J. Agrofor. Environ. 4 (1): 207-210, 2010 ISSN 1995-6983

Efficacy of mixture of garlic, allamanda and neem extract against shoot and fruit borer of eggplant

M. Moniruzzaman, M.B. Meah, M.H. Rahman[1], A.T.M.S. Islam[2] and M. Shahiduzzaman
Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh-2202, [1]Department of Entomology, Patuakhali Science and Technology University, Patuakhali, [2]Department of Plant Pathology, Hajee Mohammad Danesh Science and Technology University, Dinajpur

Abstract Efficacy of garlic, allamanda, neem, garlic+neem and allamanda+neem tablets for controlling shoot and fruit borer of eggplant cv Laffa were evaluated using 1:4 (w/v) concentration at flowering and fruiting stages under field condition. Among the treatments, neem tablet at 1:4 (w/v) concentration was found effective in reducing percent shoot and fruit infestation caused by shoot and fruit borer of eggplant. For successful management of shoot and fruit borer of eggplant, spray of neem tablet may be recommended at 1:4 (w/v) concentration at flowering and fruiting stage.
Key words: Garlic, allamanda, neem, extract, shoot and fruit borer, eggplant.

Introduction

Eggplant (*Solanum melongena* L.) is the most common and economically important vegetable in Bangladesh and is cultivated as a popular vegetable throughout the entire tropical and sub-tropical region of the world. It is the second most important vegetable crop, next to potato in respect of total acreage (60,700 ha) and production (3,33,000 metric tons per year) (BBS, 2008). Such an economically important crop suffers from the damage of various insect pests; about 18 different species of insect pests have so far been recorded in Bangladesh (Alam, 1969). Among them the brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) is the most destructive one. The incidence of brinjal shoot and fruit borer (BSFB) occurs either sporadically or severely each year throughout Bangladesh wherever eggplant is grown. The yield loss caused by this pest has been estimated up to 67% in Bangladesh (Islam and Karim, 1991) and up to 63% in Haryana, India (Dhankar *et al.*, 1977). To control this insect for commercial production of eggplant, synthetic pesticides are being used none selectively and indiscriminately at a large scale which creates serious problems to agro-ecosystem. Otherwise, disruption of natural ecological balance by destroying beneficial organisms and antagonistic soil microbes as well as augmenting water and air pollution which results environmental degradation. Surveys conducted in Bangladesh indicated that farmers spray insecticides up to 84 times during a 6–7 month cropping season (BARI, 1995). Socio-economic studies of current BSFB control practices in Jessore District of Bangladesh indicated that 98% of farmers relied exclusively on the use of pesticides and more than 60% farmers sprayed their crop 140 times or more in the 6–7 month cropping season though pesticide was the costliest item demanding 32% of total cost of production (Alam *et al*., 2003).

Proper insect control measures can substantially improve the quality and significantly increase the yield of eggplant. Therefore, the efforts are being made to discover suitable substitutes for environmentally hostile synthetic pesticides. Resistant variety and bio-pesticides are in the frontline. But resistant variety is presently not available (Ahmed and Sultana, 1984). The development and research agencies in various parts of the world have focused their research activities in search of botanical and biological pesticides. Now a days, use of different botanicals in insect control has gained popularity in many countries of the world. It will reduce the cost of production and increase the profit of farmers because of low price of botanical pesticides. So, eco-friendly plant health management is now being considered as an approach that aimed at the proper utilization of IPM components with great emphasis on environment, economics and social acceptance (Cook, 2000). In view of above facts, the present research was undertaken to determine the effectivity of mixture of garlic (*Allium sativum*), allamanda (*Allamanda cathartica*) and neem (*Azadirachta indica*) tablets against shoot and fruit borer of eggplant.

