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Bhut JB
Assistant Research Scientist (Ento.)
Main Oilseeds Research Station,
Junagadh Agricultural University,
Junagadh- 362001, Gujarat, India

Khanpara DV
Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh- 362001, Gujarat, India

Bharadiya AM
Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh- 362001, Gujarat, India

Madariya RB
Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh- 362001, Gujarat, India

Correspondence:
Dr. Jignesh B. Bhut
Assistant Research Scientist (Ento.)
Main Oilseeds Research Station,
Junagadh Agricultural University,
Junagadh- 362001, Gujarat, India
Email: jignesh1315@jau.in

Bio-Efficacy of Chemical Insecticides Against Defoliators *Spodoptera litura* and *Achaea janata* in Castor

Bhut JB, Khanpara DV, Bharadiya AM, Madariya RB

ABSTRACT

Field experiments on bio-efficacy of chemical insecticides against defoliators *Spodoptera litura* and *Achaea janata* in castor was carried out at Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh during consecutive three year *i.e.* 2015-16, 2016-17 and 2017-2018. All the treatments were significantly superior over untreated check. Results of the experiment indicated that lowest number of larvae per plant for *S. litura* and *A. janata* was recorded in the treatment of chlorantraniliprole 18.5 SC 0.006% (0.42 & 0.22 larvae/plant), which was at par with the most of the insecticidal treatments except the treatment of poneem after three days of the first spray. More or less similar trend was observed after 7 and 14 days of first spray as well as 3,7 and 14 days after second spray. The highest net return was recorded in treatment of indoxacarb 14.5 SC 0.0073% (Rs. 31870/-) followed by the treatment chlorantraniliprole 18.5 SC 0.006% (Rs. 31080/-), spinosad 45 SC 0.009% (Rs.29240/-) and emamectin benzoate 5 % WG 0.002 % (Rs. 26232/-). Looking to the ICBR, the treatment of profenophos 40 % + cypermethrin 4% 44 EC noted the highest ICBR i.e. (1:11.60) followed by the treatment of chlorpyriphos 20 EC 0.05% (1: 10.20), indoxacarb 14.5 SC 0.0073% (1:9.30) and emamectin benzoate 5 % WG 0.002 % (1:7.30).

Keywords: Castor, Bio efficacy, Defoliators, *Spodoptera litura*, *Achaea janata*.

INTRODUCTION

Castor is a major oilseed crop in dry land areas. The yield loss due to insect pests has been estimated in the range of 35-40 per cent. More than 100 pest species infest castor crop, but only a few major pests are responsible for the crop losses [1]. The castor semiooper, *A. janata* and tobacco caterpillar, *S. litura* are the most common and regular pests of castor, which can cause even the complete defoliation [2,3].

Mohan *et al.* (2010) [4] studied the pest scenario of castor at various phonological stages and they observed that *A. janata* was found the peak incidence was during the first fortnight of August to second fortnight of September. There is great need to initiate work on chemical control. With view of the economic significance attached to these insect pests, the present investigations were undertaken to testing bio-efficacy of chemical insecticides against defoliators *S. litura* and *A. janata* in castor.

MATERIALS AND METHODS

With a view to find out the efficacy of chemical insecticides against defoliators *S. litura* and *A. janata* in castor; a field experiment was conducted at Main Oilseeds Research Station, JAU, Junagadh during consecutive three year *i.e.* 2015-16, 2016-17 and 2017-2018 in randomized block design with three replication. The spray of insecticides was done at initiation of defoliator damage. The observations on population of defoliator larva were recorded from 5 randomly selected plants of each treatment before 24 hours and at 3, 7 & 14 days after spray. Second and subsequent spray of insecticides was applied on need base at 15 days interval. Yield data was recorded from each plot and converted in hectare basis. Data were subjected to ANOVA after following square root transformation.

RESULTS AND DISCUSSION

The defoliators *S. litura* and *A. janata* population was found non-significant before spray but after first and second spray, it was found significantly differ in all the treatments over control (Table 1 & 2).

Pooled data after three days of spray (2015-16, 2016-17 and 2017-18) indicate that the lowest population of for spodoptera and semilooper were recorded in the treatment of chlorantraniliprole 18.5 SC @ 0.006% (0.42 & 0.22 larvae/plant) which was at par with indoxacarb 14.5 SC @ 0.0073% (0.46 & 0.31 larvae/plant), spinosad 45 SC @ 0.009% (0.54 & 0.35 larvae/plant), emamectin benzoate 5% SG @ 0.002% (0.56 & 0.40 larvae/plant), thiodicarb 75 WP @ 0.15% (0.56 & 0.44 larvae/plant), novaluron

