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Bio-efficacy of *Beauveria bassiana* (Balsamo) Vuillemin against *Helicoverpa armigera* (Hubner) on pigeonpea under laboratory condition

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A laboratory experiment was conducted to determine the bio-efficacy of *Beauveria bassiana* (Balsamo) Vuillemin alone and in combination with chemical insecticides against *Helicoverpa armigera* (Hubner) on pigeonpea at bio-control laboratory, Department of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* season of 2011. The results revealed that polytrin-C 0.044 per cent and chlorpyriphos 0.05 per cent alone recorded the highest mortality, whereas *B. Bassiana* @1.25 kg/ha combined with polytrin-C 0.044 per cent and *B. Bassiana* @1.25 kg/ha combined with chlorpyriphos 0.05 per cent were the next best treatments and can be recommended for eco-friendly management of *H. armigera* in pigeonpea ecosystem.

Key words : *Beauveria bassiana* (Balsamo) Vuillemin, *H. Armigera*, Pigeonpea

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Pigeonpea, an important pulse cum grain legume crop is attacked by a key pest, *Helicoverpa armigera* (Hubner) is during reproductive phase of pigeonpea. Due to the indiscriminate use of chemical pesticides against this pest has caused the environment pollution. Hence, entomologists and environmentalists felt to develop viable alternate strategies which could be integrated into a workable system called integrated pest management. Among such eco-friendly approaches, entomopathogenic fungi form one of the most important components which are being employed to control noxious insect pest of pigeonpea ecosystem *viz.*, *H. armigera*. Among several entomopathogenic fungi, *B. bassiana* is the most important entomopathogenic fungus for its control as well as reducing the chances of development of resistance against *H. armigera*. Looking to the importance of *B. bassiana* as microbial control agent, and seriousness of *Helicoverpa* and hazards of chemical pesticides, it is highly necessity to evaluate the bio-efficacy of *B. bassiana* alone and in combination with insecticides against this pest infesting pigeonpea.

The laboratory experiment on pigeonpea (var. BDN-2) was conducted at bio-control laboratory, Department of Entomology, College of Agriculture, Junagadh Agricultural University, Junagadh during 2001. Fresh immature pods of pigeonpea collected from the unsprayed pigeonpea field were washed properly with clean water and air-dried. The spray of each treatment (Table 1) was applied to pods of pigeonpea separately with the help of atomizer. Care was taken to obtain uniform coverage of insecticide. Treated pods were allowed to dry under ceiling fan for 15 minutes. The one day starved third instar larvae of *H. armigera* were kept individually in plastic boxes (7.5 cm height ´ 3.9 cm in diametre) along with lip made of small holes for ventilation. Then the treated leaves were provided as food for them. Ten larvae per treatment in each repetition were kept. The larvae were provided with fresh untreated food after 24 hours of feeding on the treated food. Mortality counts were recorded 1, 2, 3 and 5 days after the treatment. Data on mortality were converted into corrected per cent mortality of the pest in each treatment by using modified formula given by Henderson and Tilton (1955).

Data presented in Table 1 revealed that there was a significant difference in percentage larval mortality at every observation days. All the treatments were found significantly superior by giving higher mortality of *H. armigera* larvae to

the control. After first day, the treatment of polytrin-C 0.044 per cent gave significantly highest reduction (57.00 %) and chlorpyriphos 0.05 was next best treatment (50.00 %). Among the other treatments, B. *bassiana* 2.5 kg/ha (20.00 %) and *Bb* 1.25 kg/ha + acephate 0.022 per cent (27.50 %) gave lowest reduction. The remaining treatments, acephate 0.15 per cent, *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent remained next effective treatment, which recorded 41.25, 40.00, and 33.25 per cent pest reduction, respectively.

Data recorded at second day of treatment indicated that polytrin-C 0.044 per cent gave significantly highest reduction (65.62 %) and it was at par with the treatment of chlorpyriphos 0.05 (62.84 %). Among the other treatments, *B. bassiana* 2.5 kg/ha (22.91 %) and *Bb* 1.25 kg/ha + acephate 0.022 per cent (31.24 %) gave lowest reduction. The remaining treatments, acephate 0.15 per cent, *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent remained next best treatments, which recorded 51.38, 50.13, and 42.70 per cent pest reduction, respectively.

The treatment of polytrin-C 0.044 per cent recorded highest mortality (75.00 %) at 3 days after treatment. The treatments of chlorpyriphos 0.05 per cent, acephate 0.15 per cent, *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent remained next best treatments, which recorded 72.37, 65.62, 62.50 and 59.37 per cent pest reduction, respectively. Whereas, the treatments of *B. bassiana* 2.5 kg/ha and *Bb* 1.25 kg/ha + acephate 0.022 per cent recorded comparatively lower larval reduction of 46.87 and 53.12 per cent, respectively.

