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MANAGEMENT OF SUCKING PESTS OF BRINJAL IN HOMESTEAD GARDEN

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AB STRACT

The study was carried out in homestead garden of Patuakhali Science and Technology University (PSTU) campus for the management of sucking pests of brinjal during the period from December 2017 to March 2018. Five treatments viz., T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water, T_4 = Yellow sticky trap and Untreated control were tested. In case of mealy bug and mite control, 4 treatments except yellow sticky trap were applied. Results revealed that the lowest number of aphid population (0.70/3 leaves) was found in brinjal plants sprayed with Voliam flexi 300SC (T_1) while the control treatment had significantly the highest (3.66/3 leaves) aphid population in the top, middle and lower canopies of brinjal plants. Similar trend was also found in whiteflies and jassid populations by the same treatment. In terms of the percent population reduction over control, the highest reduction of aphid (86.22%), whiteflies (67.44%) and jassid (100%) was obtained from T_1 followed by T_2 and T_3 in different canopies of brinjal plant. In case of mealy bug and red spider mite, no and lowest populations number of mealybug and red spider mite were found in brinjal plants sprayed with T_1 and T_3 while the highest number of mealybugs/ 3 leaves was recorded in control plants in all canopies. In terms of the percent mite population reduction over control, the highest reduction of mite was obtained from T_1 (65.50%) and T_3 (65.50%). Similar trend was also observed in middle and lower canopies. Voliam flexi 300SC @ 0.5 ml/l of water (T_1) provided good control in reducing the populations of aphid, whitefly, jassid, mealy bug and red spider mite followed by T_3 (Biotap plus extra 95EC @ 0.2 g/l of water) and T_2 (Bioneem plus 1EC @ 1 ml/l of water) in different canopies of brinjal plant.

***Keywords*:** Homestead Garden, brinjal, insecticides, management, sucking pests

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INTRODUCTION

Brinjal (*Solanum melongena* L) is solanaceous crop of Indochina origin is now grown in many tropical and subtropical regions of the world (Tsao and Lo 2006). Brinjal is rich in vitamins, minerals, and antioxidants, making it a valuable addition to a healthy diet. It is also low in calories and high in fibre, supporting weight management and digestive health (Naeem and Ugur 2019). It is a crop that can be grown in a variety of agroclimatic conditions and with the use of sustainable farming methods. Brinjal deserves promotion because of its nutritional value, medicinal worth, and agricultural significance. Brinjal is facing significant threats from sucking pests which include whitefly (*Bemisia tabaci*), aphids (*Aphis gossypii* Glover), leaf hoppers (*Amrasca biguttula biguttula* Ishida) and mealy bugs such as aphid's, jassids, whitefly, mealybug, thrips and mite (Chatterjee 2018). They cause substantial damage to brinjal crops, resulting in reduced yields, lower-quality produce, and economic losses for farmers. With the global demand for brinjal projected to increase, managing sucking pests is crucial for ensuring food security and sustainable agriculture (Romeh 2019). Infestation due to aphid, whitefly and jassid results in about 70-92% yield loss of brinjal (Rosaiah 2001). Whiteflies, specifically *Bemisia tabaci* is sucking pest that seriously harm brinjal by extracting sap and spreading viruses. Aphid, jassid, and whitefly imbibe cell sap from succulent plant parts affecting normal growth and development. The nymphs and adults of these sucking pests suck cell sap from the succulent parts especially leaves of the plants with their piercing sucking mouthparts. The infested plants lead to crinkling and yellowing of the leaves, and reduce normal growth, development and vigor (Alam *et al*. 2004). The leaves and fruits of the thrips infested plants appear cosmetic silvery color and become unhealthy (Srinivasan 2009).

