Sindh Univ. Res. Jour. (Sci. Ser.) Vol. 45(2) 311-316 (2013)

SINDH UNIVERSITY RESEARCH JOURNAL (SCIENCE SERIES)

Field Evaluation of Bio-Pesticides Against Jassid, *Amrasca Biguttula Biguttula* (Ishida) in Okra Crop

B. K. SOLANGI[++], R. SULTANA*, V. SUTHAR**, M. S.WAGAN*,

Department of Entomology, Sindh Agriculture University Tandojam

Received 17th April 2013 and Revised 22th June 2013

Abstract: Field studies on evaluation of biopesticides against jassid, *Amrasca biguttula biguttula* (Ishida) in okra crop was carried out at the experimental area of Habib Farm, District Hyderabad, during the year 2012. The crop was sown on well preapred seedbed keeping 45 cm distance between ridge to ridge, after thinning a plant to plant distance of 22.5 cm in CRB design. During the present study four replications and five treatments i.e. T_1 (Neem Powder), T_2 (Tobacco leaves), T_3 (Neem Oil), T_4 (Neem oil + Beneficial micro-organism B.M), T_5 (Control) were used. The pre-treatment observations were taken 24 hours before spray whereas post-treatment observations were taken at the intervals of 24, 48 and 72 hours and after one and two weeks. Relative neem oil + BM displayed greater reduction of jassid population (78.47%), followed by neem oil (76.57%), whereas, neem powder (65.46%) and tabacco leaves (63.16%) were less effective in reducing the population of jassid in field. However, during 2nd and 3rd spray the efficacy of all products remained the same altough it was higher as compared to 1st spray. The average performance of three sprays was maximum in case of (Neem oil + B.M) (81.28%), followed by neem oil (79.40%), neem powder (72.93%) and tabacco leaves (69.00%) respectively. The present study strongly suggests that the use of bio-pesticides may be helpfull to reduce the effect of pesticides in the environment.

Key words: Biopesticides, jassid population, treatment, replications, efficiency,

1. INTRODUCTION

Okra is an important vegetable crop cultivated in Pakistan on an area of about 14.465 thousand hectares with annual production of 109.239 thousand tones, while in Sindh province of Pakistan it is cultivated on 4.678 thousand hectares with a production of 21.588 thousand tones (Anonymous, 2006). It originated from Africa and belongs to the family Malvaceae and genus *Abelmoschus.* This genus is distinct from hibiscus in having a deciduous type of calyx, whereas they are persistent in the genus hibiscus. The okra belongs to the species *esculentus*. There are a large number of varieties of okra and they may be classified as tall, medium tall and dwarf according to the height of the plant. The varieties are further classified according to pod quality, some varieties are with prominent ridges, some are deep green in colour whereas some are light green (Khoso, 1996).

Insect pests cause serious losses to the okra crop. Among the different insect pests attacking okra, jassid, *Amrasca biguttula biguttula* (Ishida) is considered to be "the devastator". Damage to the crop is caused by the adults as well as nymphs, both of which are very agile and move briskly, forward and sideways. Adults are three mm long and greenish yellow during the summer, acquiring a reddish tinge in the winter. The winged adults jump or fly away at the slightest disturbances and are attracted to light in the night. The pest breeds practically throughout the year, but during summer months, only adults are found on plants such as potato, brinjal, tomato, etc. In spring, they migrate to okra and start breeding. The females lay about 15 yellowish eggs on the underside of the leaves, embedding them into the leaf veins. The eggs hatch in 4-11 days and are very active. They leave and pass throughout six stages of growth in 7-21 days. On transformation into weighed adults, they live for 5-7 weeks, feeding constantly on the plant juice. The pest completes seven generations in a year (Atwal, 1993). The injury to plant is due to the loss of sap and probably also due to the infection of toxins. The attacked leaves turn pale and then rust-red. With change in appearance, the leaves turn downwards, dry up and fail to the ground. Owing to the loss of the plant vitality, causing 35 percent reduction in yield (Atwal, 1993). To minimize the losses caused by jassid, it is necessary to regulate pest management. Use of insecticides is the most common method of pest control under the local conditions, but it creates environmental, soil and water pollution, and kills the beneficial insects (predators, pollinators etc.). However, use of bio-pesticide is one of the safest methods of pest control; it does not cause environmental, soil and water pollution and also no damage to beneficial insects. Several plant products are used to control insect pests effectively. Keeping the above facts in view, an experiment was carried out to determine the evaluation of bio-pesticides against jassid in okra crop.

