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COMPARATIVE EFFICACY OF SYNTHETIC AND BOTANICAL INSECTICIDES AGAINST SUCKING INSECT PEST AND THEIR NATURAL ENEMIES ON COTTON CROP

M. A. Baker[1, 2], A. H. Makhdum, [1, 2], M. Nasir[1, 2], A. Imran[1, 2], A. Ahmad[1, 2], F. Tufail[1, 2]*

1. World Wide Fund Pakistan for nature conservation, Rahim Yar Khan, Pakistan.
2. Sustainable Agriculture Programme, World Wide Fund -Pakistan (WWF-Pakistan)

ABSTRACT

The Synthetic and botanical insecticides are relatively safer for environment and beneficial insects. The study was conducted in Rahim Yar Khan during the cotton cropping season 2014 to evaluate the comparative efficacy of two Synthetic insecticides i.e. Nitenpyram (Jasper 10% SL) and Pyriproxyfen (Bruce 10.8% EC) and two botanical extracts of *Calotropic procera* and *Azadirachta indica*, against sucking insect pest complex of cotton and their natural enemies. Upon reaching economic thresholds, the recommended field doses of all the insecticides were applied on cotton cultivar MNH-886. Data against sucking pests and their natural enemies was recorded 24 hours prior to insecticidal application and then 24, 48, 72 and 96 hours after insecticidal application. Results revealed that Nitenpyram was much toxic against sucking pests followed by Pyriproxyfen as compared to two botanical extracts. On the other hand, the synthetic insecticides did not prove safer for natural enemies as compared to botanical extracts. It was concluded that as an Integrated Pest Management (IPM) strategy, botanical extracts can be used at low infestation levels so that ecosystem service of biological control may be sustained.

KEYWORDS: Synthetic insecticides, botanical insecticides, cotton, sucking pests, IPM

*Corresponding Author: (Email: mabaker@wwf.org.pk, Phone: 0092-685900733)

1. INTRODUCTION

Cotton is the most important fiber crop of Pakistan and it plays a dominant role in its agrarian and industrial economy. Cotton is alsoconsidered the backbone of Pakistan's Textile Industry. Cotton and cotton products contribute nearly 1.5 per cent Gross Domestic Product (GDP)and 10.22 billion US$ to the foreign exchange earnings of the country [1].

Many farmers use plant extracts such as Neem, Kortumma, wild tobacco, dried chilies, (Ak Plants) Calotropic procera etc. for controlling and repelling sucking pests of cotton. The cultural control has not been exploited as yet [2]. Botanical pesticides are generally regarded as environmentally safe and can be used directly in organic agricultural practices. Plant extracts contain multiple active ingredients that can be used to control a range of insect pests. Plant extracts do not cause the pollution problems and have no residual effect.

Biopesticides are an important group of naturally occurring, often slow-acting crop protectants that are usually safer to humans and the environment than conventional pesticides and with minimal residual effects. Biopesticides can be biochemical or microbial. Biochemical pesticides may include plant-derived pesticides (botanicals) that can interfere with the growth, feeding, or reproduction of pests or insect pheromones applied for mating disruption, monitoring or attract-and-kill strategies [3].

Continuous use of large quantities of synthetic insecticides is creating health hazards to human and animal life as well as environmental pollution that have resulted in crop failure in different parts of the world [4, 5].

The objective of the study was to evaluate the efficacy of two synthetic insecticides and

botanical extracts against insect pest of cotton and beneficial insects in cotton field.

2. METHODOLOGY

The study was conducted having two synthetic insecticides (Nitenpryam 10 SLand Pyriproxyfen 10.8 EC) and equal number of botanical insecticides i.e. Calotropic procera and Azadirachta indica against sucking insect pests of cotton and their natural enemies on a cotton cultivar MNH-886, at Farmers' field in Rahim Yar Khan during cotton cropping season 2014. At the time of experiment temperature was 43±2 degree centigrade. Randomized Complete Block Design (RCBD) was used for statistical data analysis. The dimension of each plot was 5445 ft2. Details of the insecticides used in the experiment are given in Table.

Table1: insecticides used in the experiment.

Treatments	Common Name	Dose per acre
T1	Nitenpryam	200 ml
T2	Pyriproxyfen	400 ml
T3	Neem leaf extract	6000 ml
T4	Ak Plant Leaf extract	6000 ml
T5	Control	

The spray materials were prepared at their recommended doses mentioned on the label of insecticides i.e. Nitenpryam 10 SL (200 ml/acre), Pyriproxyfen 10.8 EC (400ml/acre) after calibration. Knapsack sprayer was used to spray the insecticides. Experiment was repeated once a time with three replications per treatment. The data of Thrips (Thrips tabaci; Thripidae; Thysanoptera), Jassid (Amrasca bigutella; Jassidae; Homoptera), and Whitefly (Bemisia tabaci; Aleyrodidae; Homoptera) and their natural enemies form each plot were recorded 24 hours before and 24, 48, 72 and 96 hours after application from five randomly selected plants. During experiment 300 plants were studied having the age of 47 days. The populations of Thrips (Thrips tabaci), Jassid (Amrasca bigutella) and Whitefly (Bemisia tabaci) were recorded from top, middle and bottom leaves of the plants while populations of the natural enemies were recorded on randomly selected plants.