10 EC @ 0.01% (0.60 & 0.54 larvae/plant), profenophos 40% + cypermethrin 4% @ 0.044% (0.69 & 0.60 larvae/plant) and chlorpyriphos 20 EC @ 0.05% (0.92 & 0.67 larvae/plant). More or less similar trend was observed after 7 and 14 days of second spray. The review on bio-efficacy of chemical insecticides against defoliators *S. litura* and *A. janata* in castor was very scanty; however, the review available of another crop was discussed here. Chlorantranilliprole 0.0185% was found most effective to control larvae population of *S. litura* in groundnut followed by indoxacarb 0.01%, emamectin benzoate 0.002%, cypermethrin 0.002%, profenophos 0.1% and quinalphos 0.005 % [5]. The effectiveness of chlorantranilliprole 18.5 SC also proved by Kumar *et al*. (2015) [6] in groundnut, Muzammil *et al*. (2017) [7] in sunflower, Chopade *et al*. (2018) [8] against capsule borer in sesame, Gadhiya *et al*. (2014) [9] against *H. armigera* and *S. littura* in Groundnut.

The results were also confirmed with the finding of Bhandane *et al.* (2016) [10] who reported emamectin benzoate and cypermethrin more effective against *S. litura* on castor. Randhawa *et al.* (2009) [11] found spinosad 48 SC was most effective insecticide aginst *H. armigera* in berseem followed by indoxicarb 15 EC.

Seed yield and Economics

Considering the seed yield on hectare base, the treatment of chlorantraniliprole 18.5 SC 0.006% recorded significantly the highest seed yield (4337 kg/ha) and it was remained at par with the treatment of Profenophos 40 % + Cypermethrin 4% 44 EC 0.044%, Indoxacarb 14.5 SC 0.0073%, Spinosad 45 SC 0.009%, Emamectin Benzoate 5 % WG 0.002 % and Thiodicarb 75 WP 0.15% which recorded the seed yield of 4055, 4293, 4268, 4160 and 4067 kg/ha, respectively (Table 2).

The highest net return was recorded in treatment of Indoxacarb 14.5 SC 0.0073% (Rs. 31870/-) followed by the treatment Chlorantraniliprole 18.5 SC 0.006% (Rs. 31080/-) and Spinosad 45 SC 0.009% (Rs.29240/-) and Emamectin Benzoate 5 % WG 0.002 % (Rs. 26232/-)

CONCLUSION

Looking to the efficacy and yield the treatments chlorantraniliprole 18.5 SC 0.006%, indoxacarb 14.5 SC 0.0073%, spinosad 45 SC 0.009%, and emamectin benzoate 5 % WG 0.002 % were found the most effective and economical insecticides for management of defoliators in castor.

Table 1: Effect of different insecticides on leaf eating caterpillar *Spodoptera littura* in Castor

No.	Treatments	After First Spray				After Second Spray			
		No. larva/plant				No. larva/plant			
		BF	3 DAS	7 DAS	14 DAS	BF	3 DAS	7 DAS	14 DAS
1	Chlorantraniliprole 18.5 SC 0.006%	1.95 (3.30)	0.96* (0.42)	0.78# (0.11)	0.77 (0.09)	0.77 (0.09)	0.74 (0.05)	0.71 (0.00)	0.71 (0.00)
2	Profenophos 40% + Cypermethrin 4% 44 EC 0.044%	1.87 (3.00)	1.09 (0.69)	0.95 (0.40)	0.92 (0.34)	0.85 (0.21)	0.86 (0.24)	0.80 (0.14)	0.76 (0.08)
3	Indoxacarb 14.5 SC 0.0073%	1.87 (3.00)	0.98 (0.46)	0.81 (0.16)	0.81 (0.15)	0.83 (0.18)	0.75 (0.06)	0.74 (0.05)	0.71 (0.00)
4	Spinosad 45 SC 0.009%	1.96 (3.34)	1.02 (0.54)	0.82 (0.17)	0.81 (0.15)	0.81 (0.16)	0.78 (0.11)	0.75 (0.06)	0.72 (0.02)
5	Emamectin Benzoate 5% SG 0.002%	1.98 (3.42)	1.03 (0.56)	0.85 (0.22)	0.81 (0.15)	0.81 (0.15)	0.78 (0.11)	0.75 (0.06)	0.72 (0.02)
6	Thiodicarb 75 WP 0.15%	1.87 (3.00)	1.03 (0.56)	0.87 (0.26)	0.83 (0.18)	0.81 (0.15)	0.79 (0.12)	0.78 (0.11)	0.76 (0.08)
7	Novaluron 10 EC 0.01%	1.96 (3.34)	1.05 (0.60)	0.88 (0.27)	0.85 (0.21)	0.92 (0.34)	0.83 (0.19)	0.79 (0.12)	0.76 (0.08)
8	Poneem @ 3 ml/lit	1.90 (3.11)	1.73 (2.49)	1.84 (2.89)	1.80 (2.73)	1.80 (2.73)	1.94 (3.26)	1.91 (3.15)	1.58 (2.01)
9	Chlorpyriphos 20 EC 0.05%	1.97 (3.38)	1.19 (0.92)	1.00 (0.50)	0.93 (0.36)	0.93 (0.36)	0.88 (0.27)	0.80 (0.14)	0.79 (0.12)
10	Control	2.05 (3.70)	1.98 (3.42)	1.94 (3.26)	1.94 (3.28)	1.94 (3.28)	2.02 (3.58)	1.96 (3.34)	1.84 (2.87)
T	SEm ±	0.05	0.13	0.10	0.10	0.10	0.10	0.10	0.12
	C.D. at 5%	NS	0.37	0.29	0.30	0.30	0.29	0.29	0.36
Y X T	SEm ±	0.08	0.06	0.05	0.06	0.06	0.06	0.04	0.05
	C.D. at 5%	NS	0.16	0.14	0.16	0.16	0.16	0.12	0.13
C.V. %		8.20	8.20	9.40	9.60	9.47	9.47	10.70	8.40

