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Bio-efficacy of different bio agents against population of Whitefly, (*Bemisia tabaci Gennadius*)

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Abstract

In the present study, the bio-efficacy of different bio agents against sucking insect pest Whitefly, *Bemisia tabaci Gennadius*, was evaluated. Total three sprays of each bio agent were done to protect but cotton variety RCH-134 But (BG-II) from the infestation of sucking pest. In the result, it was found that maximum reduction in whitefly population was recorded in the treatment of Neem oil + liquid soap (61.53%) which was at par with the treatment of of NSKE 5% (56.90%) and Pest guard 5% (54.84%). These three treatments were superior to rest of the treatments. The treatment of *Verticillium lecanii* (38.28%) formed the next best treatment to reduce whitefly population, followed by *Fusarium SP* (37.09%), *Beauveria bassiana* (36.02%) and Buprofenzin I.G.R (31.76%).

Keywords: Whitefly, *Bemisia tabaci Gennadius*, NSKE, Bt cotton

Introduction

India is the only country in the world that grows not only all the four cultivated species of cotton namely, *G. arboreum* (Sea Island Cotton), *G. hirsutum* (American cotton), *G. herbaceum* (indian cotton) and *G. barbadense* (Egyptian cotton) but also their intra- and inter-specific hybrids on a commercial scale. Area wise, India ranks first in global scenario contributing about 34% of the world cotton area. However, the productivity of cotton in India still far less than other major cotton growing countries of the world, viz. Australia (1802 kg ha⁻¹), Brazil (1446 kg ha⁻¹), China (1326 kg ha⁻¹), USA (865 kg ha⁻¹), Pakistan (721 kg ha⁻¹) and Uzbekistan (682 kg ha⁻¹) (AICCIP 2012a). The insect pests are a major constraint in achieving high productivity. Due to several new technological developments such as transgenic cotton, cotton genomics, molecular breeding, pest and disease resistance, integrated pest management, insect resistance management, integrated nutrient management, and cotton by-products utilization, the cotton scenario in the country is changing much faster than it was anticipated. However, there is a continuous loss, in the productivity of cotton due to many reasons, mainly due to pest attack.

Gupta *et al.* (1998b) [3] observed that Neem oil gave encouraging results against whitefly, jassid and thrips cotton fields. Neem produced nontoxic effects after the 1st spray, and acted as antifeedant, growth regulator, oviposition reduction and mortality was maximum after 3rd spray. Dimetry *et al.* (1996) [2] reported that Neem seed extract significantly reduced population density of whitefly. Patel & Patel (1996) [5] concluded that Neem seed kernel 5% showed a repellent effect against jassids. Bajpai & Sehgal (1999) [1] reported that Neem oil at 2.0%, NSKE at 5.0% and Karanj oil at 2% were effective against the pest population compared to control. In the present study, the bio-efficacy of different bioagents against sucking insect pest Whitefly, *Bemisia tabaci Gennadius*, was evaluated. Total three sprays of each bioagent were done to protect Bt cotton variety RCH-134 Bt (BG-II) from the infestation of sucking pest. The observations on percent reduction of sucking pest population were recorded 24 hours before spray and 2-4 days after each spray of the treatment.

Material & Method

The experiment involved 8 treatments including control. The treatments consist of NSKE 5% (Neem Seed Kernal Extract), Neem Oil + liquid soap, Pest guard 5%, *Fusarium SP*, *Verticillium lecanii*, *Beauveria bassiana*, Buprofenzin I.G.R. (Insect Growth Regulator) and Control. Total three sprays of each bio agent were given at 7-10 days' interval to protect the Bt cotton against sucking pests. The following bio agents were used for spraying the crop during crop season. The treatments were imposed as and when the population of whitefly reached

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Economic Threshold Level (ETL). The Population of sucking pest were recorded on the crop, 24 hours before spray and 2-4 days after each spray of the treatment. Population counts of whitefly were made on the lower surface of three leaves (one each from upper, middle and lower plant canopy) of each of the five randomly selected plants per plot. Later the

population was averaged to present as number per three leaves. The average seasonal means were considered for pooled analysis of two years. The observations on the surviving insects after each treatment at definite time intervals were recorded and percent reduction in population was calculated.

