Pigeonpea pod borer complex management

DEVATA B. PATIL, S.M. THAKARE AND S.A. KONDE


SUMMARY

The pigeonpea [Cajanus cajan (Linn.)] crop is found to be badly affected by pod borer complex and becoming serious problem. The pod borer complex comprises Helicoverpa armigera, Exelastis atomosa and Melanagromyza obtusa, which are responsible to cause direct damage to pods and grains resulting into, not only the grain yield loss but fodder too. This research makes an efforts to find out the suitable management modules, comprising the low cost and eco-safe technologies, to manage this problem at the initiation point to avoid the damage keeping environmental harmony as synthetic pesticides has been found hazardous. The investigated results indicate that the “biointensive module” comprising seed treatment of Trichoderma @ 4 g/kg seed followed by spraying of Neem seed extract 5% at bud initiation stage followed by spraying of Spinosad 45 SC @ 0.01 per cent at 15 days after bud initiation stage, found most effective in reducing larval population green pod damage by pod borer complex and recorded highest yield and ICBR; followed by IPM module i.e. collection and destruction of last year residues, ploughing of soil in April, selection of resistant variety, increased seed rate by 20 per cent, seed treatment with Trichoderma @ 4 g/kg seed, spraying NSE 5 per cent at bud initiation stage, spraying of NSE 5 per cent at 5 % fruiting bodies damage level and spraying of HaNPV 250 LE/ha for H. armigera if observed and low cost technology module, consisting of deep ploughing in April, mechanical collection of larvae, use of moderately pest resistant variety i.e. Asha, increased seed rate by 20 per cent, seed treatment with Trichoderma @ 4 g/kg seeds and spraying of NSE 5 per cent at bud initiation stage and 15 days after bud initiation stage. All these three modules recorded lower larval population of pod borers; reduced green pod damage and higher ICBR and net profit too.

Key words: Biointensive module, Insecticide module, IPM, Low cost technology, Trichoderma, Pod borer management

Materials and Methods

A well planned field experiments was conducted on experimental field of Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra, India) in Kharif 2009, to come out with effective pod

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borer complex management modules, using a Randomized Block Design consisting of five treatment modules and four replications. Each individual plot was of the size 4.8 X 4.8 m. The modules tested were, M1-as an Insecticide module \( i.e. \) spraying of Endosulfan 35 EC @ 0.07 per cent at bud initiation stage, followed by spraying of Indoxacarb 14.5 SC @ 0.01 per cent at 15 days after bud initiation stage, followed by spraying of Triazophos 35 per cent + Deltamethrin 1 per cent @ 0.09 per cent at 30 days after bud initiation stage; M2- The Bio-intensive module (includes seed treatment of Trichoderma @ 4 g/ kg seed followed by spraying of Neem seed extract 5 per cent at bud initiation stage followed by spraying of Spinosad 45 SC @ 0.01 per cent at 15 days after bud initiation stage); M3- An IPM module (includes collection and destruction of last year residues, ploughing in April, selection of wilt and moderately pest resistant variety \( i.e. \) Asha, increased seed rate by 20 per cent. Seed treatment with Trichoderma @ 4 g/kg of seed, spraying of NSE 5 per cent at bud initiation stage. Spraying of NSE 5 per cent at 5 % fruiting bodies damage level and spraying of HaNPV 250 LE/ha for \( H. \) armigera if needed; and M4- as Low cost technology module (which includes, Deep ploughing in April, mechanical collection of larvae, use of moderately pest resistant variety \( i.e. \) Asha, increased seed rate by 20 per cent, seed treatment with Trichoderma @ 4 g/kg seeds and spraying of NSE 5 per cent at bud initiation stage and 15 days after bud initiation stage) along with M5- as an untreated control.

Methods of observation:
*Helicoverpa armigera* and *Exelastis atomosa* larval count per plant:

From each plot, five plants were selected randomly as representative of the overall plant population of each plot. Three twigs of three sides of each selected plant were tagged for recording weekly observations. The three twigs total count was considered as per plant count. The number of *H. armigera* and *E. atomosa* larvae were counted weekly from bud initiation stage to pod maturity stage \( i.e. \) after completions of module applications. Finally observations were statistically analysed and drawn the conclusion.

*Pod damage by lepidopteran pests:*

The total pods and pods having damage holes of Lepidopteran pests from three twigs of each selected plant were counted and percent pod damage was worked out.

*Pod damage by Melanagromyza obtusa:*

Per plot, fifty green pods excluding border rows were collected and by splitting the pods, the pod damage by *M. obtusa* were counted and per cent pod damage was worked out. The same method was used for pod damage at harvest.

**Grain yield:**

The module wise grain yields per plot were recorded and on that basis yields per hectare were calculated.

