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Field evaluation of *Beauveria bassiana* (Balsamo) Vuillemin against *Helicoverpa armigera* (Hübner) infecting chickpea

HEM SAXENA and R. AHMAD
Indian Institute of Pulses Research
Kanpur 208 024, Uttar Pradesh, India

ABSTRACT: *Beauveria bassiana* (Balsamo) Vuillemin was tested under field conditions to control *Helicoverpa armigera* (Hübner) infesting chickpea for two crop seasons and was found very effective. The concentration of fungal spores in spray fluid had definite negative correlation with the pest incidence. At a concentration of 2.68 x 10^7 spores/ml, the average pod damage was 6.8 per cent and yield of 2377 kg/ha. Untreated control recorded 16.3 per cent pod damage with an yield level of 1844 kg/ha.

KEY WORDS: *Beauveria bassiana*, chickpea, *Helicoverpa armigera*

Beauveria bassiana (Balsamo) Vuillemin, the white muscardine fungus, has been reported from India infesting several insect pests (Ramaraj Urs *et al.*, 1965; Srivastava and Nayak, 1978; Agarwal and Rajak, 1985; Abbaiah *et al.*, 1988; Gowda and Ravi Prasad, 1992). Susceptibility and dose-mortality relationship against *Helicoverpa armigera* have been studied by Deva Prasad *et al.* (1990) as also by Gopalakrishnan and Narayanan (1990). So far the studies on the pathogenecity of the fungus against gram pod borer, *H. armigera* have been mostly restricted to laboratory studies. An effort has been made to test the field efficacy of *B. bassiana* for management of *H. armigera* in chickpea for two crop seasons and result obtained are discussed.

Beauveria bassiana spore suspension used in this study was obtained from *B. bassiana* culture isolated from *H. armigera* and later maintained on Potato-Dextrose-Agar media at India Institute of Pulses Research, Kanpur. Serial dilutions were made to obtain four different concentrations *viz.*, s x 10^7, s x 10^6, s x 0^5 and s x 10^4 spores/ml. 's' is base concentration which was 2.68 during 1993-

Table 1. Pod damage to *Helicoverpa armigera* and yield of chickpea in various concentrations of *Beauveria bassiana*

1993-94			1994-95			Mean		
Concentration (spores/ml)	Pod damage (%)	Yield (kg/ha)	Concentration (spore/ml)	Pod damage (%)	Yield (kg/ha)	Concentration (spore/ml)	Pod damage (%)	Yield (kg/ha)
2.68×10^7	7.3 (15.01)	2508	2.95×10^7	6.3 (14.05)	2246	2.82×10^7	6.8 (15.05)	2377
2.68×10^6	8.75 (17.9)	2380	2.95×10^6	8.7 (17.14)	2005	2.82×10^6	8.7 (17.16)	2192
2.68×10^5	11.9 (20.5)	2303	2.95×10^5	9.1 (17.53)	1968	2.82×10^5	10.5 (18.84)	2135
2.68×10^4	13.2 (21.29)	2175	2.95×10^4	10.6 (18.98)	1875	2.82×10^4	11.9 (20.13)	2025
Control	18.1 (25.12)	2016		14.5 (22.5)	1672		16.3 (23.82)	1844
CD (P=0.05)	1.22	117.3		1.18	97.15		-	-

94 and 2.95 during 1994-95. It was practically difficult to get the same base concentration, hence slight variation was recorded. The mass multiplication, serial dilution and counting of spores was done following the procedure adopted by Gopalakrishnan and Narayanan (1990).

Field trials were conducted for the two crop seasons i.e., 1993-94 and 1994-95 to evaluate the efficacy of *B. bassiana* against gram pod borer, *H. armigera* in chickpea. The experiment was conducted in a randomised block design having 5 treatments, replicated 4 times. Chickpea variety L 550 was sown on 15 November. The plot size was 5 x 4 m. Two applications of each treatment was given, one at pod formation stage and an other after 10 days by hand compression sprayer using 500 liters of spray fluid/ha when natural *H. armigera* population reached its ETL (more than 1.5 larvae/m row length). Observation were recorded on per cent pod damage from ten randomly selected plants and yield of whole plot at the time of harvest. Data were subjected to statistical analysis.

The trend of results on pod damage and yield under different concentrations of *B. bassiana* for both the year (1993-94 and 1994-95) was the same (Table 1). It is clear that *B. bassiana* controls *H. armigera* effectively resulting in lower pod damage and increase yield. With the decrease in spore concentration in spray suspension, the per cent pod damage increased showing almost inverse linear relationship. Spore concentration of 2.82 x 10^5 spores/ml registered on an average 10.5 per cent pod damage with an average yield of 2135 kg/ha. The lowest spore concentration tested in the trial (2.82 x 10^4 spores/ml) though recorded higher average pod damage (11.9%) but it was also effective to some extent and resulted in a mean yield of 2025 kg/ha when compared to 16.3 per cent mean pod damage and mean yield of 1844 kg/ha in untreated plots. Least pod damage (6.8%) to chickpea due *to H. armigera* was recorded in case of higher spore concentration (2.82 x 10^7 spores/ml) followed by 2.82 x 10^6 spores/ml (8.7%) resulting in highest yield of 2377 kg/ha and 2192 kg/ha, respectively.

Thus it can be concluded that the application of *B. bassiana* against gram pod borer, *H. armigera* is highly effective in bringing down the pod damage and consequently increase in yield. Similar observations were made by Gopalakrishnan and Narayanan (1990) wherein *B. bassiana* was highly effective against different stages of *H. armigera*. There is a possibility of incorporating *B. bassiana* as a component in integrated pest management programme of chickpea along with other components.

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REFERENCES

Abbaiah, K., Satyanarayana, A., Rao, K. T. and Rao, N. V. 1988. Incidence of a

fungal disease on *Heliothis armigera* larvae in Andhra Pradesh, India. *International Pigeonpea Newsletter*, **8**: 11.

Agarwal, G. P. and Rajak, R. C. 1985. A list of entomopathogenic fungi of insect pests of crops and forest nurseries in Jabalpur (M. P.). *Biological Bulletin India*, **7**: 67-89.

Deva Prasad, V., Jayaraj, S. and Rabindra, R. J. 1990. Susceptibility of gram caterpillar, *Heliothis armigera* Hübner (Noctuidae, Lepidoptera) to certain entomogenous fungi. *Journal of Biological Control*, **4** (1): 44-47.

Gopalakrishnan, C. and Narayanan, K. 1990. Studies on the dose-mortality relationship between entomofungal pathogen *Beauveria bassiana* (Bals.) Vuillemin and *Heliothis armigera* (Hübner) (Lepidoptera: Noctuidae). *Journal of Biological Control*, **6** (2): 112-115.

Gowda, Javare and Ravi Prasad, T. N. 1992. Occurrence of *Beauveria bassiana* (Bals.) Vuillemin on the redgram pod borer *Heliothis armigera* (Hübner.) *Journal of Biological Control*, **6** (1): 48-49.

Ramaraj, Urs, M. V., Govindu, H. C. and Shivansankara Sastry, K. S. 1965. A preliminary study of white muscardine fungus on cabbage semilooper from Mysore. *Current Sciences*, **34**: 382-383.

Srivastava, R. P. and Nayak, P. 1978. A white muscardine disease on BPH of rice. *Current Science*, **47**: 355-356.