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Research Article

BIO-EFFICACY OF INSECTICIDES AGAINST COTTON PESTS AND PATHOGENS

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ABSTACT
Major constraint in attaining high production of seed cotton is damage inflicted by insect pests. Newer chemistries of pesticides have raised the hopes for better management of dreaded pest worldwide. Therefore, an attempt was made to study the comparative efficacy of new group of insecticides against bollworms in cotton crop. The ravages of cotton bollworm are known to cause total crop failures in various regions where farmers are becoming victims of pest menace resulting in socio economic calamities, now and then. Thus, new group of insecticides proved their efficacy against cotton bollworm with highest seed cotton yield. Thus, insecticides (Spinosad, Indoxacarb and Profenophos) could be deployed for effective pest management.

Key Words: *Bio-Efficacy, Insecticides, Spinosad, Profenophos*

INTRODUCTION

Cotton is of utmost importance to developing countries. Cotton constitutes more than 70% of the total world consumption of fibres. Besides being a major natural fibre crop, cotton also provides edible oil and seed by-products for livestock food. On about fifty species of cotton plants within the world only four are domestically cultivated for their fibres. The most commonly cultivated species of cotton in the world include *Gossypium hirsutum* and *Gossyspium barbadense. Gossypium hirsutum* L. is widely grown, since it has a very high adaptability and rich diversity for yield and yield related morphological and physiological characters. Cotton is unanimously designated as "King of fibres" as it tops the table depicting the statistics of fibre crops. As a leading commercial crop it is grown world wide India occupies largest area and third place in the production of cotton in the global scenario. Major constraint in attaining high production of seed cotton is damage inflicted by insect pests. The pest spectrum of cotton is quite complex and as many as 200 species of insects have been reported to attack cotton at different stages of crop growth in India (Anon., 1981) of which bollworm complex consisting of three notorious bollworms, *Helicoverpa armigera* Hub. (American bollworm) *Earias vittella* Fab. Spotted bollworms and *Pectinophora gossypiella* Sau. (Pink bollworm) are considered to be great enace. Generally, the pest management problems are associated with resistance of *H. armigera* to various groups of insecticides translating into poor pest control and subsequent crop failure. The ravages of cotton bollworm are known to cause total crop failures in various regions where farmers are becoming victims of pest menace resulting in socio economic calamities, now and then. The most commonly used insecticides like Monocrotophos, Endosulfan, Quinalphos and Cypermethrin form the major insecticides share used in cotton plant protection. Reports of high level of resistance to these conventional insecticides in *H. armigera* and other pests of cotton (Kranthi *et al*., 2001 and Ramsubramanian, 2004) have resulted in renewed interest in the farmers for using new group of insecticides available in the market. Newer chemistries of pesticides have raised the hopes for better management of dreaded pest world wide. Therefore, an attempt was made to study the comparative efficacy of new group of insecticides against bollworms in cotton crop.

MATERIALS AND METHODS

The present investigation was carried out at Institute of Science, Nagpur during *kharif* 2006-07 and 2007-08 under rain fed conditions. The design of the experiment was laid out in Randomized Block Design (RBD) replicated thrice with plot size of 5.4 x 5.4 sq. m. for both years. The popular cotton hybrid DHH-11 was sown at a spacing of 90 x 60 cm.

