Efficient Microbes (EM)® for Pest Management in Organic Cucumber Plants in the Humid Tropics

Presented by Matthew Wood, SCD LLC

INTRODUCTION

SCD Efficient Microbes (EM)® is a mixed, probiotic culture of beneficial microorganisms which works to repopulate environments with good bacteria. This is a natural process, harnessing powerful and beneficial microbes to achieve results.

- **Agriculture** -- SCD EM-Ag™ enriches the soil and produces high-quality crops at a higher yield; reduces pests and disease and decreases the need for weeding, tilling and agricultural chemicals.
- **Livestock** -- SCD Efficient Microbes (EM)® significantly reduces foul odors, improves animal health,reduces mortality rates, and increases the quality of meat & dairy.
- **Environmental** -- SCD EM-Ag™ is used to clean polluted waters including the cleanup of oil spills, the recycling of water from sewage facilities, odor and fly control in composting facilities, and recycling of organic waste into quality fertilizer.

Diaphania nitidalis is a moth that commonly damages crops of cucumbers, summer squash, and muskmelons from North to South America. It is conventionally controlled using chemical insecticides but these chemicals are damaging to beneficial insect populations and aquatic life. These chemicals are dangerous for the farmer to work with and there is evidence that they can remain on crops and be ingested by the consumer. Because of these dangers, there are growing movements like organic farming in which these synthetic chemical pesticides cannot be used. Therefore, alternative methods of managing pest population must be developed.

Using an integrated approach of augmenting the natural, beneficial microorganisms in the soil and on cucumber plants using different applications of SCD EM-Ag™ has given promising results in the control of ***Diaphania nitidalis***. At EARTH College in Costa Rica, field trials were carried out using different foliar treatments of beneficial microorganisms to determine their effect on yields and ***Diaphania nitidalis*** infection.

The beneficial microbial inoculants used for foliar treatments are know as EM-Fermented Plant Extract (EM-FPE) and EM-5. These are made by an anaerobic fermentation of different materials using EM to initiate the fermentation process.

PEST CONTROL FORMULAS

EM-5

Plant materials:

Garlic chopped (2% by volume),
Chili peppers chopped (0.5% by volume),
Flowers chopped (2% by volume)

Solution materials:

Water (60% by volume),
Molasses (10% by volume),
Natural Vinegar (10% by volume),
Distilled Alcohol (10% by volume)
SCD EM-Ag™ (10% by volume)

EM-FPE (Fermented Plant Extract)

Plant materials:

Citronella (25% by volume),
Eucalyptus leaves (25% by volume),
Citrus rinds (25% by volume),
Weeds (25% by volume)
Total dry volume = 60% unpacked volume of container

Solution materials:

Water (94% by volume),
Molasses (3% by volume),
SCD EM-Ag™ (3% by volume)

Full instructions and optional variations on the formulas are available at www.SCDWorld.com

MATERIALS AND METHODS

In a field trial, 240 cucumbers were grown organically in a randomized complete block design on 12 plots. Each plot received 21 kg of traditional compost and 3 kg of EM Banana Bokashi compost 14 days before seeding. All blocks received the same kind and quantity of irrigation. There were 3 different types of foliar treatments and 4 replications of each treatment. Foliar treatments were applied in the same volume every 4 days. The foliar treatments were applied every 4 days throughout the entire life of the cucumber plants. Treatments were:

1. Water (control)
2. EM-FPE diluted in water alternating with water
3. EM-FPE diluted in water alternating with EM-5 diluted in water

RESULTS

Control replications matured slower than and were not as large as replications receiving EM-FPE + Water or EM-FPE + EM-5. Leaf Blight appeared in the control plots at an average of 22 days before the end of harvest, while it appeared in the plots receiving foliar applications of beneficial microorganisms (EM) an average of 16 days before the end of harvest.

The amount of fruit produced by the control plots was significantly lower than the amount of fruit produced by plots receiving EM-FPE + Water or EM-FPE + EM-5. The difference in the amount of fruit produced between the two foliar treatments of SCD EM-Ag™ was not significant.

