Evaluation of biopesticides against gram pod borer
_Helicoverpa armigera_ (HUB.) on pigeonpea

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**ABSTRACT**

A field experiment on evaluation of biopesticides against gram pod borer (_Helicoverpa armigera_ Hub.) on pigeon pea was carried out during _kharif_ season of 2012-13. The experiment was laid out in randomized block design with three replications. Gram pod borer is a major pest of pigeon pea in India. For the management of this pest seven biopesticides were tested along with control. Among the biopesticides, _Beauveria bassiana_ @ 1 liter/ha (1x10¹² spores/ml) was found to be most effective biopesticide as it recorded lowest larval population (6.68 larvae/5 plants). The highest larval population was recorded in control (12.61 larvae/5 plants). The least effective treatment was _Paecilomyces fumosoroseus_ (9.31 larvae/5 plants). Similar trend was observed in the grain yield as 1667.55 kg/ha, 709.41 kg/ha and 1025.21 kg/ha, respectively.

**Key words:** Biopesticides, Efficacy, _Helicoverpa armigera._

**INTRODUCTION**

Pigeon pea is one of the important pulse crop of Madhya Pradesh. In the state it is extensively grown in Narsinghpur, Raisen Vidisha, Jabalpur,Gwalior, Bhind Morena, Sidhi Sahdole districts. It is attacked by various insect pests right from sowing to storage of the crop. Among the insect species infesting pigeon pea the pod borer complex is responsible to the yield loss up to 27.77 per cent (Sahoo and Senapati, 2000). The pod borer comlex comprises of _Helicoverpa armigera_, _Grapholitha critica_, _Maruca testulalis_, _Lampides boeticus_, _Exelastis atomosa_ and _Melanagromyza obtusa_. Amongst them _Helicoverpa armigera_ is a key pest infecting 80-90% of loss caused by pod borers. It causes considerable yield loss of 250000 tonnes of grains/annum worth more than 3750 million rupees per year, (Banu et al. 2005). Various synthetic insecticides are used by the farmers for its control but due to undesirable effects on environment, alternate eco-safe biopesticides need to be developed. Microbial pathogens are considered for eco-friendly management strategy of the pests. Hence, a field trial consisting of seven microbial products was conducted to evaluate the efficacy against the gram pod borer in pigeon pea.

**MATERIALS AND METHODS**

The field trial was carried out at the experimental field of Department of Entomology, Live stock farm, Adhartal, J.N.K.V.V., Jabalpur (M.P.) during _kharif_ season 2012-13. The trial was laid out in randomized block design with three replications. Pigeon pea variety JA-4 was sown at 60 cm spacing (row to row) having plot size of 5mx4.2m.

**RESULTS AND DISCUSSION**

**Larval population:** Data presented in Table 1 showed no significant differences in the _Helicoverpa armigera_ larval population among different treatments recorded as pre-treatment observations, indicating more or less uniform distribution of the pest in the experimental field. Further, post treatment showed significant differences among various treatments after three days of spray. Among the treatments, _Beauveria bassiana_ @ 1 kg/ha (1x10¹² spores/ml) was found to be most effective, as it recorded the lowest larval population (7.87 larvae/5 plants). This was followed by...
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose</th>
<th>Mean $H. \text{armigera}$ larval population/5 plant</th>
<th>Over</th>
<th>Damage (%) ***</th>
<th>Grain Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-treatment</td>
<td>Days after spraying*</td>
<td>Pod</td>
<td>all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>mean</td>
</tr>
<tr>
<td>Beauveria bassiana</td>
<td>1 liter/ha</td>
<td>9.37</td>
<td>7.87</td>
<td>6.30</td>
<td>5.87</td>
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<tr>
<td>Metarrhizium anisopliae</td>
<td>1 liter/ha</td>
<td>(3.06)**</td>
<td>(2.80)</td>
<td>(2.51)</td>
<td>(2.42)</td>
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<tr>
<td>Paecilomyces fumosoresus</td>
<td>1 liter/ha</td>
<td>(3.11)</td>
<td>(3.04)</td>
<td>(3.05)</td>
<td>(3.02)</td>
</tr>
<tr>
<td>Verticillium lacanii</td>
<td>1 liter/ha</td>
<td>9.76</td>
<td>9.31</td>
<td>9.25</td>
<td>9.37</td>
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<tr>
<td>Bacillus thuringiensis var.</td>
<td>1.5 liter/ha</td>
<td>9.50</td>
<td>8.26</td>
<td>8.16</td>
<td>8.22</td>
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</tbody>
</table>

