Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; Sp 9(6): 348-351
Received: 09-07-2020
Accepted: 11-08-2020

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Effect of different biopesticides and insecticides treatments on average per cent pod damage and grain yield of chickpea (*Cicer Arientinum)*

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Abstract
The present investigation was undertaken to find out suitable and low cost substitute for the management of *Helicoverpa armigera* (Hubner) on chickpea by using microbials and botanicals. The field trial was laid out in the premises of Insectary, Entomology Section, College of Agriculture, Nagpur, during the rabi season of 2013-14. The experiment was laid out in randomized block design (RBD) with three replications and eight treatments including control (water spray). The observations were recorded on average per cent pod damage caused by Helicoverpa armigera (Hubner) and average grain yield of chickpea. The observations on percent pod damage at harvest stage indicated that pod damage ranged from 18.64% to 38.85%. The treatments spinosad 45 SC 0.01% (18.64%) and quinolphos 25 EC 0.05% (21.24%) recorded lowest pod damage and afforded the best protection against *Helicoverpa armigera* (Hubner) by reducing 18.64 per cent and 21.24 per cent pod damage respectively on harvest as compared to control (38.85%). The treatments spinosad 45 SC 0.01%, quinolphos 25 EC 0.05% and HaNPV 500 LE/ha 1ml/l had shown similar effect and recorded 15.23,14.22 and 12.68 q/ha grain yield respectively, as compared to control 7.45 q/ha.

Keywords: Biopesticides, Insecticides, Per Cent Pod Damage, Grain Yield, Chickpea

Introduction
Chickpea (*Cicer arientinum* Linn,) is the third most important pulse crop cultivated world wide and one of the most important staple legume food crop in India. It is the potent source of dietary constituent i.e. lysine, phosphorus and calcium and also a major part of the protein requirement. There are several pulse crops considered important at various locations throughout the world. Bengal gram or chickpea first domesticated in the Middle East, is widely cultivated in India, Mediterranean area, the Middle East, Ethiopia, Mexico, Argentina, Chile and Peru. Chickpea, one of the prime pulse crop of India in terms of both area and production. India is the largest producer of chickpea in the world sharing 65.25 and 65.49 per cent. Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh and Karnataka are the major chickpea producing states sharing over 95 per cent area. Insect pests stand as a major bottleneck in realizing higher yield. More than 50 species of the insect pests reported infesting chickpea under field and storage conditions (Garg and Surendra, 2000) [2]. Helicoverpa armigera (Hubner), (Family-Noctuidae, order-lepidoptera) popularly known as gram pod borer or American bollworm is a cosmopolitan, polyphagous and dynamic insect pest causing drastic yield losses in chickpea. In India, annual crop losses caused due to this pest has been estimated at 2000 crores despite the use of chemical insecticides worth about 500 crores for combating this pest (Pawar, 1998) [7]. The population of this pest fluctuates drastically resulting in significant yield losses upto 70% (Lal *et al.* 1985) [3]. In Maharashtra losses due to this pest reported to the extent of 20% (Mahajan *et al.* 1990) [5]. In the present scenario the menace caused by *Helicoverpa armigera* (Hubner) becomes stumbling block in chickpea production. No doubt, several chemical insecticides have been found effective against this pest. However, due to overuse and misuse of these chemical insecticides, natural balance has been disturbed, leading to enormous problems such as resistance, residue, resurgence and destruction of natural enemies, pollution, and health hazards etc. There is need of comprehensive management strategy, to confront this pest and to find out ecofriendly, reliable substitute for such chemical insecticides. Biological component viz. microbials and botanicals are found promising for the management of this pest. Keeping in view of the emerging crisis, pragmatic efforts have been made, in the present study for the suppression of this pest by using microbials and botanicals alone and in combination with recommended insecticide. In this context this research was aimed with the objective - to study the effect of

different biopesticides and insecticides treatments on average per cent pod damage & grain yield of chickpea at harvest.

Materials and Methods

The field trial was laid out in the premises of Insectary, Entomology Section, College of Agriculture, Nagpur, during the rabi season of 2013-14 considering the objectives.to find out suitable and low cost substitute for the management of *Helicoverpa armigera* (Hubner) on chickpea.

A) Materials-

For conducting the present investigation, required material like chickpea seed (Variety Jaki-9218), fertilizers, agricultural implements,bullock pair, chemical insecticide (quinolphos), neem seed, Neem oil, HaNPV, Beauveria bassiana, spinosad, polythene bags, measuring cylinder, labels, plastic bucket, pegs, threads, measuring tape etc. were made available by Entomology Section, College of Agriculture, Nagpur.

Beauveria bassiana was made available from Plant pathology Section, College Agriculture Nagpur. Also, Rhizobium and Phosphorus solubilising bacteria (PSB) culture for seed treatment was made available from Plant Pathology Section, College of Agriculture, Nagpur.

