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# EFFICACY OF BIO-PESTICIDES AGAINST THE JASSID, *AMRASCA BIGUTTULA BIGUTTULA* IN OKRA AT BHUBANESWAR, ODISHA, INDIA

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## Abstract

The study was carried out during *Kharif* 2013 and summer 2013-14 in Bhubaneswar for evaluating some biopesticides like *Beauveria bassiana*, *Metarhizium anisopliae*, *Verticillium lecanii*, Neemazol against the jassid in okra. The treatments were applied twice at 15 and 30 days after germination (DAG). The schedule with acetamiprid was the most effective one reducing the incidence of jassids from 4.53/plant to 1.28/plant in 10 days. The biopesticides were also effective against the jassid recording incidence of 3.41, 3.47, 3.84, 4.20, 4.84 and 5.60/ plant in the schedules with *M. anisopliae*, *C. zastrowi sillemi* @ (1 lakh/ha), *C. zastrowi sillemi* @ (75,000/ha), *B. bassiana, V. lecanii* and Neemazol respectively. While the percentage reduction of the pest was highest in acetamiprid schedule (90.59%), in the other BIPM schedules it was 74.85, 74.49, 71.77, 69.02, 64.42 and 58.84%, respectively.

***Key words :*** Bio pesticides, evaluation, okra, jassid.

## Introduction

Incidence of insect pests is one of the limiting factors in production of okra. jassids (*Amrasca biguttula biguttula*), whitefly (*Bemisia tabaci*) and shoot and fruit borer (*Earias vittella* Fab.) are important pests of okra. At present, schedule based application of various insecticides are recommended for the management of different insect pests. But, the injudicious use of synthetic chemicals to manage these pests has resulted in resistance, resurgence, secondary infestation, phyto-toxicity, toxicity to beneficial organisms, residues in food beyond the tolerance limits posing unwarranted health hazards to the consumers (Mandal *et al*., 2006). Botanical insecticides like Neem pesticides, microbials like *Bacillus thuringiensis*, *Beauveria bassiana*, *Metarrhizium anisopliae* and *Verticillium lecanii* and biological control agents (spider, *Chrysoperla* and *Trichogramma*) should be integrated for economic management of insect pests of okra (Arora *et al*., 1996 and Abro *et al*., 2004). Bio control agents and neem extracts have been reported eco-friendly options for management of insect pests of okra (Al-Eryan *et al*., 2001; Bindu *et al*., 2003; Paulraj and Ignacimuthu, 2005).

## 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. 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 × 5m. Treatment schedule was as follows:

**Treatment details**

| Treatment No. | Treatment name | Dose | DAG (Days after germ-ination) |
|---|---|---|---|
| $T_1$ | *Beauveria bassiana* | $1 \times 10^8$cfu/g | at 15 and 30 |
| $T_2$ | *Metarrhizium anisopliae* | $1 \times 10^8$cfu/g | at 15 and 30 |
| $T_3$ | *Verticillium lecanii* | $1 \times 10^8$cfu/g | at 15 and 30 |
| $T_4$ | Neemazal 4% | 1x $10^8$cfu/g | at 15 and 30 |
| $T_5$ | *Chrysoperla zastrowi sillemi* | 75000 1st instar larvae /ha | at 15 and 30 |
| $T_6$ | *Chrysoperla zastrowi sillemi* | 100,0001st instar larvae /ha | at 15 and 30 |
| $T_7$ | Acetamiprid | 0.025% | at 15 and 30 |
| $T_8$ | Control | Untreated | |

Fifteen days after germination (DAG) the first application of biopesticides were done. Before that, at the 14th DAG, the population of jassid was recorded one day before application of the treatments (DBA). Thus, for each treatment pest population were recorded 1 day before application (DBA) and then 3 day after treatment (DAT) and 10 DAT. The population of jassid 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. 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

Data in table 1 indicated that during *Kharif* 2013, the population of jassid in okra ranged from 3.09 in $\mathbf{T_3}$ to 3.27 in $\mathbf{T_2}$ at 15 DAG when 1st observation was taken the difference between treatments in respect of jassid population was non significant. Three days after applying treatments (DAT) *i.e.* at 18 DAG, the population of jassid ranged between 1.63 in $\mathbf{T_7}$ to 3.75 in $\mathbf{T_8}$. The jassid population was lowest in 1.63/plant in $\mathbf{T_7}$ *i.e.* in the application of acetamiprid which was at par with the release of *C. zastrowi sillemii* in $\mathbf{T_6}$ having 2.43 jassids/ plant.