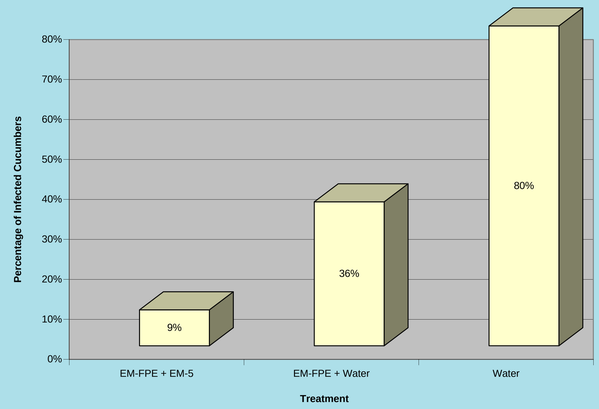
AVERAGE QUANTITY, WEIGHT, AND YIELD OF CUCUMBERS

Treatment	Total Yield (g / m²)	Quantity Harvested (cucumbers / m²)	Weight of Individual (g / cucumber)	Yield Not Infected	% of Yield Infected
Water	3296.4 a	14.8 a	223.3 a	628.6 a	80 a
EM-FPE + Water	4416.9 bc	18.8 b	235.6 b	2,799.6 b	36 b
EM-FPE + EM-5	4860.3 b	20.9 b	232.8 b	4,414.9 c	9 c
Average	4191.2 c	18.2 b	230.6 b	2614.6 b	

Treatment means and percentages in a column sharing the same letter are not significantly different from each other according to Duncan's Multiple Range Test.

Cucumber plants from treatment receiving EM-FPE alternating with EM-5. Note the deep green color and absence of leaf blight.

Cucumber plants from treatments receiving only water. Note the dead leaves with leaf blight.



As seen in the following figure, the cucumbers that received EM-FPE + EM-5 had very low incidence of pickleworm infection, followed by EM-FPE + Water. Cucumbers that received only water had much higher pickleworm infections than treatments receiving EM inoculants. All of these differences are significantly different using Duncan's Multiple Range Test.

CONCLUSIONS

The quantity, weight, and overall yield of cucumbers was significantly higher in treatments that received beneficial microbial inoculants. Foliar applications of EM-FPE alternating with water had significantly higher marketable yields than control applications. Foliar applications of EM-FPE alternating with EM-5 significantly increased marketable yields over applications of water and applications of EM-FPE alternating with water. The differences among growth of the plants, health of the plants, fruit produced, fruits infected by ***Diaphania nitidalis***, and marketable yields signifies that the foliar inoculation with beneficial microorganisms (EM) significantly helped the overall growth, health, and yield of cucumber plants.

DISCUSSION

The increased levels of beneficial microorganisms had three main effects; increase of a wide range of plant available nutrients, repelling harmful insects, and higher levels of antioxidants. These three aspects can be seen as the result of an energy shift in the entire system that is catalyzed by the increased populations of beneficial microorganisms. This shift is a regenerative shift that occurs as the microbial diversity increases to a level that is closer to what was perhaps at one point the native microbial diversity of the soil. With higher diversity comes more stability and therefore a naturally healthy system that plants can thrive in.

The diversity of beneficial microorganisms is greater with the application of both EM-5 and EM-FPE, than with EM-FPE alone. This is because the process of fermentation and the materials used for EM-FPE and EM-5 are different. EM-5 produces higher populations of species of lactic acid bacteria which create esters that deter insects by making a barrier between the insect and the plant. The repellent nature of EM-5, and the odor produced by the EM-FPE result in a much lower level of insect infection as seen in the results of pickleworm infection in this experiment

Original paper titled "Foliar Applications of EM_Fermented Plant Extract Alternating with EM5 Controls Pickle Worm (*Diaphania nitidalis*) in Organic Cucumber Plants in the Humid Tropics" 1997.
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About SCD

To be the premier global developer of probiotic EM technology and strategically partner to commercialize products & services, enhancing health and the environment.

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SCD EM INSIDE™

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