In Bangladesh, some farmers spray about 180 times during a cropping season (SUSVEG-Asia 2007). Krishnakumar *et al*. (2001) reported that thiamethoxam 25 WG @ 0.4 g L^{-1} gave significantly superior control of leafhopper. Balaji (2002) reported that foliar sprays of thiamethoxam 25 WG @ 0.025 percent recorded 67.55 percent mean reduction of whitefly population on brinjal. Sharma and Lal (2002) found that after one day of first spray of thiamethoxam 25 WG, the whitefly population was reduced by 94.06% on brinjal. They also found that it was superior against the leaf hopper. Ghosh and Senapathi (2002) reported that neem oil @ 2.5

ml per litre of water provided good control of whitefly and leafhopper population (64.37% and 65.34%, respectively) on brinjal. Dhawan and Simwat (2002) reported that thiamethoxam foliar spray @ 25 g a.i. ha^{-1} was significantly better than Oxydemeton methyl and was at par with Imidacloprid in controlling the cotton leafhopper.

Pesticide misuse has adverse effects on the environment, human and other animal's health which also increases the cost of production. Many farmers refrain from growing eggplant due to the cost of pesticides (Gapud and Canapi 1994). The farmers of Bangladesh mostly rely on broad spectrum insecticides to suppress sucking insects. The injudicious use of synthetic insecticides creates threats to eggplant ecosystem causing death of the pollinators and natural enemies of the pests. Pesticides residues in eggplant fruits are of great concern from the point of view of human consumption, causes environmental pollution and health hazard (Rashid *et al.* 2003). Cost effective crop production requires combination of optimum use of chemicals and non-chemical techniques of pest management. No published report is available on the management of sucking pests of brinjal in homestead garden. With this view in mind, the present research work has been undertaken to find out suitable management practices against sucking pests attacking brinjal in homestead garden.

MATERIALS AND METHODS

Field experiment was carried out in homestead garden of Patuakhali Science and Technology University (PSTU) campus, Dumki, Patuakhali during the period from December 2017 to March 2018. The homestead area was dug by using spade. The whole amount of cow dung, TSP, MP and half of the urea was applied during the time of final land preparation. Experiment was laid out in randomized complete block design with three replications. The spaces between blocks and between plots were 0.5m and 1.0m, respectively. The unit plot size was 2m x 2m with 50 cm spacing. The brinjal seedlings (variety BARI Begun 2 named Kazla) were collected from local market of Dumki where these seedlings are brought from Sarupkathi nursery by the seller. Seedlings were planted on 02 December 2017 in rows. Each plot contained 1 row with 3 plants separated by 50 cm. There were 3 plants for each treatment and 15 plants for 5 treatments in each replication. A total of 45 plants with 3 replications were grown for the study. The manures and fertilizers were applied according to

the recommended doses of the BARI. The agronomic practices such as mulching, weeding, application of fertilizer, irrigation etc was common for all the plots and was done as and when needed. The remaining half of urea was applied at 20 days after transplanting of seedlings as top dressing. After transplanting, the plants were monitored at morning and afternoon per week to observe the incidence, abundance and infestations of the sucking insects (jassid, whitefly, aphid, mealybugs, thrips, mites etc). There were four treatments viz., T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water, T_4 = Yellow sticky trap and Untreated Control were considered for the experiment. In case of mealy bug and mite control, 3 treatments except yellow sticky trap were applied. The treatments were applied after the infestation had occurred. An untreated control observation was made with spraying water. Mixture of insecticides in the hand sprayer was shaken well during spraying. Spraying was done at 11.00 am to avoid drift. Each of the treatment was applied in three plots and each plot considered as replication. All the treatments were applied three times at 15 days interval with a hand sprayer.

Data were collected from treated and untreated plots on population (nymph and adult) of sucking pests. The data on surviving population were reported on the basis of mean insect population/three leaves. Percent (%) insect pest population reduction over untreated control was calculated using following formula:
Percent insect pest population reduction over untreated control =

$$\frac{\text{Mean value of control} - \text{mean value of the treatment}}{\text{Mean value of control}} \times 100$$

Statistical analysis

Collected data were compiled and tabulated in proper form and were analyzed by analysis of variance using WASP (Web based Agricultural Statistical Package) software and means were separated by using Critical Difference (CD).

