Efficacy of some biopesticides against defoliators and capitulum borer, *Helicoverpa armigera* Hub. in sunflower, *Helianthus annuus* L.

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ABSTRACT

During 2008-09, six bio-pesticides were evaluated, under field conditions, for their efficacy against major defoliators and capitulum borer, *Helicoverpa armigera* Hub. infesting sunflower, at the Zonal Agricultural Research Station, UAS, Bangalore. All the six bio-pesticides *viz.*, *Spodoptera* NPV @ $2x10^8$ POB/ml, *Helicoverpa* NPV @ $2x10^8$ POB/ml, *Pongamia* Seed Kernel Extract @ 5%, Neem gold 0.03EC(300ppm)(0.5%), Neem Seed Kernel Extract @ 5 % and Prosopan @ 10ml/L. were on par with the insecticidal checks (endosulphan 35 EC @ 0.07% and profenophos 50EC @ 0.05 %) and they were found to be significantly superior than untreated check in the suppression of defoliators, 50 days after sowing. Neem seed kernal extract, (5%), prosopan (10 ml/lit) and both the insecticides were significantly superior than the other treatments, at one day after the second spray (i.e., @ 90 DAS) for *H.armigera* supression.

Key words: *Helicoverpa armigera*, crop pest, biopesticides, sunflower

INTRODUCTION

Among the biotic stress factors, insect pests and diseases are the major production constraints in sunflower production. As many as 251 insect and acarine species have been recorded on sunflower at the global level (Rajamohan, 1976). In India, sunflower crop is damaged by different species of insect pests, of which the polyphagous pests like capitulum borer (*Helicoverpa armigera* Hubner), green semilooper (*Thysanoplusia orichalcea* Fab.), Bihar hairy caterpillar (*Spilarctia obliqua* Walker), tobacco caterpillar, *Spodoptera litura* Fab., cabbage semilooper (*Trichoplusia ni* Hubner), cutworm (*Agrotis* spp.) and leafhopper (*Amrasca biguttula biguttula* Ishida) are of major economic importance (Basappa, 1995).

Crop loss due to insect pests in sunflower varies from region to region. As a result of severity of grasshopper and other seedling pests, the plant stand of sunflower crop could be reduced by more than 30 per cent (Basappa and Bhat, 1998). The loss in seed yield due to defoliators in a rainfed kharif crop was up to 268 kg per ha at Bangalore (Anon., 1976; Panchabhavi and Krishnamoorthy,1978). Similarly, Banerjee and Haque (1984) estimated yield losses up to 40 per cent due to *Diacrisia casignetum* Kollar. The capitulum borer, *H. armigera* is highly polyphagous, with about 181 host plants including important crop plants such as pulses, cotton, vegetables etc. (Manjunath *et al*., 1985). The pests like gram caterpillar *H. armigera* and tobacco caterpillar (*S. litura*) in sunflower caused near total loss. The capitulum borer directly inflicts damage to sunflower by depriving the plant of ovaries and developing seeds (Bhat and Virupakshappa, 1993).Even one *H. armigera* larva per capitulum could cause economic damage (Margal, 1990). In Karnataka, heavy infestation of *H. armigera* (83.6%) was observed with as many as six larvae per head (Thontadarya and Jayaramaiah, 1973). According to Rogers (1992), *H. armigera* (Lewin *et al.*, 1973; Rangarajan *et al.*, 1975; Panchabhavi *et al.*, 1977) and *H. peltigera* Denis and Schissermuller (Grewal *et al*., 1985; Singh and Bakhetia, 1993) might destroy more than 50 per cent of seed. Moreover, *H. armigera* caused a crop loss of 120 kg of seeds per ha. (Panchabhavi and Krishnamoorthy, 1978). Recent results show that we can manage this pest before it hatched from the egg (Malarvannan, 2009). Sunflower is an important oilseed crop of the country, which is mainly cultivated by the farmers of the dry tracts, in poor and marginal soils. Therefore, dependency on expensive and hazardous insecticides will inflate the cost of sunflower production and also reduce the profit margin of the farmer. Widespread and indiscriminate usage of synthetic chemical insecticides, has led to the development of resistance in insects, resurgence of sucking pests, destruction of beneficial fauna, in addition to the several toxic hazards due to large scale manufacture and handling of the chemical pesticides. These drawbacks are forcing

Table 1. Evaluation of biopesticides on the population of defoliators

Treatments	No. per plant		% Leaf damage	
	Semiloopers & weevils (Before spray)	Semiloopers& weevils (1 day after 1st spray)	Before spray	1 day after 1st spray
TI: Sl NPV 2x108 POB/ml	1.05 (1.23)	0.53 (1.01a)	3.94	5.06
T2: Ha NPV 2x108 POB/ml	0.88 (1.16)	0.18 (0.82a)	4.55	4.96
T3 : PSKE (5%)	1.22 (1.27)	0.22 (0.84a)	5.66	5.07
T4: Neem Gold (300ppm) 0.5%	1.16 (1.28)	0.44 (0.96a)	7.44	5.10
T5 : NSKE (5%)	0.99 (1.21)	0.44 (0.96a)	4.44	4.39
T6 : Endosulphan 35 EC (0.07%)	0.99 (1.12)	0.16 (0.81a)	5.11	5.03
T7 : Profenophos50EC (0.05%)	1.27 (1.32)	0.16 (0.81a)	5.77	4.45
T8 : Prosopan 40 EC (10ml/lit)	1.33 (1.33)	0.31 (0.88a)	4.99	3.88
T9 :Untreated Control	1.22 (1.29)	1.22 (1.30b)	5.20	5.02
F-Test (P = 0.05)	(NS)	(*)	(NS)	(NS)
S. Em	-	(0.07)	-	-
CD(P = 0.05)	-	(0.21)	-	-
CV (%)	(18.36)	(13.26)	(30.58)	(20.45)

the sunflower farmer to explore viable eco-friendly alternatives for pest management. In this context bio-pesticides offer the most feasible option to the farmer, hence the present investigation was initiated at the Zonal Agricultural Research Station, GKVK, Bangalore.