*B. bassiana*, *M.anisopliae*, *C. zastrowi sillemii* @ 75,000/ha recorded 2.62, 2.71 and 2.92 jassid/plant, which were statistically at par with each other followed by *V. lecanii* and Neemazol, which recorded 2.98 and 3.06 jassids/plant and were not significantly different. The control plots recorded the highest population of jassid at 3.75 jassids/plant. The treatments reduced the pest population in the range of 41.21% in $\mathbf{T_4}$ (Neemazol) to 80.07% in $\mathbf{T_7}$ (Acetamiprid) during *kharif* 2013. The effectiveness of *B. bassiana* against jassids has been demonstrated earlier by Naik and Sekharappa (2009) and this finding was in agreement with the observation of these authors. After 30 DAG, similar trend was observed in the jassid population. It ranged from 2.98 in $\mathbf{T_7}$ to 9.33 in $\mathbf{T_8}$ when the observations taken one DBA. The difference between treatments in respect of jassid population was significant. After 33 DAG, 2nd application was done in the same dose. Three days after treatment, *i.e.* at the 33 DAG, the population of jassid ranged between 1.33 in $\mathbf{T_7}$ to 13.42 in $\mathbf{T_8}$. The Jassid population was lowest in $\mathbf{T_7}$ (1.33/plant) *i.e.* application of acetamiprid. *C. zastrowi sillemii* @ 1lakh/ha ($\mathbf{T_6}$) was the next best with 1.85 jassids/plant. *B. bassiana*, *M. anisopliae* and *C. zastrowi sillemii* @ 75,000/ha recorded 4.08, 4.01 and 4.10 jassids/plant respectively, which were statistically at par with each other, followed by *V. lecanii* and Neemazol which recorded 0.37 and 2.14 jassids/plant and were statistically similar with each other.

At 40 DAG, the population of jassid ranged between 14.17 in $\mathbf{T_8}$ to 1.06 in $\mathbf{T_7}$. The percentage reduction in population varied from 68.62% to 92.52%, acetamiprid being the most effective and Neemazol being the least affective. *B. bassiana*, *M. anisopliae* and *C. zastrowi sillemi* @ 1 lakh/ha were at par having percentage reduction between 77.69%, 78.63% and 76.52% respectively. *V. lecanii* and *C. zastrowi sillemii* @ 75,000/ ha were equally effective in reducing the jassid population reduction to the tune of 69.61% and 68.62%.

Data in table 2 indicated that during summer 2013-14, the population of jassids in okra ranged from 7.96 in $\mathbf{T_4}$ to 8.95 in $\mathbf{T_7}$ at 15 DAG when 1st observation was taken at one DBA. The difference between treatments in respect of jassid population was non significant. After 3 days of applying treatments *i.e.* at 18 DAG the population of jassid ranged between 12.42 in $\mathbf{T_8}$ to 3.21 in $\mathbf{T_7}$. The Jassid population was lowest in 3.21 jassids/ plant in $\mathbf{T_7}$, *i.e.* application of acetamiprid which was at par with the application of *C. zastrowi sillemii* in $\mathbf{T_6}$ having 5.63 jassid/plant.

*B. bassaina*, *M.anisopliae* and *C. zastrowi sillemi* (@ 75,000/ha) recorded 6.93, 5.82 and 5.89 jassid/plant respectively, which were statistically at par with each other. *V. lecanii* and Neemazol recorded 7.32 and 7.51 jassids/plant, which where statistically similar.