2.1 Preparation of Plant Extracts

Leaves of Neem (Azadirachta indica) and Akk Plant (Calotropic procera) were plucked. 3 Kg chopped leaves of Neem (Azadirachta indica) were soaked in 6 liter water and 3 Kg chopped leaves of Akk Plant (Calotropic procera) were soaked in 6 liter water separately and kept for about three to four days and nights. After that material was filtered and stored in canes for subsequent use.

3. RESULTS

Average number of Thrips (Thrips tabaci), Jassid (Amrasca bigutella), Whitefly (Bemisia tabaci) and Lady Bird beetle (Coccinella spp), Chrysopa (Chrysoperla carnia) and mystery bug (Campylomma verbasci; Miridae; Hemiptera) was recorded after 24, 48 72 and 96 hourspost treatment. In case of pest population, least number of jassid, whitefly and thrips was found in Nitenpryam and Pyriproxyfen treated plots which were significantly different from Neem leaf extract and Akk plant leaf extract treated plots. Highest population of pests was found in Akk leaf extracts and Neem leaf extracts treated plots as shown in table 2.

Table 2: Mean Number of insect pests recovered on cotton crop at different time intervals post treatment.

Treatments	24 h			48 h			72 h			96 h		
	Jassid	Whitefly	Thrips	Jassid	Whitefly	Thrips	Jassid	Whitefly	Thrips	Jassid	Whitefly	Thrips
Nitenpryam(T_1)	0.4a	0.6a	1b	0.2a	0.2a	0.6b	0a	0.2a	0.4a	0a	0.2b	0.4b
Pyriproxyfen (T_2)	0.6b	1b	0.8a	0.4b	0.2a	0.4a	0.2b	0.2a	0.4a	0.2b	0a	0.2a
Neem leaf extract (T_3)	1.2c	1.2bc	1.6c	0.8c	0.8b	1.2c	0.4c	0.8b	1b	0.4c	0.6c	0.8c
Akk Plant Leaf extract (T_4)	1.6d	1.6d	1.8cd	1d	1.2c	1.4d	0.6d	1c	1.2bc	0.4c	0.8cd	1d

Control(T_5)	1.6d	4e	8.2e	1.6e	3.8d	7e	1.8e	3.6d	6.4d	1.4d	3.4e	6.6e

Mean number of insect pests represented by same letters in a column are not significantly different

Table 3: Number of beneficial insects recovered on cotton crop at different time intervals post treatment.

Treatments	**24 h**			**48 h**			**72 h**			**96 h**		
	Lady Bird Beetle	Chrysopa	Mystery Bug	Lady Bird Beetle	Chrysopa	Mystery Bug	Lady Bird Beetle	Chrysopa	Mystery Bug	Lady Bird Beetle	Chrysopa	Mystery Bug
Nitenpryam (T_1)	0.2d	0.4d	0c	0.2d	0.2d	0d	0e	0.2d	0c	0e	0d	0c
Pyriproxyfen (T_2)	0.2d	0.2e	0c	0.2d	0.2d	0d	0.2d	0e	0c	0.2d	0d	0c
Neem leaf extract (T_3)	2.4a	1.6b	0.6a	2.6a	1.8b	0.8c	2.4b	1.6c	1.2b	3a	1.8c	1b
Ak Plant Leaf extract (T_4)	2.2b	1.4c	0.4b	2.4b	1.6c	1.2a	3a	2.2a	1.2b	2.6b	2.6a	1.4a
Control(T_5)	2c	2a	0.6a	2c	2.4a	1b	2.2c	2b	1.6a	2.2c	2.2b	1.4a

Mean number of beneficial insects represented by same letters in a column are not significantly different

4. DISCUSSION

The results showed that new chemical or synthetic insecticides effectively kept the level of sucking insect pests of cotton below economic threshold levels. Botanical extract of neem and Akk plant was less toxic against sucking pests and friendly for natural enemies.

The side effects of insecticides against non-target insects especially predators have been demonstrated in field conditions[6, 7].The results of a field study have also reported less toxicity of these insecticides for a variety of predators [8].

Efficacy of Neem leaf extract (Azadirachta indica) and Ak Plant extract (Calotropis procera)in field conditions for controlling the sucking pest of cotton plant showed effective results against Jassid, Thrips and Whitefly [10].

Santos and Costa (2004) reported that botanicals are used an alternative technique for controlling the sucking pest of cotton. The plant extract applied against sucking pest causes mortality at nymph stage [10].

Indirect way of affecting parasitoids negatively by neonicotinoid insecticides is suggested because foliar, drench or granular applications may decrease host population levels so that there are not enough hosts to attack and sustain parasitoid populations [11].

Based on growth inhibition and antifeeding activities, the plant extracts like neem (Azadirachta indica) widely used at field level and cause reduction in growth and population of insects [12].

Neem seed extracts rich in azadirachtin (10–25%) act both as potent antifeedants and insect growth regulators [13, 14].

The non-selective insecticides can bring serious problems of reduction in the population of beneficial insects on the crops all over the world. Hence, in order to preserve natural enemies, selective insecticides compatible with bio-control agents should be available to include in the programs of Integrated Pest Management (IPM) [15].

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