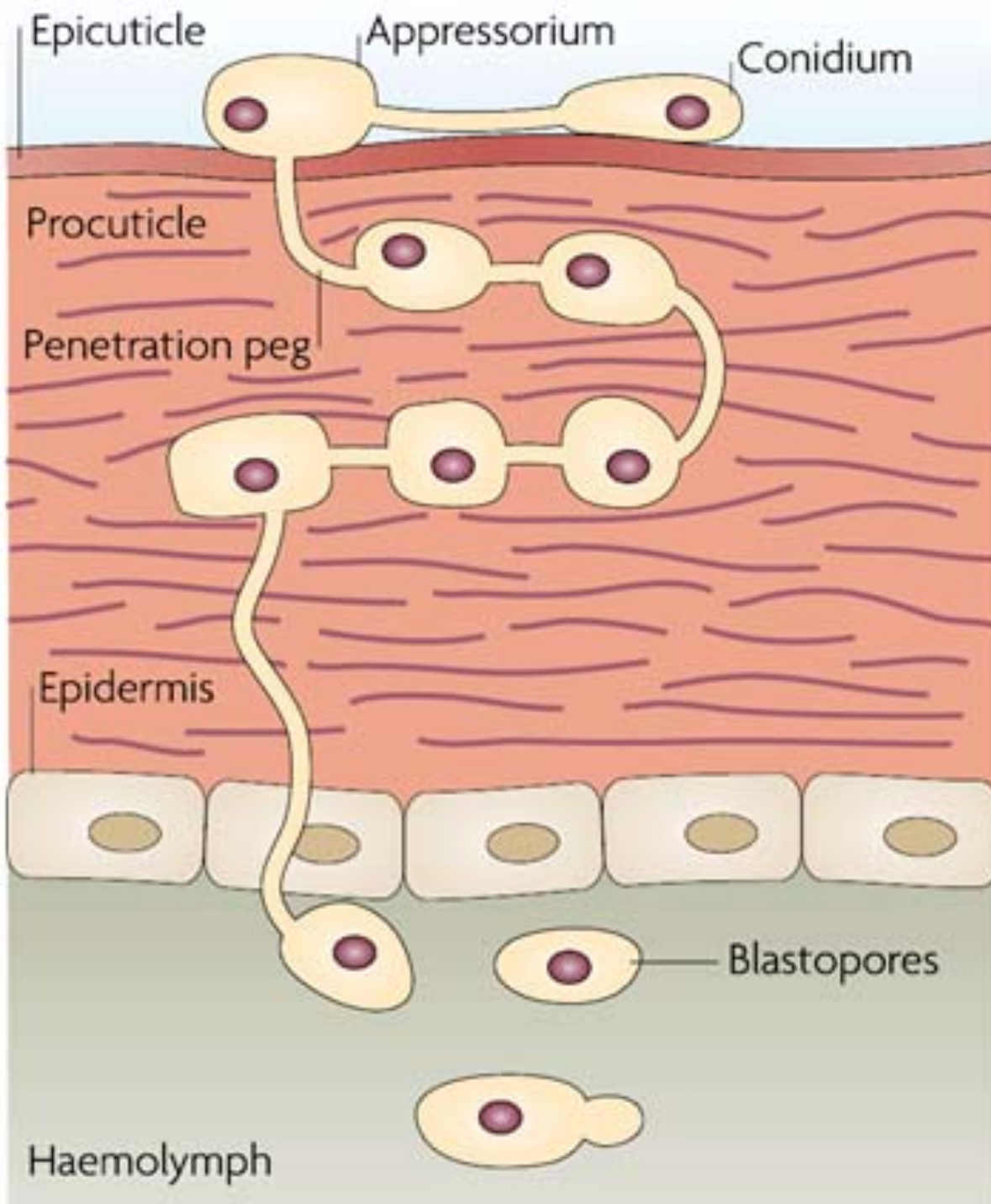


Biological Control of SWD: Microbe Entomopathogens and Commercial Formulation Studies



Beauveria bassiana Basl.-Criv.
(Hypocreales; Clavicipitaceae)