**Mean of three spraying***

**Figures are square root transformed values**

***Figures are arcsine transformed values

* = NS-Non significant

Verticillium lecanii) @ 1 kg/ha (1x10^12 spores/ml) (8.17 larvae/5 plants), Bacillus thuringiensis var. kurstaki (PDBC-BT-1) @ 1.5 liter/ha (8.26 larvae/5 plants), neem soap @ 1 kg/ha (10 g/l) (8.34 larvae/5 plants), pongamia soap @ 1 kg/ha (10 g/l) (9.14 larvae/plants), Metarrhizium anisopliae @ 1 kg/ha (1x10^12 spores/ml) (9.95 larvae/5 plants) and Paecilomyces fumosoresus @ 1 kg/ha (1x10^12 spores/ml) (9.31 larvae/5 plants), but all of them differed significantly from each other. The highest larval population was recorded in control (10.84 larvae/5 plants).

At seven days after treatment, the differences in the mean larval population among different treatments were significant. All the biopesticide treatments significantly reduced the larval population as compared to control (15.77 larvae/5 plants). Among the treatments, Beauveria bassiana @ 1 kg/ha (1x10^12 spores/ml) was found to be the most effective as it recorded the lowest larval population (6.30 larvae/5 plants). This was followed by Verticillium lecanii @ 1 kg/ha (1x10^12 spores/ml) (7.9 larvae/5 plants), PDBC-BT-1 @ 1.5 liter/ha (8.16 larvae/5 plants), neem soap @ 1 kg/ha (10 g/l) (8.25 larvae/5 plants), pongamia soap @ 1 kg/ha (10 g/l) (8.33 larvae/5 plants), Metarrhizium anisopliae @ 1 kg/ha (1x10^12 spores/ml) (9.28 larvae/5 plants) and Paecilomyces fumosoresus @ 1 kg/ha (1x10^12 spores/ml) (9.25 larvae/5 plants), but all of them differed significantly from each other. The highest larval population was recorded in control (15.77 larvae/5 plants).

At ten days after treatment, the differences in the mean larval population among different treatments were significant. All the biorational treatments significantly reduced the larval population as compared to control (11.21 larvae/5 plants). Among the treatments, Beauveria bassiana @ 1 kg/ha (1x10^12 spores/ml) was found to be the most effective as it recorded the lowest larval population (5.87 larvae/5 plants). The next group of treatments were Verticillium lecanii @ 1 kg/ha (1x10^12 spores/ml) (7.87 larvae/5 plants), PDBC-BT-1 @ 1.5 liter/ha (8.22 larvae/5 plants), neem soap @ 1 kg/ha (10 g/l) (8.30 larvae/5 plants), pongamia soap @ 1 kg/ha (10 g/l) (8.31 larvae/plants) and Metarrhizium anisopliae @ 1 kg/ha (1x10^12 spores/ml) (9.09 larvae/5 plants), with no significant differences among them. The least effective treatment was Paecilomyces fumosoresus @ 1 kg/ha (1x10^12 spores/ml) (9.37 larvae/5 plants) which was significantly superior to control. The highest larval population was recorded in control (11.21 larvae/5 plants).