[++]Corresponding author: Email: bhaikhan_solangisau@yahoo.com, Cell.No. +92-3003796765
*Department of Zoology, University of Sindh Jamshoro,Pakistan.
**Department of Statistics, Sindh Agriculture University Tandojam

2. MATERIALS AND METHODS

An experiment was carried out in the experimental area of Habib Farm, District Hyderabad, during the year 2012. Healthy and homogenous seeds of okra were sown on well-prepared ridges, keeping 45 cm distance between ridge to ridge and 22.5 cm distance between plant to plant during the month of March. There were five treatments; each treatment was replicated four times, thus twenty plots in total. Each treatment consists of an area of 6x3.5 meter. The experiment was laid out in a four-replicated Randomized Complete Block Design (RCBD). Bio-pesticides and their doses used against jassid on okra crop are shown in **(Table-1).**

Table-1 Healthy and homogenous seeds of okra

Treatment	Bio pesticides used	Dose/ acre	Dose/ plot
T1	Neem powder	3 kg	1 kg
T2	Tobacco leaves	5 kg	1 ½ kg
T3	Neem oil	1 liter	50 CC
T4	Neem oil + Beneficial Micro-organism	1liter	50 CC
T5	Control	-	-

Spray of each product was applied at economic threshold level. Before each spray of the product, the spray tank was washed carefully to avoid admixture. Three sprays were practiced throughout the life span of okra crop at interval of one month. For recording the population of jassid, five plants were selected randomly from each treatment plot and tagged. Five leaves (each one from top, two from middle and two from bottom portion) were examined carefully. Pre-treatment jassid count was made one day before each spray and post treatment population was recorded after 24, 48, 72 hours, and one and two weeks of spray. To see the evaluation of bio-pesticides reduction percentage was calculated by using the method of Hinderson and Tilton (1955).

$$\text{Percentage mortality} = 1 - \frac{Ta \times Cb}{Ca \times Tb} \times 100$$

Where;

Tb = Number of jassids in the treated plots before treatment.

Ta = Number of jassids in the treated plots after treatment.

Cb = Jassid population in the control plots before treatment.

Ca = Jassid population in the control plots after treatment.

Statistical analysis:

The data obtained were subjected to analysis of variance; to test the superiority of treatment means, LSD test was applied after Gomez and Gomez (1984). For this purpose a statistical computer package "MSTAT-C" was used.

3. RESULTS

1st Spray

The results shown in Table 2 revealed that after 24 hours of 1st spray with various bio pesticides, the population of jassid decreased in all treated plots as compared to un-treated control. The reduction percentage differed significantly between the tested products. Relatively neem oil + BM proved more effective and caused greater reduction of pest (93.21%), closely followed by neem oil (91.05%), while neem powder (84.46%) and tobacco leaves (82.48%). was found less effective in checking the population of jassid. It was further observed that after the 48 hours of 1st spray the trend of all bio-pesticides remained same as observed after 24 hours of spray. Neem oil + BM remained on top and displayed maximum reduction of jassid after (86.25%), closely followed by neem oil (84.30%) and tobacco leaves (78.70%), while Neem powder recorded lower reduction of pest (78.30%). After 72 hours of 1st spray with different bio-pesticide, the reduction %age of jassid decreased in all products. However, Neem oil + BM proved superior and recorded greater reduction of pest (82.46%), followed by Neem oil (81.03%) and neem powder (61.12%) respectively. Opposing to this, tobacco leaves lost its efficacy (58.44%). The differences in the reduction %age between the bio-pesticides were highly significant 78.47% statistically. After one week of 1st spray the efficacy of all four bio-pesticides decreased when compared to 72 hours of their application. However, Neem oil + BM gave significant results with greater reduction of jassid (72.41%), followed by Neem oil (70.43%) and Neem powder (58.74%), on contrary to this, tobacco leaves (54.72%) was found less effective against jassid population It was noted that reduction %age of jassid varied significantly ($P<0.01$) between the treatments. It was observed that after two weeks of 1st spray all the bio-pesticides further reduced their effectiveness as compared to one week of spray. Whereas, the differences in the reduction %age between the bio-pesticides were highly significant. neem oil + BM recorded maximum reduction of pest (58.01%), followed by neem oil (56.02%) and neem powder (44.69%), however, tobacco leaves recorded lowest reduction of jassid (41.45%). On average it was observed that during 1st spray Neem oil + BM proved superior and caused maximum reduction of pest (78.47%), followed by neem oil (76.57%), and Neem powder (65.46%) respectively. While, tobacco leaves displayed lower reduction (63.16%) of jassid population.