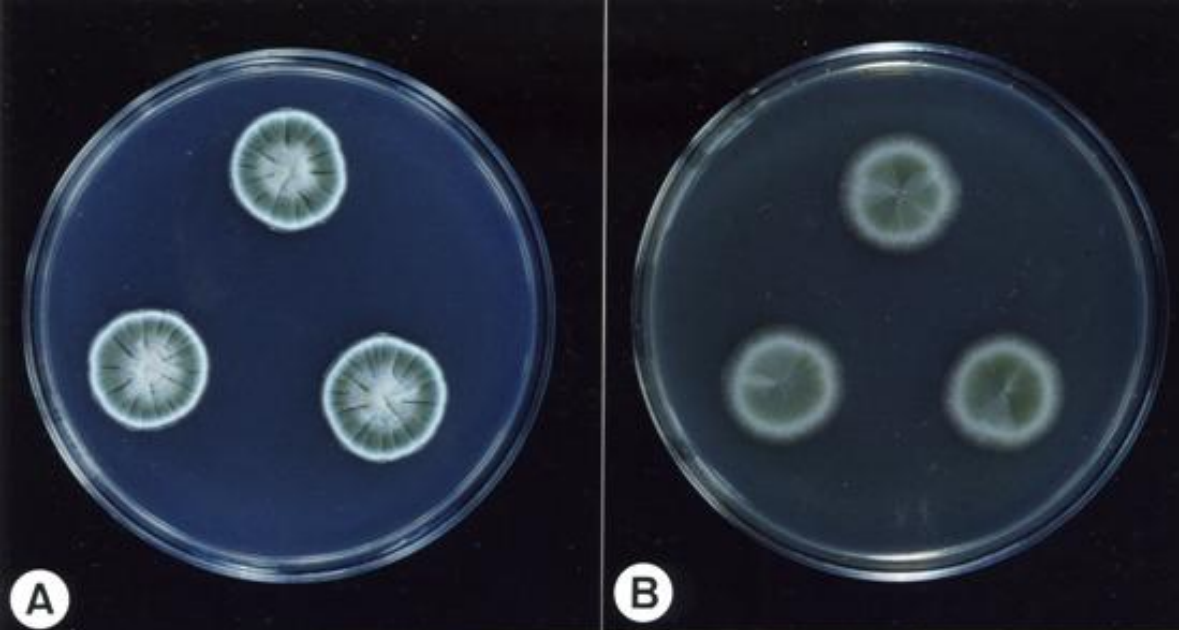
- Fungal parasite that causes White Muscardine Disease in insects.
- Microscopic spores of fungi come into contact with insect host, which germinate and penetrate the cuticle.
- Fungus then grows inside of insect, killing it within a matter of days.
- White fruiting bodies emerge from insect, releasing spores.
- Anamorph of *Cordyceps bassiana*.



The in vivo development cycle of the entomopathogenic fungi *Beauveria bassiana*

- Conidia (spores) adhere to the host cuticle, then the conidia germinate and the germ tube and appressorium (penetration structure) are produced.
- The cuticle is penetrated by a combination of mechanical pressure and the action of cuticle-degrading enzymes.
- **The fungus grows by vegetative growth in the host haemocoel and external conidia are produced upon the death of the host**

Can fungal biopesticides control malaria?
 Matthew B. Thomas & Andrew F. Read
 Nature Reviews Microbiology 5, 377-383
 (May 2007)