On the basis of overall mean, the differences in the mean overall larval population per 5 plants among different treatments were significant. All the biorational treatments significantly reduced the larval population as compared to control (12.61 larvae/5 plants). Among the treatments, Beauveria bassiana @ 1 kg/ha (1x10^12 spores/ml) was found to be the most effective as it recorded the lowest larval population (6.68 larvae/5 plants). The next group of treatments were Verticillium lecanii @ 1 kg/ha (1x10^12 spores/ml)
All the treatments registered significantly as 1kg/ha (8.21 larvae / 5 plants), neem soap @ 1kg/ha (10g/l) (8.30 larvae /5 plants), but were all at par with each other. The next effective group of treatments were pongamia soap @ 1kg/ha (10g/l) (8.59 larvae/plants) and Metarhizium anisopliae @ 1kg/ha (1x10^{12} spores / ml) (9.21 larvae/5 plants). The least effective treatment was Paecilomyces fumosoresus @ 1kg/ha(1x10^{12} spores/ml) (9.31 larvae /5 plants), but was significantly superior to control. The highest larval population was recorded in control (12.61 larvae /5 plants). Hence, it is clear that all the treatments effectively reduced the larval population. These finding are in general agreement with those of Madan lal and Mishra (2003), Mohapatra and Shrivastava (2008) and Prasad et al. (2010).

**Pod and grain damage:** The results indicated in the Table-1 showed that all the treatments significantly reduced the pod and grain damage by gram pod borer as compared to control i.e. 20.70 and 14.65%, respectively. Among the treatments, V. lecanii @ 1kg/ha (1x10^{12} spores/ml) was found to be most effective as it recorded lowest pod damage (13.41%) followed by treatments B. bassiana @ 1kg/ha (1x10^{12} spores/ml) (14.76%), Bt (PDBC-BT-1) @ 1.5/l/ha (16.04 kg/ha) and pongamia soap @ 1kg/ha (10g/l) (15.24%) but they were all at par with each other. However, in case of grain damage B. bassiana @ 1kg/ha (1x10^{12} spores/ml) was found to be most effective as it recorded lowest grain damage (6.71%) followed by V. lecanii @ 1kg/ha (1x10^{12} spores/ml) (7.03%), Bt (PDBC-BT-1) @ 1.5/l/ha (7.70%) and neem soap @ 1kg/h (10g/l) (7.0%) but they were all at par with each other. The least effective treatments were pongamia soap @ 1kg/ha (10g/l) (8.09%), M. anisopliae @ 1kg/ha (1x10^{12} spores/ml) (8.58%) and P. fumosoresus @ 1 kg/ha (1x10^{12} spores/ml) (9.28%), however all the three treatments were at par with each other. The results obtained are in accordance with the findings of Reddy et al., (2001) and Prasad et al., (2010).

**Grain yield:** All the treatments registered significantly higher grain yields as compared to the control. The highest grain yield was recorded in B. bassiana @ 1kg/ha (1x10^{12} spores / ml) treated plots (1667.55kg/ha) which was significantly superior to the rest of the treatments. This was followed by Verticillium lecanii @ 1kg/ha (1x10^{12} spores/ml) (1604.3 kg/ha) and Bt (PDBC-BT-1) 1.5l/ha (1504.13 kg/ha) but were at par with each other. The next effective treatments were neem soap @ 1kg/ha (10g/l) (1486.55 kg/ha) followed by pongamia soap @ 1kg/ha (10g/l) (1374.86 kg/ha), M. anisopliae @ 1kg/ha (1x10^{12} spores / ml) (1272.74 kg/ha) and P. fumosoresus @ 1kg/ha (1x10^{12} spores / ml) (1025.21 kg/ha) and lowest yield was recorded in control plot (809.41 kg/ha) and they differed significantly from each other. The present findings are in conformity with the findings of Prabhakara and Srinivasara (1998), Khanpara et al. (2012) and Sreekanth and Seshamahalakshmi (2012).

**REFERENCES**


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