

Evaluation of Different Bio Pesticides Against the Aphid in okra at Bhubaneswar

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Abstract: Aphid population ranged from 2.01- 2.21 in the beginning of Kharif 2013 and 3.87 to 4.21 in summer 2013-14 after the application of biopesticides and bioagents at 40 DAG aphid infestation during 2013 was found to be 0.36/plant in acetamiprid treatment (T₇) but bioagent *C. zastrowi sillemi* also reduced the population substantially recording 1.0 and 1.09 aphid/ plant at 40 DAG. The reduction was 96.54% in insecticide were as it was 90.41% in *C. zastrowi sillemi* @ 1 lakh / ha and 89.54% in *C. zastrowi sillemi* @ 75,000 / ha indicating the effectiveness of *C. zastrowi sillemi* in the control of sucking pest similarly corresponding incidence in summer was 0.96, 1.28 and 1.31 aphids/ plant and 92.29 and 86.32 and 85.74% reduction respectively. The biopesticides were also effective for control of aphid the most effective being *V.lecanii* which recorded 1.86 and 2.06 aphids/plant and 82.16 and 82.92% reduction of aphid population during Kharif and summer respectively. The other biopesticides in order of effectiveness were *M. anisopliae*, *Neemazol* and *B.bassiana* recording (3.02 and 3.10, 4.01 and 3.92, 3.96 and 4.08 aphid/plant) during Kharif and summer respectively. It was observed that over the two seasons, the aphid population ranged between 0.77 in acetamiprid treatment to 3.69 in *B.bassiana* treatment among the bioagent and biopesticides where as in controlled plot it was 8.34 aphid/plant correspondingly the population reduction was also highest in T₇ (80.21%) followed by T₃ (79.46%), T₅ (77.57%), T₂ (67.86%), T₄ (60.67%) and T₁(55.75%) indicating that *C.zastrowi sillemi* and *V.lecanii* were most effective bioagents against aphids.

Key words: Evaluation • Aphid • Okra

INTRODUCTION

Okra is ravaged by as many as 45 species of insect-pests throughout its growth period (Rawat and Sahu, 1973) [1]. Among these, the aphid, *Aphis gossypii* is a polyphagous sucking pest and also found damaging okra all over India. It also acts as vector of virus and transmits mosaic, leaf curl etc. (Butani and Verma, 1976) [2]. The indiscriminate use of pesticides has caused toxicity to non-target beneficial organisms resulting in development of pest resistance to the chemical pesticides and resurgence of pest due to pyrethroids (Basha *et al.* 1982) [3]. Adoptions of IPM strategies ensure safety of environment. In this regard encouragement of natural enemies occupies a central position in integrated pest management because biological control of pests and weeds through natural enemies is eco-friendly (Shivalingaswamy *et al.*, 2002 [4]; Telang *et al.*, 2004; Sardana *et al.*, 2005 [5]). The

effectiveness of bio pesticides like *Beauveria bassiana*, *Verticillium lecanii* and *Metarhizium anisopliae* against okra aphid *Aphis gossypii* has been reported by Harischandra Naik and Shekharappa (2008) whereas that of the neem pesticides has been elaborated by Dhanalakshmi and Mallapur (2011) [6]. The chrysopid predator, *C. carnea* has also successfully controlled okra aphid (Puri, 1992). Keeping all these in view, a field experiments were taken up at the Orissa University of Agriculture and Technology, Bhubaneswar to evaluate bio pesticides against the okra aphid.

MATERIALS AND METHODS

The field experiments were taken up in the Central Research Station of Orissa University of Agriculture and Technology (OUAT), Bhubaneswar during Kharif 2013 and Summer 2013-14. The okra variety Utkal Gaurav was sown in well prepared land and the crop was grown

following all standard package of practices. The experiments were laid in Randomized Block Design (RBD) with three replications and eight treatments. The plot size was 5m x 5m. Treatment schedule was as follows :

- T₁ = Application of *Beauveria bassiana* @ 1x 10⁸ cfu/g at 15 and 30 DAG (Days after Germination)
- T₂ = Application of *Metarrhizium anisopliae*@ 1x 10⁸ cfu/g as in T₁
- T₃ = Application of *Verticillium lecanii* @ 1x 10⁸ cfu/g as in T₁.
- T₄ = Application of Neemazal 4% as in T₁.
- T₅ = Release of *Chrysoperla zastrowi sillemi* @ 75000 1st instar larvae/ha at 15 and 30 DAG
- T₆ = Release of *Chrysoperla zastrowi sillemi* @ 100,000 1st instar larvae /ha at 15 and 30 DAG
- T₇ = Application of acetamiprid 0.025% at 15 and 30 DAG
- T₈ = Untreated control