Plates of *B. bassiana*

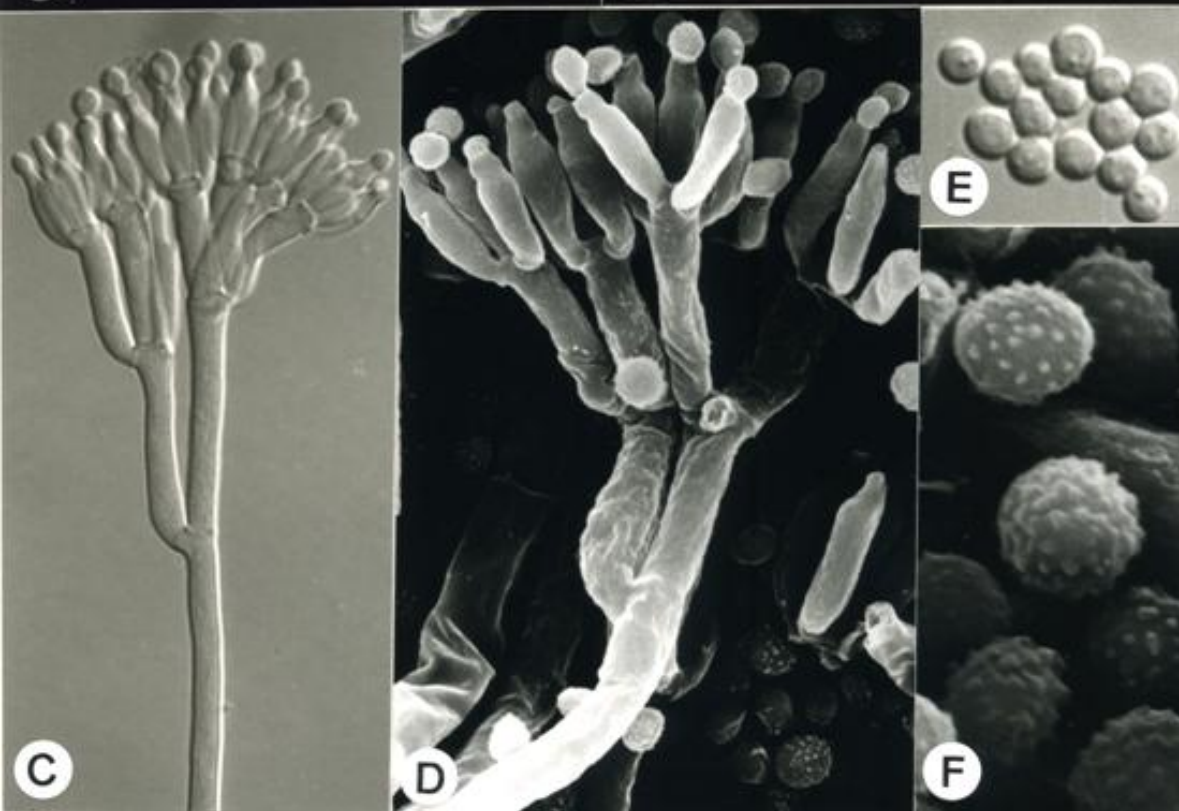
A. Dorsal surface

B. Ventral surface

C. Fruiting structures

D. Fruiting structures

E. Conidia



Objectives:

- Determine the lethality of *B. bassiana* on **SWD adults, larvae, and pupae.**
- Determine the effect of *B. bassiana* on **oviposition.**
- Determine if transfer between gravid **females and offspring** occurs, and if so, does it affect the next generation's size?
- Determine if generalized **strain** (GHA) performs as well as Diptera-specific strain (HF23 - BalEnce).



Methods and Materials (con't)

- Insects were **reared** in test tubes with 1 Tbs *Drosophila* media, 1.5 Tbs Distilled Water, and 0.5 tsp Active Dry Yeast at 23° C for up to 14 days.
- F2 Adults were removed for experimentation at or before 24 hours of pupal eclosion. **Healthy adults were selected** at random for experimentation after removal from colonies.
- **Washed and dried blueberries were sprayed** at highest labeled rates (Mycotrol O=2 qt/A, BalEnce=1 qt/A). Using airbrush at 20 psi air pressure, sprayed until point of drip on surface of fruit.
- Berries **allowed 2 hours to dry** under fume hood (reentry interval of both materials).
- 25 random male SWD and 25 random females SWD removed from colony and introduced to berries (**50 flies/treatment/rep.**).



Methods and Materials (con't)

- At 48 hours, insects removed and **eggs were counted**. Live insects were counted and placed in isolation. **All dead insects separated into isolation to observe potential fungal growth.**
- **Isolation chambers** kept at 23° C and 100% humidity to encourage visible fungal growth.
- **After 10 days, insects examined for *B. bassiana*, positive ID's attained through spore microscopy.**