Table-2 Mean reduction %age of jassid recorded after different time intervals of 1st spray with various bio-pesticides in okra crop.

Treatments	Time interval					Mean
	24 hours	48 hours	72 hours	One week	Two weeks	
T1=Neem powder	84.46 b	78.30 b	61.12 b	58.74	44.69 b	65.46
T2=Tobacco leaves	82.48 b	78.72 b	58.22 b	54.72 c	41.45 c	63.16
T3=Neem oil	91.05 a	84.30 a	81.03 a	70.43 a	56.02 a	76.57
T4=Neem oil + BM	93.21 a	86.25 a	82.46 a	72.41 a	58.01 a	78.47

Values followed by similar letter do not differ significantly at 1% level of probability.

2nd spray

The results on the reduction %age of jassid recorded after different time of 2nd spray with various bio-pesticides are shown in Table-3. It may be seen from the results that all products reduced the population of jassid during each interval. After 24 hours of spray Neem oil + B.M recorded greater reduction of pests (91.10%), followed by Neem oil (89.74%), Neem powder (88.51%) and Tobacco leaves (87.93%) respectively. However, after 48 hours of spray the efficacy of all products increased as compared to 24 hours of their application. Neem oil + B.M remained on top with greater reduction of jassid (95.70%), followed by Neem oil (94.73%) and Neem powder (92.38%) respectively. While, tobacco leaves was less effective (91.24%). It was further apparent from the results that after 72 hours of spray all the bio-pesticides further increase their effectiveness as compared to 24 and 48 hours of spray. Relatively Neem oil + BM displayed significantly greater reduction of jassid (98.12%), followed by Neem oil (96.53%), and Neem powder (94.94%), respectively. Whereas application of Tobacco leaves proved comparatively less effective in lowering the pest density (94.34%), but was equally good when compared to neem powder. All the tested products show great effectiveness after the one week spray as compare to 24 hours sprays however the trend of efficacy was same. Neem oil + B.M recorded maximum reduction of jassid (79.14%), followed by Neem oil (77.79%) and Neem powder (71.07%) respectively. While, tobacco leaves lost its efficacy and showed lower reduction of pest (58.32%). The results further indicated that after two weeks of spray the efficacy of all products decreased as compared to one week of spray. Neem oil + BM remained of top and caused greater reduction of jassid (35.06%), followed by Neem oil (31.98%) and Neem powder (24.52%), while tobacco leaves as less effective in controlling the jassid (15.06%). On average, it was found that Neem oil + BM was more effective in reducing the population density of jassid (79.82%), followed by Neem oil (78.15%) and Neem powder (74.28%), while tobacco leaves was found less effective in reducing the population of pest (69.38%).

