Improving strawberry plant health with entomopathogenic fungi

Surendra Dara
Strawberry and Vegetable Crops Advisor and Affiliated IPM Advisor
University of California Cooperative Extension, San Luis Obispo, Santa Barbara and Ventura Counties

Under the soil is a complex and dynamic world of moisture, pH, salinity, nutrients, microorganisms, and plant roots along with pests, pathogens, weeds and more. A good balance of essential nutrients, moisture, and beneficial microorganisms is critical for optimal plant growth and yield. Healthy plants maintain a good balance of nutrients and natural plant defense compounds that help them withstand stress caused by biotic and abiotic factors.

There are some products that promote plant growth and improve health, yield potential and quality. Some have mycorrhizae while others have a blend of micro and/or macro nutrients that are utilized by plants as well as beneficial microorganisms in the soil that promote plant health. In addition to the macro nutrients such as nitrogen, phosphorus, and potassium, several micro nutrients are critical for optimal growth and yield potential. Understanding the plant-microbe-nutrient interactions and how different products help crop production are important for making appropriate decisions.

Mycorrhizae or fungi of roots establish a symbiotic relationship with plants and serve as an extended network of the root system. They facilitate improved uptake of moisture and nutrients resulting in better plant growth and yield. Mycorrhizae can absorb certain nutrients more efficiently than plants and make them more readily available for the plant. With increased moisture and nutrient absorption, plants become more drought tolerant. A healthy root system can fight soil diseases and weed invasion. Additionally, mycorrhizae increase organic matter content and improve soil structure.

Recent studies indicate that entomopathogenic fungi such as *Beauveria bassiana*, *Metarhizium brunneum*, and *Isaria fumosorosea* form mycorrhizal and endophytic relationship with various species of plants. These fungi are currently used for pest management, but their interaction with plants is a new area of research. Understanding this interaction will potentially expand the use of the biopesticides based on these fungi for improving plant growth and health.

Study 1 – Impact of *Beauveria bassiana* on strawberry plant health:

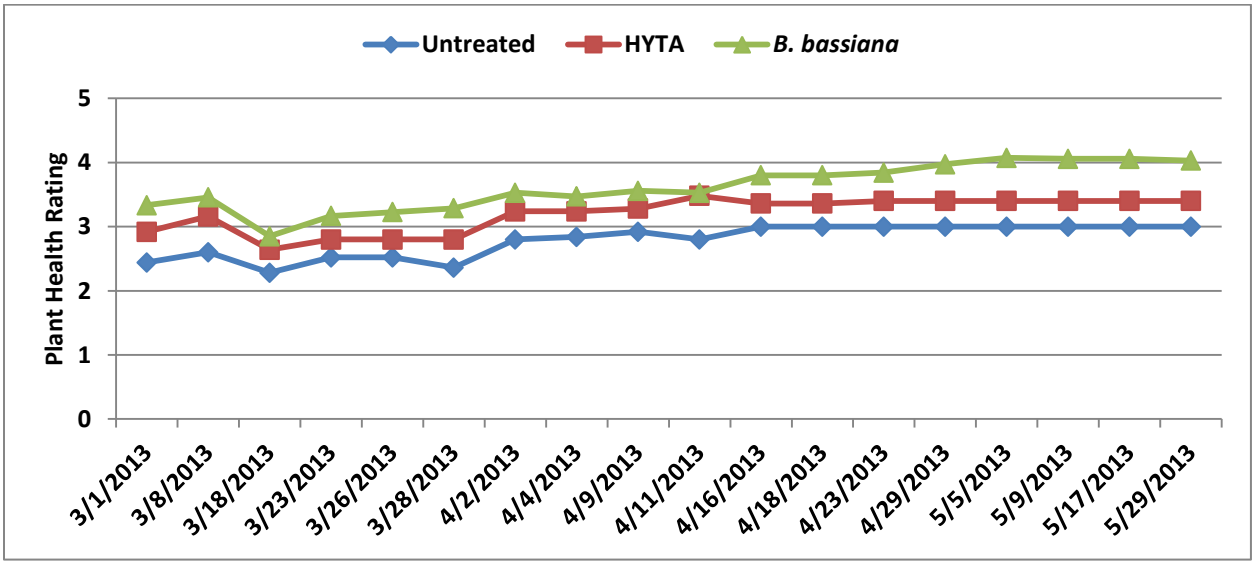
This study was conducted in 2013 using strawberry plants grown in raised beds (20X5X2'). Strawberry transplants (cultivar Monterey) were treated by applying treatment materials to the plant base. Transplants were planted in beds after 48 hours and regularly watered and fertilized (with fish emulsion). Plant health condition was periodically monitored.