RESULTS AND DISCUSSION

Effectiveness of different treatments in reducing aphid: Mean aphid population and percent reduction of aphid in different canopies of brinjal plant as influenced by

different treatments are presented in Table 1. At top canopy, mean aphid population was significantly lowest (0.70/3 leaves) in T_1 followed by T_2 (0.88/3 leaves), T_4 (1.05/3 leaves) and T_3 (1.18/3 leaves). However, there was no significant difference between T_2 and T_4. The untreated control had significantly the highest (3.66/3 leaves) aphid population. In terms of the percent aphid population reduction over control, the highest reduction of aphid was obtained from T_1 (80.87%) followed by T_2 (75.96%), T_4 (71.31%) and T_3 (67.76%). At middle canopy, mean aphid population was lowest in T_1 (0.70/3 leaves) which was statistically similar to T_3 (0.88/3 leaves) followed by T_4 (1.18/3 leaves) and T_2 (2.21/3 leaves) and the highest (5.11) was in untreated control. In terms of the percent aphid population reduction over control, the highest reduction of aphid was obtained from T_1 (86.30%) followed by T_3 (82.78%), T_4 (76.91%) and T_2 (56.75%). At lower canopy, the mean aphid population was the lowest in T_1 (0.70/3 leaves) which was statistically similar to T_3 (0.99/3 leaves), T_2 (1.18/3 leaves) and T_4 (1.27/3 leaves) and the highest (5.08) was in untreated control. In terms of the percent aphid population reduction over control, the highest reduction of aphid was obtained from T_1 (86.22%) followed by T_3 (80.51%), T_2 (76.77%) and T_4 (75.00%).

Table 1. Mean aphid population and percent reduction of aphid in different canopies (top, middle and lower) of brinjal plant as influenced by different treatments

Treatment	Mean aphid population/3 leaves					
	Top	% reduction over control	Middle	% reduction over control	Lower	% reduction over control
T_1	0.70c	80.87	0.70c	86.30	0.70b	86.22
T_2	0.88bc	75.96	2.21b	56.75	1.18b	76.77
T_3	1.18b	67.76	0.88c	82.78	0.99b	80.51
T_4	1.05bc	71.31	1.18bc	76.91	1.27b	75.00
Untreated control	3.66a	-	5.11a	-	5.08a	-
CD (5%)	0.356		1.188		0.918	
CV (%)	12.70		11.22		16.42	

Figures in the column 2, 4 and 6 are transformed values after square root transformation. Values are average of three replications. T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water, T_4 = Yellow sticky trap and Untreated Control.

Effectiveness of different treatments in reducing whitefly: Mean whitefly population and percent reduction of whitefly in different canopies of brinjal plant as influenced by different treatments are presented in Table 2. At top canopy, mean whitefly population was significantly lowest (0.70/3 leaves) in T_1 which was statistically similar to T_4 (0.91/3 leaves) followed by T_3 (1.08/3 leaves) and T_2 (1.18/3 leaves). However, there was no significant difference between T_2 and T_3. The untreated control had significantly the highest (4.67/3 leaves) whitefly population. In terms of the percent whitefly population reduction over control, the highest reduction of whitefly was obtained from T_1 (85.01%) followed by T_4 (80.51%), T_3 (76.87%) and T_2 (74.73%). At middle canopy, mean whitefly population was the lowest in T_1 (1.05/3 leaves) which was statistically similar to T_4 (1.07/3 leaves), T_3 (1.11/3 leaves) and T_2 (1.12/3 leaves) and the highest (4.78/3 leaves) was in untreated control. In terms of the percent whitefly population reduction over control, the highest reduction of whitefly was obtained from T_1 (78.03%) followed by T_4 (77.62%), T_3 (76.78%) and T_2 (76.57%). At lower canopy, the mean whitefly population was the lowest in T_1 (0.70/3 leaves) which was statistically similar to T_3 (0.70/3 leaves), T_4 (0.70/3 leaves) and T_2 (0.84/3 leaves) and the highest (2.15/3 leaves) was in untreated control. In terms of the percent whitefly population reduction over control, the highest reduction of whitefly was obtained from T_1 (67.44%) followed by T_3 (67.44%), T_4 (67.44%) and T_2 (60.93%).

