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Research Article

Effect of biopesticides on insect mortality and fungi associated with American bollworm of cotton

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American bollworm;
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Abstract

The study had been planed to evaluate the effect of biopesticides, neem based products and growth regulators on insect mortality (%) at Pest Warning and Quality Control of Pesticides, Okara, Renala Khurd & Depalpur during 2014 with RCBD. The result of the experiment revealed that among the fungi isolated from adult insects; *Metarhizium anisopliae*, Paecilomycetes, fumosorosens, *Verticillium lecanii* , *Aspergillus flavus* and *Beauveria bassiana* proved pathogenic properties. The result of the experiment showed that different spray materials like Larvo Btk biopesticide, alone and in combination with Nimbokill at 0.7 percent level of concentration recorded 7% and 17% insect mortality respectively

Introduction

Cotton (*Gossypium hirsutum* L.) is cash crop popularly known as silver fiber, backbone of Pakistan; considered the forth largest producer and third largest consumer throughout the world (Zeeshan et al. 2010). Cotton having a share of 1.4% in GDP, 6.7% in agriculture value addition and an important source of raw material to the textile industry. Cotton known as silver fiber, back bone of country; considered the forth largest producer. American bollworm (*Halicoverpa armigera*) causes maximum damage to cotton crop. Cotton crop is heavily sprayed with insecticides in Pakistan to the tune of 35.5% to overcome the problem of insect pest (Anonymous, 1987). Exessive usage of these pesticides creates environment hazards resulted loss of beneficial fauna (Iqbal et al., 2011). However this indiscriminate use of insecticides on large scale helped in creating resistance in the insects. Control of insects through biocontrol agents and neem based products is a new field of science that has emerged recently and significant work in this direction has been done in foreign countries. The present studies were carried out so as to known the affect of certain biocontrol agents such as biopesticides on insect mortality. High mortality of American bollwarm was recorded by Dextruins A and B where *M.anisopliae* was used (Suzuki et al.,1971). Many researchers reported that statistically 71.52% and 70.64% mortality was recorded by golobulus 54.34 %, 52.67%, Spinosad 51.20% and 52.15% for controlling *N. lugens* and *F. furcifera E. golobulus* + Spinosad after 1st day. However minimum mortality was recorded by combined effect of A. indica + E. golobulus +Spinosad i.e. 77.95%& 74.92% after 1st day. Statistically significant reduction in both the pests were recorded by golobulus +Spinosad after three days i.e. 72.72%, 61.14% followed by A. indica; E. golobulus and A. indica + E. Spinosad i.e. 64.69% & 60.81%; 45.05% & 50.34%; 33.04% & 29.66% respectively. However A. indica + E. golobulus +Spinosad was sprayed and reduced populations of these two pests i.e. 48.45% & 49.34% statistically highly significant effect followed by (24.05 & 29.42%); E. golobulus A. indica (22.39% & 22.86%) and Spinosad (21.01% & 20.36%) after seven days (Zohaib et al., 2015). Krishanan and Narayanan (1988) reported that 80-100% mortality of larvae in all 5 instars when M.anisopliae was used at a concentration of 1.8x109 conidida/ml. During1996, Schan AND Katti,obtained

significant control of *H.armigera* with 5% neem seed kernel extract compared to conventional insecticides. Jaglan (1997) reported that neem seed and leaf extracts showed better insecticidal properties against *H.armigera*. After application, Spinosad caused higher reduction in spider's population than Eucalyptus and control. Significant difference was recorded in botanical insecticides in reducing spider's population. After three days, all the chemical pesticides showed non significant effects in reduction in spider's population than control. After seven days, Spinosad caused significantly higher reduction than botanical and control treatment.The result showed that maximum reduction in population of spider was recorded 33.23%, 28.01% and 25.06% with Spinosad, A. indica was and E. globolus concluded that spider's population was significantly resistant to 20% concentration (Zuhaib et. al., 2015). Botanical extracts not only played a vital role for controlling pests but also act as alternate to pesticides (Zohaib et. al., 2015). However the study had been planed to evaluate the effect of biopesticides, neem based products and growth regulators on insect mortality (%) at Pest Warning and Quality Control of Pesticides, Pakpattan during 2014.

