

# Field Efficacy of *Beauveria bassiana* Isolates Selected for Wine Grape Cutworm Management, Against a Common Lepidopteran Pest - Cabbage Looper (*Trichoplusia ni*) and Potential for Mass Production

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## Abstract

Efficacy of *Beauveria bassiana* isolates against cabbage looper larvae was carried out in the field at Institute for Sustainable Horticulture (ISH) at Kwantlen Polytechnic University (KPU), Langley campus, BC. Mass production optimization experiments were conducted for registration purposes. The results indicated that OK-373 killed the cabbage looper larvae faster than the other isolates with the highest rate of mortality and sporulation in comparison with ISH-189 and BotaniGard in the field. In the lab, OK-373, ISH-189 and BotaniGard caused 100% mortality of cabbage looper larvae after a week and no significant difference was observed between them. OK-373 produced the highest number of spores per gram of substrate on both rice and barley; however, there was no statistical difference among OK-373, ISH-190 and ISH-189 either produced on rice or barley.

## Introduction

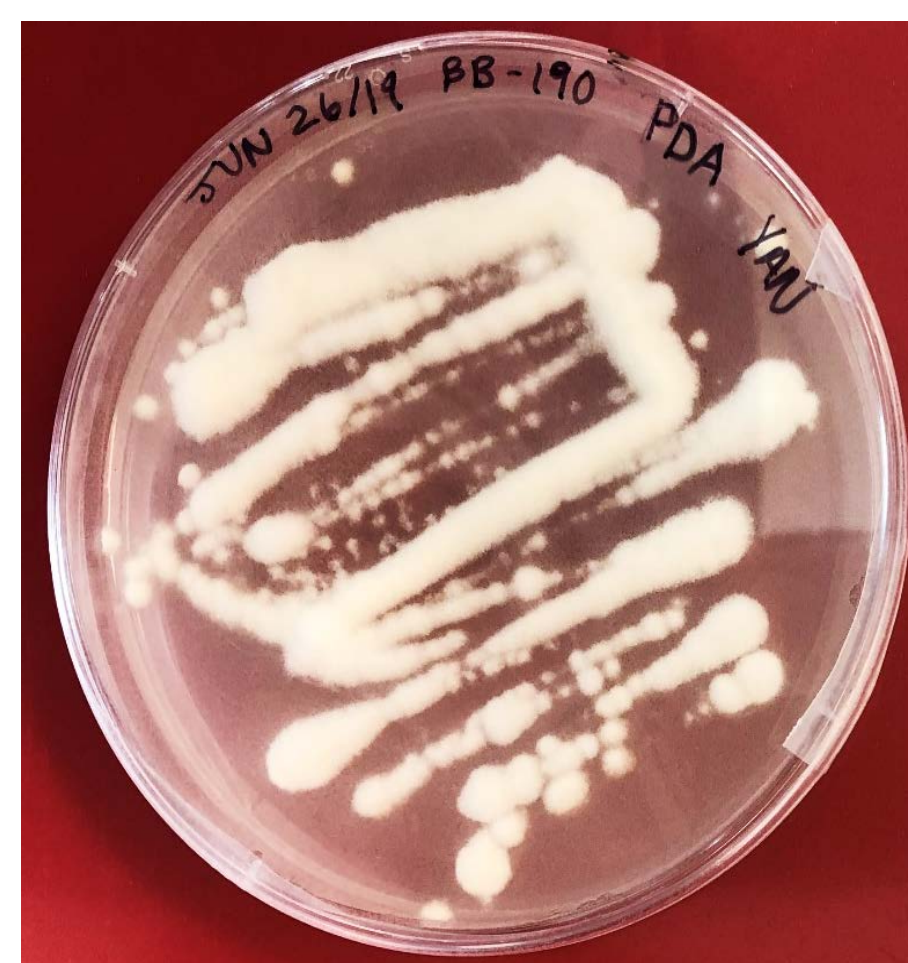
Cabbage looper as a well-known and cosmopolitan pest damages over 160 plants. *Beauveria bassiana* is one of the most successful entomopathogenic fungi, that kills a broad range of insect pests.