Table 2. Mean whitefly population and percent reduction of whitefly in different canopies (top, middle and lower) of brinjal plant as influenced by different treatments

Treatment	Mean whitefly population/3 leaves					
	Top	% reduction over control	Middle	% reduction over control	Lower	% reduction over control
T_1	0.70c	85.01	1.05b	78.03	0.70b	67.44
T_2	1.18b	74.73	1.12b	76.57	0.84b	60.93
T_3	1.08b	76.87	1.11b	76.78	0.70b	67.44
T_4	0.91c	80.51	1.07b	77.62	0.70b	67.44
Untreated control	4.67a	-	4.78a	-	2.15a	-
CD (5%)	0.342		1.421		0.098	
CV (%)	13.25		16.32		20.42	

Figures in the column 2 and 6 are transformed values after square root transformation. Values are average of three replications. T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water, T_4 = Yellow sticky trap and Untreated Control.

Effectiveness of different treatments in reducing jassid: Mean jassid population and percent reduction of jassid in different canopies of brinjal plant as influenced by different treatments are presented in Table 3. At top canopy, mean jassid population was significantly lowest (1.00/3 leaves) in T_1 which was statistically identical to T_4 (1.00/3 leaves), T_3 (1.00/3 leaves) and similar to T_2 (1.33/3 leaves). The untreated control had significantly the highest (5.33/3 leaves) jassid population. In terms of the percent jassid population reduction over control, the highest reduction of jassid was obtained from T_1 (81.24%) followed by T_4 (81.24%), T_3 (81.24%) and T_2 (75.05%). At middle canopy, the mean jassid population was the lowest in T_1 (0.09/3 leaves) which was statistically similar to T_4 (1.10/3 leaves), T_3 (1.18/3 leaves) and T_2 (1.21/3 leaves) and the highest (4.88/3 leaves) was in untreated control which was statistically different from the other treatments. In terms of percent jassid population reduction over control, the highest reduction of jassid was obtained from T_1 (77.66%) followed by T_4 (77.46%), T_3 (75.82%) and T_2 (75.20%). At lower canopy, the mean jassid population was the lowest in T_1 (0.20/3 leaves) which was statistically similar to T_2 (0.70/3 leaves), T_4 (0.88/3 leaves) and T_3 (0.91/3 leaves) and the highest (5.96/3 leaves) was in untreated control. In terms of the percent jassid population reduction over control, the highest reduction of jassid was obtained from T_1 (100.00%) followed by T_2 (88.26%), T_4 (85.23%) and T_3 (84.73%).

Table 3. Mean jassid population and percent reduction of jassid in different canopies (top, middle, lower) of brinjal plant as influenced by different treatments

Treatment	Mean jassid population/3 leaves					
	Top	% reduction over control	Middle	% reduction over control	Lower	% reduction over control
T_1	1.00b	81.24	1.09b	77.66	0.20b	100.00
T_2	1.33b	75.05	1.21b	75.20	0.70b	88.26
T_3	1.00b	81.24	1.18b	75.82	0.91b	84.73
T_4	1.00b	81.24	1.10b	77.46	0.88b	85.23
Untreated control	5.33a	-	4.88a	-	5.96a	-
CD (5%)	3.039		2.421		0.093	
CV (%)	13.25		16.32		20.42	

Values are average of three replications. T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water, T_4 = Yellow sticky trap and Untreated Control.