The control plot recorded highest population and jassid at 12.42 jassids/plant. After 25 DAG again observation was taken, which showed 15.76 jassids/plant as highest in $\mathbf{T_8}$ and 2.01 jassids/ plant lowest in $\mathbf{T_7}$. *B.bassiana* ($\mathbf{T_1}$) and *M. anisopliae* ($\mathbf{T_2}$) were equally effective as in reduction of the jassid population. *M. anisopliae* and *C. zastrowi sillemi* @ 75,000 showed % reduction as 73.18, 64.12 and 69.86% respectively where as *B. bassiana*, *V. lecanii* and Neemazol showed % reductions as 66.94%, 58.85% and 55.42%, respectively. It was found that the effectiveness of the mycopesticides where reduced in the summer season.

After 30 DAG similar trend was observed in jassid population. One DBA, jassid population ranged from 3.0 in $\mathbf{T_7}$ to 17.40 in $\mathbf{T_8}$ when the observations taken, the difference between treatments in respect of jassid population being significant. After 33 DAG 2nd application was done in the same dose as that of the first treatment. 3 days after of applying treatment *i.e.* at the 33 DAG, the population of jassid ranged between 1.17 in $\mathbf{T_7}$ to

**Table 1:** Effect of different BIPM schedules on the jassid population during *Kharif* 2013 at Bhubaneswar

| Treatment | 1st Application | | | Reduction over control (%) | 2nd Application | | | Reduction over control (%) |
|---|---|---|---|---|---|---|---|---|
| | DBA | 18DAG | 25DAG | | DBA | 33DAG | 40DAG | |
| $T_1$ | 3.18 (1.78) | 2.62 (1.61) | 2.06 (1.43) | 59.76 | 6.36 (2.52) | 4.08 (2.01) | 3.16 (1.77) | 77.69 |
| $T_2$ | 3.27 (1.80) | 2.71 (1.64) | 2.13 (1.45) | 58.40 | 5.42 (2.32) | 4.01 (2.00) | 3.03 (1.74) | 78.63 |
| $T_3$ | 3.09 (1.75) | 2.98 (1.72) | 2.76 (1.66) | 46.09 | 6.97 (2.64) | 5.62 (2.37) | 4.31 (2.07) | 69.61 |
| $T_4$ | 3.20 (1.78) | 3.06 (1.74) | 3.01 (1.73) | 41.21 | 8.75 (2.95) | 4.62 (2.18) | 4.45 (2.10) | 68.62. |
| $T_5$ | 3.17 (1.78) | 2.92 (1.70) | 2.56 (1.60) | 50.00 | 4.21 (2.05) | 4.10 (2.02) | 4.08 (2.01) | 71.23 |
| $T_6$ | 3.25 (1.80) | 2.43 (1.55) | 2.08 (1.44) | 59.37 | 3.97 (1.99) | 3.43 (1.85) | 3.33 (1.82) | 76.52 |
| $T_7$ | 3.19 (1.78) | 1.63 (1.27) | 1.02 (1.00) | 80.07 | 2.98 (1.72) | 1.33 (1.15) | 1.06 (1.02) | 92.52 |
| $T_8$ | 3.18 (1.78) | 3.75 (1.93) | 5.12 (2.26) | - | 9.93 (3.15) | 13.42 (3.66) | 14.17 (3.76) | - |
| SE (m) ± | NS | 0.14 | 0.31 | | 0.36 | 0.63 | 0.66 | |
| CD | NS | 0.42 | 0.93 | | 1.07 | 1.89 | 1.97 | |

Figures in parentheses are $\sqrt{x}$ values.