Materials and Methods

The experiment was conducted at Plant Disease Diagnostics Clinic (PDDC), net house and in the Field Laboratory of the Department of Plant Pathology, Bangladesh Agricultural University (BAU), Mymensingh during January, 2008 to March, 2009. Eggplant variety Laffa S was used in the experiment. Seedlings were raised in plastic trays in the net house with proper care and management to ensure disease free healthy growth of seedlings. Healthy seedlings were transplanted at the age of 45 days in the field. Fifteen healthy seedlings were transplanted in each subplot of each block, maintaining distance from plant to plant 75 cm and line to line 1 meter (Islam, 2006). Recommended doses of manures and fertilizers were applied (Anonymous, 2005). Irrigation and weeding were done as and when necessary. Garlic bulb, allamanda and neem leaf extracts were prepared by crushing the cloves and leaves with the help of a mortar and pestle. The crushed materials were blended in an electric blender for fresh extract, added required amount of sterile water at 1:1 for solution. The blend was filtered through sterile cheesecloth. The supernatant was mixed with carrier material supplied from IPM Lab. The mixture was put into wooden pellet device, thus the tablets were prepared. Garlic (*Allium sativum*), allamanda (*Allamanda cathartica*) and neem (*Azadirachta indica*) tablets were prepared separately and also in combination (Garlic+Neem and Allamanda+Neem tablet). The treatments used in this experiment were T_1 (Garlic), T_2 (Allamanda), T_3 (Neem), T_4 (Garlic+Neem), T_5 (Allamanda+Neem) at the dose of 1:4 (w/v) and T_0 (Control).

Rearing brinjal shoot and fruit borer : Infested fruits were collected from brinjal field and kept in plastic tray with leaves. Within two weeks pupae were found on dried leaves. Then the pupae were put in plastic container covered with net. Finally adults came out within three weeks (Fig. 1).

Fig. 1. Rearing brinjal shoot and fruit borer, infested fruit on tray (A), infested fruit covered with tray (B) and pupa and adult in plastic container (C)

Preparation of garlic, allamanda, neem, garlic + neem and allamanda + neem tablet suspension and their application: Suspension of concentration 1:4 (w/v) of garlic, allamanda, neem, garlic + neem and allamanda + neem tablets were prepared separately through soaking required amount of tablets in distilled water (Islam, 2005). Seventy milliliters of tablet suspension were applied in each plant at flowering and fruiting stage. Four plants were kept untreated.

Releasing brinjal shoot and fruit borer on eggplant: The eggplants were covered with mosquito net. After application of the treatments (garlic, allamanda, neem, garlic+neem and allamanda+neem in 1:4 w/v) adults were released in plot at flowering and fruiting stage of eggplant (Fig. 2).