**RESULTS AND DISCUSSION**

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

**Effect on larval population of *H. armigera:***

Each of the module tested was proved significantly superior over untreated control (Table 1). However, the highest efficiency to manage *Helicoverpa* larval population was achieved with bio-intensive module recording only the population of 1.72/plant followed by the insecticide module with 1.88 larvae /plant and both modules proved statistically similar. While IPM module and low cost technology module being statistically at par proved next effective in recording the larval population of 2.70 and 3.10 per plant, respectively. The bio-intensive module, not only proved effective to reduced the population of *Helicoverpa armigera* but also recorded higher natural enemies (Table 4) and emerged as ecofriendly and

| Table 1: Effect on larval population of *H. armigera* and *E. atomosa* |
|---------------------------|-----------------------------|-----------------------------|
| **Sr. No.** | **Modules** | **Average number of *H. armigera* larvae per plant** | **Average number of *E. atomosa* larvae per plant** |
| 1 | M₁- Insecticide module | 1.88 (1.37) | 2.95 (1.71) |
| 2 | M₂- Bio-intensive module | 1.72 (1.31) | 2.54 (1.59) |
| 3 | M₃- IPM Module | 2.70 (1.64) | 4.37 (2.09) |
| 4 | M₄- Low cost technology module | 3.10 (1.76) | 6.13 (2.47) |
| 5 | M₅- Untreated control | 4.52 (2.12) | 7.27 (2.69) |

<table>
<thead>
<tr>
<th>‘F’ test</th>
<th>Sig.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.E. (m)</td>
<td>0.07</td>
<td>0.16</td>
</tr>
<tr>
<td>C.D. (P=0.05)</td>
<td>0.21</td>
<td>0.47</td>
</tr>
</tbody>
</table>
economical (Table 5). Even though the insecticide module proved effective in reducing the pest population, its input cost is higher and hence found uneconomical, while IPM module proved to be not only economical but ecofriendly too. Baviskar et al., (2002) reported the efficacy of NSE 5 % against H. armigera. While the effectiveness of HaNPV 250 LE in managing larval population is also reported by Bhatt and Patel (2002); Srinivasa and Sridhan (2008) which supports these findings.

Effect on the larval population of Exelastis atomosa:

The data presented in (Table1) indicated that the bio-intensive module proved to be the most effective in reducing the larval population of E. atomosa to 2.54/plant followed by an equally effective insecticide module which reduced the larval population to 2.95 /plant. Where as the IPM module with 4.37 larvae/plant was found next effective. However the low cost technology was not found effective to reduce larval population as it recorded 6.13 larvae/plant but was superior over untreated control.

Thakare and Sarode (2003) also reported the NSE 5 % + half dose of Endosulfan as a effective treatment in managing the larval population of E. atomosa. While Baviskar et al. (2002) reported the positive efficacy of NSE 5 % against E. atomosa.

Effect on green pod damage by lepidopteron pests (H. armigera and E. atomosa):

All the pest management modules have recorded significantly superior results (Table 2) over untreated control. The bio-intensive module was found most effective in minimizing the green pod damage to 14.8 per cent and was significantly superior over all other modules followed by insecticide module (18.9 %) and IPM modules (21.8 %) in reducing the green pod damage, the later two treatments were statistically equally effective. While, the low cost technology module found inferior as compared to other modules and recorded higher pod damage (28.4 %) but significantly superior over untreated control which recorded highest (35.9 %) pod damage by lepidopteron pests.

The effectiveness of NSE 5 per cent in reducing the green pod damage in pigeonpea by lepidopteron pests has also been reported by Nath et al. (2008). IPM modules including the treatments of NSE 5 per cent. HaNPV 250 LE and Endosulfan 35 EC found effective in reducing the pod damage by lepidopteran pests by Srinivasan and Sridhar, (2008) and Katole et al. (1999).

Effect on green pod damage by M. obtusa:

The significant reduction was found (Table 2) in per cent green pod damage due to M. obtusa on pigeonpea by all the pest management modules over untreated control. However, the bio-intensive module was emerged as the most effective module and statistically significant over all other modules in recording minimum pod damage (16.00 %) by followed by an insecticide module and IPM module which also recorded lower pod damage of 16.7 and 19.5 per cent. Where as each of the modules

Effect on green pod damage by pod borer complex:

The per cent green pod damage by pod borer complex i.e. collective damage of H. armigera, E. atomosa and M. obtusa presented in Table 2 revealed that all pest management modules were found significantly superior over untreated control. Among the four modules, the bio-intensive module recorded minimum green pod damage (10.4 %) and proved most effective and was significantly superior over all other modules, followed by insecticide module, IPM module and low cost technology module which recorded 16.7, 19.5 and 24.75 per cent pod damage, respectively. Where as each of the modules