B) Treatment Details

Table 1: Treatment details as per following

Sr. No.	Treatment Number	Treatment Name	Concentration
1	T1	Neem Seed Extract	5%
2	T2	Neem oil + Detergent powder	2%
3	T3	Beauveria bassiana 108 conidia/ml	2ml/l
4	T4	Azadirachtin 1500 ppm	2.5ml/l
5	T5	HaNPV 500 LE/ha	1ml/l
6	T6	Spinopsad 45 SC	0.01%
7	T7	Quinoplhoos 25 EC	0.05%
8	T8	Control (Water spray)	--

C) Method of Recording Observations

1) Observations on pod damage

Observations on pod damage by the pest was recorded at harvest stage, by counting the total number of pods and those damaged by the pest from already selected plants from each plot. Accordingly per cent pod damage was worked out.

$$\text{Per cent pod damage} = \frac{\text{Total no. of damaged pods}}{\text{Total no. of pods}} \times 100$$

2) Observations on grain yield

The yield obtained at harvesting stage was recorded from each plot and converted into hectare basis, to evaluate the effect of different treatments on yield performance of the crop.

The data thus obtained on per cent larval population reduction, per cent pod damage at harvest stage and grain yield per hectare were subjected to statistical analysis, and considered for the conclusion.

Result & Discussion

1. Effect of treatments on average per cent pod damage at harvest

The data presented in (Table-1) indicated that the effect of treatments on average per cent pod damage at harvest ranged from 18.64% to 38.85%. The treatments spinosad 45 SC 0.01% (18.64%) and quinolphos 25 EC 0.05% (21.24%) recorded lowest pod damage and afforded the best protection against *Helicoverpa armigera* (Hubner) by reducing 18.64 per cent and 21.24 per cent least pod damage respectively on harvest as compared to control (38.85%) Both these treatments exhibited parity with each other.

The present findings are corroborative with the findings of Singh *et al.,* (2012) [11] reported promising effects of spinosad 45 SC @ 100 g a.i./ha and was found most effective in minimizing pod damage in chick pea.

Babar *et al.,* (2012) reported less pod damage on chick pea. Patil *et al.,* (2007) [6] reported minimum pod damage on chick pea. These findings are in agreement with the present findings.

Amongst the bioagents, the next effective treatment in average percent pod damage at harvest was HaNPV 500 LE/ha 1ml/l recorded 22.23% average percent pod damage at harvest and afforded the best protection against *Helicoverpa armigera* (Hubner) by minimizing pod damage at harvest. Pawar and Kadam (1995) [8] and Vyas and Lakhohaura (1996a) [13] also reported the effectiveness of HaNPV 250 LE/ha exhibited less pod damage on chick pea. Ujagir *et al.* (1997) [12] and Sarode and Sonalkar (2000) [9] reported less pod damage on chickpea treated with HaNPV 250 LE/ha. These findings are in agreement with the present findings.

Next effective treatments were *Beauveria bassiana* 10^8 conidia/ml 2ml/l (27.58%), neem oil + detergent powder 2% (28.68%), azadirachtin 1500 ppm 2.5 ml/l (29.24%) and neem seed extract 5% (31.12%) and all these treatments were on par with each other and showed less pod damage at harvest. However, all the treatments were significantly superior over control where maximum pod damage to the extent of (38.52 %) was recorded.

Table 1: Effect of treatments on average per cent pod damage at harvest stage of chickpea

Treat. No.	Treatment	Average per cent pod damage			Total	Mean
		R-I	R-II	R-III		
T1	Neem seed extract 5%	32.77 (34.92)	29.14 (32.67)	31.44 (34.10)	101.70 (93.35)	31.12 (33.90)
T2	Neem oil + detergent powder 2%	32.40 (34.69)	29.42 (32.84)	24.22 (29.48)	97.02 (86.04)	28.68 (32.34)
T3	*Beauveria bassiana* 10^8 conidia/ml 2ml/l	29.05 (32.61)	25.83 (30.54)	27.87 (31.86)	95.02 (82.75)	27.58 (31.67)
T4	Azadirachtin 1500 ppm 2.5 ml/l	33.37 (35.28)	30.30 (33.39)	24.95 (29.96)	98.65 (88.62)	29.54 (32.88)
T5	HaNPV 500 LE/ha 1ml/l	22.12 (28.05)	30.44 (27.58)	23.13 (28.74)	84.38 (66.69)	22.23 (28.13)
T6	Spinosad 45 SC 0.01%	21.06 (27.31)	19.12 (25.92)	15.74 (23.37)	76.62 (55.92)	18.64 (25.54)

T7	Quinolphos 25 EC 0.05%	19.38 (26.11)	21.37 (27.53)	22.97 (28.63)	82.29 (63.72)	21.24 (27.43)
T8	Control (water spray)	35.52 (36.58)	45.90 (42.65)	35.13 (36.34)	115.58 (116.55)	38.85 (38.53)
	'F' test					Sig.
	S. E.(m) ±					1.18
	CD at 5%					3.58

*Figures in parentheses are corresponding arcsine transformed values.

