



# Suppression of Powdery Mildew (*Podosphaera xanthii*) by Compost Tea on Dill's Atlantic Giant (*Cucurbita maxima* 'Atlantic Giant') Pumpkin Plants

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## Introduction

Compost tea has a long history of use for suppressing diseases of plants. The popularity of compost tea is increasing in both the homeowner and organic areas. There is little scientific research, however, to support the anecdotal evidence for disease suppression.

One suggested mechanism for disease suppression by compost teas include biofilm formation, which is described as, "bacteria adhering to environmental surfaces in multicellular assemblies" (Ramey *et al.* 2004). Beneficial microbes from teas may competitively exclude the pathogen by the formation of biofilms. Another suggested mechanism is a change in pH on the leaf surface, which can reduce disease symptoms. However, Ferrandino *et al.* (2006) showed that a milk solution was more effective against powdery mildew than 1% baking soda (NaHCO<sub>3</sub>), indicating there are other factors affecting disease suppression than only pH alterations.

The objective of this experiment was to test the effectiveness of actively and passively brewed compost teas for the suppression of powdery mildew on giant pumpkin plants.

## Materials and Methods

This study was conducted at the Research Station at the University of Connecticut in Storrs. Giant pumpkins were transplanted at the three leaf stage in a randomized complete block design with two replications. The experiment was located adjacent to a field with many different types of cucurbits to increase the chance that inoculum would be present. Fertilizer was applied based on recommendations from the Soil Test Lab at the university.

### 5 treatments

1. Control, no treatment
2. Compost Tea (active) applied early in week, and 40% milk applied later in week
3. Compost Tea (active) applied early in week, and Bacteria Brew + 40% milk later in week
4. Compost Tea (passive) applied early in week, and 40% milk applied later in week
5. Chemical control (Daconil a.i. Chlorothalonil)

### Recipes:

#### Actively and Passively Aerated Brews

- ◆ **Compost:**  
0.8 oz. per gallon Alaskan Humus  
0.8 oz. per gallon Worm Castings

- ◆ **Nutrients:**  
1 oz. per gallon SoilSoup Nutrient solution  
0.5 tsp per gallon Organic Gem Fish  
0.5 tsp per gallon Joel Holland Kelp  
0.5 tsp per gallon TurfPro

#### Bacteria Brew (Used in treatment #3 only)

- ◆ Serenade MAX 0.5 tsp per gallon
- ◆ SoilSoup Nutrient Solution 1 oz. per gallon
- ◆ - Milk was added to the finished (12-14 hr.) actively aerated bacteria brew and applied on the 7-10 day schedule.

Dechlorinated water was used for all brews. The compost tea and the milk and bacteria brew were on a 7-10 day spray schedule with the milk and bacteria brew sprayed a few days after the compost tea. When possible the applications occurred the day after a rain storm.

The actively and passively aerated compost brews both had the same ingredients, only the method of aeration and time differed in their production. The aerated brew was made using an air pump to directly add air to the compost-water-nutrient mix for a period of 12-14 hrs. before being applied. The passively aerated brew had a paddle system that stirred the ingredients and ran for 20-24 hrs. before being applied.

The milk treatments were created by adding powdered milk to water at a 40% dilution. The Bacteria Brew was a distinct brew that was produced by using active aeration, Serenade MAX, and a nutrient solution. This combination was used only in treatment 3.

The percentage of leaf surface covered by powdery mildew colonies was assessed about every 5 days by using the Horsfall-Barratt scale. Each plant was visually evaluated on three different leaf sample sizes: the single worst leaf, an 8-leaf sample size, and the entire plant.