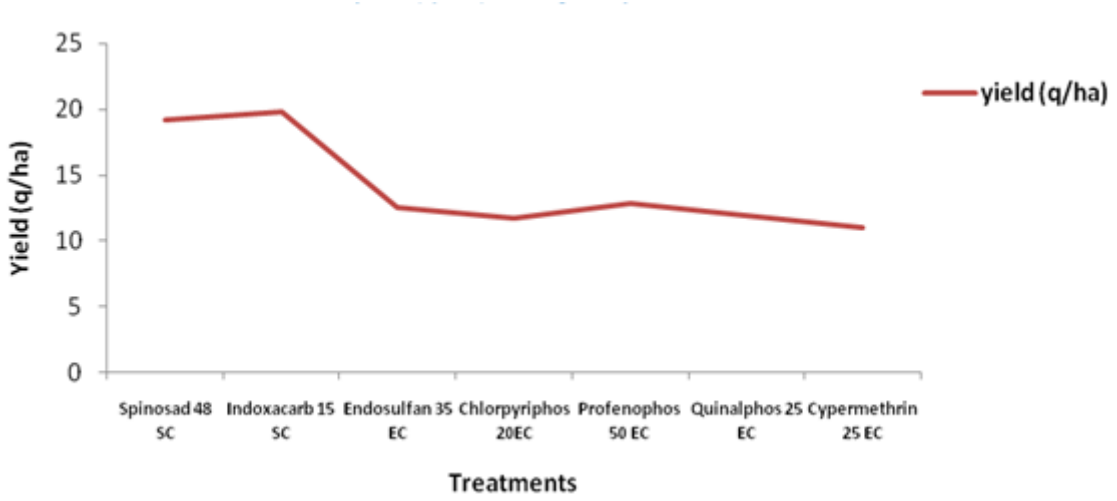
All recommended agronomic practices were followed during the experimentation for proper crop management. The treatments included in the present study were 1) Spinosad 48SC @ 50gai/ha 2) Indoxacarb 15SC @ 75gai/ha 3) Endosulfan 35EC @ 875gai/ha 4) Chlorpyriphos 20EC @ 600 gai/ha 5) Profenophos 50 EC @ 1000 gai/ ha 6) Quinalphos 25 EC @ 500 gai/ ha 7) Cypermethrin 25 EC @ 60 gai/ ha 8) Untreated check (UTC). Total of six sprays were given based on ETL (one larvae per plant). Observations on number of *Helicoverpa* larvae per plant, fruiting body damage (%), number of good opened bolls (GOB) and bad opened bolls (BOB) were recorded before and after application of insecticides.

Table 1: Bio efficacy of new group of insecticides against cotton bollworms (2006-07)

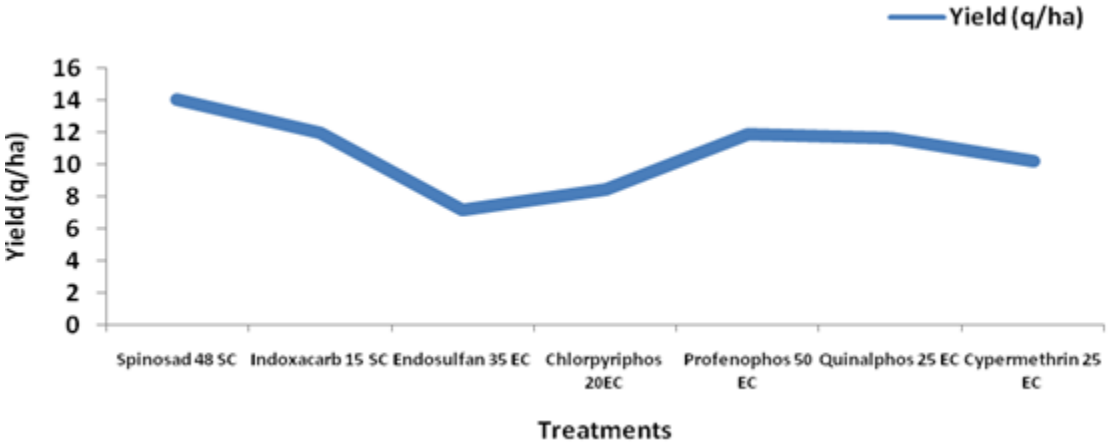
Treatments	Dosage g a.i/ha	*Helicoverpa* larvae/plant	Damage to fruiting bodies (%)	GOB /plant	BOB /plant	Yield (q/ha)
Spinosad 48 SC	50	1.42	19.84	20.98	1.88	19.20
Indoxacarb 15 SC	75	1.45	20.89	18.92	1.98	19.78
Endosulfan 35 EC	875	2.59	27.72	18.24	4.09	12.56
Chlorpyriphos 20EC	600	2.39	26.21	15.59	4.79	11.68
Profenophos 50 EC	1000	1.81	23.89	17.88	3.48	12.85
Quinalphos 25 EC	500	2.11	24.95	16.09	3.88	11.89
Cypermethrin 25 EC	60	2.41	28.15	13.87	5.31	11.01
U.T.C	-	3.31	32.39	8.95	10.87	7.95
SEm±	-	0.13	0.88	0.97	0.21	0.62
CV (%)	-	11.35	18.31	9.48	12.69	13.40
CD 5%	-	0.45	2.59	2.69	0.72	1.85

