pennsylvania
DEPARTMENT OF AGRICULTURE

PDA Mushroom Compost Grant Projects

Since 2005 the PA Department of Agriculture (PDA) has awarded agricultural research grants to Pennsylvania growers through the Community Awareness Committee (CAC), now Mushroom Farmers of Pennsylvania (MFPA). The grants are used to explore the beneficial uses of Mushroom Compost (MC) also known as Spent Mushroom Substrate, SMS or Spent Mushroom Compost. The grants help mushroom farmers find alternative uses for Mushroom Compost as a valued added product and to continue growers' commitment to the growth of "green" agricultural products. One of the most important objectives of the grant is to improve the profitability of mushroom farms in Pennsylvania by moving MC from the waste stream into a marketable product that will lead to profitable business opportunities.

MFPA requests proposals from various researchers and Pennsylvania agencies for projects. Three reports from the 2011-2012 grant are highlighted in this issue.

Preliminary Test for Developing an Outdoor Aging Method for Mushroom Compost

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The purpose of this field investigation was to test a method to control weed infestation when mushroom compost is placed in an outdoor environment to passively age the material for future use as an agricultural soil amendment.

At mushroom farms in Southeastern Pennsylvania (i.e., Berks, Chester, and Delaware counties), Mushroom Compost (MC) is often placed outdoors in fields to "passively age" for future use as a beneficial agricultural soil amendment. The major problem with outdoor placement is weed infestation. Although the material is steam pasteurized prior to removal from the farm and potential viable weed seeds are destroyed, outdoor aged MC often becomes infested with many weed species associated with farms and pastures, and these weeds are difficult and expensive to manage. Also, the quality of the MC can be compromised when infested with the various weeds often found in agricultural fields in PA.

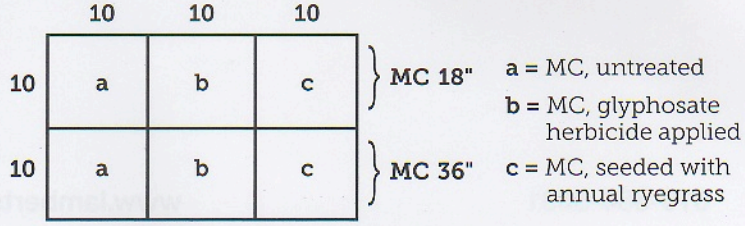
Methods:

Fresh MC from Giorgi Mushroom Company (Reading, PA) was delivered to the test location in a pasture field at the Penn State Berks Campus in Reading, PA. The test site was treated with glyphosate (Roundup 4L herbicide) at 2 quarts product per acre to control and eliminate any existing weeds at the start of the experiment. The herbicide was applied with a backpack sprayer calibrated to deliver 50 gallons water-carrier per acre from a flat-fan spray nozzle discharged at 40 psi.

At the test site, posts and 'chicken-wire' fencing were installed around the perimeter of each individual test plot to contain the MC (Figure 1). The entire plot area or whole plot measured 20 ft x 30 ft. The whole plot was divided into two sub-plots of 10 ft x 30 ft. MC was placed in one sub-plot at a height of 36 inches, and MC was placed in the other sub-plot at a height of 18 inches. Each sub-plot was further divided into three sub-sub-plots measuring 10 ft x 10 ft. These sub-sub-plots served as the 3 (three) treatments: (1) untreated MC, left undisturbed, (2) MC treated with Roundup only when weeds emerged (i.e., post emergence weed control), and (3) MC seeded with annual ryegrass (*Lolium multiflorum*) at 100 lbs per acre, in hopes that the annual ryegrass "cover crop" will prevent or out-compete any weeds from infesting the plot.

The test site was established on March 12, 2012, with plots erected, fresh MC placed into the test plots and annual ryegrass seeded. The herbicide was applied once on June 2, 2012, due to the visual appearance of an excessive amount of weeds present in the test plots.