Effectiveness of different treatments on brinjal mealybugs: Figure 1 reveals the effectiveness of different treatments on the number of mealybug in different plant canopies. At top canopy, no mealybug population was found in brinjal plants sprayed with T_1 and T_3 treatments. The highest number of mealybugs/3 leaves was recorded in untreated control plants (4) followed by T_2 treated plants (2). At middle canopy, no mealybug population was found in brinjal plants sprayed by T_1 (0) and the lowest number of mealybug was recorded in T_3 treated plants (1) followed by T_2 treated plants (2). The highest number of mealybugs/ 3 leaves was recorded in untreated control plants (6). At lower canopy, the lowest number of mealybug/3 leaves was observed in plants sprayed T_1 treatment (1) followed by T_3 (3). The highest number of mealybugs/ 3 leaves was recorded in untreated control plants (8) followed by T_2 treated plants (5.67).

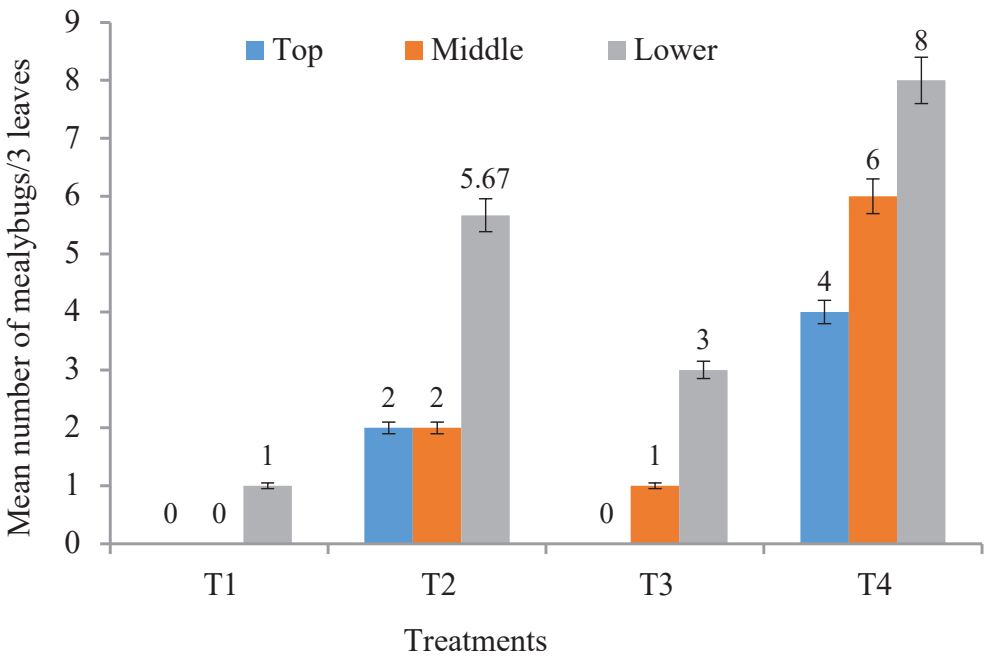


Fig. 1. Effect of different treatments on mean number of mealybugs per 3 leaves in different canopies (Top, middle, lower) of brinjal plant. T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water and Untreated Control.