3rd Spray

The results on reduction %age of jassid recorded after 24, 48, 72 hours, one and two weeks of 3rd spray with different bio-pesticides in okra crop are displayed in the Table-4. It was observed from the results that after 24 hours of spray with respective bio-pesticides all the products reduced the population of jassid. Comparatively Neem oil + BM proved superior and caused maximum reduction of pest (91.98%), closely followed by Neem oil (91.39%), while Neem powder (88.90%) and Tobacco leaves (88.32%) were less effective in reducing the density of jassid. The results further revealed that after 48 hours of spray all the bio-pesticides further increased their performance and recorded maximum reduction of jassid. Relatively neem oil + BM showed highest reduction of jassid (93.86%) closely followed by Neem oil (93.18%) and Neem powder (91.68%), while Tobacco leaves showed slightly lower reduction of jassid (91.22%). After 72 hours of spray all the bio-pesticides further improved their effectiveness as compared to 24 and 48 hours of their application. Among the products evaluated Neem oil + BM recorded greater reduction of pest (95.99%), followed by Neem oil (95.36%) and Neem oil powder (93.96%), while tobacco leaves was slightly less (93.10%) when compared to Neem powder. It was observed that after one week of spray all bio-pesticides reduced their efficacy as compared to 24, 48 and 72 hours of spray but the trend remained the same. Neem oil + BM recorded greater reduction of pest (79.07%), followed by Neem oil (76.71%) and Neem powder (75.28%) while Tobacco leaves reduces it efficacy and recorded lowest reduction of jassid (65.11%). The results further indicated that after two weeks of spray with different bio-pesticides all the products reduces their efficacy as compared to one week of their spray; however, the trend of effectiveness remained same. The maximum reduction percentage of jassid was recorded when Neem oil + BM was applied (66.91%), followed Neem oil (60.81%) and Neem powder (45.49%), while Tobacco leaves recorded minimum reduction of pest (34.58%). On average, it was observed that Neem oil + BM recorded greater efficacy (85.56%), followed by Neem oil (83.49%) and Neem powder (79.06%), while Tobacco leaves proved less effective (74.47%).

Overall performance of bio-pesticides against jassid on okra crop

The results on average performance of three sprays of bio-pesticides against jassid in okra are presented in (Table3-5). The results depicted that all bio-pesticides applied reduces the population of jassid during each spray. However, Neem oil + BM when applied in combination recorded maximum reduction percentage (81.28%), followed by Neem oil (79.40%) and Neem powder (72.93%), while tobacco leaves recorded lowest reduction percentage (69.00%) and proved less effective.

Table-3. Mean reduction %age of jassid recorded after different time intervals of 2nd spray with various bio-pesticides in okra crop

Treatments	Time interval					Mean
	24 hours	48 hours	72 hours	One week	Two weeks	
T1=Neem powder	88.51 c	92.38 b	94.94 c	71.07 b	24.52a b	74.28
T2=Tobacco leaves	87.93 c	91.24 b	94.34 c	58.32 c	15.06b	69.38
T3=Neem oil	89.74 b	94.73 a	96.53 b	77.79 a	31.98a	78.15
T4=Neem oil + BM	91.10 a	95.70 a	98.12 a	79.14 a	35.06a	79.82

Values followed by similar letter do not differ significantly at 1% level of probability.

Table-4. Mean reduction %age of jassid recorded after different time intervals of 3rd spray with variousbio-pesticides in okra crop.

Treatments	Time interval					Mean
	24 hours	48 hours	72 hours	One week	Two weeks	
T1=Neem powder	88.90 c	91.68 c	93.96 c	75.28 b	45.49	79.06
T2=Tobacco leaves	88.32 d	91.22 d	93.10 d	65.11 c	34.58	74.47
T3=Neem oil	91.39 b	93.18 b	95.36 b	76.71 b	60.81	83.49
T4=Neem oil + BM	91.98 a	93.86 a	96.99 a	79.07 a	66.91	85.56

Values followed by similar letter do not differ significantly at 1% level of probability.

Table-5. Overall reduction %age of jassid after various sprays in okra crop with different bio-pesticides

Treatments	No. of spray			Average
	1st spray	2nd spray	3rd spray	
T1=Neem powder	65.46	74.28	79.06	72.93
T2=Tobacco leaves	63.16	69.38	74.47	69.00
T3=Neem oil	76.57	78.15	83.49	79.40
T4=Neem oil + BM	78.47	79.82	85.56	81.28