HYTA: HYTA contains soil-based microorganisms that fix atmospheric and applied nitrogen, solubilize nutrients, and build soil organic matter.

Mycotrol-O: *B. bassiana* is a soil inhabiting fungus which is pathogenic to several arthropod pests. It is known to colonize some plants as an endophyte (symbiont that lives inside a plant without causing a disease) and provide protection against arthropod pests feeding on those plants. Some isolates are also known to be antagonistic to plant pathogens.

Untreated control: Plants were not inoculated with any material.

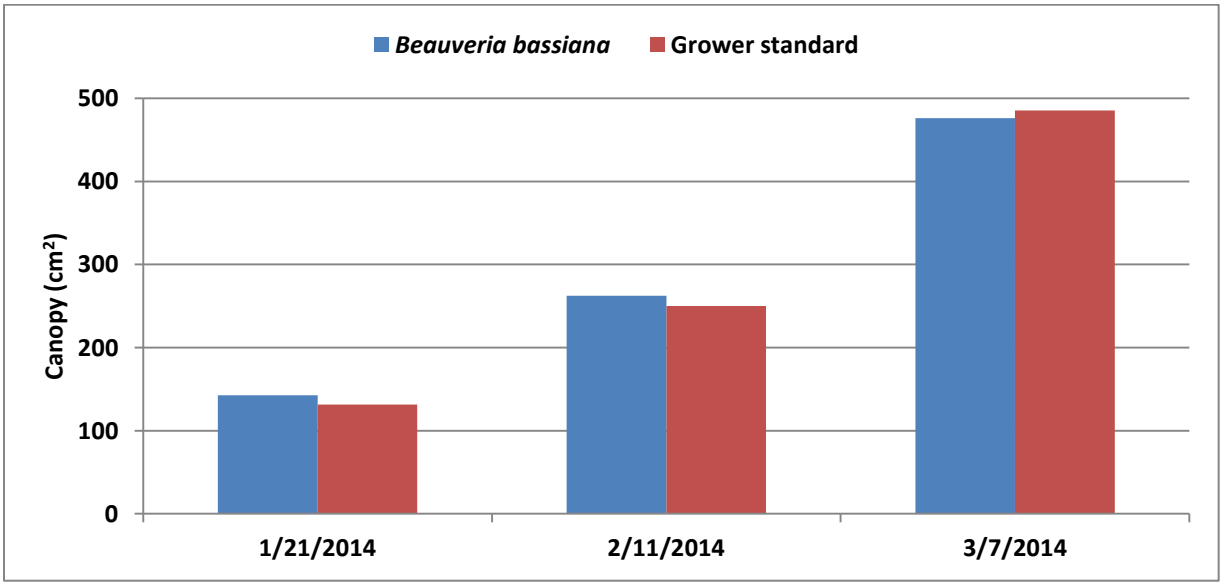
Results: Plant health appeared to be superior for plants treated with *B. bassiana* (3.6/5.0) followed by those treated with HYTA (3.2/5.0) and untreated control (2.8/5.0) although differences were not statistically different.