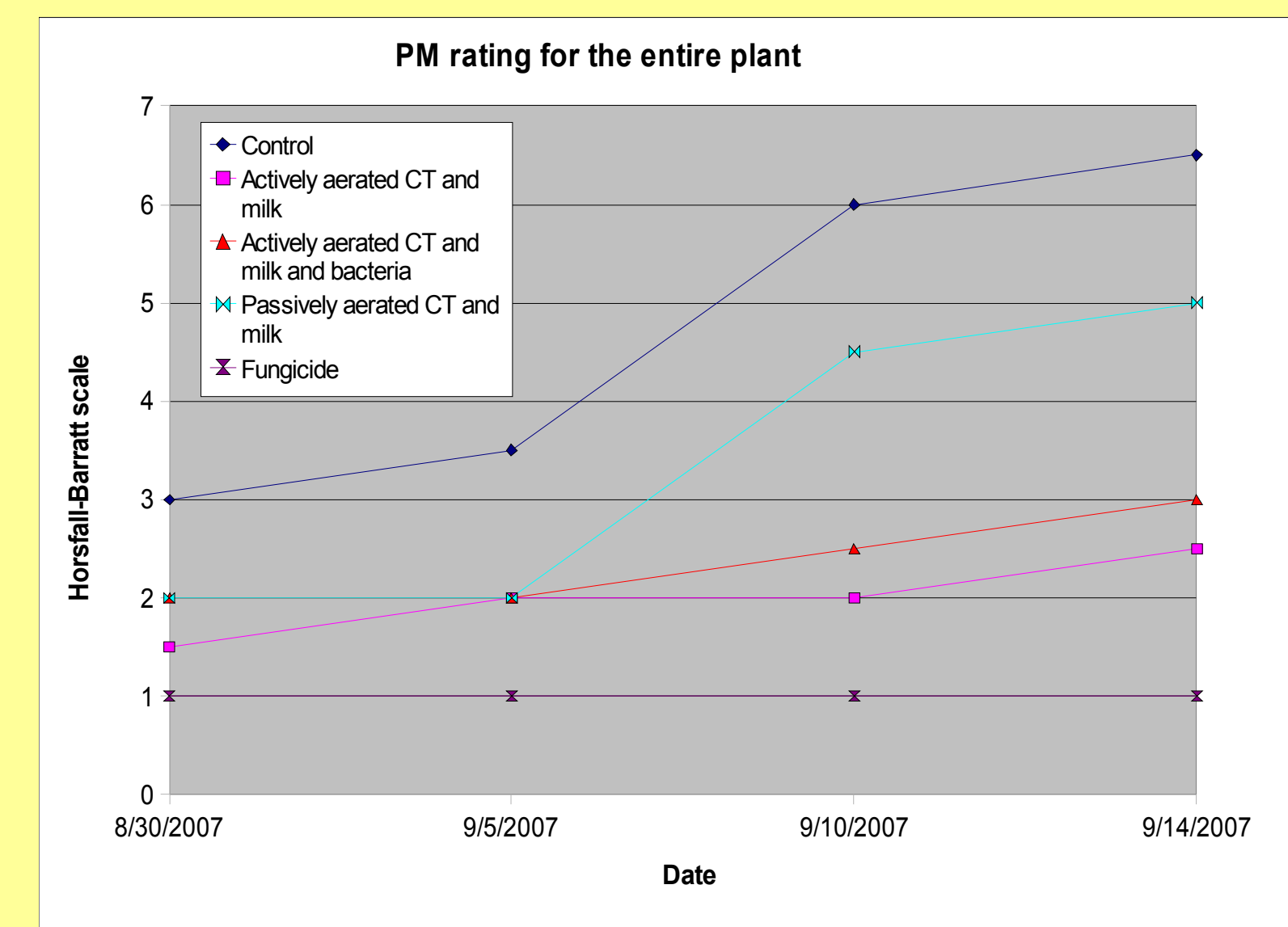
## Results

This picture was taken in the field in mid-September 2007. The leaf on the left is from a control plot, while the leaf on the right is from the Compost Tea (actively aerated) and 40% milk treatment.