2. Effect of treatments on grain yield

The studies in respect of grain yield (q/ha) of chick pea (Fig-1) revealed that, all the treatments were significantly superior over control. The treatments spinosad 45 SC 0.01%, quinolphos 25 EC 0.05% and HaNPV 500 LE/ha 1ml/l had shown similar effect and had recorded 15.23,14.22 and 12.68 q/ha grain yield respectively as compared to control 7.45 q/ha. Patil *et al.* (2007) [6] observed effectiveness of spinosad 45 SC @ 60 g a.i./ha which recorded pod damage 3.3% and grain yield 22.56 kg/ha as compared to endosulfan. This findings are in support of our present investigation.

Deshmukh *et al*. (2010) [1] reported that spinosad 0.009% recorded 1760 kg/ha grain yield against *Helicoverpa armigera* (Hubner) on chickpea.

Singh *et al*. (2012) [11] observed effectivity of spinosad 45 SC @ 100 g a.i./ha obtained highest yield (1.79 t/ha) against *Helicoverpa armigera* (Hubner) on chickpea.

M.P. Gupta (2006) reported promising effect of quinolphos 25 EC 0.05% against *Helicoverpa armigera* (Hubner) on chickpea and recorded grain yield (2636 kg/ha).

Sarode *et al*. (1995) [10] and Kulat (1999) also reported the increased grain yield in the treatment of HaNPV 250 LE/ha. The present findings are in agreement with the above findings.

The remaining treatments *Beauveria bassiana* 10^8 conidia /ml 2ml/l (11.32q/ha), azadirachtin 1500 ppm 2.5 ml/l (11.37 q/ha) and neem oil + detergent powder 2% (10.84 q/ha) and neem Seed Extract 5% (10.46q/ha) had shown parity with each other and predicted grain yield better over control (7.45 q/ha).

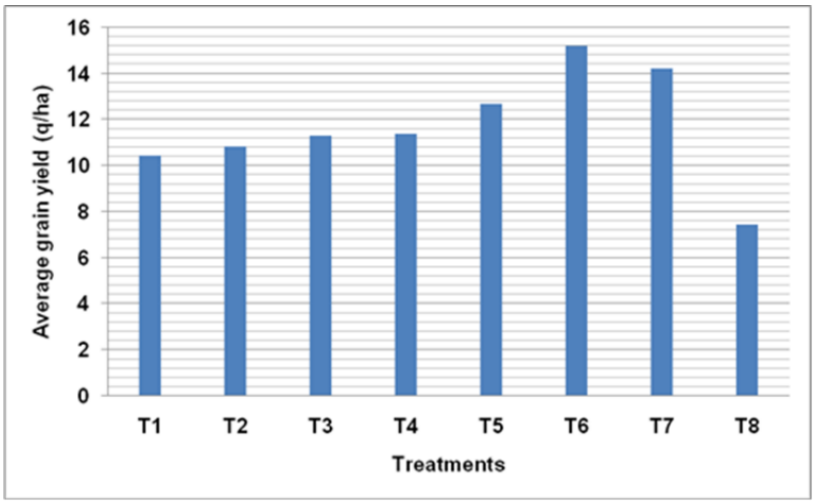

Fig 1: Effect of treatments on average grain yield of chickpea

Conclusion

From the above results it is concluded that, pod damage ranged from 18.64% to 38.85%. The treatments spinosad 45 SC 0.01% (18.64%) and quinolphos 25 EC 0.05% (21.24%) recorded lowest pod damage and afforded the best protection against *Helicoverpa armigera* (Hubner) by reducing 18.64 per cent and 21.24 per cent pod damage respectively on harvest as compared to control (38.85%) Both these treatments exhibited parity with each other. The studies in respect of grain yield (q/ha) of chick pea revealed that, all the treatments were significantly superior over control. The treatments spinosad 45 SC 0.01%, quinolphos 25 EC 0.05% and HaNPV 500 LE/ha 1ml/l had shown similar effect and recorded 15.23,14.22 and 12.68 q/ha grain yield respectively, as compared to control 7.45 q/ha. Singh *et al.* (2012) [11] observed effectivity of spinosad 45 SC @ 100 g a.i./ha obtained highest yield (1.79 t/ha) against *Helicoverpa armigera* (Hubner) on chickpea.

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