Materials and Methods

The study had been planed to evaluate the effect of biopesticides, neem based products and growth regulators on insect mortality (%) at Pest Warning and Quality Control of Pesticides, Okara during 2014. Samples of naturally infected and dead insects of cotton bollworm collected from three tehsils of Okara (Okara, Renala Khurd & Depalpur) on Sabour and Dextrose agar method. To avoid contamination, Streptomycin sulphate (0.5 g/lit) and rose Bengal (1.30,000) were added to the medium after sterilization and before pouring. The isolates were followed by Raper and Fennell,1965; Ellis, 1971; Kendrick, 1971; Barnett and Hunter,1972. The identified isolates were multiplied on liquid Sabour and Mecium. The concidia from 15 days old culture were harvested and properly dilutions T1 (high), T2 and T3 (moderate) and T4(low) were made with the help of Haemocytometer. Different larval instars were prepared suspensions and placed in plastic containers and closed with muslin cloth from preparation . Fresh leaves of lady's finger were supplied as diet. Different concentrations (0.1 - 0.7 percent) of Larvo Btk, Entomokil, Nimbokill and Cascade were applied on cotton plants and wrapped with muslin cloth. The mortality of the larvae was recorded after every 48 hours. The data collected were analysed statistically for interpretation of the results (Steel and Torrie, 1980).

Results and Discussion

The mortality in all the concentration was recorded which was comparatively higher in 0.6 and 0.7 per cent concentration (Table 1). The result revealed that when the material was used in different combinations, slightly higher mortality (%) was recorded. When used above, indicating that it is good to use the material in mixture form (Table 2). Use of biocontrol agents at high concentration (T1) resulted in higher mortality especially in M. anisopliae and B. bassiana compared to other biocontrol agents. Although in case of low concentration, mortality of larval instars but it was significantly low compared to high concentration (Table 3).

Table 1: EFFECT OF DIFFERENT CONCENTRATION OF SPRAY MATERIAL ON MORTALITY OF COTTON BOLLWORM LARVAE

	Mortality (%) at different concentration						
Spray Material	0.1	0.2	0.3	0.4	0.5	0.6	0.7
T 1 Larvo Btk	7 a	7 a	8 a	8 ab	9 a	16 a	17 a
T2 Entomokill	6 a	9 a	7 a	10 a	9 a	13 b	13 ab
T3 Nimbokill	8 a	5 a	4 ab	6 bc	8 a	10 ab	11 ab
T4 Cascade	5 a	7 a	5ab	3 c	7 a	9 b	9 b
T5 Control	0 b	0 b	0 b	0 d	0 b	0 c	0 c

Table 2: COMBINED EFFECT OF DIFFERENT BIOPESTICIDES AND GROWTH REGULATORS ON INSECT MORTALITY

	Mortality (%) at different Larval instars						
TREATMENTS	0.1	0.2	0.3	0.4	0.5	0.6	0.7
T1 Larvo Btk + Nimbokill	6a	8a	9a	11a	14a	16a	17a
T2 Larvo Btk + Entomo kill	7ab	5ab	5b	7bc	7b	9b	11b
T 3 Larvo Btk+ Cascade	4a	8a	7a	9ab	11a	15a	17a
T4 Nimbokill + Entomokill	1ab	5ab	5b	6bc	7b	7bc	10b
T 5 Nimbokill+Cascade	6 bc	3 bc	3bc	6bc	5b	5c	9b
T 6 Entomokill+Cascade	2bc	2bc	1c	3ca	5b	5c	10 b
T 7 Control	0c	0c	0c	0d	0c	0d	0c

Table 3: EFFECT OFDIFFERENT BIO CONTROL AGENTS ON MORTALITY OF DIFFERENT LARVAL INSTARS

Treatment (Bio control agent)	Mortality (%) at different concentration				
	T 1	T 2	T 3	T 4	T 5(check)
M.anispoliae	17 a	17 a	6 b	9b	0 c
P.fumosorosens	13a	11a	6b	3bc	0c
B.bassiana	16a	15a	9b	5c	0d
A.flavus	11a	8ab	5bc	3cd	0d
V.lecanii	8a	7a	5ab	3bc	0c

According to the results, at 0.1 percent concentration of Larvo Btk, the mortality was 7 percent and it was 17 percent with the application of 0.7 percent concentration. Studies also revealed that at 0.7 percent concentration of the bio pesticides and high concentration of bio control agents, the rate of mortality of different larval instars of American bollworm was increased. According to Urs and Govider (1971), Krishnan and Narayanan (1989), the entomogenous fungus namely Metarbizium anisopliae caused high mortality (80-100%) of the all the five instars larvae of *Heliothis armigera* it was reported to be toxic like Destruxins A and H (Suzuki et al., 1971). M.anisopliae, besides other insects, also attacked Coleopterans (Yendol and Robert, 1971). For better results,high concentration of biopesticides and biocontrol agents be used. As American bollworm had a broad host range of both cultivated and weed plants so there are more chances of damage through this insect. In such cases it is proper that instead of single tactic, multiple tatics be used.

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