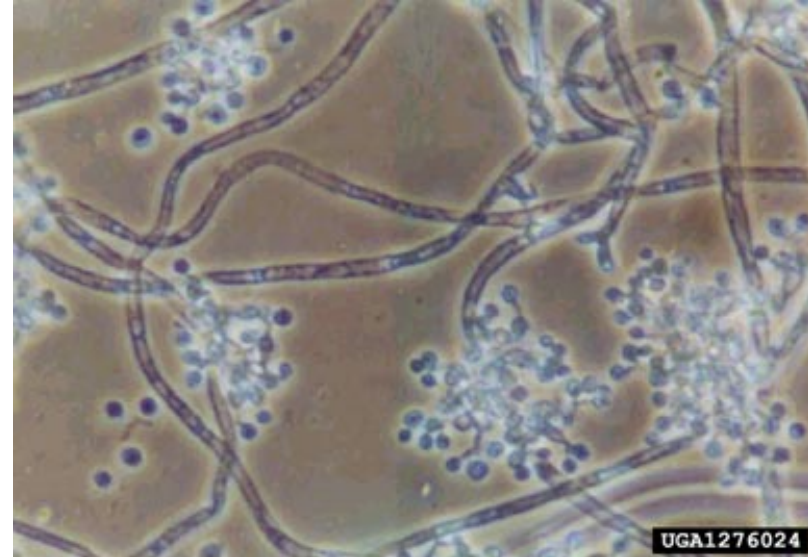


Photo: Svetlana Y. Gouli, University of Vermont, Bugwood.org



Mycotrol-O mycopesticide. (*Beauveria bassiana*) to control *D. suzukii* adults



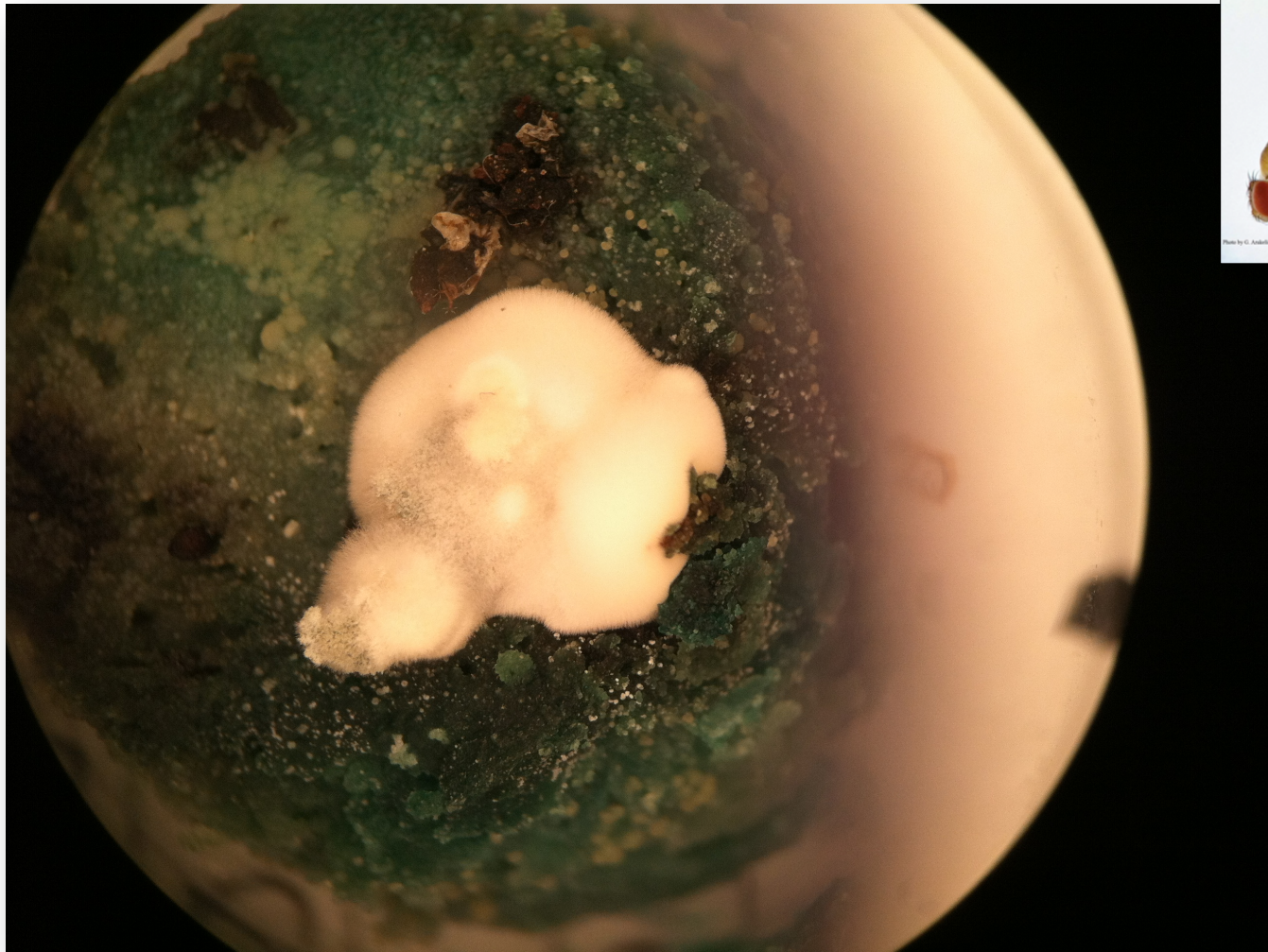
Advanced stage of fungal growth (~10 days of exposure).
Most of the spores have already detached.