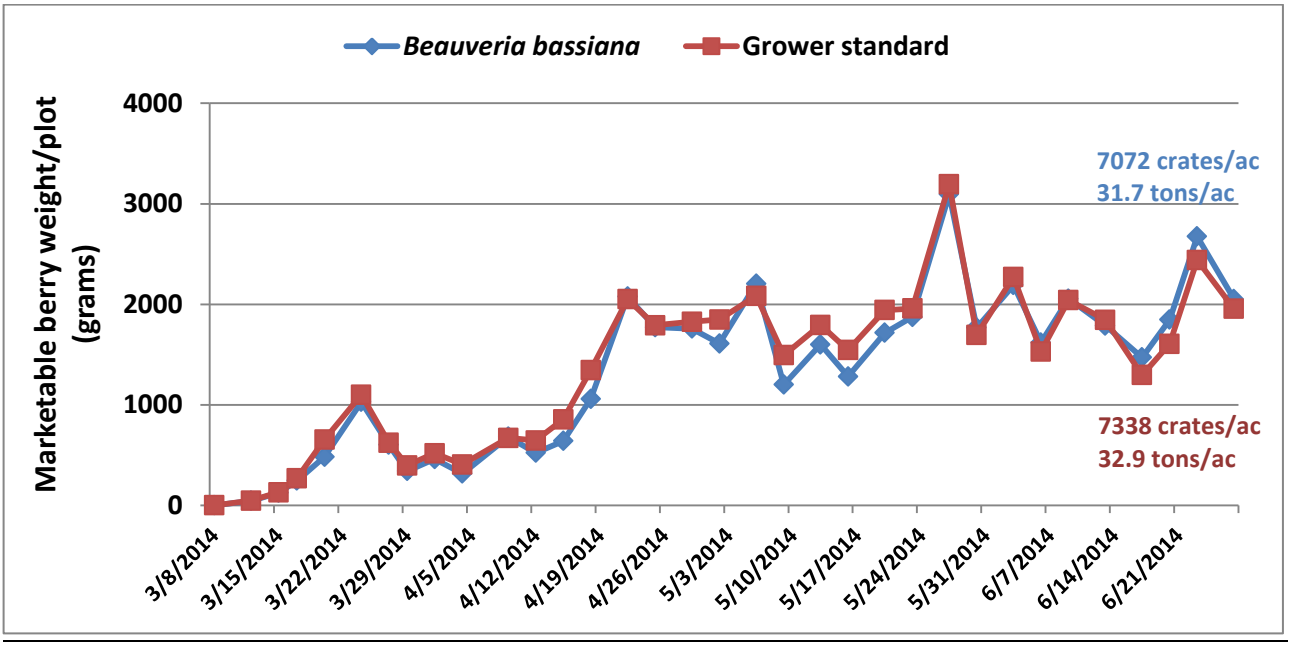


Health rating: 0 = Dead, 1 = Weak, 2 and 3 = Moderate, 4 = Good, and 5 = Very Good