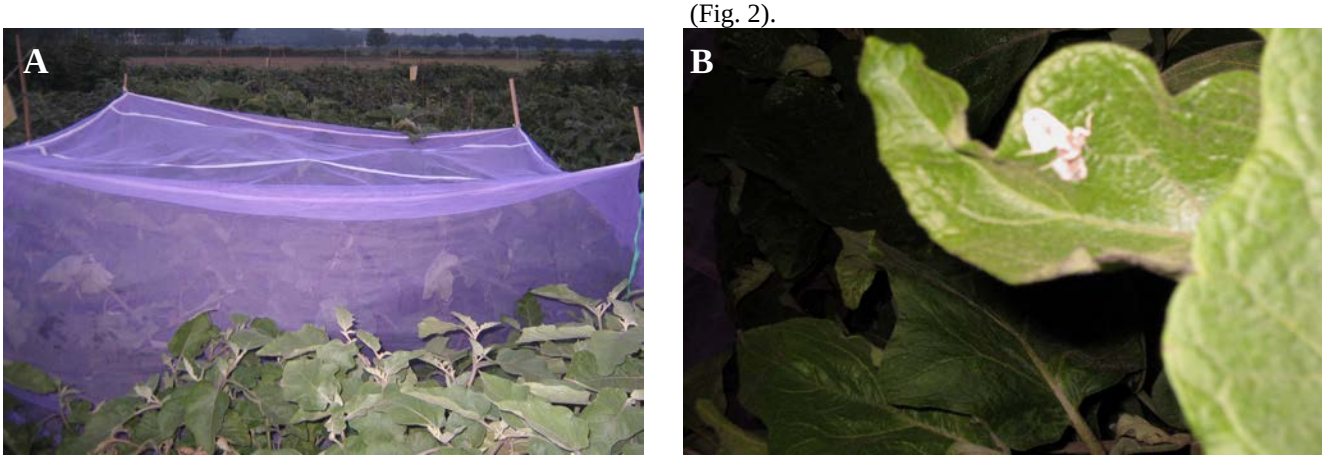

Fig. 2. Releasing brinjal shoot and fruit borer on eggplant (A), Eggplant covered with net and Shoot and fruit borer on eggplant (B)

Data collection: Data were recorded on percent shoot infestation and fruit infestation before plant tablets suspension spray, one week after 1st spray, one week after 2nd spray and one week after 3rd spray. Experiment was set following Randomized complete block design (RCBD) with four replications. Single plant was used as one treatment unit. Data were analyzed by the computer statistical package MSTAT and means were compared by DMRT (Gomez and Gomez, 1983).

Results and Discussion

Evaluation of tablets against shoot and fruit borer on eggplant cv Laffa: Tablets at dose 1:4 (w/v) were sprayed before releasing brinjal shoot and fruit borer in plot with eggplant cv Laffa at flowering and fruiting stage.

Flowering stage: In this stage, the lowest shoot infestation and fruit infestation were recorded in treatment with Neem. In case of shoot infestation, Garlic and Garlic+Neem treatments showed statistically similar effect but lower than the untreated condition. Highest percentage of shoot infestation and fruit infestation were obtained in untreated eggplants, which were significantly higher than the Neem treatment (Table 1).

Fruiting stage: In case of shoot infestation, Garlic and Garlic+Neem treatments showed statistically similar effect but lower than the untreated condition. Neem treatment was very effective to reduce shoot and fruit infestation than the other treatments. Lowest percentage of shoot infestation and fruit infestation were recorded in eggplant treated with Neem. All other treatments showed statistically similar effect on fruit infestation (Table 2). Highest percentage of shoot infestation and fruit infestation were obtained in untreated eggplants which were significantly higher than the Neem treatment (Table 2).

Table 1. Effect of tablets on infestation of shoot and fruit borer of eggplant cv Laffa at flowering stage

Treatment	Shoot infestation (%)	Fruit infestation (%)
T_1 (Garlic)	24.68 b	18.00 a
T_2 (Allamanda)	27.83 ab	19.33 a
T_3 (Neem)	16.68 c	10.00 b
T_4 (Garlic+Neem)	25.00 b	16.68 ab
T_5 (Allamanda+Neem)	26.68 ab	15.83 ab
T_0 (Control)	34.33 a	21.68 a
LSD (P=0.01)	7.52	6.45

Figures in a column with common letters do not differ significantly at the P values indicated.

Table 2. Effect of tablets on infestation of shoot and fruit borer of eggplant cv Laffa at fruiting stage

Treatment	Shoot infestation (%)	Fruit infestation (%)
T_1 (Garlic)	21.00 b	38.33 b
T_2 (Allamanda)	23.33 ab	40.00 b
T_3 (Neem)	13.33 c	24.68 c
T_4 (Garlic+Neem)	20.00 b	35.68 b
T_5 (Allamanda+Neem)	22.50 ab	36.00 b
To (Control)	28.33 a	56.68 a
LSD (P=0.01)	6.12	6.64

Figures in a column with common letters do not differ significantly at the P values indicated.