Table 2: Bio efficacy of new group of insecticides against cotton bollworms (2007-08)

Treatments	Dosage g a.i/ha	*Helicoverpa* larvae/plant	Damage to fruiting bodies (%)	GOB /plant	BOB /plant	Yield (q/ha)
Spinosad 48 SC	50	0.45	8.92	18.29	1.25	14.02
Indoxacarb 15 SC	75	0.59	8.99	16.21	1.37	11.98
Endosulfan 35 EC	875	1.95	18.36	9.65	4.56	7.18
Chlorpyriphos 20EC	600	2.24	12.45	8.17	3.68	8.48
Profenophos 50 EC	1000	1.18	11.09	13.48	1.73	11.84
Quinalphos 25 EC	500	1.12	12.02	12.57	2.28	11.65
Cypermethrin 25 EC	60	1.33	16.27	11.86	2.89	10.19
U.T.C	-	2.65	29.02	4.29	6.87	4.87
SEm±	-	0.16	2.14	0.98	0.22	0.92
V (%)	-	17.08	24.59	18.41	11.90	14.21
CD 5%	-	0.46	6.48	2.75	0.59	2.33



Graph 1: Bio efficiency of new group of insecticides against cotton bollworms yeild (q/ha) during the year 2006-07



Graph 2: Bio efficiency of new group of insecticides against cotton bollworms yield (q/ha) during the year 2007-08

RESULTS AND DISCUSSION

The average value of these observations has been subjected for statistical analysis to assess the overall impact on pest suppression and seed cotton yield. The data representing the efficacy of insecticides against bollworm incidence and yield has been presented in table 1 and 2 and Graphs 1 and 2. Indoxacarb @ 75 gai/ ha and Spinosad @ 48 SC @ 50 gai/ ha were found equally effective by registering significantly lowest larval population of 1.42 and 1.45 larvae/ plant respectively followed by Profenophos 50 EC @ 1000 gai/ ha (1.81 larvae/ plant) and Quinalphos 25EC @ gai/ ha (2.11 larvae/ plant) during 2005-06 and 2006-07. Significantly lowest percent of fruiting body damage was noticed in the treatment Spinodad 48 SC and Indoxacarb 15 SC (19.84 and 20.89 % respectively) compared to other treatment.

However, these treatments were followed by Profenophos 50 EC (23.89 %) and Quinalphos 25 EC (24.95%) but both were on par with each other. The two treatments Indoxacarb 15 SC and Spinosad 48 SC occupied top positions by registering maximum number of good opened bolls (18.92 and 20.98 bolls/ pant) as against untreated check (8.95 bolls /plant) and were at par with each other followed by Profenophos 50 EC and Endosulfan 35 EC. The next best is Quinalphos 25 EC and was on par with

Chlorpyriphos 20EC. Significantly minimum number of bad opened bolls of 1.88 and 1.98 bolls per plants registered with Spinosad 48 SC and Indoxacarb 15 SC respectively as against 10.87 bolls per plant in untreated check, indicating superiority of the treatments which were followed by the Profenophos 50 EC, Quinalphos 25 EC and Endosulfan 35 EC. The treatments Spinosad 48 SC and Indoxacarb 15 SC were proved to be equally effective by recording higher yield of 19.20 and 19.78 q/ ha respectively followed by Profenophos 50 EC (12.85 q/ ha). Quinalphos 25 EC and Endosulfan 35 EC were next best treatments. The lowest yield was observed in untreated check (7.95 q/ ha).

