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Field Efficacy of Some Bioinsecticides Against Maize and Jowar Stem Borer, *Chilo Partellus* (Pyralidae: Lepidoptera)

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ABSTRACT

The field evaluation of Nimbokil (a neem derivative), Tracer and Abamectin alongwith Cyperemthrin was studied on infestation level of maize stem borer (*Chilo partellus*). In Tracer treated plots, the infestation was reduced from 10.72% before spray to 3.05% seven day after first spray and to 0.74% at seven day of second spray which was done one week after first spray. Nimbokil, Abamectin and Cypermethrin could not show effectiveness in reducing the infestation level of *C. partellus* on autumn maize.

Key Words: Bioinsecticide; Maize; Stem borer; *C. partellus*

INTRODUCTION

The number of several bio-insecticides, consisting of viruses, bacteria, fungi, protozoa, nematodes and plant materials, has increased to prominence since the marketing of insecticides composed of the bacterium (*Bacillus thuringiensis*, *Bt*). The shift, from conventional synthetic insecticides to biological control agents, has been due to environmental concerns and difficulties with insecticides resistance, thus bio-insecticides are virtually considered to be safe and environment friendly insect control agents (Miranpuri & Kachatourian, 1993). However, the evidence of *Bt* resistance in many pest insects has compelled the search for new insect control agents (Tabashnik, 1994).

Neem derivatives have been in the market for quite long time and their effectiveness for control of chewing and sucking pests and borers on many vegetable and grain crops have been demonstrated with variable success (Akbar *et al*., 1993, 1996, 1999; Aliniazee *et al.*, 1999; Dash *et al.*, 1997; Bhatnagar & Sharma, 1997; Kumar & Bhatt, 1999; Ganguli & Ganguli, 1998; Bhanukiran & Panwar, 2000). Recently introduced natural products obtained from *Saccharopolyspora spinosa* and *Streptomyces* spp., respectively known as Spinosad and Abamectin has been found effective against cotton bollworm complex (Ahsan, 2000), *Leptintarsa* sp. and *Ostrinia nubilalis* (Anonymous, 2000).

The present studies were undertaken to determine the effect of Spinosad (Tracer), Abamectin and neem derivatives on the infestation level of maize and jowar stem borer, *Chilo partellus* (Swin.) on autumn maize.

MATERIALS AND METHODS

Insecticides

1. Nimbokil was supplied by Pakistan Agricultural Research Council, TARI, Karachi University Campus, Karachi.
2. Tracer and Abamectin were obtained from FMC Pakistan
3. Cypermethrin was purchased from local market

The experiment was laid out in Randomized Complete Block Design, with six treatments including a control one, all treatments replicated thrice. The plot size for each treatment was 750 ft^2. The Havard variety of maize was sown in Entomological Research Area, University of Agriculture, Faisalabad. All standard agronomic practices were carried out.

The formulation and dose of each insecticides applied is given as follows:

Insecticide	Formulation	Dose $acre^{-1}$
Nimbokil	60EC	500 mL
Tracaer	240SC	80 mL
Abamectin	-	250 mL
Cypermethrin	10EC	300 mL

The stem borer infestation was recorded from 15 randomly selected plants in each plot 24 h, before spray and then post-treatment interval of 24, 48, 72, 96 h and seven days were chosen. First spray of insecticides was done at 10% infestation level, which is economic threshold level of *C. partellus* (Hashmie *et al.*, 1983). Second spray was done at one week interval. In this case, the pre spray data was seven day post treatment interval of first spray. The percent infestation in each treatment was calculated and average infestation percentage was worked out. Treatments were compared in ONE WAY OF ANALYSIS (MINITAB II). Means were compared by Duncan Multiple Range Test (DMR test) (Mohammad, 1995).

RESULTS

Table I shows the infestation level of *C. partellus*, 24 h before, and after 24, 48, 72, 96 h and seven days. There was no significant difference of stem borer infestation before and post-treatment interval in plots treated with Nimbokil (old), where as Nimbokil (new) had shown significant difference at 24 and 48 h of spray when compared with pre spray infestation level (8.90%). Tracer gave significantly lowest infestation (2.25%) at 96 h of spray as compared to pre-spray infestation level (10.72%). Abamectin registered lowest infestation level (2.25%) at 72 h of spray. Cypermethrin could not show significantly difference of infestation level between pre-and post-treatment intervals.

Table II shows the infestation level of *C. partellus* after 24, 48, 72, 96 h and seven day of 2nd spraying. Nimbokil (old and new) had non-significant difference in infestation level at above post-treatment intervals. Tracer showed lowest infestation level (0.74%) among all treatments at seven days of spray. Abamectin had significantly lowest infestation level at 96 h and seven days of spray. Cypermethrin also showed effect with 5.47% infestation compared to 9.81%, respectively, at seven days and 24 h of spraying.

