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# *In vitro* Efficacy of *Beauveria bassiana* (Bals.) Vuill. and *Verticillium lecanii* (Zimm.) viegas against selected insect pests of cotton

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Abstract

The bioefficacy of selected entomopathogenic fungi *viz. Beauveria bassiana* (Bals.) Vuill. against *Heliothis armigera* Hubner, *Spodoptera litura* Fabricius, *Earias vittella* Fabricius and *Verticillium lecanii* (Zimm.) Viegas against *Aphis gossypii* Glover, *Bemisia tabaci* Gennadius and *Amrasca devastans* Distant was studied under laboratory conditions at Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamilnadu, India during 2007-2008. Three different concentrations *viz.,* 0.15, 0.20 and 0.25 per cent of liquid formulation of these entomopathogenic fungi were tested to evaluate the effective concentration. Among the three concentrations, 0.25 per cent recorded the highest mortality of *H. armigera* (86.67 %), *S. litura* (86.67 %), *E. vittella* (73.33 %), *A. gossypii* (100.00 %), *B. tabaci* (100.00 %) and *A. devastans* (93.33 %) respectively.

Keywords: Entomopathogenic fungi, *Beauveria bassiana*, *Verticillium lecanii*, Cotton pests

## INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is the world's major fibre crop. In India, it plays a dominant role in its agrarian and industrial economy. It is perhaps unique in the broad nature of the insect attacks to which it is subjected and the control of cotton insect pests remains an unabated challenge. Insect pests are the principal cause of yield losses in cotton.

The modern cotton production technology relies predominantly on use of chemicals to control insect pests. Keeping in view the negative aspects of chemical insecticidal usage, biological control of insect pests has gained greater momentum. Under biological control, use of entomopathogenic microorganisms especially entomopathogenic fungi occupies a predominant position. Toxins of *B. bassiana* such as Beauvericin, Oosporin weaken the host's immune system. Its victims are mainly caterpillars, plant hoppers and also beetles, whiteflies, aphids, thrips, locusts, termites and mites (Kreutz *et al.,* 2004). The fungus *V. lecanii* infects mostly whiteflies, thrips and rarely caterpillars (Jung *et al.,* 2006). This paper attempts to evaluate the appropriate dosage level of liquid formulations of
*B. bassiana* and *V. lecanii* against the key pests of cotton.

## MATERIALS AND METHODS

The present investigation was carried out at the Department of Entomology, Faculty of Agriculture, Annamalai University during 2007-2008. The liquid formulations tested were Beevicide (*B. bassiana*) against the bollworm complex, American bollworm (*Heliothis armigera* Hubner), spotted bollworm (*Earias vittella* Fabricius), leafworm (*Spodoptera litura* Fabricius) and Verelac (*V. lecanii*) against certain sucking pests *viz.,* Aphids (*Aphis gossypii* Glover), whitefly (*Bemisia tabaci* Gennadius) and leafhopper (*Amrasca devastans* Distant) under laboratory condition. These formulations were obtained from Romvijay Biootech Pvt. Ltd., Pondicherry, India.

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The test insects were mass cultured on respective food sources, namely *H. armigera* reared on artificial semi synthetic diet, *E. vittella* reared on bhendi fruits and *S. litura* mass cultured on castor leaves. The sucking pests, *A. gossypii* and *B. tabaci* were cultured on potted cotton plants. The formulation was evaluated by contaminated food bioassay method (Anitha Bharath, 2005). The different concentrations *viz.,* 0.15, 0.20 and 0.25 per cent of *B. bassiana* and *V. lecanii* respectively were compared with an untreated control. The treatments were replicated thrice with five insects per replication. Post-treatment observations were recorded at 24 h interval up to eight days and cumulative mortality was computed. In all the experiments, per cent values were arc sine transformed and then analyzed. The data were analysed using computer based IRRISTAT analysis developed by International Rice Research Institute, Philippines.