Mycotrol-O mycopesticide. (*Beauveria bassiana*) to control *D. suzukii* adults

Recently deceased SWD adult (~5 days of exposure). Signs of fungal growth present on head (around antennae) and abdomen.



(Beauveria bassiana) Infesting *D. sukuzii* larvae

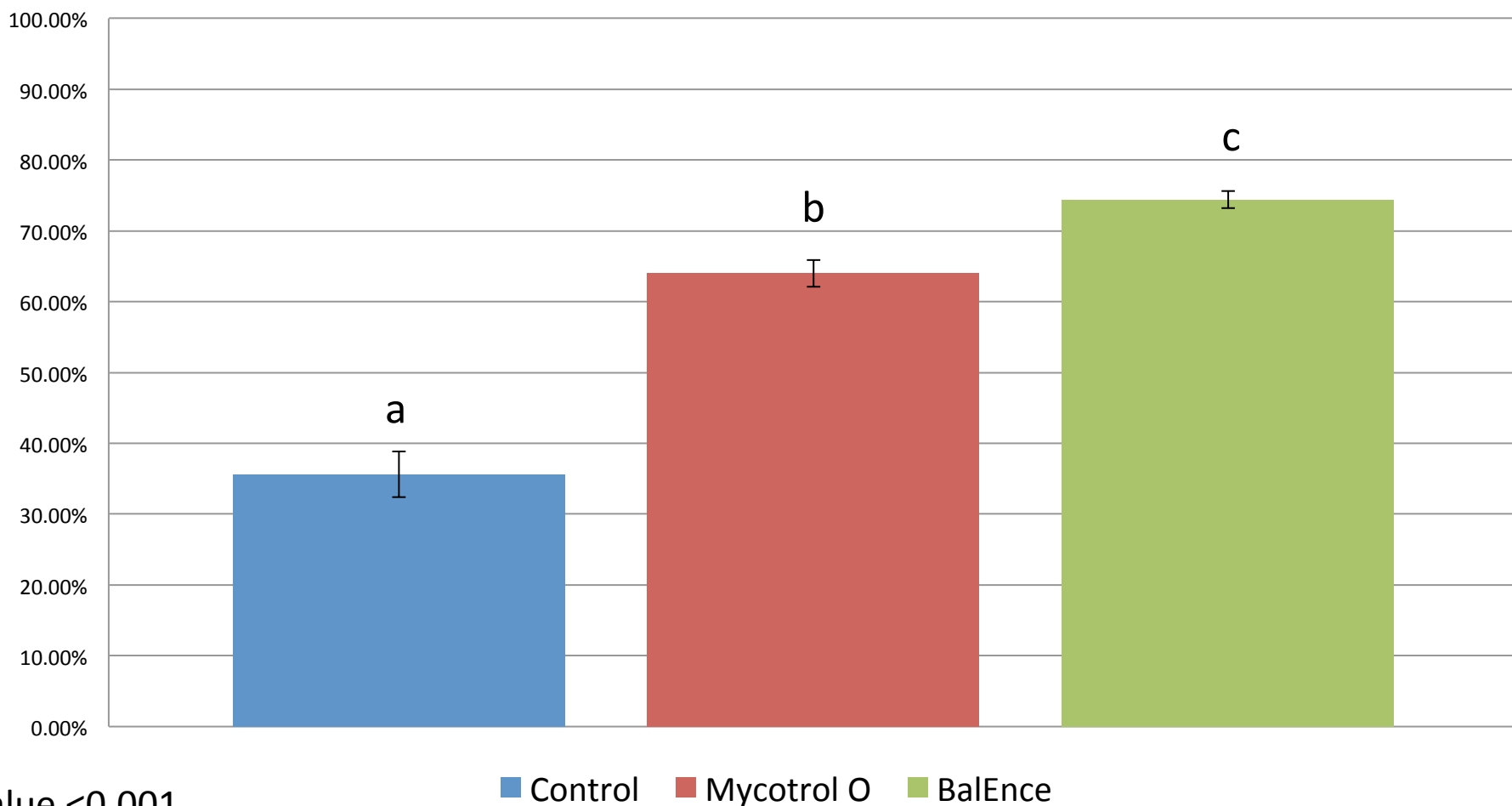


Advanced stage of fungal growth (~10 days of exposure) completely engulfing a cluster of 3rd instar Larvae.