4. DISCUSSION

The results of the present study on evaluation of bio-pesticides against Jassid in Okra crop indicated that all four bio-pesticides (Neem powder, Tobacco leaves, Neem oil and Neem oil + BM) applied significantly reduced the population of Jassid after 24,48,72 and one and two week of their application during three spray. However, combination of Neem oil + BM were found more effective and caused significantly greater reduction of Jassid after 24 hours (93.21%), 48 hours (56.25%), 72 hours (82.46%), one week (72.41%), and two weeks (58.01%) of 1st spray, closely followed by Neem oil, while Neem powder and tobacco leaves when applied did not prove effective as Neem oil + BM and Neem oil respectively. On overall average the reduction %age was maximum under Neem oil + BM (78.47%), Neem oil (76.57%), Neem powder (65.46%) and Tobacco leaves (63.15%). The results further indicated that during the 2nd & 3rd sprays the performance of all bio-pesticides improved although the trend of efficacy remained the same. These results are supported by the findings of Mishra and Mishra (2002) who evaluated various botanical products against the insect pests. Neem seed kernel at 1.0 kg/ha and Neem oil at 2.5 liter/ a and Biotox at 1 kg/ha with Malathium at 0.5 kg/ha was applied twice at 20 days interval starting from 20 days after germination, the population of sucking pests was lowest where neem oil was applied. Pervez *et al.* (1998) evaluated the efficacy of Neem derivative i.e. Neem samples (1 and 2%), neem oil (5 to 6%), and Neem seed Kernel extract (3 and 4%) and 0.5% Nuvacron against the Jassid in okra.Neem oil significantly reduced the population of Jassid and found effective. Panickar *et al.* (2003) determined the efficacy of the botanical production 0.5% Achok alone or in combination with 0.35% endosulfan against sucking pests of okra. Twice spray of Achok provided the highest control of sucking pests. Rao *et al.* (2002) tested joint action potential of extract of neem and kernel in combination with methalonic extract of two other botanical sweet flag and across calamus against the okra leaf hopper, the combination of (0.42%) gave greater mortality of jassid. Singh and Kumar (2003)

evaluated various Neem based products against jassid on okra and found that Endosulfan and Achok was the most effective in controlling the okra Jassid. Kumar and Singh (2001) evaluated the efficacy of various insecticides and found that Endosulfan, followed by Achok and Neem seed Kernel extract were effective in controlling jassid of the three. Neem seed kernel gave the highest cost benefit ratio (1:10.7). Kaulat *et al.* (1997) reported that extract of tobacco and neem both gave effective control of cotton jassid in okra and gave similar level of control compared to Endosulfan and monocrotophos.

5. CONCLUSIONS

It may be concluded that all the four bio-pesticides reduced the population of jassid in okra crop during each spray. However, neem oil + BM was found superior in reducing the pest, closely followed by neem oil, while neem powder and tobacco leaves proved less effective in decreasing the population of jassid in okra crop.

REFERENCES:

Atwal, A. S. (1993) Agricultural pests of India and South East Asia (6th Edition), Kalyana Publish. New Delhi, 279-280.

Gomez, K. A. and A. A. Gomez. (1984) Statistical procedures for Agricultural Research. John Wiley and Sons New York.

Henderson, C. F. and E. W. Tilton, (1955) Tests with acaricides against the brow wheat mite, J. Econ. Entomol. 48:157-161.

Khoso, A.W. (1996) Vegetable Crops of Sindh. Allied Printing Press Hyd. 32-35.

Kulat, S. S., S.A. Nimbalkar and B. J. Hiwase. (1997) Relative efficacy of some plant extracts against *Aphis gossypii* Glover and *Amrasca devastans* (Distant) on okra. PKV Research J. 21 **(2)**:146-148.

Kumar, M. and A. K. Singh. (2001) Bioefficacy of insecticides against the cotton jassid, *Amrasca biguttula biguttula* (Ishida), on okra. Pest Management and Econ. Zool. 9 **(1)**: 55-58.

Mishra, N. C. and S. N. Mishra. (2002) Impact of biopesticides on insect pests and defenders of okra. Indian J. Plant Protection. 30 **(1)**: 99-101.

Panickar, B., 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. Entomol. 65 **(3)**: 344-346.

Parvez, A., W. A. Shah and A. Manan. (1998) Some studies on the efficacy of neem (*Azadirachta indica* A. Juss.) extracts on okra against cotton jassid (*Amrasca devastans* Dist.). Pakistan Entomol. 20 **(1/2)**: 11-13.

Rao, N. S. and R. Rajendran. (2002) Joint action potential of neem with other plant extracts against the leafhopper, *Amrasca devastans* (Distant) on okra. Pest Management and Econ. Zool. 10 **(2)**: 131-136.

Singh, A.K. and M. Kumar. (2003) Efficacy and economics of neem based products against cotton jassid, *Amrasca biguttulla biguttulla* Ishida in okra. Crop Research (Hisser). 26 **(2)**: 271-274.