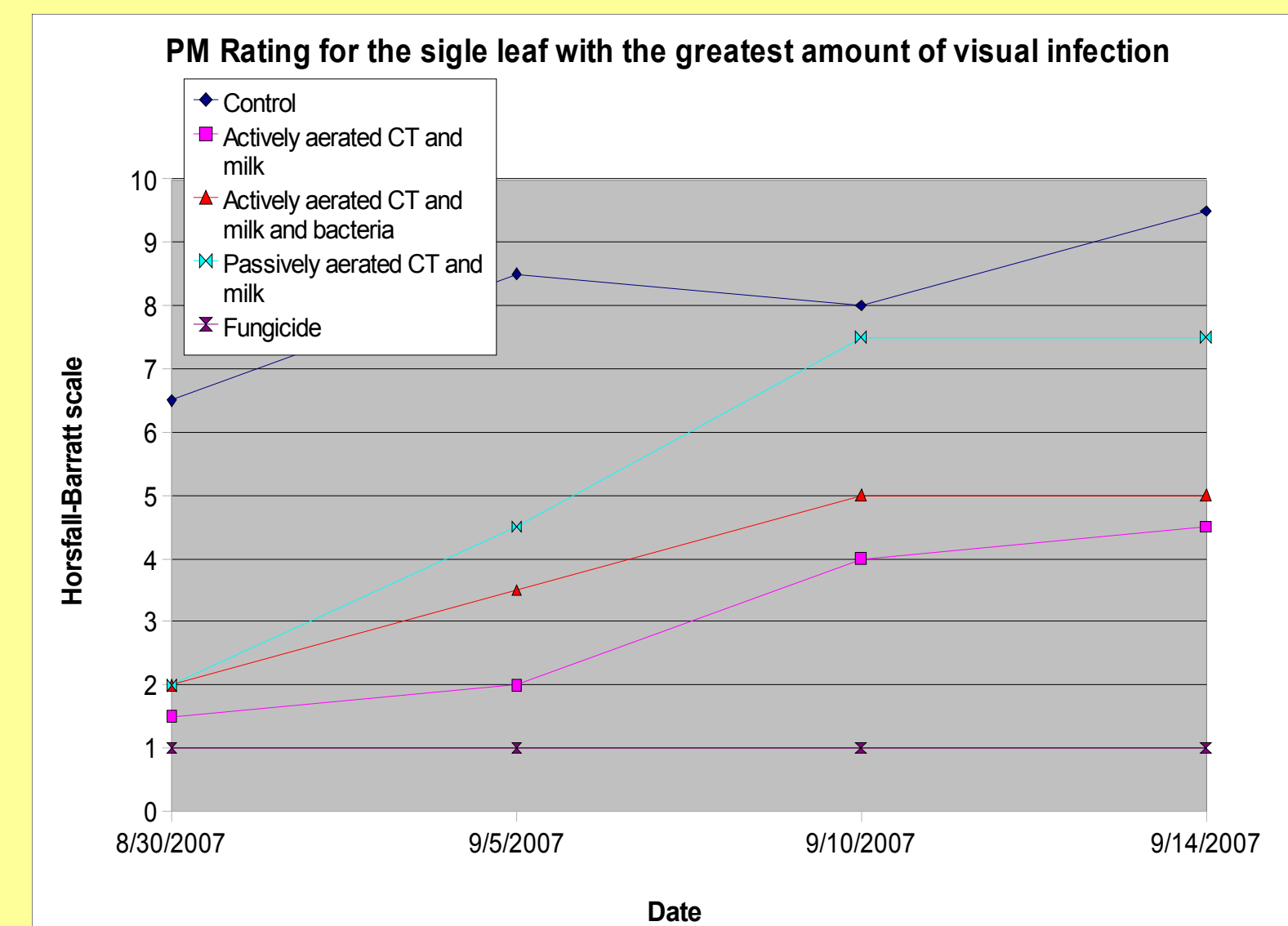
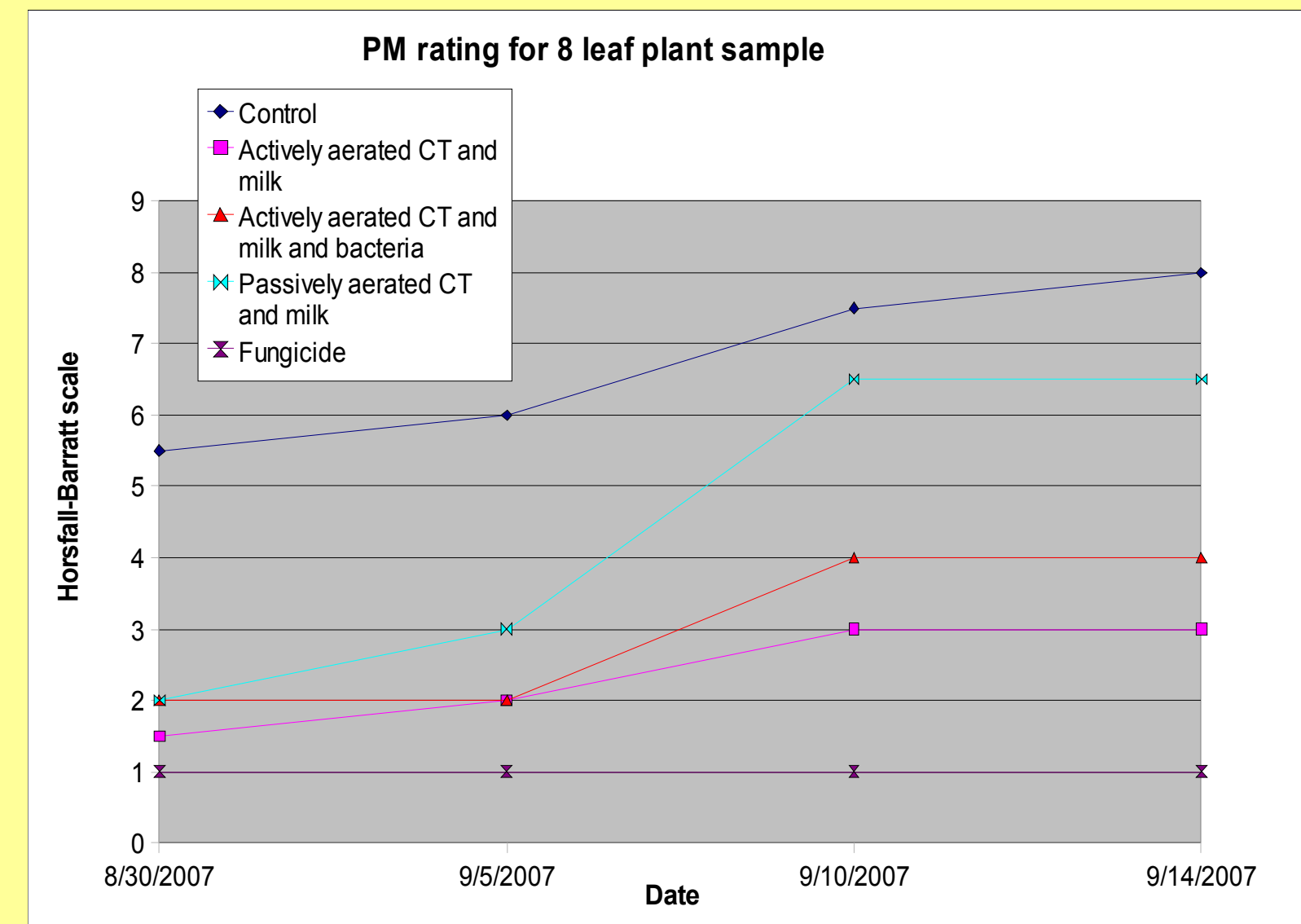