<u>Study 2 - Impact of *B. bassiana* on strawberry plant growth:</u>

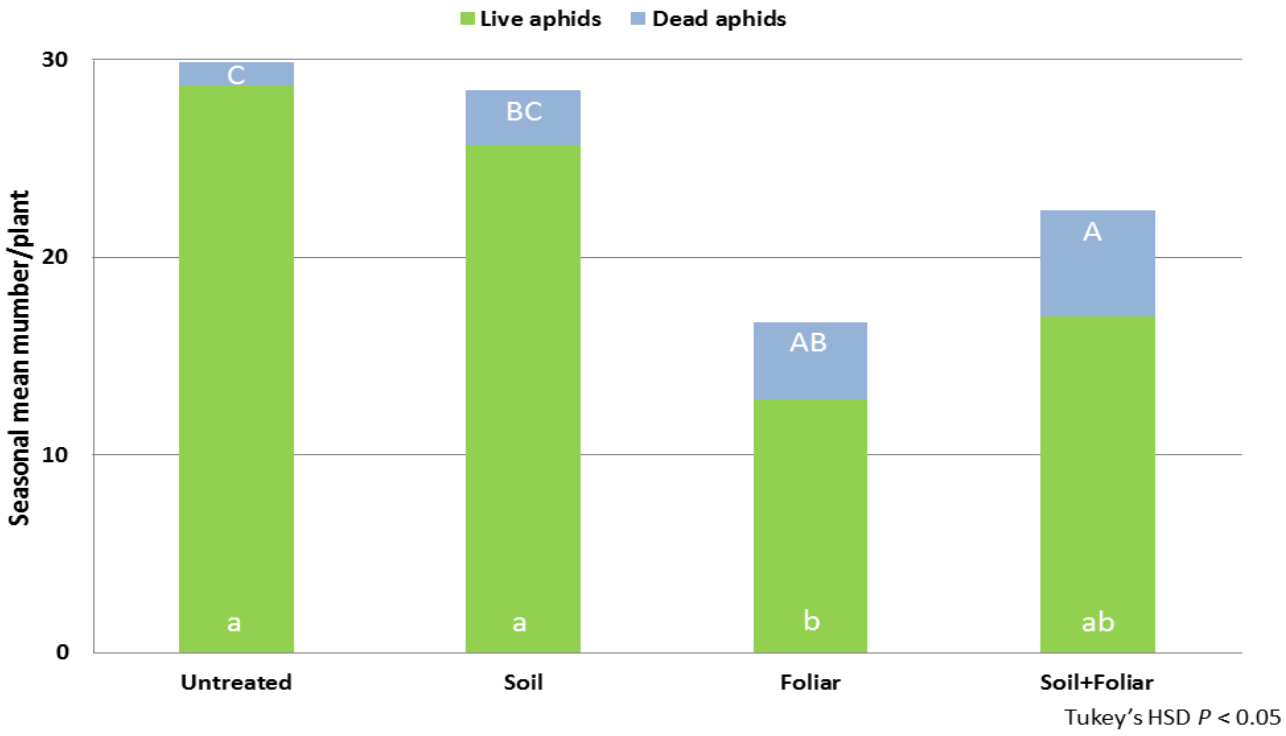
This study was conducted in 2014 in a commercial strawberry field. Starting from five days after planting, BotaniGard ES (*B. bassiana*) was applied at the base of the plant every week for seven weeks followed by six biweekly applications. Canopy size and yield were periodically monitored in treatment and grower standard plots.





