Artillery Fungi

Suppression by Mushroom Compost

Don Davis
& Mike Fidanza
Artillery Fungi

Will start with a review...
What grows in my mulch??
Mushrooms...

Some edible...

Some poisonous

“Toadstools”
Slime Molds... "Dog Vomit"
Stinkhorns...

Attract flies

“Eggs”

Smell bad
Bird’s Nest Fungi... ("splash cups")

Rainsplash
Passive, not active
Artillery Fungi

Very small, difficult to see...

0.1 inches across...
Don’t confuse with Bird’s Nest Fungus
What are Artillery Fungi?

a. **Wood decay** fungi in nature (as such live in landscape mulch)

b. **Shoot sticky spores (onto sides of houses)**
   Light colored, then turn black; leave stain

a. World-wide, but a major problem in the Northeast

d. Often very severe in SE PA and NJ
How Does The “Artillery” Work?

- Membrane is flipped
- Orients toward light...
- Spore is flipped up into the air

(Ingold 1972)
When thousands of spores land on the side of your house, you have a problem!!

Spore stuck to siding

Sticks like “super glue”

Leaves a brown stain
Artillery Fungi

On House Siding

Lots of complaints…
We Are Interested In Three Factors

Artillery
Fungus

Mulch
Compost
1. Landscape Mulch

a. Great demand for landscape mulch

b. Annually, the landscape industry of PA applies approximately 5,000,000 cu yards in PA (worth approximately $125,000,000); applied during a 3.5-month period each year

b. Of that, **2,700,000 cu yards** are sold in SE PA
2. Artillery Fungus

- More housing developments built...
- So, more mulch is used...
- The mulch is currently mainly recycled wood, not bark...
- Climate in SE PA and NJ seems ideal for artillery fungus...
- All of which favor the artillery fungus...

In addition...
  + Light-colored vinyl siding...
  + Public awareness, perception...
Artillery fungus...

Spores can be carried by the wind to the second story of a house
Not only on the house, but also on foundation plantings

Spores on Hosta

On Astilbe
More Plantings

Rhododendron

Redbud
Even on Stone

Will not **grow** on stone...
Infested leaves, infest the mulch when they drop

So, if the nursery has an artillery fungus problem...
Spread by rabbits and deer in droppings

**What does this suggest about liability as well as control?**
3. Mushroom Compost

a. Annually, the mushroom industry of PA has sales of approximately $400,000,000 but in doing so, produces 1,200,000 cu yards of used (recyclable) mushroom compost each year.

b. Most used mushroom compost is produced in SE PA.

c. $1,200,000 \div 2,700,000 = 44.4\%$**
Penn State Research

Blending Used Mushroom Compost With Landscape Mulch To Suppress Nuisance Fungi
Early Study
1. 27 Different Mulches
Filled plots with 27 different mulches
Inoculated Mulch

Using spores on Petri plate lids
Initial Results (2002)
27 Mulches in Field Trial, put in 9 Groups

Aged

Results only
3. Field Plots at Berks Campus Using Fresh
Obtained **Fresh** Used Mushroom Compost From Giorgi Mushrooms
Constructed Blends Using Fresh

100% mulch → 100% compost

0, 10, 20, 40, 100% Blends
Inoculated Mulch Plots
4. Results: **Fresh Compost**
   *(On-going 2009)*

![Graph showing number of species per square meter with percentage of mushroom compost]
5. Bird’s Nest Fungi

Splash cups
Bird’s Nest Fungi
(in press)
6. Slime Molds  
(in progress)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Mulch</th>
<th>% Compost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>100</td>
</tr>
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</table>
Slime Molds (in progress)

- 5 treatments
- 15 bins/treatment
- 2 replications
- Total = 150 bins
Publicity & Marketing*

Newspapers

*Lynda Farrell
Blue Heron Consulting

NPR Radio
Public and Industry Awareness

Trade Magazines

Spent Mushroom Compost Can Help Win the War Against Artillery Fungi

BY DONALD D. DAVIS, MIKE FIDANZA & LARRY J. KUHNS

Summer 2007

Soil & Mulch Producer NEWS
Serving Mulch & Soil Producers and Soil Remediation Contractors

Green Gardens in the Age of Global Warming

Taking A Closer Look At The Canadian Sphagnum Peat Industry As It Faces Today's Environmental Challenges

By Donald D. Davis, Mike Fidanza & Lynda Farrell

Photo courtesy of Lynda Farrell, Blue Heron Consulting, Honeysuckle Hill Farms

Blending Landscape Mulch With Mushroom Compost:
A Green Solution to the Artillery Fungus Problem

By Donald D. Davis, Mike Fidanza & Lynda Farrell
Trade Magazines

**Blending Landscape Mulch with Mushroom Compost: A Green Solution to the Artillery Fungus Problem**

With the increase of both commercial and residential development, beautifully maintained landscape mulch beds are increasingly in demand. At the same time, the popularity of landscape mulch has been an economic boon to the landscape mulch industry. However, the rising use of landscape mulch has also been associated with an increased incidence of a relatively new plague – the explosive artillery fungus, *Sphaerobus sp.*

**The Problem**

The public has become aware that artillery fungi are the cause of sticky tar-like spots that tenaciously and permanently affix themselves to the sides of buildings, houses and automobiles. When homes are bombarded by artillery fungus, owners turn to their insurance agents expecting compensation but the fungus is not covered by their policy.

Homeowners file costly lawsuits against landscape professionals when claims are denied. Since the explosive artillery fungi live in landscape mulch, homeowners think landscape professionals must somehow be responsible.