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Modules</th>
<th>Percent green pod damage by lepidopteron pests</th>
<th>Per cent green pod damage by M. obtusa</th>
<th>Percent green pod damage by pod borer complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>M₁- Insecticide module</td>
<td>18.90 (25.77)</td>
<td>21.00 (27.28)</td>
<td>16.7 (24.12)</td>
</tr>
<tr>
<td>2.</td>
<td>M₂- Bio-intensive module</td>
<td>14.8 (22.63)</td>
<td>16.00 (23.58)</td>
<td>10.4 (18.81)</td>
</tr>
<tr>
<td>3.</td>
<td>M₃- IPM module</td>
<td>21.8 (27.83)</td>
<td>27.2 (31.44)</td>
<td>19.5 (26.21)</td>
</tr>
<tr>
<td>4.</td>
<td>M₄- Low cost technology module</td>
<td>28.4 (32.20)</td>
<td>30.90 (33.77)</td>
<td>24.75 (29.82)</td>
</tr>
<tr>
<td>5.</td>
<td>M₅- Untreated control</td>
<td>35.9 (36.81)</td>
<td>38.3 (38.23)</td>
<td>29.2 (32.71)</td>
</tr>
<tr>
<td></td>
<td>F’ test</td>
<td>Sig.</td>
<td>Sig.</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td>S.E. (m)</td>
<td>0.92</td>
<td>0.58</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td>C.D. (P=0.05)</td>
<td>2.29</td>
<td>1.49</td>
<td>1.72</td>
</tr>
</tbody>
</table>

Table 2: Effect on green pod damage
in sequence was significantly superior over other. Maximum green pod damage (29.2 %) was noticed in untreated control.

The effectiveness of NSE 5 per cent against pod borer complex was reported by Nath et al. (2008). Reduction in the pod damage of pigeonpea due to pod borer complex by application of Spinosad 45 SC has been reported by Bhoyar et al. (2004); Singh et al. (2008). Srinivasan and Sridhar (2008) tested the effectiveness of IPM module including treatments of NSE 5 per cent, HaNPV 250 LE and Endosulfan 35 EC@ 0.07 per cent against the pod damage by pod borer complex.

Effect on grain yield of pigeonpea:

All the pest management modules were significantly superior over untreated control in increasing grain yields (Table 3). The bio-intensive module recorded the highest grain yield of 14.72 qt/ha followed by insecticide module which recorded 14.01 qt/ha and both modules were statistically at par. The next effective modules were IPM module and low cost technology module that recorded the yield of 11.84 q/ha and 10.92 q/ha, respectively as compared to untreated control which recorded lowest (8.26 q/ha) grain yield. From this it can be concluded that, there was significant increased in yield of pigeonpea in all plant protection modules over the untreated control. While among the four modules, yield recorded in the bio-intensive module and insecticide module was higher over other modules, that is because of less pod damage by pod borers due to the effective and timely pest management which not only helped to reduce the larval population, pod damage but also wilt in pigeonpea. Even though there was comparatively more larval population and pod damage in the IPM module and low cost technology module than insecticidal module, but the CIBR were higher than insecticide module i.e. 10.23 and 8.60 against 8.18 in insecticide module and also were effective in increasing the yield due to the application of NSE 5 %, HaNPV 250 LE and might be due seed treatment of Trichoderma as they reduce the wilt and produce growth regulating factors that increase the yield and plant biomass. Hence, the bio-intensive module followed by IPM module and low cost technology module are proved to be the best alternatives to insecticides to get maximum net profit with an additional advantage of pesticides free grains and pollution free environment.

Earlier workers like, Theradimani and Hepziba, (2003) also recorded increased yield due to seed treatment of Trichoderma sp. in sunflower. Windham et al. (1986) reported that Trichoderma sp. produces growth regulating factors that increases the plant biomass. Kokate (1999); and Ousley (1994) reported the increased vigour index due to the Trichoderma species. Singh et al. (1998) and Monoco et al. (1998) reported the efficacy of Trichoderma sp. against both F. oxysporum and Rhizoctonia bataticola which also supports these results.

Conclusion:

From the above results, it is concluded that bio-intensive module and IPM module were quite safer for the multiplication of natural enemies and found effective in reducing the larval population, pod damage and in increasing the grain yield and ICBR of pigeonpea. Hence farmers can adopt these two modules as an alternative to insecticides as economical, environmentally safe, easy to use and socially acceptable too.

Authors’ affiliations:
DEVATA B PATIL AND S.A. KONDE, Department of Entomology, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA

REFERENCES


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