Table 1: Efficacy of different bio agents against whitefly population on RCH-134 Bt (BG-II) during Kharif 2012-13.

Treatment	Doses/lit. of water	Mean (%) reduction of whitefly/3leaves after 1 st spray	Mean (%) reduction of whitefly/3leaves after 2 nd spray	Mean (%) reduction of whitefly/3leaves after 3 rd spray
NSKE 5%	5 ml	61.91# (51.87)*	53.85# (47.19)*	50.90# (45.50)*
Neem oil + liquid soap	3 ml + 1 ml	61.05 (51.37)	58.94 (50.14)	55.68 (48.24)
Pest guard 5%	4 ml	57.94 (49.56)	53.20 (46.82)	47.64 (43.62)
<i>Fusarium</i> SP	2 g	36.65 (37.18)	33.41 (35.19)	34.04 (35.59)
<i>Verticillium lecanii</i>	3 g	38.85 (38.52)	34.49 (35.86)	31.05 (33.78)
<i>Beauveria bassiana</i>	3 g	38.43 (38.67)	29.60 (32.92)	29.45 (32.82)
Buprofenzin I.G.R.	2 ml	32.21 (34.49)	27.92 (31.74)	22.69 (28.31)
Control		2.25 (8.50)	2.41 (8.82)	2.53 (9.08)
SEM±		1.68	1.63	1.68
CD (5%)		5.10	4.96	5.11
CV%		7.51	7.85	8.42

Mean of three replications

* Values in parenthesis are transformed angular values

Table 2: Efficacy of different bioagents against whitefly population on RCH-134 Bt (BG-II) during Kharif 2013-14

Treatment	Doses/lit. of water	Mean (%) reduction of whitefly/3leaves after 1 st spray	Mean (%) reduction of whitefly/3leaves after 2 nd spray	Mean (%) reduction of whitefly/3leaves after 3 rd spray
NSKE 5%	5 ml	58.35# (49.81)*	55.02# (47.86)*	61.37# (51.56)*
Neem oil + liquid soap	3 ml + 1 ml	66.23 (54.48)	64.71 (53.59)	62.56 (52.31)
Pest guard 5%	4 ml	57.27 (49.12)	52.17 (46.23)	60.79 (51.22)
<i>Fusarium</i> SP	2 g	39.96 (39.16)	38.18 (38.12)	40.33 (39.18)
<i>Verticillium lecanii</i>	3 g	40.61 (39.51)	45.77 (42.55)	38.92 (38.53)
<i>Beauveria bassiana</i>	3 g	39.12 (38.66)	36.98 (37.41)	42.57 (40.66)
Buprofenzin I.G.R.	2 ml	35.22 (36.33)	34.79 (36.11)	37.73 (37.80)
Control		2.47 (8.97)	2.40 (8.77)	2.34 (8.71)
SEM±		1.83	1.41	2.18
CD (5%)		5.56	4.26	6.60
CV%		8.04	6.27	9.43

Mean of three replications

* Values in parenthesis are transformed angular values

Table 3: Efficacy of different bio agents against whitefly population on RCH-134 Bt (BG-II) during Kharif 2012-13 and 2013-14 (Pooled data of two years).

