International Journal of Biology Research
ISSN: 2455-6548, Impact Factor: RJIF 5.22
www.biologyjournal.in
Volume 2; Issue 3; July 2017; Page No. 38-40

Evaluation of bio agents against *Thrips* population on RCH-134 Bt (BG-II)

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Abstract
The present investigation was conducted to evaluate of bio agents against *Thrips* population on RCH-134 Bt (BG-II). 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 bioagent were given at 7-10 days' interval to protect the Bt cotton against sucking pests. In the result, it was found that maximum reduction in thrips population was recorded in the treatment of Neem oil + liquid soap (47.17%) which was at par with the treatment of NSKE 5% (42.53%) and Pest guard 5% (39.82%). These three treatments were superior to rest of the treatments. The treatment of *Verticillium lecanii* (25.53%) formed the next best treatment to reduce *Thrips* population, which was at par with the treatment of *Fusarium SP* (23.90%). Rest of the treatments were observed to be inferior to all mentioned treatments.

Keywords: fusarium SP, verticillium lecanii, beauveria bassiana, buprofenzin I.G.R., thrips

Introduction
Nearly 130 species of insect pests occur on Indian cotton with a dozens of these arthropods requiring their management for realizing better cotton yields. Existing species associations among insect pests seem to avoid competition among them as well as to match with the phenology of cotton growth. Sucking pest's viz., aphids (Aphis gossypii Glover), leaf hopper (Amrasca biguttula biguttula Ishida), whiteflies (Bemisia tabaci Gennadius) and thrips, (Thrips tabaci Lindeman) are deleterious to the cotton crop growth and development (Vennila *et al.* 2007) [6]. The estimated loss due to sucking pest's complex was up to 21.20 per cent (Dhawan *et al.* 2003) [2].

Present day trends are aimed for finding effective but safer insecticide that can be used in conjunction with biological agents, botanical pesticides to regulate pest population within economic limits. Now-a-days, numbers of new molecules are introduced in the market and those are not only effective but also cost effective and less toxic to the existing natural enemies of the pests. Therefore, the present investigation was conducted to evaluate of bioagents against *Thrips* population on RCH-134 Bt (BG-II).

Material & method
The treatments were imposed as and when the population of *Thrips* reached 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 *thrips* 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. 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.

Result & discussion
The data presented for both the years in Table 1 and 2 and pooled data in Table 38 revealed that all the bio agent's treatments proved significantly superior in reducing the thrips population in comparison to control. On the basis of pooled data presented in Table 3 revealed that, during 2012-13, maximum reduction in *Thrips* population was recorded in the treatment of Neem oil + liquid soap (51.34%) which was at par with the treatment of NSKE 5% (46.65%) and Pest guard 5% (41.96%). These three treatments were superior over the other treatments. The treatment of *Verticillium lecanii* (27.87%) and *Fusarium SP* (23.76%), formed the next group of treatments to reduce *thrips* population and were at par to each other. During 2013-14, maximum reduction in *thrips* population was recorded in the treatment of Neem oil + liquid soap (43.00%) which was at par with the treatment of NSKE 5% (38.40%) and Pest guard 5% (37.69%). These three treatments were superior over the other treatments. The treatment of *Fusarium SP* (24.04%), *Verticillium lecanii* (23.19%) and *Beauveria bassiana* (17.12%), formed the next group of treatments to reduce *thrips* population and were at par to each (Table 3). The pooled mean as depicted in Table 3 regarding reduction in *thrips* population revealed that, maximum reduction in *thrips* population was recorded in the treatment of Neem oil + liquid soap (47.17%) which was at par with the treatment of NSKE 5% (42.53%) and Pest guard 5% (39.82%). These three treatments were superior over the other treatments. The treatment of *Verticillium lecanii* (25.53%) formed the next

treatment to reduce thrips population, which was at par with the treatment of *Fusarium SP* (23.90%). In the present study, it was found that maximum reduction in thrips population was recorded in the treatment of Neem oil + liquid soap (47.17%) which was at par with the treatment of of NSKE 5% (42.53%) and Pest guard 5% (39.82%). These three treatments were superior to rest of the treatments. The treatment of *Verticillium lecanii* (25.53%) formed the next best treatment to reduce *Thrips* population, which was at par with the treatment of *Fusarium SP* (23.90%). Rest of the treatments were observed to be inferior to all mentioned treatment

Present findings are in agreement with the report of Muthukrishnan *et al.* (1992) who concluded that Margocide CK20 and Ethion recorded minimum incidence of whitefly, aphid, jassid and thrips on cotton when compared with Margocide OK 80, Acephate, Triazophos, Neem oil, Metasystox and Dimethoate. Sachan and lal (1993) also reported that all the treatments (Neem seed kernel extract, Neem leaf extract, Neem oil and other insecticides) reduced the pest population in chickpea. Gupta *et al*. (1998) observed that Neem oil gave encouraging results against whitefly, jassid and thrips cotton fields. Bajpai and Sehgal (1999) 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.