Fifteen days after germination (DAG) the first application of biopesticides were done. Before that, as the 14th DAG, the population of pests were recorded before application of the treatments (DBA). Thus for each treatment pest population were recorded 1 day before application (DBT) and then 3 day after treatment (DAT) and 10 DAT. The population of pests was recorded from 10 randomly selected plants in each subplot after the first application of biopesticides and bioagents. Observations were taken from 3 leaves i.e., from top, middle and lower portion of the plant for sucking pests. Data so obtained during Kharif 2013 and summer 2013- 14 were statistically analysed after suitable transformation and the inferences were drawn basing on the results.

RESULTS AND DISCUSSION

During Kharif 2013, the population of aphids in okra ranged from 2.01 in T₁ to 2.22 in T₇. Fifteen days after germination (DAG) when the 1st observation was taken the difference between treatments in respect of aphid population was non-significant. After 3 days of applying treatments i.e. 18 DAG, the population of aphid ranged between 0.63 in T₇ to 3.80 in T₈. The aphid population was lowest in (0.63/plant) in T₇ i.e. application of acetamiprid which was at par with the application of *Verticillium lecanii* (T₃) having 1.36 aphids/plant.

The treatments with *Beauveria bassiana*, *Metarrhizium anisopliae* and Neemazol recorded 2.12, 2.09 and 2.03 aphids/plant which were at par with each other.

The bioagent *Chrysoperla zastrowi sillemi* when released @ 1,00,000/ha was as effective as the application of acetamiprid, but when released at the rate of 50,000/ha the predator as effective as the but the biopesticide *Verticillium lecanii*.

The treatment reduced the pest population in the range of 87.71% in T₇ to 42.16 in T₁ during Kharif 2013 (Table 1). This observation corroborate with the finding of Nirmala *et al.* (2006) have recorded similar effectiveness of *V. lecanii*. After 30 DAG similar trend was observed in the aphid population. Days before application (DBA) aphids ranged from 1.02 in T₇ to 5.81 in T₈ when the observations was taken. The difference between treatments in respect of aphid population was significant. After 33 DAG 2nd application was done in the same dose. After 3 days of applying treatment i.e. at the 33 DAG the population and aphid ranged between in T₇ 0.61 to 7.29 in T₈. The aphid population was lowest (0.61/plant) in T₇ i.e. application of acetamiprid which was at par with application of *C. zastrowi sillemi* in T₆ having 1.12 aphids/plant. Control plots recorded the highest population of aphid at 3.80 aphids/plant.

V. lecanii and *C. zastrowi sillemi* in T₈ i.e. @ 75,000/ha recorded 1.98 and 1.43 aphids/plant which were statistically at par with each other. *B. bassiana*, *M. anisopliae* and Neemazol were recorded 4.67, 3.33 and 4.07 which were statistically similar will each other.

During summer 2013-14 (Table 2), the population of aphid in okra ranged from 9.2-3.75 at 15 days after germination when the 1st observation was taken. The differences between treatments in respect of aphid population was non-significant. After 3 days of applying treatments i.e. 18 DAG the population of aphid ranged between 2.00 in T₃ to 5.32 in T₈. The aphid population was lowest (2.00/plant) in T₈ i.e. application of acetamiprid which was at par with the application of *V. lecanii* (T₃) having 2.02 aphids/plant. The biopesticides. *B. bassiana*, *V. lecanii* and Neemazol recorded 4.19, 3.21 and 3.12 aphids per plant which were statistically at par will each other. The bioagent *C. zastrowi sillemi* when released at the rate of 1,00,000/ha was as effective as the application of acetamiprid, but when released at the rate of 50,000/ha the predator was as effective as the best biopesticide *V. lecanii*. Control plots recorded the highest population of aphid at 5.32 aphids per plant.