Treatment	Doses/lit. of water	2012-13	2013-14	Pooled mean
		Mean (%) reduction of whitefly/3leaves after spray	Mean (%) reduction of whitefly/3leaves after spray	Mean (%) reduction of whitefly/3leaves after spray
NSKE 5%	5 ml	55.55# (48.19)	58.25# (49.74)	56.90## (48.97)*
Neem oil + liquid soap	3 ml + 1 ml	58.56 (49.92)	64.50 (53.46)	61.53 (51.69)
Pest guard 5%	4 ml	52.93 (46.67)	56.74 (48.85)	54.84 (47.76)
<i>Fusarium</i> SP	2 g	34.70 (35.98)	39.49 (38.82)	37.09 (37.4)
<i>Verticillium lecanii</i>	3 g	34.79 (36.05)	41.77 (40.2)	38.28 (38.13)
<i>Beauveria bassiana</i>	3 g	32.49 (34.81)	39.55 (38.91)	36.02 (36.86)
Buprofenzin I.G.R.	2 ml	27.61 (31.51)	35.91 (36.75)	31.76 (34.13)
Control		2.40 (8.8)	2.40 (8.82)	2.40 (8.81)
SEM±		1.67	1.81	1.74
CD (5%)		5.05	5.48	5.26
CV%		7.93	7.91	7.92

Pooled mean of two years

Mean of three sprays

* Values in parenthesis are transformed angular values

Result & Discussion

The data of Whitefly, *Bemisia tabaci* Gennadius presented in Table 1 and 2 pertaining to percent reduction in whitefly population for the years of 2012-13 and 2013-14, respectively and pooled data in Table 3 revealed that all the bio agent's treatments proved significantly superior in reducing the whitefly population in comparison to control. On the basis of pooled data presented in Table 3 revealed that, during 2012-13, maximum reduction in whitefly population was recorded in the treatment of Neem oil + liquid soap (58.56%) which was at par with the treatment of NSKE 5% (55.55%) and Pest guard 5% (52.93%). These three treatments were superior over the other treatments. The treatment of *Verticillium lecanii* (34.79%), *Fusarium SP* (34.70%), *Beauveria bassiana* (32.49%) and Buprofenzin I.G.R (27.61%), formed the next group of treatments to reduce whitefly population and were at par to each other. During 2013-14, maximum reduction in whitefly population was recorded in the treatment of Neem oil + liquid soap (64.50%) which was at par with the treatment of NSKE 5% (58.25%) and Pest guard 5% (56.74%). These three treatments were superior over the other treatments. The treatment of *Verticillium lecanii* (41.77%), *Beauveria bassiana* (39.55%), *Fusarium SP* (39.49%), and Buprofenzin I.G.R (35.91%), were less effective to control whitefly population and were at par to each (Table 3). The pooled mean as depicted in Table 3 regarding reduction in whitefly population revealed that, maximum reduction in whitefly population was recorded in the treatment of Neem oil + liquid soap (61.53%) which was at par with the treatment of NSKE 5% (56.90%) and Pest guard 5% (54.84%). These three treatments were superior over the other treatments. The treatment of *Verticillium lecanii* (38.28%) formed the next treatment to reduce whitefly population, followed by *Fusarium SP* (37.09%), *Beauveria bassiana* (36.02%) and Buprofenzin I.G.R (31.76%). These four treatments were at par to each other.

In the present study, it was found that maximum reduction in whitefly population was recorded in the treatment of Neem oil + liquid soap (61.53%) which was at par with the treatment of of NSKE 5% (56.90%) and Pest guard 5% (54.84%). These three treatments were superior to rest of the treatments. The treatment of *Verticillium lecanii* (38.28%) formed the next best treatment to reduce whitefly population, followed by *Fusarium SP* (37.09%), *Beauveria bassiana* (36.02%) and Buprofenzin I.G.R (31.76%). These four treatment were at par to each other.

The present findings are in agreement with those of Verma *et al.* (1989)^[8] who reported that Neem oil (3 l/ha) reduced the whitefly population by 98.76 percent as against 96.72, 96.42 and 66.47 percent in Quinalphos, Amitraz and Triazophos, respectively. They reported Neem oil was significantly better than Triazophos. Similar trend was reported by Nataranjan and Sundramurthy (1990)^[4]. Shelke *et al.* (1990)^[6] and Sidding (1991)^[7] reported that two applications of neem seed extract @ 1 kg/40 L water at a 14-day interval starting at the beginning of infestation significantly reduced the population of *Bemisia tabaci* to less than 50% of the control.

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