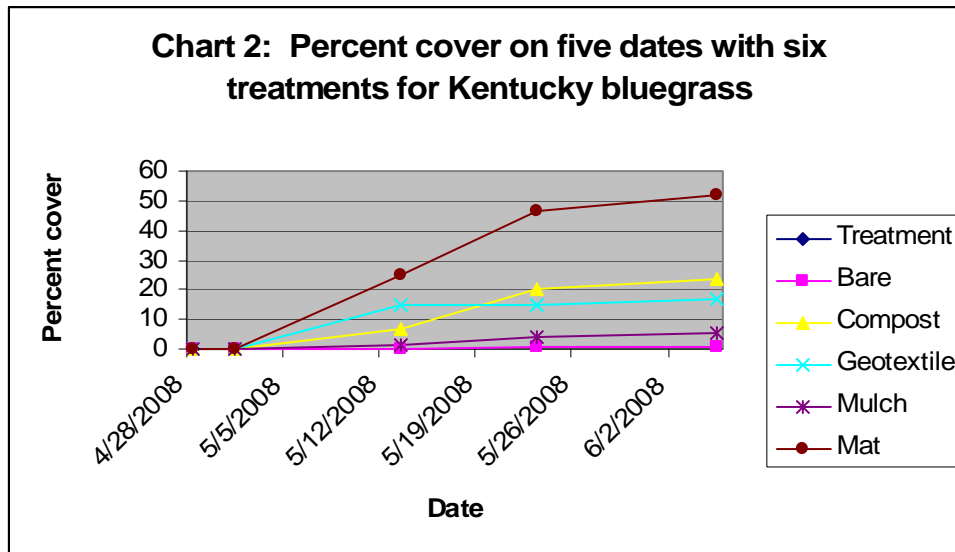
Results for Kentucky bluegrass:

Observations were made on the Kentucky bluegrass plots on April 28, May 1, May 13, May 23 and June 5. Data for these plots is in Table 2.

Table 2: Average percent cover on five dates for ten treatments for Kentucky bluegrass

	<u>4/28</u>	<u>5/1</u>	<u>5/13</u>	<u>5/23</u>	<u>6/5</u>
Treatment	Percent cover				
Bare	0	0.0	0.0	1.0	1.0
Compost	0	0.3	6.7	20.0	23.3
Geotextile	0	0.0	15.0	15.0	16.7
Mulch	0	0.0	1.3	4.0	5.7
Mat	0	0.2	25.0	46.7	51.7

Again, conditions were extremely dry and there was no rain from April 8 to April 28. The earliest germination was seen in the compost and mat plots, but by May 13 more germination had occurred in the mat and geotextile plots. The mat plots by far had the quickest rate of germination and the highest percent cover by June 5, with 51.7% cover. All other plots had much less germination, especially the mulch plots (5.7%) and the bare check plots (1.0%) by that date. This data is shown graphically in Chart 2 below.



Conclusions:

*Observations on the treatments:* Similar observations on the ease of installing the treatment were made in the 2008 study as were made in 2007. Applying the ¼ inch of compost was difficult and time consuming. The compost had to be screened to break up large clumps and create an even application. The geotextile was held down using landscape staples, was easy to use and could be re-used in future years. Both of these methods have an added benefit: unlike the mat treatment, they could also be used on a thin turf area that was overseeded, rather than the bare ground used in this study. This would be a very common situation on home lawns and on sports fields.

The mulch product was easy to apply. The mat was also easy to use and was held down using landscape staples.

Some loss of seed was noted in the bare plots due to high winds, which also blew some compost off of the plots and created the need to stake the mat and geotextile down firmly.

*Perennial ryegrass and Kentucky bluegrass:* For perennial ryegrass, the mat, geotextile and compost plots all showed a quick rate of germination and cover development. The mat treatment may have been the best at keeping the scarce moisture in the ground and available for seed germination. The mat, geotextile and compost methods can all be recommended for perennial ryegrass, based on these results and similar results from 2007. A turf manager might select one of these methods over another given the site (bare soil vs. overseeding into an existing turf), costs, labor available, etc. All three of these methods produced a large number of turfgrass seedlings quickly, which would provide the best possible scenario to outcompete crabgrass and other spring germinating weeds if pre-emergent herbicide is not used.

Perennial ryegrass seedlings in the mulch treatment developed cover much more slowly and therefore would be less competitive with weeds in the weeks after seeding, but eventually caught up to the other treatments by June 5. Seed on bare soil produced a slower developing, less dense cover (45% by June 5) which would be much less competitive.

Germination, seedling development and cover development was slow for Kentucky bluegrass, which was not unexpected, given that this is normally a slow to establish species. The mat treatment produced the quickest germination and the greatest percent cover by June 5 (51.7%), followed by the compost (23.3%) and geotextile (16.7%) treatments. Similar to what was observed in the perennial ryegrass plots, the mat treatment may have been the best at keeping the scarce moisture in the ground and available for seed germination.

By June 5, the bare check plots had very few seedlings present (1.0% cover) and the mulch had only 5.7%. For Kentucky bluegrass, the mat treatment clearly had the best chance of producing enough seedlings to outcompete early spring weeds. Further examination of Kentucky bluegrass under more favorable weather conditions should be undertaken.

Interestingly, perennial ryegrass under the least favorable conditions (bare check plot) produced a similar cover (45.0%) to Kentucky bluegrass (51.7%) under the best conditions (mat).

These results show that it is possible to greatly increase the rate of seedling germination and development in both perennial ryegrass and Kentucky bluegrass using aids to germination.

*Sharing these results:* The results of this research were incorporated into the project leader's overseeding presentations for 2008. These presentations were given to groups at the Westchester Turf and Landscape Conference, a golf course superintendent's meeting at Cornell Cooperative Extension of Westchester County, and at the Sports Turf

Manager's of New York Conference in Syracuse, among others. These results will also be part of a new overseeding brochure, currently under development, which will be shared with Extension educators statewide in 2009.

Sources Cited:

1. New York Turfgrass Survey, New York Agricultural Statistics Service, Albany, NY, 2003
2. Cornell University Cooperative Extension Pesticide Management Education Program website, <http://pmep.cce.cornell.edu/>
3. "Aggressive Sports Turf Overseeding," Dr. Frank Rossi, in "Cornell Field Day '03 Program Booklet," Cornell University, 2003
4. Personal communication with Tom Kilcer, Field Crops Extension Educator, Cornell Cooperative Extension of Rensselaer County



Overall view of the research plots on April 29, 2008. The white fabric is the geotextile, the dark plots are covered in compost, the green plots are covered with the mat, and the pale green plots are covered with mulch.