Effectiveness of different treatments in reducing brinjal mite: Mean mite population and percent reduction of mite in different canopies of brinjal plant as influenced by different treatments are presented in Table 4. At top canopy, mean mite population was significantly lowest (1.18/3 leaves) in T_1 which was statistically identical to T_3 (1.18/3 leaves) and statistically similar to T_2 (1.38/3 leaves). The untreated control had significantly the highest (3.42/3 leaves) mite population. In terms of the percent mite population reduction over control, the highest reduction of mite was obtained from T_1 (65.50%) followed by T_3 (65.50%) and T_2 (59.65%). At middle canopy, the mean mite population was the lowest in T_3 (0.33/3 leaves) which was statistically similar to T_1 (1.67/3 leaves) and T_2 (3.33/3 leaves) and the highest mite (7.67/3 leaves) was in untreated control plot. In terms of the percent mite population reduction over control, the highest reduction of mite was obtained from T_3 (95.70%) followed by T_1 (78.23%) and T_2 (56.58%). At lower canopy, the mean mite population was the lowest in T_1 (0.33/3 leaves) which was statistically identical to T_3 (0.33/3 leaves) followed by T_2 (22.67/3 leaves) and the highest (32.33/3 leaves) was in untreated control plot. In terms of the percent mite population reduction over control, the highest reduction of mite was obtained from T_1 (98.98%) and T_3 (98.98%) followed by T_2 (29.87%).

Table 4. Mean mite population and percent reduction of mite in different canopies of brinjal plant as influenced by different treatments

Treatment	Mean mite population/3 leaves					
	Top	% reduction over control	Middle	% reduction over control	Lower	% reduction over control
T_1	1.18b	65.50	1.67b	78.23	0.33c	98.98
T_2	1.38b	59.65	3.33b	56.58	22.67b	29.87
T_3	1.18b	65.50	0.33b	95.70	0.33c	98.98
Untreated control	3.42a	-	7.67a	-	32.33a	-
CD (5%)	2.039		2.821		2.193	
CV (%)	13.25		13.32		20.42	

Values are average of three replications. T_1 = Voliam flexi 300SC @ 0.5 ml/l of water, T_2 = Bioneem plus 1EC @ 1 ml/l of water, T_3 = Biotap plus extra 95EC @ 0.2 g/l of water and Untreated Control.

Mite population per 3 leaves at different canopies of brinjal plant: Figure 2 indicates that the highest red spider mite population per 3 leaves was recorded in lower canopy followed by middle canopy while the lowest was in top canopy before and after spraying baitap plus extra. In case of voliam flexi 300SC, the highest red spider mite population per 3 leaves was recorded in lower canopy followed by middle canopy while the lowest was in top canopy before and after spray, the highest mite population was in middle canopy and lowest was in top canopy.

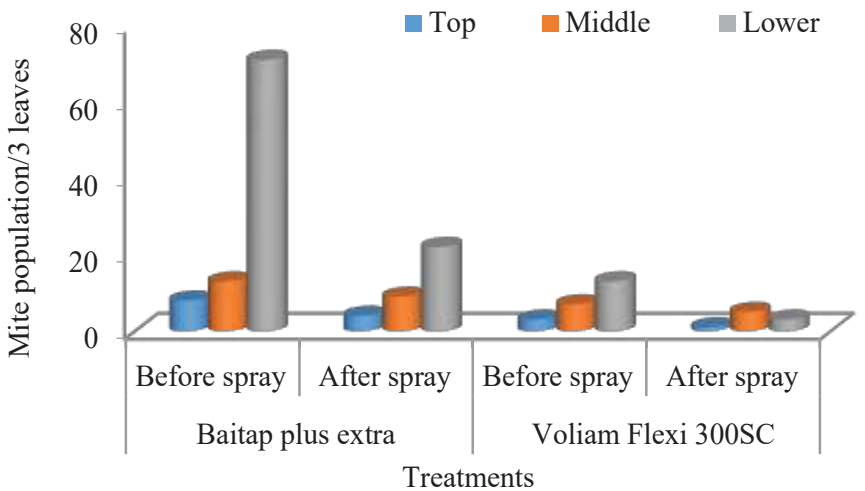


Fig. 2. Mite population per 3 leaves at different canopies of brinjal plant recorded before and after spray