During summer 2013-14 (Table 2), the population of aphid in okra ranged from 9.2-3.75 at 15 days after germination when the 1st observation was taken. The differences between treatments in respect of aphid population was non-significant. After 3 days of applying

Table 1: Effect of different bioagents on the aphid population in okra during Kharif 2013

Treatment	1 st Application			Reduction over control (%)	2 nd Application			Reduction over control (%)
	DBA	18 DAG	25 DAG		DBA	33 DAG	40 DAG	
T ₁	2.01 (1.41)	2.12 (1.45)	2.73 (1.65)	42.16	4.81 (2.19)	4.67 (2.16)	3.96 (1.98)	62.02
T ₂	2.13 (1.45)	2.09 (1.44)	1.65 (1.28)	65.05	4.00 (2.0)	3.33 (1.82)	3.02 (1.73)	71.01
T ₃	2.11 (1.45)	1.36 (1.16)	1.06 (1.02)	77.54	2.91 (1.70)	1.98 (1.40)	1.86 (1.36)	82.16
T ₄	2.21 (1.48)	2.03 (1.42)	2.00 (1.41)	57.64	4.42 (2.10)	4.07 (2.01)	4.01 (2.00)	61.54
T ₅	2.09 (1.44)	1.80 (1.34)	1.73 (1.38)	59.12	1.32 (1.14)	1.43 (1.19)	1.09 (1.04)	89.54
T ₆	2.13 (1.45)	1.65 (1.28)	1.53 (1.23)	67.59	1.28 (1.13)	1.12 (1.05)	1.00 (1.00)	90.41
T ₇	2.22 (1.48)	0.63 (0.79)	0.58 (0.76)	87.71	1.02 (1.00)	0.61 (0.78)	0.36 (0.60)	96.54
T ₈	2.20 (1.48)	3.80 (1.94)	4.72 (2.17)	-	5.81 (2.41)	7.29 (2.7)	10.42 (3.22)	-
SE(m)±	NS	0.27	0.32		NS	0.38	0.64	
CD(0.05)	NS	0.81	0.96		NS	1.13	1.92	

Figures in parentheses are \sqrt{x} values

Table 2: Effect of different bioagents on the aphid population in okra during Summer 2013-14

Treatment	1 st Application			Reduction over control (%)	2 nd Application			Reduction over control (%)
	DBA	18 DAG	25 DAG		DBA	33 DAG	40 DAG	
T ₁	4.20 (2.04)	4.19 (2.04)	4.03 (2.00)	34.79	5.12 (2.26)	4.36 (2.08)	4.08 (2.01)	66.17
T ₂	3.78 (1.99)	3.21 (1.79)	2.97 (1.72)	51.94	3.39 (1.84)	3.16 (1.77)	3.10 (1.76)	74.30
T ₃	3.75 (1.93)	2.02 (1.42)	1.86 (1.36)	69.90	2.98 (1.72)	2.12 (1.45)	2.06 (1.43)	82.92
T ₄	4.21 (2.05)	3.71 (1.92)	3.22 (1.79)	47.73	4.86 (2.20)	4.43 (2.10)	3.92 (1.97)	67.50
T ₅	4.08 (2.01)	3.12 (1.76)	2.96 (1.72)	52.10	2.14 (1.46)	1.88 (1.37)	1.72 (1.31)	85.74
T ₆	4.11 (2.02)	3.01 (1.73)	2.43 (1.55)	60.68	2.08 (1.44)	1.70 (1.37)	1.65 (1.28)	86.32
T ₇	3.87 (1.96)	2.00 (1.41)	1.23 (1.10)	80.09	2.42 (1.55)	1.10 (1.04)	0.93 (0.96)	92.29
T ₈	4.01 (2.00)	5.32 (2.30)	6.18 (2.48)	-	6.82 (2.61)	8.91 (2.98)	12.06 (3.47)	-
SE (m) ±	NS	0.11	0.19		0.14	0.17	0.28	
CD(0.05)	NS	0.32	0.58		0.42	0.52	0.85	

Figures in parentheses are \sqrt{x} values

treatments i.e. 18 DAG the population of aphid ranged between 2.00 in T₃ to 5.32 in T₈. The aphid population was lowest (2.00/plant) in T₈ i.e. application of acetamiprid which was at par with the application of *V. lecanii* (T₃) having 2.02 aphids/plant. The biopesticides, *B. bassiana*, *V. lecanii* and *Neemazol* recorded 4.19, 3.21 and 3.12 aphids per plant which were statistically at par with each other. The bioagent *C.zastrowi sillemii* when released at the rate of 1,00,000/ha was as effective as the application of acetamiprid, but when released at the rate of 50,000/ha the predator was as effective as the best biopesticide *V. lecanii*. Control plots recorded the highest population of aphid at 5.32 aphids per plant.

The treatments reduced the pest population in the range of 34.79% (T₁) to 80.09% (T₇) during summer 2013-14. This observation is in agreement with the findings of Yokomi and Gottwald (1998) [7] who have recorded similar effectiveness of *V. lecanii* against *A. gossypii*.