MATERIALS AND METHODS

Six bio-pesticides were evaluated under field conditions for their efficacy against defoliators and capitulum borer (*H. armigera*) infesting sunflower (cv.KBSH-44), during 2008-09, *viz.*, commercial Nuclear Polyhedrosis Virus (NPV) formulations of *S. litura* (Sl NPV@ $2x10^8$ POBs/ml)and *H. armigera* (Ha NPV@ $2x10^8$ POBs/ml of Bio-pest Management Pvt. Ltd., Bangalore), *Pongamia* Seed Kernel Extract (PSKE@ 5%), Neem Seed Kernel Extract(NSKE@ 5%), Neem gold 0.03EC (300ppm)(0.5%) and Prosopan 40EC @10ml/lit. (an extract of *Prosopis juliflora*, supplied by Directorate of Oilseeds Research, Hyderabad). The insecticides like, endosulphan 35EC @ 2ml/lit and profenophos 50EC @ 1ml/lit, were included as recommended checks for comparison.

RESULTS AND DISCUSSION

All the six biopesticides were on par with the insecticidal checks (Endosulphan 35 EC @ 0.07% and Profenophos 50EC @ 0.05 %) in the suppression of defoliators and they were found to be significantly superior than untreated check in the suppression of defoliators (Table 1) at one day after spray (ie. 50DAS). Against the capitulum borer (*H.armigera*), NSKE (5%), prosopan (10 ml/lit) and both the insecticidal

Table 2. Effect of bio-pesticides on the population of defoliators and capitulum borer

Treatments	Number per plant				
	Semiloopers / plant (1 day after 2nd spray)	*S. litura* / Plant (1 day after 2nd spray)	Tot. No. of defoliators / plant (1 day after 2nd spray)	*H.armigera* / plant (1 day after 2nd spray)	Seed Yield (kg / ha)
TI: Sl NPV 2x108 POB/ml	1.05 (1.14)	0.16 (0.80)	1.21 (1.20)	2.33 (1.65ab)	1524
T2: Ha NPV 2x108 POB/ml	1.33 (1.34)	1.05 (1.08)	2.38 (1.67)	2.44 (1.66ab)	1339
T3 : PSKE (5%)	0.88 (1.16)	0.27 (0.85)	1.16 (1.25)	3.44 (1.98ab)	1984
T4: Neem Gold (300ppm) 0.5%	1.72 (1.48)	0.10 (0.77)	1.82 (1.51)	2.22 (1.63ab)	1810
T5 : NSKE (5%)	1.21 (1.29)	0.27 (0.86)	1.49 (1.38)	1.44 (1.35a)	2008
T6 : Endosulphan 35 EC (0.07%)	0.16 (0.80)	0.32 (0.89)	0.49 (0.98)	1.49 (1.40a)	1458
T7 : Profenophos50EC (0.05%)	0.27 (0.86)	0.22 (0.83)	0.49 (0.96)	1.38 (1.36a)	1650
T8 : Prosopan 40 EC (10ml/lit)	0.72 (1.09)	0.00 (0.70)	0.72 (1.09)	1.72 (1.48a)	1530
T9 :Untreated Control	1.33 (1.34)	1.11 (1.26)	2.44 (1.70)	3.38 (1.97ab)	1361
F-Test (P=0.05)	(NS)	(NS)	(NS)	(*)	(NS)
S. Em	-	-	-	(0.12)	-
CD(P=0.05)	-	-	-	(0.38)	-
CV (%)	(20.64)	(27.53)	(21.70)	(13.69)	(35.60)

checks (endosulphan and profenophos) were significantly superior (Table 2) than the other treatments, at one day after the second spray (i.e., 90 DAS). Similar results were obtained by Sireesha (2000), wherein, Ha NPV @ 250 LE per ha was found to be significantly more effective and on par with NSKE (5%) followed by *Nomuraea rileyi* (1kg/ha), *Bacillus thuringiensis* (1kg/ha) and *Beauveria bassiana* (1kg/ha). However, two sprays of endosulfan (2ml/l) at 15 days interval was found significantly more effective compared to the bioagents. Similiarly, Jagadish *et al*. (2006) found that the IPM module like seed treatment with imidacloprid (5g/kg)+ two sprays of NSKE 5% + two sprays of HaNPV at 250LE/ ha gave a significant decrease in population of all sucking pests and defoliators, besides higher incidence of predators, lower incidence of *H. armigera*, highest grain yield and cost: benefit ratio (1:2.32) and it was also superior to chemical control in sunflower. Therefore, in the present investigation, NSKE (5%) and prosopan (10 ml/lit) have proved their superiority against both the target pests.

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