The results of the present studies are comparable to those of Reghupathy *et al.* (1997) who suggested the use of yellow trap to manage whiteflies. Mhaske and Mot (2005) reported that higher dose of thiamethoxam 25 @ 50 g ha^{-1} were effective against leaf hopper and whitefly infesting brinjal. Naik *et al.* (2009) found that thiamethoxam as the effective chemical against leafhoppers. They also reported that thiamethoxam showed high efficacy against whiteflies. Nath and Sinha (2010) reported that both neonicotinoids (thiamethoxam and acetamiprid) were effective against leaf hopper and whitefly. Dey *et al.* (2005) reported that thiamethoxam and imidacloprid provided effective control against *Bemisia tabaci*. It caused reduction in whitefly adult and immature stage populations by 87.5 and 82.4% after three

sprays, respectively. Acetamiprid and thiamethoxam caused reduction in adults of *B. tabaci* to the tune of 67.3 and 84.7%, respectively. The immature stages of the pest were reduced by 60.1 and 82.1, respectively (Al-kherb 2011). Iqbal *et al.* (2013) reported that thiamethoxam resulted in a maximum mortality of the jassid followed by acetamiprid. While in case of whitefly, acetamiprid was effective and resulted in a minimum population. Naik *et al.* (2009) found thiamethoxam had the high efficacy against whiteflies and leafhoppers and they also showed that combination effect of azadirachtin with other chemicals give better control of sucking pests and shoot and fruit borer. Sarangdevot *et al.* (2006) reported that two sprays of neem oil @ 10 ml per litre of water were effective against aphids, leafhoppers and whiteflies on brinjal. Foliar sprays of Thiamethoxam 25 WG @ 0.025% recorded 67.55 percent mean reduction of whitefly population on brinjal (Balaji 2002). Studies conducted by Sharma and Lal (2002) reported that thiamethoxam was superior to other treatment against both the leafhopper and whitefly. After one day of first spray of thiamethoxam 25 WG, the whitefly population was reduced by 94.06% on brinjal. Mhaske and Mot (2005) reported that higher doses of Imidacloprid (18 and 22.5 g per ha and thiamethoxam 25 and 50 g per ha) were effective against leafhopper and whitefly on brinjal. However, Patil *et al*. (2009) evaluated the efficacy of various insecticides against sucking pests of cotton, at ARS, Dharwad. They reported that all the insecticides were found to give effective control of leafhoppers, aphids, and thrips. Fipronil 40% + Imidacloprid 80 WG 40% were better than Imidacloprid 200 SL.

REFERENCES

ALAM, S. N., ROUF, F. M. A., MIAH, M. R. U., NASIRUDDIN, M., CORK, A. & TALEKAR, N. S. 2004. Field guide on harmful and beneficial insects of brinjal (In Bangla) P. 22.

AL-KHERB, W. A. 2011. Field efficacy of some neonicotinoid insecticides on whitefly, *Bemisia tabaci* (Homoptera; Aleyrodidae) and its natural enemies on brinjal and tomato plants in Al-qassim Region, KSA. *J. Entomol.* **8**(5): 429-439.

BALAJI, K. 2002. Efficacy of some new insecticides against pest complex of brinjal (*Solanum melongena* Linn.). M. Sc. (Ag.) Thesis. Acharya N. G. Ranga Agric. Univ. Hyderabad.

CHATTERJEE, S., KUNDU, S.S., DHIREN, CHETTRI &, KUMAR, A.K. 2018. Population dynamics of sucking pests in brinjal ecosystem under new gangetic alluvial zone. *J. Entomol. Zool. Stud*. **6**(5): 2157-2161.

DEY, P. K., JANA, S. K., CHAKRABORTY, G. & SOMCHOUDHURY, A. K. 2005. Evaluation of imidacloprid (70WS and 20SL) against sucking pest complex of okra, *Abelmoschus esculentus*. *J. Entomol. Res.* **29**(3): 215-218.

DHAWAN, A. & SIMWAT, G.S. 2001 Field evaluation of Thiamethoxam for control of cotton jassid Amrasca biguttula biguttula (Ishida) on upland cotton. *Pestology*, **26**(1): 15-19.