After 30 DAG, similar trend was observed in the aphid population. DBA, it ranged from 2.42 in T₇ to 6.82 in T₈ when the observation were taken. The difference between treatments in respect of aphid population was significant. After 3 days i.e. 33 DAG again the 2nd spraying was done. The aphid population varied from 1.10 in T₇ to 8.91 in T₈ aphid/plant showing acetamiprid as most effective treatment with 92.29% population reduction followed by *C. zastrowi sillemii* @ 1 lakh/ha and 75,000/ha resulting in 86.32% and 85.74 % reduction in aphid population respectively. Next best treatment was *V. lecanii* showing 82.92 % reduction, *M.anisopliae* showing 74.30 % reduction, *Neemazol* showing 67.50 % reduction and *Bt* showing 66.17 % reduction in aphid population. The effectiveness of *V.lecanii* and *C.zastrowi sillemi* in controlling aphids has been reported by Khalil *et al.* (1983) [8] , Yokomi and Gottwald (1998), Ramarethinam *et al.* (2005) [9] and Nirmala *et al.*, (2006) [10] earlier and the present study also confirmed their findings.

Table 3: Effect of different biopesticides on the aphid population in okra (pooled over Kharif 2013 and summer 2013-14)

Treatment	DBA	18 DAG	25 DAG	(%) Reduction over control
T ₁	4.03 (2.00)	3.83 (1.95)	3.69 (1.92)	55.75
T ₂	3.33 (1.82)	2.94 (1.71)	2.68 (1.63)	67.86
T ₃	2.93 (1.71)	1.87 (1.37)	1.71 (1.30)	79.49
T ₄	3.92 (1.96)	3.56 (1.88)	3.28 (1.81)	60.67
T ₅	4.81 (2.19)	2.05 (1.43)	1.87 (1.36)	77.57
T ₆	2.39 (1.54)	1.91 (1.38)	1.65 (1.28)	80.21
T ₇	2.38 (1.54)	1.08 (1.03)	0.77 (0.88)	90.76
T ₈	4.70 (2.16)	6.32 (2.51)	8.34 (2.88)	-
SE (m) ±	NS	0.22	0.19	
CD(0.05)	NS	0.68	0.59	

Figures in parentheses are \sqrt{x} values

The pooled data (Table 3) of both the seasons revealed that the DBA, the aphid population ranged from 2.93 / plant in T₃ i.e. V. lecanii to 4.70 in untreated control. The lowest population in T₃ is due to application of V. lecanii. The plots treated with insecticide acetamiprid registered, recorded lowest population of 2.38 aphids/ plant where as the biopesticide recorded 3.33,3.92 and 4.03 aphids / plant in respect of M. anisopliae, Neemazol and B. bassiana application.

18 DAG and 25 DAG the population of aphid ranged from 1.08/ plant in T₇ to 6.32/plant and 0.77 to 8.34/ plant respectively, acetamiprid being the most effective treatment recording both the lowest population. The biopesticides were also found effective in controlling the aphid population. The most effective one was V.lecanii recording 1.87 and 1.71 aphids/ plants respectively the corresponding aphid population in respect of M.anisopliae Neemazol and B. bassiana were 2.94 and 2.68, 3.56 and 3.28,3.83 and 3.69 aphids / plant respectively. Acetamiprid recorded the highest reduction in population of aphid (90.76%) followed by C. zastrowi sillemii @ 1 lakh / ha (80.21%), V. lecanii (79.49%) in C. zastrowi sillemii @75,000/ha (77.57%), M. anisopliae (67.86%), Neemazol (60.67%) and B. bassiana (55.75%).

The effectiveness of Chrysoperla in reducing the sucking as well as borer pest of different crops has been demonstrated by Balakrishnan et. al. (2004), Inayatullah (2007) in tomato, Pathan et.al, in okra (2010).The present findings are in agreement with the above authors.

CONCLUSION

The differences between treatments in respect of aphid population was non-significant. After 3 days of applying treatments i.e. 18 DAG the population of aphid

ranged between 2.00 in T₃ to 5.32 in T₈.The aphid population was lowest (2.00/plant) in T₈ i.e. application of acetamiprid which was at par with the application of V. lecanii (T₃) having 2.02 aphids/plant. The biopesticides. B. bassiana, V. lecanii and Neemazol recorded 4.19, 3.21 and 3.12 aphids per plant which were statistically at par with each other. The bioagent C.zastrowi sillemii when released at the rate of 1,00,000/ha was as effective as the application of acetamiprid, but when released at the rate of 50,000/ha the predator was as effective as the best biopesticide V. lecanii. Control plots recorded the highest population of aphid at 5.32 aphids per plant.

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