DISCUSSION

The future of existing chemicals is fraught with the evolution of pesticide resistant insects and mounting community concerns over chemical residues in commodities and in the environment. A new control strategy involves development of bioinsecticides - naturally occurring pathogens of the pests which companies can produce in bulk by fermentation processes but which can then be used by farmers just like traditional chemicals. Bioinsecticides are seldom as effective as chemicals in their wild-type form. Another development is procurement of natural products produced by the microorganisms. Such examples are the spinosad (tracer) and abamectin which are not microorganism themselves but the chemicals produced by them.

Plant species belonging to the Meliaceae family i.e. *Azadirachta indica*, *A. excelsa* and *A. siamensis* have been candidates for the biological testing of insecticidal components, however, the main focus of the research work was on neem, *A. indica*. Many commercial neem derivatives such as Repllin 1%, neem seed kernel extract 5%, Achook 0.5%, Neemark 0.5%, Indiara 1%, and Azadex 0.2%, have been found effective against rice leaffolder (*Cnaphalocrocis medinalis*), maize stem borer (*C. partellus*), mango hopper (*Amritodus atkinsoni*), thrips (*Scirtothrips mangiferae*), whitebacked planthopper, (*Sogatella furcifera*), insect pests of brinjal (Akbar *et al*., 1993, 1996, 1999; Aliniazee *et al.*, 1999; Dash *et al*., 1997; Bhatnagar & Sharma, 1997; Kumar & Bhatt, 1999; Ganguli & Ganguli, 1998; Bhanukiran & Panwar, 2000). The present studies could not show effective reduction in the infestation of *C. partellus* on maize by the Nimbokil however, Nimbokil (New) gave ~50% reduction in infestation at 24 and 48 h of first spray and beyond that time period there was no significant difference in infestation level. The immediate effect could be due to anitfeedant activity of Nimbokil against neonate larvae *of C. partellus* as observed by Ganguli and Ganguli (1998) and Bhanukiran and Panwar (2000), when neem based formulations were used. There is scanty information on the efficacy of spinosad and abamectin on *C. partellus*, therefore, the present results cannot be compared. It is of note here that spinosad (Tracer) has shown excellent properties of reducing the infestation

Table I. Infestation level of *C. partellus*, 24 h before, and after 24, 48, 72, 96 and 7 days of first spray

Time period	Treatments					
	Nimbokil old	Nimbokil New	Tracer	Abamectin	Cypermethrin	Control
Before	6.31±0.61a	8.90±1.12a	10.72±0.97a	6.31±0.61a	5.42±0.69a	8.90±1.16b
24 h	7.97±2.33a	5.13±1.87b	7.00±3.86ab	5.45±1.45a	5.82±1.49a	8.01±1.13b
48 h	5.47±0.59a	5.47±0.59b	5.39±2.86ab	5.47±0.77a	5.49±0.73a	8.90±0.92b
72 h	7.97±2.38a	7.16±0.29ab	3.82±1.50ab	2.25±1.31b	5.45±1.45a	9.78±1.75b
96	7.16±0.29a	7.16±0.29ab	2.25±1.20b	4.60±2.30a	7.02±3.64a	9.78±1.75b
7 days	8.91±0.48a	8.91±0.48a	3.05±0.69b	8.90±1.16a	8.91±0.92a	17.09±1.90a

Values are means±SE. Means in a column with same letters are not different at 5% level of significance.

Table II. Infestation level of *C. partellus*, 24 h before, and after 24, 48, 72, 96 and 7 days of first spray

Time period	Treatments					
	Nimbokil old	Nimbokil New	Tracer	Abamectin	Cypermethrin	Control
24 h	8.90±1.16a	9.81±0.56a	3.03±1.52a	8.90±1.56a	9.81±0.56a	17.77±1.11a
48h	7.13±1.61a	8.16±1.88a	3.80±2.04a	7.14±1.25ab	8.90±1.16ab	17.77±1.11a
72h	7.12±1.99a	6.26±2.19a	2.25±1.26a	6.29±1.30ab	6.76±1.19b	18.63±2.76a
96h	9.81±0.81a	6.76±1.29a	1.49±0.75a	3.82±1.42b	6.30±0.81b	17.73±2.07a
7 days	5.47±0.75a	6.30±0.94a	0.74±0.74a	3.04±0.69b	5.47±0.59b	19.92±3.06a

Values are means±SE. Means in a column with same letters are not different at 5% level of significance

level of *C. partellus* on autumn maize in the studies under report. Cyperemthrin was used as a reference synthetic insecticide for comparison with bioinsecticides. Surprisingly, it has shown no effect in reducing the infestation level of *C. partellus*, this part of result need further investigation as whether it was due to resistance to Cypermethrin or some environmental factors had worked to reduce the effectiveness of Cypermethrin.

CONCLUSION

Amongst the bioinsecticides, Spinosad has shown some promise in alleviating the infestation of maize stem borer on autumn crop.

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