Perusal of results (Table 1) on mortality of *H. armigera* larvae at 5th days after treatment revealed that polytrin-C 0.044 per cent gave 86.15 per cent mortality and chlorpyriphos 0.05 (78.51 %) remained next best treatment. The next effective treatments were acephate 0.15 per cent, *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent which recorded 74.21, 72.31 and 71.56 per cent larval reduction, respectively. Whereas, the treatments of *B. bassiana* 2.5 kg/ha and *Bb* 1.25 kg/ha + acephate 0.022 per cent recorded comparatively lower larval reduction of 61.16 and 63.12 per cent, respectively.

The mean results revealed that the treatment of polytrin-C 0.044 per cent recorded significantly highest larval mortality (70.94 %). The treatment of chlorpyriphos 0.05 per cent was found next in order to larval reduction and recorded 65.93 per cent mortality. The next best treatments were acephate 0.15 per cent, *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent recording of 58.11, 56.23, and 51.72 per cent larval reduction, respectively. Whereas, the treatments of *B. bassiana* 2.5 kg/ha and *Bb* 1.25 kg/ha + acephate 0.022 per cent recorded comparatively lower larval reduction of 37.73 and 43.74 per cent, respectively.

Thus, this study convinced that the treatments of polytrin-C 0.044 per cent, chlorpyriphos 0.05 per cent and acephate 0.15 per cent were found the most toxic, the next best treatments were *Bb* 1.25 kg/ha + polytrin-C 0.022 per cent and *Bb* 1.25 kg/ha + chlorpyriphos 0.025 per cent. The bio-pesticide alone, *B. bassiana* showed the toxicity from second day of application and increased drastically in subsequent period up to maximum toxicity at 5th day of application, and found more or less compatible with either insecticides.

Effective control of *Helicoverpa* was obtained with the treatment of polytrin-C 0.044 per cent as reported by Kazi *et al.* (2004) and Pal *et al*. (1996). Aherkar *et al.* (2006) reported that acephate 75 SP (2.0 kg/ha) and *B. bassina* 3.75 kg/ha as effective against *H. armigera* larvae under laboratory conditions. Gundannavar *et al.* (2006) evaluated the larval instars of *H. armigera* for their susceptibility to *B. bassiana* under laboratory conditions and reported that the *B. bassiana* at 10^8 conidia per ml gave maximum larval mortality. Thus, the present findings are in conformity with findings of earlier workers.

The laboratory study concluded that the treatment of *B. bassiana* @ 1.25 kg/ha in combination with polytrin-C 0.022

Table 1 : Efficacy of biopesticides alone and in combination with insecticides against third instar larvae of *H. armigera* in laboratory

Sr. No.	Treatments	Larval mortality (%) days after treatment				
		1 days	2 days	3 days	5 days	Mean
1.	*Beauveria bassiana* 2.5kg/ha	26.56* (20.00)	28.59* (22.91)	43.19 (46.87)	51.45 (61.16)	37.45 (37.73)
2.	*Bb*1.25kg/ha+ Acephate 0.075%	31.54 (27.50)	33.95 (31.24)	46.80 (53.12)	52.61 (63.12)	41.25 (43.74)
3.	*Bb*1.25kg/ha+ Chlorpyriphos 0.025%	35.17 (33.25)	40.80 (42.70)	50.42 (59.37)	58.00 (71.56)	46.04 (51.72)
4.	*Bb*1.25kg/ha+ Polytrin-C 0.022%	39.23 (40.00)	45.08 (50.13)	52.23 (62.50)	58.26 (72.31)	48.69 (56.23)
5.	Acephate 0.15%	39.95 (41.25)	45.80 (51.38)	54.17 (65.62)	59.49 (74.21)	49.83 (58.11)
6.	Chlorpyriphos 0.05%	45.00 (50.00)	52.47 (62.84)	58.35 (72.37)	62.69 (78.51)	54.52 (65.93)
7.	Polytrin-C 0.044%	49.32 (57.00)	54.11 (65.62)	60.00 (75.00)	68.16 (86.15)	57.81 (70.94)
S.Em. ±		0.96	1.32	1.43	1.64	1.33
C.D. (P=0.05)		2.80	3.85	4.17	4.79	3.90
C.V.%		5.39	6.57	5.83	5.94	5.93

* Angular transformation. Figures in parentheses are original values

per cent or chlorpyriphos 0.025 per cent was found as effective as the recommended synthetic insecticides for mortality of *Helicoverpa* larvae on pigeonpea.

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