## Results

Index	Percent Affected
1	0
2	0 to 3
3	3 to 6
4	6 to 12
5	12 to 25
6	25 to 50
7	50 to 75
8	75 to 87
9	87 to 94
10	94 to 97
11	97 to 100
12	100



There were large differences in the ability of the treatments to suppress powdery mildew. The control treatment had a high disease rating, which indicates there was a good source of inoculum in this experiment.



Visual ratings of powdery mildew for the 8-leaf sample and the single-leaf sample were similar to the ratings for the whole plant shown above. The two actively aerated compost tea treatments showed a significant decrease in disease severity.

## Discussion

◆ The weather in the 2007 growing season had below-normal rainfall and a warmer than average September. Because this field was not irrigated, the plants showed signs of slow growth due to a lack of water. While severe wilting was not noted, the vigor and growth of the plants was reduced. Deer also pruned some of the newer growth and older leaves on some of the plants.

◆ There was a visually obvious reduction in disease through the use of compost teas.

◆ In all leaf sample sizes the disease severity is similar, with the actively aerated compost tea and 40% milk treatment showing the greatest ability to suppress disease.

◆ Previous research has shown Serenade MAX was an effective suppressant of powdery mildew. The bacteria brew, which included the use of Serenade MAX, did not enhance the effectiveness to suppress disease. This could be because the milk had some detrimental effect on the bacteria.

◆ Serenade MAX has been reported to reduce powdery mildew when used with a copper-based fungicide, however, copper in the environment has negative effects and was not used for that reason.

## Conclusions

◆ Actively aerated compost tea suppressed powdery mildew better than the passively aerated tea.

◆ Adding bacteria to the brew did not increase the ability of the tea to suppress disease.

◆ The fungicide treatment provided the most effective control of powdery mildew, but because we did not measure yields, it is unknown if the fungicide treatment provided a yield benefit compared with the actively aerated compost tea.

## Acknowledgments

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## References

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