Figure 1. Diagram of test plot



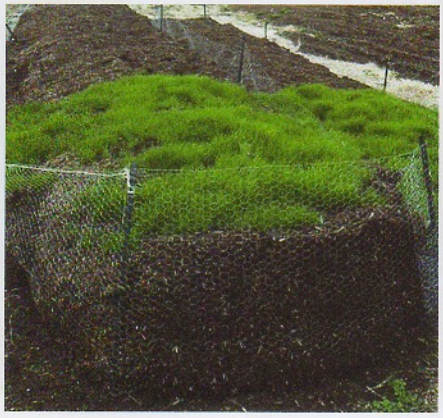


Photo 1: Close-up of annual ryegrass easily germinating and emerging in fresh mushroom compost. Photo 2 & 3: Bottom section = annual ryegrass cover crop; Middle section = applied with glyphosate herbicide; Back section = fallow. Photos taken a few weeks after the start of the field trial. On the left-side, fresh mushroom compost was initially piled to a 36 inch height; on the right-side, fresh mushroom compost was initially piled to a 18-inch height.

Results:

Results from this preliminary investigation are shown in Tables 1 and 2. Overall, the results were similar with MC stored outdoors at either the 36-inch or 18-inch height. Therefore, initial storage height would be a preference by each individual mushroom farm. Weed infestation was observed in untreated MC plots. These weed species consisted of lambsquarter, foxtail and a few other species. Weed infestation was also observed in Roundup-treated plots, however, when weeds appeared, those plots were treated with Roundup to control with weeds. No weeds were observed in plots seeded with annual ryegrass. The annual ryegrass emerged and provided a thick, dense cover, and therefore may have prevented weed seeds from establishing or perhaps out-competed the weeds. In conclusion, seeding MC into annual ryegrass would be an economical solution to preventing or minimizing weed infestation in outdoor-aged MC, since treating with Roundup has an expense of both materials and labor.

Compost was placed at the aging site in the spring and divided into three contiguous plots, as shown in the photos. Each plot had the same amount of compost spread the same way, but had three different treatments to compare weed seed control. These were:

- Compost with a cover crop; annual rye grass was sown into compost.
- Treatment with Glyphosate to prevent weed growth and seed production.
- Fallow, to allow natural weed propagation.

Table 1. Annual ryegrass cover[1] on the fresh mushroom compost (MC) test plots, 2012

	3/12	3/28	4/12	4/29	5/15	6/2	6/14	6/28
36-inch Height Fresh MC	%							
Not seeded, untreated	0	0	0	0	0	0	0	0
Not seeded, glyphosate-treated	0	0	0	0	0	0	0	0
Seeded with Annual Ryegrass[2]	0	2	15	40	80	99	99	99
18-inch Height Fresh MC	%							
Not seeded, untreated	0	0	0	0	0	0	0	0
Not seeded, glyphosate-treated	0	0	0	0	0	0	0	0
Seeded with Annual Ryegrass[2]	0	5	15	30	75	95	99	99

[1] Annual ryegrass cover visually estimated as percent plot surface-area covered.
[2] Annual ryegrass seeded at 100 lbs/acre on 3/12/12; not irrigated (i.e., relied on natural rain for germination).

Table 2. Weed cover on fresh mushroom compost (MC) test plots. 2012

	Plot area covered with weeds[2] 6/2	Plot area covered with weeds [2] 6/28	Plot area covered with annual ryegrass 6/2	6/28
36-inch Height Fresh MC	%			
Not seeded, untreated	80	85	0	0
Not seeded, glyphosate-treated	70	< 1	0	0
Seeded with Annual Ryegrass	< 1	< 1	99	99
18-inch Height Fresh MC	%			
Not seeded, untreated	90	98	0	0
Not seeded, glyphosate-treated	75	< 1	0	0
Seeded with Annual Ryegrass	< 1	< 1	99	99

[1] Annual ryegrass seeded at 100 lbs/acre on 3/12/12; not irrigated (i.e., relied on natural rain for germination).
[2] Glyphosate (Roundup 4L) applied at 2 qts per acre on 6/2/12; weed cover, and annual ryegrass cover, visually estimated as percent plot surface-area covered.

First samples will be taken in the spring of 2013 to assess changes to the mechanical, chemical and biological properties of the compost in addition to the number of weed seeds present.