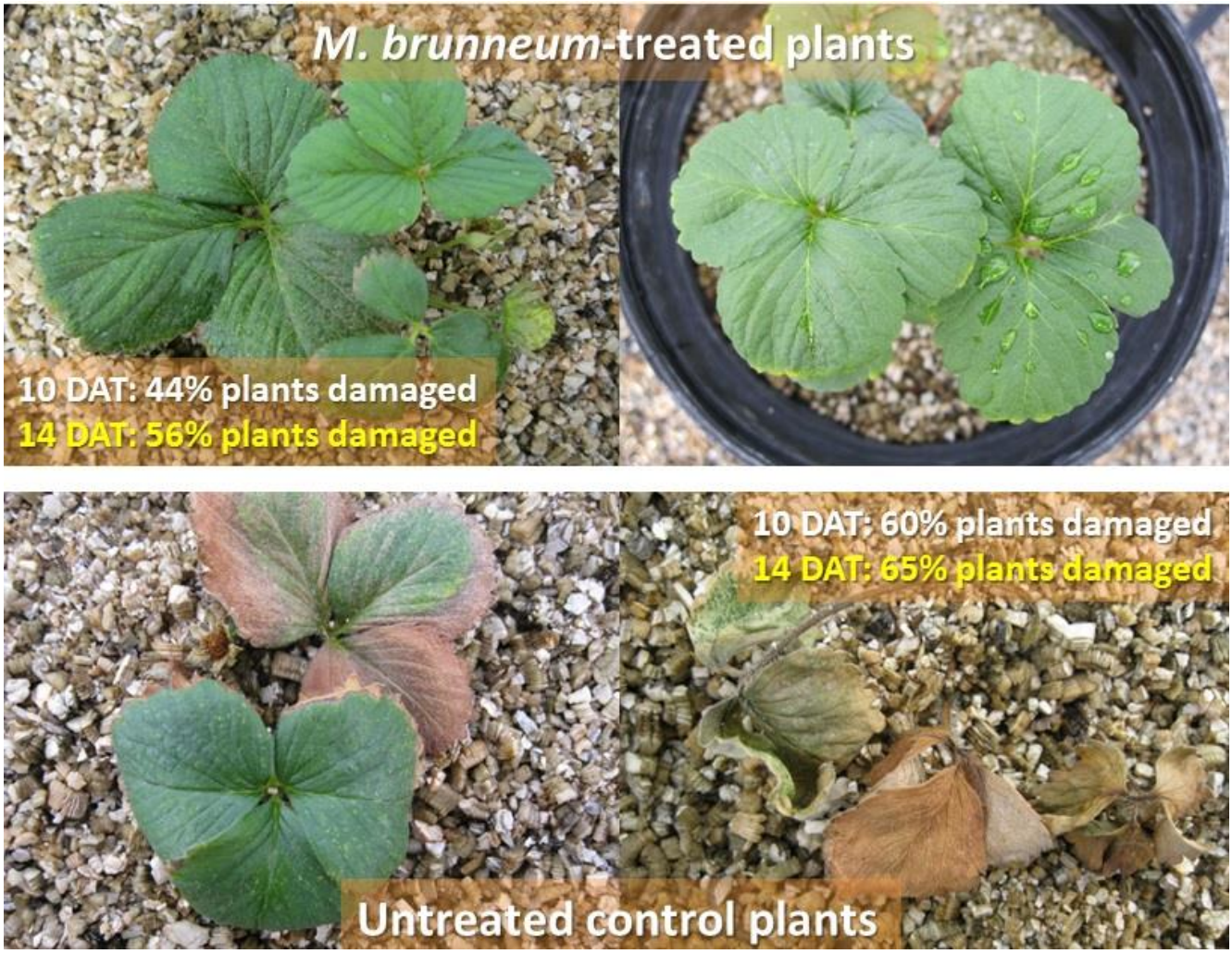
Study 3 – Impact of endophytic *B. bassiana* on green peach aphids feeding on strawberry plants:

A greenhouse study was conducted in 2013 to evaluate the impact of endophytic *B. bassiana* on green peach aphids feeding on strawberry plants. Potted plants were infested with green peach aphids and BotaniGard ES (*B. bassiana*) was administered as soil, foliar, and soil + foliar treatments. Number of live and dead aphids were periodically monitored and compared among treatments and untreated control. Results suggest that endophytic *B. bassiana* negatively impacted green peach aphid populations.



Study 4 - Impact of endophytic *Metarhizium brunneum* on spider mites:

In a greenhouse study, conducted in 2010, for evaluating the ability of *Metarhizium brunneum* to colonize strawberry plants, there was an unexpected infestation by twospotted spider mites. Plants inoculated with *M. brunneum* appeared to withstand mite infestation and resulting damage better than untreated controls. Like *B. bassiana, M. brunneum* is a soil inhabiting fungus which is pathogenic to various arthropods.



These studies look at new interactions that entomopathogenic fungi have with plants and herbivores, which could be exploited to benefit crop production. If entomopathogenic fungi can help improve plant health through means other than pest control, their multipurpose use can make a positive contribution to sustainable agriculture.

Surendra Dara PhD, DAIT
Strawberry and Vegetable Crops Advisor and Affiliated IPM Advisor,
UC Cooperative Extension, 2156 Sierra Way, Ste. C, San Luis Obispo, CA 93401, Phone: 805-781-5940, Fax: 805-781-4316, Email: skdara@ucdavis.edu
eNewsletters: http://ucanr.edu/strawberries-vegetables and http://ucanr.edu/pestnews **Newsletter:** http://ucanr.edu/ccah
Download free iOS app "IPMinfo" about strawberry pests and diseases
Twitter: @calstrawberries and @calveggies **Tumbler:** berriesnveggies.tumblr.com
Facebook: www.facebook.com/strawberriesvegetables