Using a decade of research data and expertise as Professor of Plant Pathology at Penn State, Dr. Davis has successfully testified on behalf of landscape professionals under litigation from property owners whose homes have been shot with artillery fungi living in landscape mulch.

**The Fungus**

Artillery fungi have two entirely different life styles, having developed a very successful “dual ecology” survival strategy. They can survive as white rotting, wood-decay fungi on dead trees, branches, wood and bark. The fungus also can live on droppings of herbivores such as rabbits.

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**Environmental Issues**

Pennsylvania Nutrient Trading – Jole Neidle

Blending Landscape Mulch with Mushroom Compost – David D. Davis, Michael Fidanza, Lynda Farrell

Food Safety Meets More Than Morale: Testing – Robert Biliaver
Brochures (AMI)

Using Mushroom Compost to Prevent Artillery Fungus

1. Suppresses sporulation of the artillery fungus in landscape mulch.
2. Decrease or eliminate the cost of liming by using a low cost, consistently high-quality organic fertilizer of Mushroom Compost.
3. Restore soil structure by improving soil quality, nutrient content and beneficial soil microbe population and activity.
4. Improve water retention during drought conditions and in poor soils.
5. Mushroom Compost’s organic nutrient values are consistently and available year round.
6. It is sustainable agriculture and a good environmental stewardship practice, providing a nutrient rich soil amendment in a complete ecological recycling process.
7. Addition of compost reverses soil organic matter depletion, providing improved turfgrass and plant production.
8. Composting stabilizes nitrogen and reduces nitrate leaching.
9. Improved water infiltration in clay soils.
10. Mushroom Compost is a Pennsylvania Department of Agriculture (PDA) accepted fertilizer and PA Preferred product.

Support for this project was provided by a grant from the Pennsylvania Department of Agriculture.

Top 10 Reasons to Use Mushroom Compost in Landscaping & Lawn Care

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<th>Reason</th>
<th>Benefit</th>
</tr>
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<td>1.</td>
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Mean of Parameters Measured/Calculated On a Wet Volume Basis:

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<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Bulk Density</td>
<td>574.73 lbs/yr³</td>
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<tr>
<td>pH</td>
<td>6.62</td>
</tr>
<tr>
<td>C:N (carbon-to-nitrogen) ratio</td>
<td>12.79:1</td>
</tr>
<tr>
<td>Soluble salts (1:5 w:w)</td>
<td>13.27 mmhos/cm</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Parameter</th>
<th>Value (lbs/yr³)</th>
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<tbody>
<tr>
<td>Solids</td>
<td>243.37</td>
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<tr>
<td>Moisture</td>
<td>331.47</td>
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<tr>
<td>Organic Matter</td>
<td>146.73</td>
</tr>
<tr>
<td>Carbon (C)</td>
<td>81.13</td>
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<tr>
<td>Total Nitrogen (N)</td>
<td>6.40</td>
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<tr>
<td>Organic Nitrogen (Organic-N)</td>
<td>6.19</td>
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<tr>
<td>Ammonium Nitrogen (NH₄-N)</td>
<td>0.21</td>
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<tr>
<td>Phosphorus as P₂O₅</td>
<td>3.82</td>
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<tr>
<td>Potassium as K₂O</td>
<td>7.10</td>
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<tr>
<td>Calcium (Ca)</td>
<td>13.17</td>
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<tr>
<td>Magnesium (Mg)</td>
<td>2.01</td>
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<td>Sulfur (S)</td>
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<tr>
<td>Iron (Fe)</td>
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<tr>
<td>Manganese (Mn)</td>
<td>0.12</td>
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<tr>
<td>Copper (Cu)</td>
<td>0.04</td>
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<tr>
<td>Sodium (Na)</td>
<td>0.67</td>
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<tr>
<td>Aluminum (Al)</td>
<td>0.89</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>0.05</td>
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www.mushroomcompost.org
Handout on Frequently Asked Questions

Artillery Fungus

Bulbous Mushrooms

With Landscape Mulch

Q: What is the 2-3 cm soil layer on top of the landscape mulch?
A: The soil layer is added to the landscape mulch to provide nutrients and moisture for the bulbous mushrooms. It also helps to retain water and improve the health of the soil.

Q: Why is the soil layer important?
A: The soil layer is important because it provides a suitable environment for the bulbous mushrooms to grow. Without it, the mushrooms may not thrive.

Q: How long does it take for the bulbous mushrooms to grow?
A: The bulbous mushrooms typically take 2-3 years to mature and produce fruiting bodies.

Q: How do I care for the bulbous mushrooms?
A: To care for the bulbous mushrooms, make sure to keep the soil layer moist and well-drained. Also, fertilize the soil layer regularly to provide nutrients for the mushrooms.

Q: Can I eat the bulbous mushrooms?
A: It is safe to eat the bulbous mushrooms, but make sure to identify them correctly before consuming them. Some types of mushrooms are poisonous and can be deadly.

Q: What is the benefit of using landscape mulch?
A: Landscape mulch helps to retain water, improve soil structure, and suppress weeds. It also provides a suitable environment for bulbous mushrooms to grow.

Q: How do I apply the landscape mulch?
A: To apply the landscape mulch, spread it evenly over the soil layer and water it well. Make sure to spread it to the edges of the landscape bed to provide the bulbous mushrooms with a suitable environment to grow.
Bottom Line: Why not blend landscape mulch with Used Mushroom COMPOST???