*Beauveria* spores attach to the surface of pests, penetrate the cuticle and eventually reach and use the insects' nutrients, causing death. Within a few days, the spores of *Beauveria* show up on the surface of the dead insect, and subsequently spread in the environment infecting other insects.

## Methods

### Treatments:

Two isolates of *Beauveria bassiana*, one from Okanagan (OK-373) and one coastal isolates (ISH-189), which were successful to kill larvae in the lab were applied against cabbage looper larvae on broccoli plants in the field. BotaniGard® WP and 0.1% Tween-20 were used as positive and negative controls, respectively.



**Field application:** In the field, 2<sup>nd</sup> instar larvae of cabbage looper on broccoli were sprayed at a concentration of  $4 \times 10^8$  spores/ml with OK-373 and ISH-189.



Two days after spraying, the treated broccoli were transferred to the lab and the larvae were placed individually in small plastic cups with one leaf disc taken from the treated plant. On the same day as the field application, a laboratory control trial was performed for each treatment product by spraying larvae on leaf discs in plastic cups. All treated larvae were incubated at  $25 \pm 1^\circ\text{C}$ , and 16 L: 8 D. Number of live, dead and sporulated larvae was recorded daily.



Live

Dead

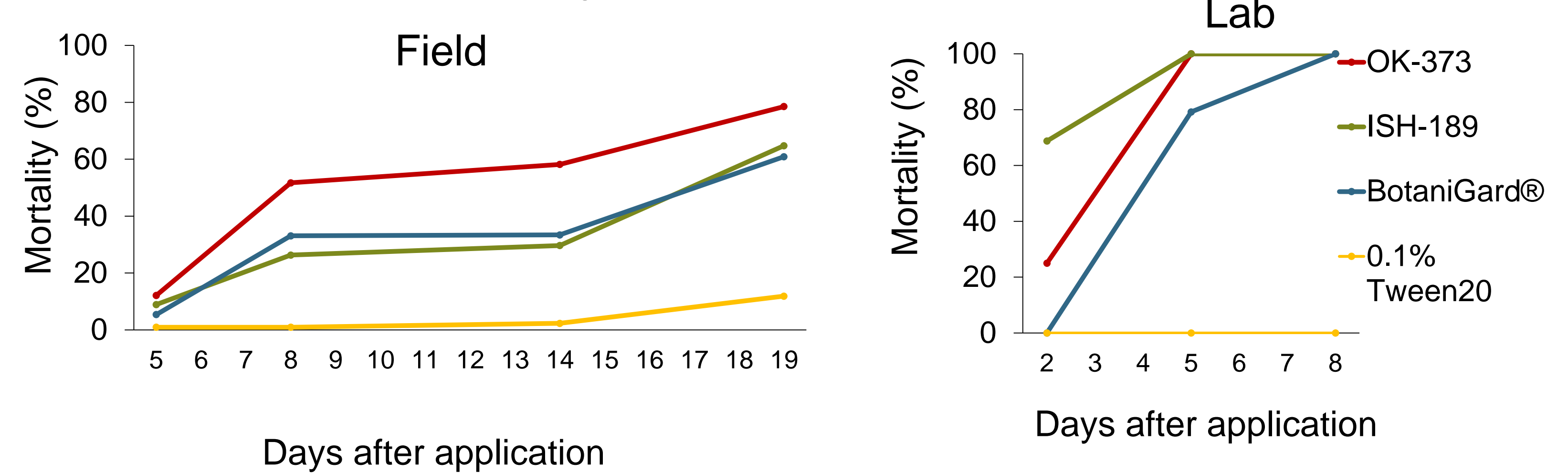
Sporulated



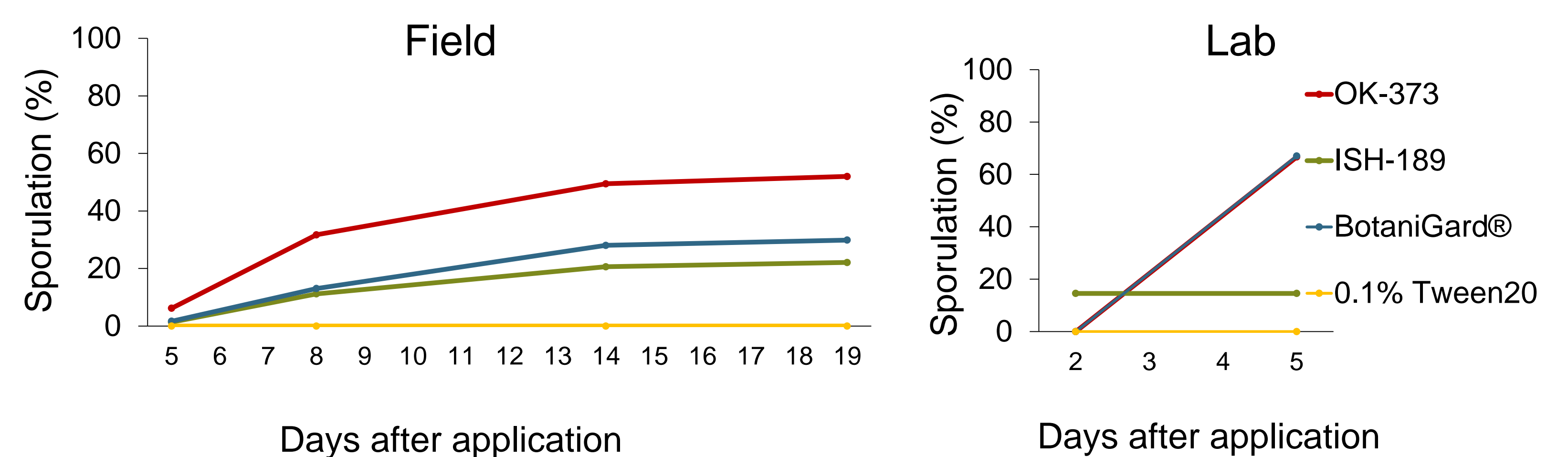
Mass production of four isolates OK-372, OK-373, ISH-189, and ISH-190 was compared using a traditional two-stage fermentation. The liquid medium used to culture all isolates of *B. bassiana* included glucose,  $\text{KNO}_3$ ,  $\text{K}_2\text{H}_2\text{PO}_4$ ,  $\text{MgSO}_4$ ,  $\text{CaCl}_2$ , and yeast extract. After four days in the liquid culture, both rice grains and barley flakes were inoculated with the cultures. A second mass production trial was conducted using a simpler liquid medium (brewer's yeast, sucrose) and using rice grains as the solid substrate. The yield of each isolate with each production protocol was compared.

## Results

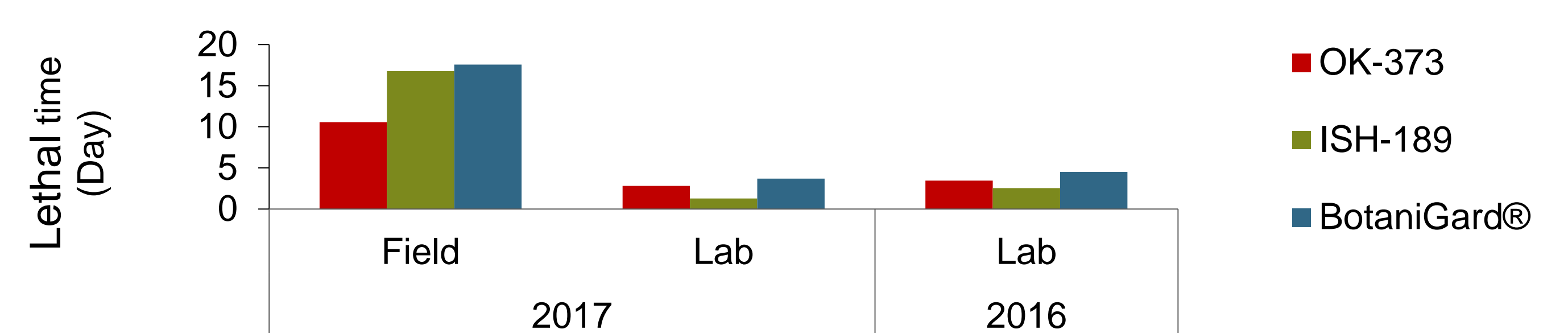
### Mortality of cabbage looper larvae exposed to *B. bassiana* isolates at $4 \times 10^8$ spores/ml concentration