Spraying eggplant crop with tablets suspension at both stages brought a reduction in brinjal shoot and fruit borer intensity. With the increase in the frequency of suspension spray, the presence of insects were further reduced. Three sprays of neem tablet suspension at flowering stage reduced shoot infestation and fruit infestation of eggplant by 16.68% and 10%, respectively over control. The results indicate that spray of tablet suspension has some positive effect against insect infestation. In insects, neem extract exhibits various behavioral responses such as antifeedant, feeding deterrent, oviposition deterrent etc., and physiological responses such as insect growth regulator, molting inhibitor, reproduction inhibitor, antifertility etc. When the neem components, especially azadirachtin enter into the body of larvae, the activity of ecdysone enzyme is suppressed and the larva fails to moult, remains in the larval stage and ultimately dies (www.neemuses.com). Similarly when the leaf is treated with neem product, because of the presence of azadirachtin, salanin and melandriol there is an anti-peristalitic wave in the alimentary canal and this produces something similar to vomiting sensation in the insect. Because of this sensation the insect does not feed on the neem treated surface (www.neemproduct.com/content/neemagro.asp). Neem also has systemic action and plant can absorb and accumulate the neem compounds to make the whole plant pest resistant. Therefore, three times sprays of neem tablet suspension at fruiting stage reduced shoot infestation and fruit infestation of eggplant by 13.33% and 24.68%, respectively over control.

From the above discussion, it may be concluded that neem tablet was effective for controlling shoot and fruit borer of eggplant at 1:4 (w/v) concentration with three times spray.

References

Ahmed, N. and Sultana, K. 1984. Fungitoxic effect of garlic on treatment of jute seed. Bangladesh J. Botany. **13** (2): 130-136.

Alam, M. Z. 1969. Insect Pests of vegetables and their control in East Pakistan. The Agril. Info. Serv., Dept. of Agriculture, Dhaka, East Pakistan. pp. 1-7.

Alam, S. N., Rashid, M. A., Rouf, F. M. A., Jhala, R. C., Patel, J. R., Satpathy, S., Shivalingaswamy, T. M., Rai, S. Wahundeniya, I., Cork, A., Ammaranan, C. and Talekar, N. S. 2003. Development of an integrated pest management strategy for eggplant fruit and shoot borer in South Asia. Shanhua, Taiwan: AVRDC—the World Vegetable Center. Technical Bulletin No. 28. AVRDC Publication No. 03-548. pp. 1-56.

Anonymous. 2005. Fertilizer recommendation guide. Bangladesh Agricultural Research Council, Dhaka, pp. 70-71.

Bangladesh Agricultural Research Institute (BARI). 1995. Annual Research Report 1993–94. Joydebpur, Gazipur, Bangladesh. pp. 1-15.

BBS. 2008. Statistical Yearbook of Bangladesh 2006. Bangladesh Bureau of Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh. Dhaka, Bangladesh. p.156.

Cook, R. J. 2000. Advance in plant health management in the twentieth century. Annu. Rev. Phytopathol. **38**: 95-116.

Dhankar, B. S., Gupta, V. P. and Singh, K. 1977. Screening and viability studies for relative susceptibility to shoot and fruit borer (*Leucinodes orbonalis* Guen.) in mortal and ratoon crops of brinjal. Haryana J. Hort. Sci. **6**(12): 50-58.

Gomez, K. A. And Gomez, A. A. 1983. Statistical procedure for agricultural research. 2nd edition. Int. Rice Res. Inst. Manila, Philippines. pp. 20-30.

Islam, M. M. 2006. Molecular Characterization of *Phomopsis vexans* and *Solanum melongena* and transfer of Phomopsis resistance trait to cultiver Dohazari. Ph. D. thesis, Dept. of

Plant Pathology, Bangladesh Agricultural University, Mymensingh. Bangladesh. pp. 26-57.

Islam, M. N. and Karim, M. A. 1991. Management of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae) in field. In: Ann. Res. Report 1990-1991. Entomology Div., BARI, Joydebpur, Gazipur. pp. 41-42.

Islam, M. R. 2005. An integrated approach for management of Phomopsis blight and fruit rot of eggplant. A Ph.D. thesis submitted to the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 1-50.