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

Treatment	Doses/lit. of water	Mean (%) reduction of thrips/3leaves after 1st spray	Mean (%) reduction of thrips/3leaves after 2nd spray	Mean (%) reduction of thrips/3leaves after 3rd spray
NSKE 5%	5 ml	45.65# (42.44)*	50.37# (45.19)*	43.94# (41.50)*
Neem oil + liquid soap	3 ml + 1 ml	54.23 (47.40)	51.08 (45.59)	48.73 (44.25)
Pest guard 5%	4 ml	48.05 (43.87)	39.40 (38.80)	38.42 (38.21)
Fusarium SP	2 g	25.28 (30.08)	22.36 (28.07)	23.64 (28.96)
Verticillium lecanii	3 g	29.13 (32.56)	27.83 (31.70)	26.64 (31.02)
Beauveria bassiana	3 g	18.08 (24.98)	14.28 (22.06)	15.23 (22.89)
Buprofenzin I.G.R.	2 ml	15.13 (22.71)	10.60 (18.85)	11.19 (19.41)
Control		2.23 (8.35)	2.21 (8.37)	2.53 (9.08)
SEM±		2.00	1.97	1.66
CD (5%)		6.06	5.98	5.04
CV%		10.97	11.44	9.78

Mean of three replications
* Values in parenthesis are transformed angular values

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

Treatment	Doses/lit. of water	Mean (%) reduction of thrips/3leaves after 1st spray	Mean (%) reduction of thrips/3leaves after 2nd spray	Mean (%) reduction of thrips/3leaves after 3rd spray
NSKE 5%	5 ml	38.84# (38.49)*	35.86# (36.74)*	40.52# (39.47)*
Neem oil + liquid soap	3 ml + 1 ml	42.77 (39.99)	38.69 (38.38)	47.54 (43.56)
Pest guard 5%	4 ml	38.83 (37.30)	35.20 (36.35)	39.04 (38.96)
Fusarium SP	2 g	23.38 (30.57)	23.95 (29.16)	24.79 (29.64)
Verticillium lecanii	3 g	25.68 (30.28)	21.86 (27.77)	22.03 (27.92)
Beauveria bassiana	3 g	17.71 (24.76)	15.56 (23.06)	18.09 (25.07)
Buprofenzin I.G.R.	2 ml	15.06 (22.63)	15.90 (23.43)	14.29 (22.01)
Control		2.03 (8.09)	2.40 (8.77)	2.34 (8.71)
SEM±		1.85	1.66	1.95
CD (5%)		5.60	5.03	5.90
CV%		11.02	10.28	11.46

Mean of three replications
* Values in parenthesis are transformed angular values

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

Treatment	Doses/lit. of water	2012-13	2013-14	Pooled mean
		Mean (%) reduction of thrips/3leaves after spray	Mean (%) reduction of thrips/3leaves after spray	Mean (%) reduction of thrips/3leaves after spray
NSKE 5%	5 ml	46.65# (43.04)*	38.40# (38.23)*	42.53## (40.64)*
Neem oil + liquid soap	3 ml + 1 ml	51.34 (45.75)	43.00 (40.64)	47.17 (43.2)
Pest guard 5%	4 ml	41.96 (40.29)	37.69 (37.53)	39.82 (38.91)
Fusarium SP	2 g	23.76 (29.04)	24.04 (29.79)	23.90 (29.41)
Verticillium lecanii	3 g	27.87 (31.76)	23.19 (28.66)	25.53 (30.21)
Beauveria bassiana	3 g	15.86 (23.31)	17.12 (24.3)	16.49 (23.8)
Buprofenzin I.G.R.	2 ml	12.31 (20.32)	15.08 (22.69)	13.70 (21.51)
Control		2.32 (8.6)	2.26 (8.53)	2.29 (8.56)
SEM±		1.88	1.82	1.85
CD (5%)		5.69	5.51	5.60
CV%		10.73	10.92	10.83

Pooled mean of two years
Mean of three sprays
* Values in parenthesis are transformed angular values

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