Beauveria bassiana to manage the *D. suzukii* adult

Results: Significant increase in **mortality of adults on treated berries** compared to untreated check. BalEnce provided higher mortality when compared to Mycotrol O.

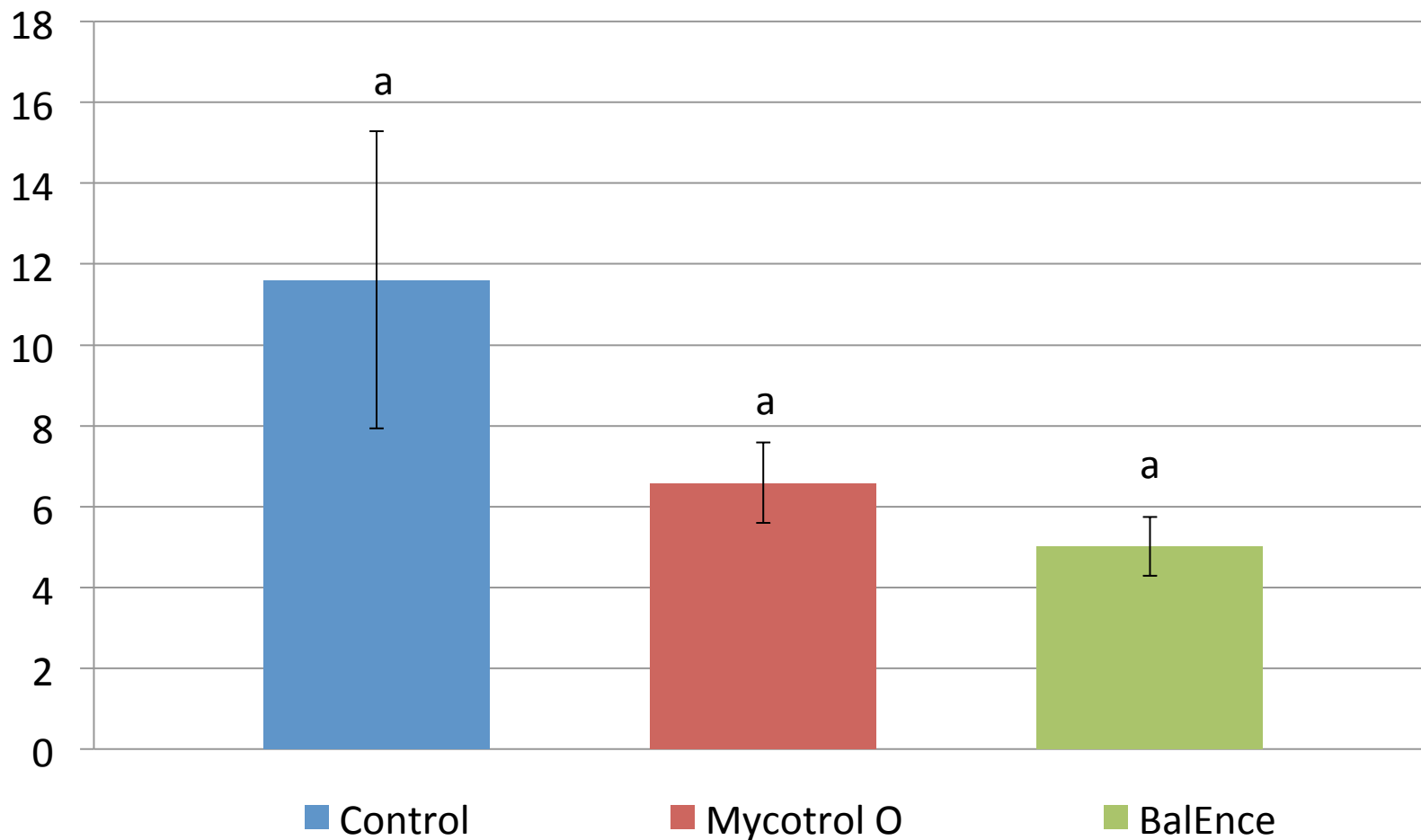
% Insects Mortality after 48 Hours



Beauveria bassiana to manage *D. suzukii* adult

Results: Numeric decrease in ovipositional activity (NS).