During 2005-06, the incidence of bollworm was generally low compared to previous season but the trend in results was strikingly similar to that of previous season. The incidence of *Helicovpera* larvae maximum in untreated check with 2.65 larvae/ plant. However, the incidence was low in Spinosad 48 SC with 0.45 larvae/ plant followed by Indoxacarb 15 SC, Profenophos 50 EC and Quinalphos 25 EC with 0.59, 1.18 and 1.12 larvae/ plant respectively also with Spinosad 48 SC. Similarly lower incidence of bollworm was obtained with Spinosad and Indoxacarb (0.3 and 0.4 larvae/ plant at 7 days after treatment respectively) as reported by Patil *et al*., (2004) who recorded lowest larval population of *Helicoverpa* with Spinosad 75 gai/ ha and 50 gai/ ha and Vadodaria *et al*., (2000) and Russell and Kranthi (2006) on Profenofos 50 EC.

The difference among the different insecticides in respect of fruiting body damage, GOB, BOB and yield were statistically significant in both years. Again in 2005-06, Spinosad 48 SC and Indoxacarb 15 SC were found to be equally superior by registering lowest fruiting body damage of 8.92 and 8.99 per cent respectively as against 29.02 per cent in untreated check followed by Profenophos 50 EC (11.09 per cent) and Quinalphos 25 EC (12.02 per cent). The next best were Chlorpyriphos 20 EC (12.45%), Cypermethrin 25 EC and Endosulfan 35 EC. Significantly maximum number of good opened bolls were obtained in the treatment Spinosad 48 SC (17.89 bolls/ plant) followed by Indoxacarb 15 SC (16.21 bolls/ plant). The Profenophos 50 EC, Quinalphos 25 EC and Cypermethrin 25 EC were the next best treatments. Where as Spinosad 48 SC was superior by registering significantly least bad opening of bolls (1.25 BOB / plant) followed Indoxacarb 15 SC (1.37 BOB/ plant) and Profenophos 50 EC (1.73 BOB / plant) and were comparable with each other and also with Spinosad 48 SC. Spinosad 48 SC remained superior with an highest yield of 14.02 as against 5.08 q/ ha in untreated check. Which was followed by Indoxacarb 15 SC (11.98 q/ha) and Profenophos 50 EC (11.84 q/ha) and were par with each other and with Spinosad 48 SC. The next best was Quinalphos 25 EC. The Chlorpyriphos 20 EC and Endosulfan 35 EC were inferior to other treatments. The present findings are in accordance with reports of Patil *et al*., (2004) who noticed the efficacy of Spinosad and Indoxacarb 15 SC against boll worm and higher seed cotton yield. Similarly Vadodaria *et al.*, (2001) and Dandale *et al*., (2000) reported on superiority of Spinosad against bollworm and Dhawan and Simwat (2000) on efficacy of Indoxacarb 15 SC against bollworm and Profenophos 50 EC (Vadodaria *et al*., 2000).

Thus, new group of insecticides proved their efficacy against cotton bollworm with highest seed cotton yield. As derivative marine Actinomycetes *Macropolyspora spinosa* Spinosad has been considered to be component of IPM programme apart from its proven bio-efficacy. Indoxacarb belongs to oxydiazinon a new chemical group of pests has novel mode of action to offset the resistance problem (Gunning and Devonshire, 2002). Thus, these two insecticides could be deployed for effective pest management. Though Profenophos belongs to organophosphate group its ovicidal property would be an added advantage.

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