**Table 2:** Effect of different BIPM schedules on the jassid population during summer 2013-14 at Bhubaneswar.

| Treatment | 1st Application | | | Reduction over control (%) | 2nd Application | | | Reduction over control (%) |
|---|---|---|---|---|---|---|---|---|
| | DBA | 18DAG | 25DAG | | DBA | 33DAG | 40DAG | |
| $T_1$ | 8.32 (2.88) | 6.93 (2.63) | 5.21 (2.28) | 66.94 | 8.75 (2.95) | 7.62 (2.76) | 6.38 (2.52) | 66.82 |
| $T_2$ | 8.60 (2.92) | 5.82 (2.41) | 4.23 (2.05) | 73.18 | 6.89 (2.62) | 4.93 (2.22) | 4.26 (2.06) | 77.84 |
| $T_3$ | 8.65 (2.94) | 7.32 (2.70) | 6.49 (2.54) | 58.85 | 7.42 (2.72) | 6.09 (2.46) | 5.83 (2.41) | 69.68 |
| $T_4$ | 7.96 (2.82) | 7.51 (2.74) | 7.03 (2.65) | 55.42 | 9.42 (3.06) | 8.75 (2.95) | 7.93 (2.81) | 58.76 |
| $T_5$ | 8.43 (2.90) | 5.89 (2.42) | 4.87 (2.20) | 69.12 | 4.97 (2.22) | 4.80 (2.19) | 3.86 (1.96) | 79.92 |
| $T_6$ | 8.18 (2.86) | 5.63 (2.37) | 4.75 (2.17) | 69.88 | 4.80 (2.01) | 4.75 (2.17) | 3.75 (1.93) | 80.5 |
| $T_7$ | 8.95 (2.99) | 3.21 (1.79) | 2.09 (1.44) | 88.74 | 3.02 (1.73) | 1.17 (1.08) | 0.96 (0.97) | 95.0 |
| $T_8$ | 8.65 (2.64) | 12.42 (3.52) | 15.76 (3.96) | - | 17.40 (4.17) | 17.86 (4.22) | 19.20 (4.38) | - |
| SE (m) ± | NS | 0.41 | 0.52 | | 0.61 | 0.70 | 0.74 | |
| CD | NS | 1.23 | 1.57 | | 1.84 | 2.10 | 2.21 | |

Figures in parentheses are $\sqrt{x}$ values.

17.86 in $\mathbf{T_8}$. The jassid population was lowest in $\mathbf{T_7}$ (1.17 jassid/plant) *i.e.* application of acetamiprid which was at par with the application of *C. zastrowi sillemii* in $\mathbf{T_6}$ having 4.75 jassid/3 leaves and $\mathbf{T_5}$ having 4.80 jassid/plant.

*B. bassiana*, *M. anisopliae* and *V. lecanii* recorded 7.62, 4.13 and 6.09 jassid/plant, which were statistically at par with each other. Neemazol effectiveness was recorded that is 8.75 jassid/plant.

After 7 days again observation was taken *i.e.* at 40 DAG. The population of jassids ranged between 0.96 in $\mathbf{T_7}$ to 19.20 in $\mathbf{T_8}$. The percentage reduction in population varied from 58.76% to 95% having acetamiprid as most effective and Neemazol the least with 58.76% reduction.

*C. zastrowi sillemii* @ 75,000/ha, *C. zastrowi sillemii* @ 1 lakh/ha and *M. anisopliae* were statistically similar having percentage reduction between 79.92%, 80.5%, 77.89% reduction. *V. lecanii* and *B. bassiana* were effective to the tune of 69.68% and 66.82% reduction in population indicating the ineffectiveness of mycopesticides in summer season.

The pooled data (table 3) of both the seasons revealed that one day before application of treatments the jassid population ranged from 4.53/plant in $\mathbf{T_7}$ to 9.78/plant in

**Table 3 :** Effect of different BIPM schedules on the jassid population at Bhubaneswar (pooled over *Kharif* 2013 and summer 2013-14).