* Square root transformed value (The data in parenthesis are retransform value), # pooled data of three years, DAS= Day After Spray, BF = Before Spray

Table 2: Effect of different insecticides on Semilooper *Achaea janata* in Castor

No.	Treatments	After First Spray No. larva/plant				After Second Spray No. larva/plant				Seed yield (Kg/ha)	Net realization (Rs)	ICBR
		BF	3 DAS	7 DAS	14 DAS	BF	3 DAS	7 DAS	14 DAS			
1	T1	1.61 (2.09)	0.85 (0.22)	0.81 (0.16)	0.78 (0.11)	0.78 (0.11)	0.73 (0.03)	0.71 (0.00)	0.71 (0.00)	4337	31080	1:5.90
2	T2	1.54 (1.87)	1.05 (0.60)	0.95 (0.40)	0.88 (0.27)	0.82 (0.17)	0.78 (0.11)	0.74 (0.05)	0.73 (0.03)	4055	23950	1:11.60
3	T3	1.50 (1.75)	0.90 (0.31)	0.79 (0.12)	0.75 (0.06)	0.75 (0.06)	0.72 (0.02)	0.71 (0.00)	0.71 (0.00)	4293	31870	1:9.30
4	T4	1.47 (1.66)	0.92 (0.35)	0.83 (0.19)	0.75 (0.06)	0.75 (0.06)	0.74 (0.05)	0.71 (0.00)	0.71 (0.00)	4268	29240	1:6.40
5	T5	1.53 (1.84)	0.95 (0.40)	0.84 (0.21)	0.76 (0.07)	0.84 (0.21)	0.75 (0.06)	0.71 (0.00)	0.71 (0.00)	4160	26232	1:7.30
6	T6	1.49 (1.72)	0.97 (0.44)	0.89 (0.29)	0.82 (0.17)	0.76 (0.07)	0.75 (0.06)	0.71 (0.00)	0.71 (0.00)	4067	18980	1:3.50
7	T7	1.51 (1.78)	1.02 (0.54)	0.94 (0.38)	0.84 (0.21)	0.88 (0.27)	0.76 (0.08)	0.72 (0.02)	0.71 (0.00)	4002	18810	1:4.60
8	T8	1.42 (1.52)	1.51 (1.78)	1.49 (1.72)	1.38 (1.41)	1.38 (1.41)	1.45 (1.60)	1.44 (1.57)	1.32 (1.25)	3491	840	1:1.30
9	T9	1.51 (1.78)	1.08 (0.67)	1.01 (0.52)	0.88 (0.27)	0.88 (0.27)	0.76 (0.08)	0.79 (0.12)	0.76 (0.07)	4019	22335	1:10.20
10	T10	1.59 (2.03)	1.58 (2.00)	1.59 (2.03)	1.53 (1.85)	1.53 (1.85)	1.60 (2.06)	1.52 (1.81)	1.50 (1.76)	3400	--	--
T	SEm ±	0.04	0.06	0.06	0.06	0.06	0.05	0.05	0.05	103.2	--	--
	C.D. at 5%	NS	0.17	0.19	0.17	0.17	0.15	0.15	0.14	292.8	--	--
Y X T	SEm ±	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.05	178.8	--	--
	C.D. at 5%	NS	0.18	0.17	0.16	0.16	0.12	0.11	0.14	NS	--	--
C.V. %		9.50	12.00	11.60	10.13	10.13	9.50	9.20	9.70	7.70	--	--

* Square root transformed value (The data in parenthesis are retransform value), # pooled data of three years, DAS= Day After Spray, BF = Before Spray

Conflict of Interest

None declared.

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ORCID ID

J. B. Bhut: https://orcid.org/0000-0001-5897-0040

A. M. Bharadiya: https://orcid.org/0000-0001-5407-7888

R. B. Madariya: https://orcid.org/0000-0001-5854-4041

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