GAPUD, V. P. & CANAPI, B. L. 1994. Preliminary survey of insects of onions, eggplant and string beans in San Jose, Nueva Ecija. Philippines Country Report, IPM CRSP – First Annual Report.

GHOSH, S.K. & SENAPATHI, S.K. 2002. Field evaluation of some pesticides from different origins against pest complex of brinjal under terai region of West Bengal. *Crop Res*. **23**(1): 108-115.

IQBAL, J., NADEEM, M., ASSI, M. S., FIAZ, M. M. & HASSAN, M. W. U. 2013. Comparative efficacy of some insecticides against sucking insect pests on mungbean, *Vigna radiata* (L.). *J. Res.* **29**(1): 31-37.

KRISHNAKUMAR, N. K., KRISHNA MOORTHY, P. N. & REDDY, R. 2001. Imidacloprid and thiamethoxam for the control of okra leaf hopper, *Amrasca biguttula biguttula* (Ishida). *Pest Manag. Hort. Ecosyst.* **7**(2): 117-123.

MHASKE, & MOT, U. N. 2005. Studies on evaluation of new insecticides against brinjal pest complex. *J. Maharashtra Agric. Univ*. **30**(3): 303-306.

NAEEM, M. Y. & UGUR, S. 2019. Nutritional content and health benefits of eggplant. *Turkish J. Agric. Food Sci. Tech*. **7**: 31-36.

NAIK, V. C. P., RAO, P. A., KRISHNAYYA, P. V. & CHALAM, M. S. V. 2009. Seasonal incidence and management of *Bemisia tabaci* (Gennadius) and *Amrasca biguttula biguttula* (Ishida) of brinjal. *Ann. Pl. Prot. Sci.* **17**(1): 9-13.

NATH, V. & SINHA, S. R. 2010. Comparative efficacy of neonicotinoids and insecticide mixtures against sucking pests of okra.

PATIL, S. B., S. S MATTI, P. V., GURUPRASAD, G. S., HIREKURUBAR, R. B., SHAILA, H. M. & VANDAL, N. B. 2009. Bioefficacy of new molecule fipronil 55 SC against sucking pest complex in Btcooton. *Karnataka J. Agric. Sci.* **22**: 1029-1031.

RASHID, M. A., ALAM, S. N., ROUF, F. M. A. & TALEKAR, N. S. 2003. Socioeconomic parameters of eggplant pest control in Jessore District of Bangladesh. *AVRDC Technical Bull.* **29**: 1-54.

REGHUPATHY, A., PALANISAMY, S., CHANDRAMOHAN, N. & GUNATHILAKARAJ, K. 1997. A Guide on Crop Pest. Sooriya desktop Publishers, Coimbatore. P. 290.

ROMEH, A. A. 2019. Integrated pest management for sustainable agriculture. Sustainability of Agricultural Environment in Egypt: Part II: Soil-Water-Plant Nexus, 215-234.

ROSAIAH, B. 2001. Evaluation of different botanicals against the pest's complex of brinjal. *Pestology*. **25**(4): 14-16.

SHARMA, S. & LAL, O. P. 2002. Bioefficacy of thiamethoxan in comparison to recommended insecticides against leaf hopper and whitefly of brinjal (*Solanum melongena* L.). *J. Entomol. Res.* **26**(3): 257-262.

SRINIVASAN, R. 2009. Insect and mite pests on eggplant: a field guide for identification and management. AVRDC. The World Vegetable Center, Shanhua, Taiwan, AVRDC Publ. No. 09. P. 64.

SUSVEG-Asia. 2007. SUSVEG-Asia Brinjal integrated pest management (IPM). http://susveg- sia.nri.org/susvegasiabrinjalipm4.html [accessed on 17 March 2018].

TSAO, J.S. & LO, H.F. 2006. Vegetables: types and biology. In: Handbook of Food Science, Technology and Engineering CRC Press.