Eggs per gram after 48 Hours of SWD Adult Exposure

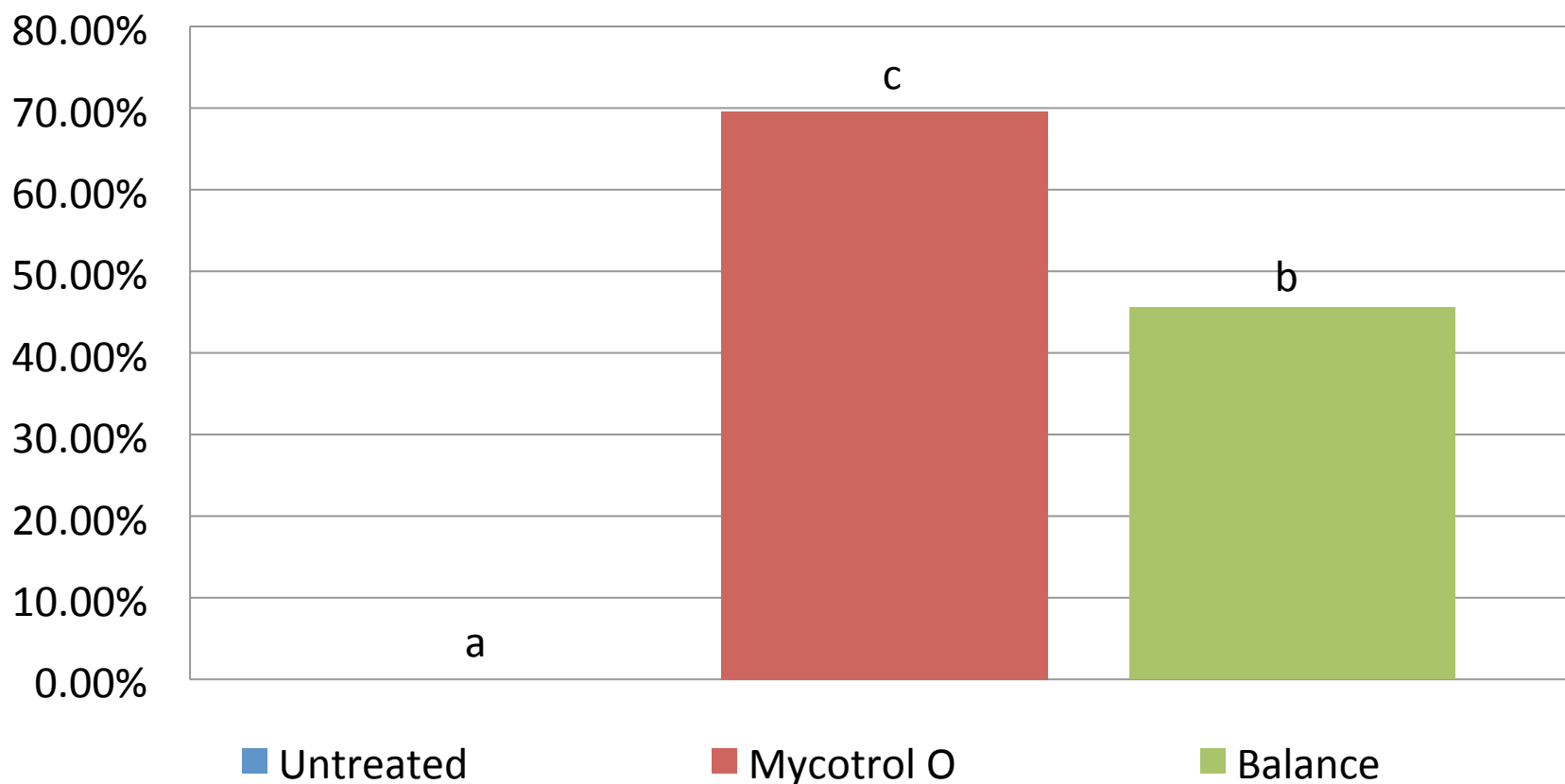


P Value 0.1687

***Beauveria bassiana* to manage *D. suzukii* larvae**

Results: SWD larva exposed to *B. bassiana* developed disease significantly more than untreated check. Mycotrol O appeared more virulent.