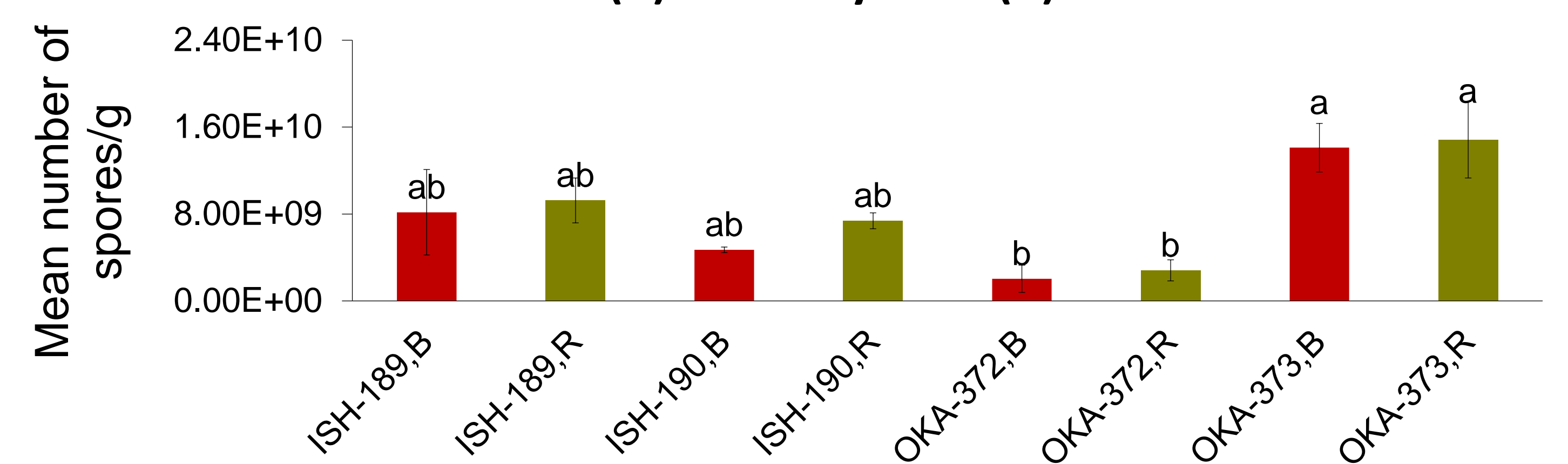
### Sporulation of cabbage looper larvae exposed to *B. bassiana* isolates at $4 \times 10^8$ spores/ml concentration



### Lethal time (LT<sub>50</sub>) for *B. bassiana* isolates on the larvae of cabbage looper (Shorter bar indicates highest toxicity to the pest)



### Mean number of spores per gram of substrate produced on grain of rice (R) or barley flaks (B)



## Conclusion

Isolate OK-373 is:

- ✓ The fastest isolate to kill the larvae in comparison with ISH-189 and BotaniGard
- ✓ Cause for the highest rate of larval mortality and sporulation of cabbage looper
- ✓ The best spore producer either on rice or on barley flakes

## Acknowledgements

We thank Dr. Tom Lowery for providing OK-372 and OK-373 isolates.



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