## RESULTS AND DISCUSSION

From the bioassay, a linear relation between per cent mortality and dose concentrations were observed. In the bioassay with *B. bassiana* against *H. armigera, S. litura* and *E. vittella,* per cent mortality increased from 26.67 to 86.67 and 33.33 to 86.67 and 20.00 to 73.33 per cent respectively as the dose was increased from 0.15 to 0.25 per cent. In a similar work, El-Khawas and Abdul El-Gward (2002) recorded that the $LD_{50}$ for *S. litoralis* was $30.65 \times 10^7$ conidia/ml. They also suggested that the treatments with fungi caused an elongation in larval and pupal duration and mortality ranged from 59 to 92 per cent. In the present study, among the applied doses, higher concentration recorded the highest mortality whereas in less concentration, various morphological abnormalities such as malformed larvae, pupae and adults were noticed. All the doses of fungus revealed certain severe pathological alterations also. Treated larvae became sluggish and stopped feeding after 48 h. The cuticle of treated larvae blackened which may due to excessive melanization indicating direct attack of fungus on the defence system of these insects.

El-Sinary (2002) and Quesada-Moraga *et al.* (2006) explained that the efficiency of the entomopathogenic fungi began clearly after

48 h after inoculation and the hyphae penetrated the integument, epithelial and epidermal cells. After 72 h, the fat tissues were damaged and mortality reached 100 per cent after 96 hrs.

In the present bioassay with *V. lecanii* against certain sap feeding insects *viz., A. gossypii, B. tabaci* and *A. devastans,* a linear relation between per cent mortality and dose concentrations was observed. The per cent mortality increased from 73.33 to 100.00 per cent; 86.67 to 100.00 per cent and 60.00 to 93.33 per cent in case of *A. gossypii, B. tabaci* and *A. devastans,* respectively as the dose level increased from 0.15 to 0.25 per cent (Table 1). Mor *et al.* (1996) compared 35 strains of *V. lecanii* from different hosts from various geographical locations and found pathogenic to nymphs of *B. tabaci*.

Table 1. Bioassay on the effect of 3 different concentrations of *B. bassiana* and *V. lecanii* against certain insect pests of cotton

| Sl. No. | Treatment Concentration (per cent) | % Mean Mortality* | | | | | |
|---|---|---|---|---|---|---|---|
| | | *B. bassiana* ($1 \times 10^7$ conidia $ml^{-1}$) | | | *V. lecanii* ($1 \times 10^7$ conidia $ml^{-1}$) | | |
| | | *H. armigera* | *S. litura* | *E. vittella* | *A. gossypii* | *B. tabaci* | *A. devastans* |
| 1 | 1.5 | 26.67 (30.79) | 33.33 (35.00) | 20.00 (26.56) | 73.33 (59.21) | 86.67 (70.94) | 60.00 (50.77) |
| 2 | 0.20 | 53.33 (46.92) | 73.33 (59.21) | 66.67 (54.99) | 93.33 (78.44) | 93.33 (78.44) | 80.00 (63.93) |
| 3 | 0.25 | 86.67 (70.93) | 86.67 (70.93) | 73.33 (59.21) | 100.00 (85.94) | 100.00 (85.94) | 93.33 (78.44) |
| 4 | Control | 0.00 (4.05) | 0.00 (4.05) | 0.00 (4.05) | 0.00 (4.05) | 0.00 (4.05) | 0.00 (4.05) |
| | S.Ed. | 6.67 | 6.78 | 4.22 | 6.08 | 7.50 | 4.54 |
| | C.D. (p = 0.05) | 15.37 | 15.63 | 9.73 | 14.03 | 17.30 | 10.47 |

* Values mean of three replications
Values in parentheses are arc sine transformed.

From the results obtained, among various concentrations, 0.25 per cent recorded the highest per cent mortality and proved its best performance against the target insects. Hence this concentration of *B. bassiana* and *V. lecanii* could be suggested in managing the target insect pest population.

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