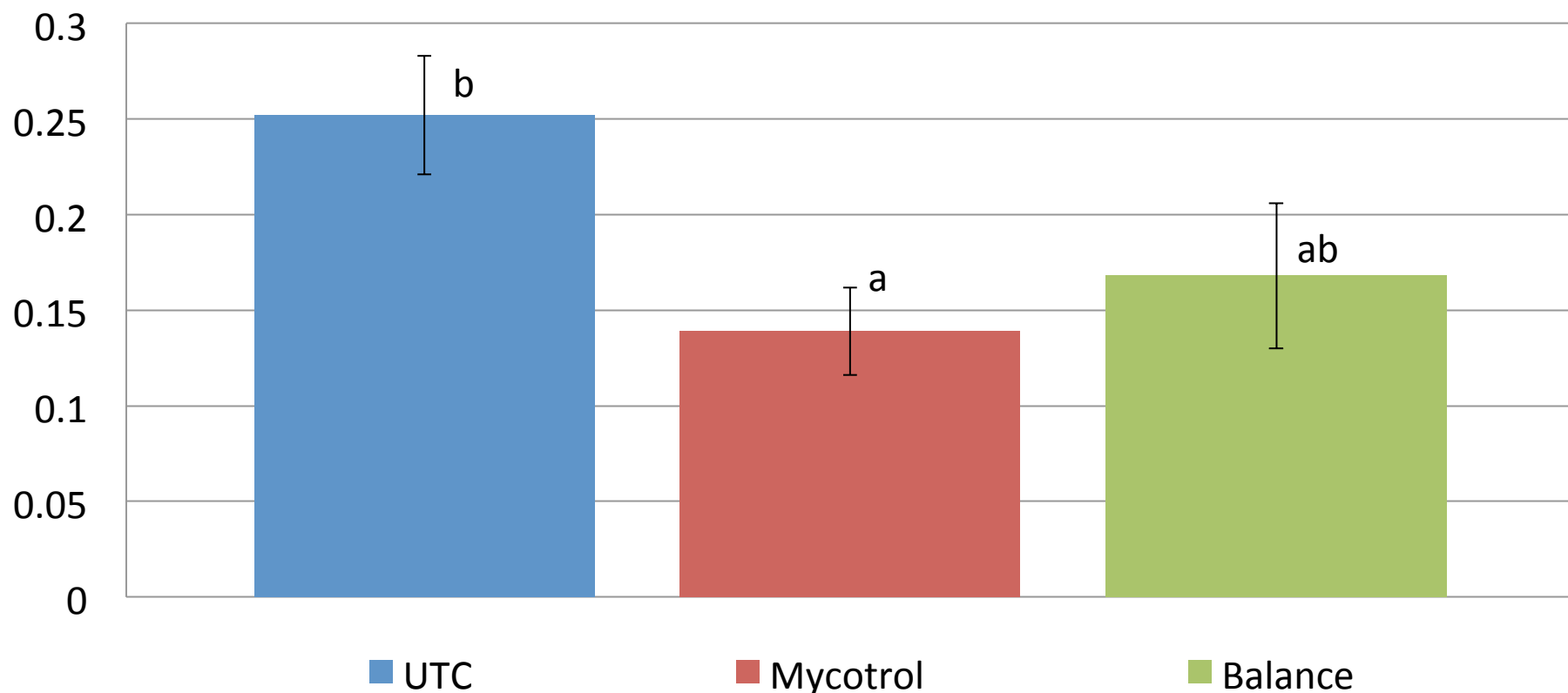
% Insects Infected with White Muscardine Disease



Beauveria bassiana to manage *D. suzukii* larvae

Results: Eggs laid in berries exposed to *B. bassiana* were somewhat less likely to mature to adulthood than those laid in untreated berries

Egg Survival (14 Days post Spray)



Data transformed prior to ANOVA from percentages. P Value: 0.07

Breakdown of Untreated (UTC) Fruit at 14 d. relative to *B. bassiana* treated fruit



Conclusions

- Both *B. bassiana* formulations cause mortality within 48hrs.
.
- Neither formulation works quickly enough to decrease egg-laying significantly.
- Insects exposed to Mycotrol O appear to express mature *B. bassiana* more readily than those exposed to BalEnce.
- Eggs that are laid on *B. bassiana* exposed berries are less likely to mature.

Thank You



Entomology Technical Staff