| Treatment | DBA | 18 DAG 33 DAG | 25 DAG 40 DAG | (%) Reduction |
|---|---|---|---|---|
| $T_1$ | 6.65 (2.57) | 5.31 (2.30) | 4.20 (2.04) | 69.13 |
| $T_2$ | 6.04 (2.46) | 4.36 (2.08) | 3.41 (1.84) | 74.85 |
| $T_3$ | 6.53 (2.55) | 5.50 (2.39) | 4.84 (2.20) | 64.42 |
| $T_4$ | 7.33 (2.70) | 5.98 (2.44) | 5.60 (2.36) | 58.84 |
| $T_5$ | 5.19 (2.27) | 4.42 (2.10) | 3.84 (1.95) | 71.77 |
| $T_6$ | 5.05 (2.24) | 4.06 (2.01) | 3.47 (1.86) | 74.49 |
| $T_7$ | 4.53 (2.12) | 1.83 (1.35) | 1.28 (1.13) | 90.59 |
| $T_8$ | 9.78 (3.12) | 11.86 (3.44) | 13.56 (3.68) | - |
| SE (m) ± | NS | 0.20 | 0.28 | |
| CD (0.05) | NS | 0.62 | 0.84 | |

Figures in parentheses are $\sqrt{x}$ values.

$T_8$ this difference might have occurred due to the differential efficiency of the treatments over the two seasons. Three days and 7 days after application of treatments over the two seasons, the jassid population was least (1.83 and 1.28 jassids/plant) in $T_7$, *i.e.* application of acetamiprid with population reduction of 90.59% over control, closely followed by $T_6$ *i.e.* release of *C. zastrowi sillemi* @ 1 lakh /ha (4.06 and 3.47 jassids/ plant, population reduction of 74.49%) and *C.zastrowi sillemi* @ 75,000/ha (4.42 and 3.84jassids/plant, population reduction of 71.77%). Among the biopesticides, *B. bassiana* was the most effective recording 5.31 and 4.20 jassids/plant over the two seasons with population reduction of 69.13% closely followed by *V.lecanii* which recorded 5.50 and 4.84 jassids/ plant with population reduction of 64.42% and *M. anisopliae* recording 4.36 and 5.53 jassids/plant and 59.35% population reduction. Neemazol, which recorded 5.98 and 5.60 jassids/ plant and population reduction of 58.84% was the least effective among the biopesticides against the jassids. The present findings are in agreement with the observation of Rombach *et al.* (1986).

## References

Abro, M., T. S. Syed and A. A. Shaikh (2004). Infestation of *Earias* spp. on cotton and okra grown as mono and mix crops. *Pak. J. biol. Sci*., **7** : 937-942.

Al-Eryan, M. A. S., A. A. Zaitoon and H. A. Rezk (2001). The use of *Coccinella punctata* (Coleoptera : Coccinellidae) against *Aphis gossypii* (Homoptera : Aphididae) on okra plant. *Alexand. J. agric Res*., **46** : 107-114.

Arora, R. K., M. K. Dhillon and H. Singh (1996). Management of pest complex in okra research summation. *Annl. Agric. Biol. Res*., **1(1/2)** : 37-45.

Bindu, P., T. M. Bharpoda, J. R. Patel and J. J. Patel (2003). Evaluation of various schedules based on botanical and synthetic insecticides in okra ecology. *Indian J. Ent*., **65** : 344-346.

Mandal, S. K., S. B. Sah and S. C. Gupta (2006). Efficacy and economics of biopesticide and insecticide combinations against okra pests. *International Journal of Agricultural Sciences*, **2(2)** : 377-380.

Naik, R. H. and Shekharappa (2009). *In vitro* evaluation of entomopathogenic fungal formulations against sucking insect pests of okra. *Karnataka J. Agric. Sci*., **22(4)** : 784-786.

Paulraj, M. G. and T. Ignacimuthu (2005). Predatory insect fauna in mixed cropping agro ecosystems in Northeastern Tamil Nadu. *Insect Environ*., **11** : 79-82.

Rombach, M. C., R. M. Aguda and D. W. Roberts (1986). Biological control of the brown plant hopper, *Nilaparvata lugens* (Homoptera : Delphacidae) with dry mycelium application of *Metarrhizium anisopliae*. *Philippines Ent*., **6** : 613-619.