J. Sylhet Agril. Univ. 2(1):29-34, 2015 **Research Article** **ISSN: 2308-1597**

INCIDENCE OF DIFFERENT INSECT PEST AND DISEASES ON EGGPLANT AS INFLUENCED BY VARIOUS ORGANIC FARMING COMPONENTS IN NORTHERN BANGLADESH

M A Rahaman*[1] and M J Alam[2]

[1]*Principal Program Officer, Mennonite Central Committee (MCC) Bangladesh, 4/10, Iqbal Road, Mohammadpur, Block-A, Dhaka – 1207*
[2]*Program Officer, Mennonite Central Committee (MCC) Bangladesh, 4/10, Iqbal Road, Mohammadpur, Block-A, Dhaka – 1207*

Abstract

This experiment was conducted at Birganj Upazilla under Dinajpur district during 2008-2009 to know the effects of different organic components on the incidence of insect pest and diseases of eggplant. There were six treatments viz. use of chemical fertilizers (@ recommended dose), poultry refuse (@ 80 g pit^{-1}), mustard oil cake (@ 80 g pit^{-1}), vermi-compost (@ 200 g pit^{-1}), cow-dung (@ 500 g pit^{-1}) and *Trichoderma* (@ 2 g pit^{-1}). Eggplant was selected as test crop. The plants were attacked by *Phomopsis*, bacterial wilt and root knot diseases in different treatments, but statistically there were no significant differences. The highest plant height (cm), number of flower plant^{-1} and yield was performed by the treatment use of Poultry Refuses (@ 80 g pit^{-1}). The highest number of branching plant^{-1} was found in treatment use of Poultry Refuses (@ 80 g pit^{-1}) and use of vermi-compost (@ 200 g pit^{-1}).

Keywords: *Trichoderma*, vermi-compost, mustard oil cake, poultry refuse

Introduction

The soil health and conservation of soil nutrients is a burning issue. Bangladesh lands are losing their productivity and soil-water environments are getting vulnerability as agrochemicals (pesticides and fertilizers) are applied at excessive and indiscriminately in all types of arable lands (Rahman and Debnath, 2015). Again to protect vegetables farmers are using different chemical pesticides randomly. Seedlings and plants of various winter vegetables such as tomato, eggplant, cabbage, etc. are widely grown during August to October. High temperature and high soil moisture in this period highly conducive to proliferation of various soil-dwelling plant pathogens that infect and damage the vegetable seedlings in the seed-bed and plants in the main field. Healthy seedlings are hardly available in an infested seed-bed, and transplanted diseased seedlings are unproductive. As a result, farmers frequently face serious problems in raising vegetables and often incur financial losses. Depending on the situation this trial was set (i) to assess the effectiveness of different organic farming on the incidence of different insect pest and diseases on eggplant, and (ii) evaluate the effects of different organic farming on yield attributes and yield of eggplant.

Materials and Methods

The trial was conducted at the farmer's field of Birganj upazilla under Dinajpur district during August 2008 to February 2009. Eggplant was selected as test crop with the variety BARI-5. Treatment plots were assigned to a randomized complete block design (RCBD). The treatments were (1) CF = Recommended chemical fertilizers (@175 g N decimal^{-1} as urea, 175 g P decimal^{-1} as triple super phosphate (TSP), 116g K decimal^{-1} as muriate of potash (MOP), (2) PR = poultry refuse (80 g pit^{-1}), (3) MOC = mustard oil cake (80 g pit^{-1}), (4) VC = vermin-compost (200 g pit^{-1}), (5) CD = cow-dung (500 g pit^{-1}) and (6) AT = Application of *Trichoderma* (2 g pit^{-1}). The experiment was laid out in a randomized complete block (RCB) design with six replications. The unit plot size was 3.7 × 2.8 m.

***Corresponding author: M A Rahaman**, Principal Program Officer, Mennonite Central Committee (MCC) Bangladesh, 4/10, Iqbal Road, Mohammadpur, Block-A, Dhaka – 1207.*

Seedlings were prepared in a separate seed-bed of 3 × 1 m. As fertilizer dose mentioned in all treatments, (1) CF - TSP @ 100 g (2) PR @ 0.5 kg (3) MOC @ 0.5 kg (4) VC was @ 2.5 kg (5) CD @ 4 kg and (6) AT @ 10 g were added in each seed-bed. Hand sowing was done keeping 3 cm apart in each furrow at 2-3 cm in depth. After 10 days of sowing some ill health seedlings were thinned to maintain the desired density of plant population.

The land was prepared with deep ploughs (four times) and during final land preparation all other common doses of chemical fertilizers at the rate of 175 g N decimal^{-1} as urea, 175 g P decimal^{-1} as triple super phosphate (TSP), 116 g K decimal^{-1} as muriate of potash (MOP) were added to the soil. After that the main plot was divided to make it sub-plot (3.7 × 2.8 m). Between the plots 50 cm gap was maintained for giving proper irrigation and drainage facilities. Row to row distance was 60 cm and plant to plant distance was 60 cm. Number of plants in each unit plot was 40.

Data were recorded on yield and different yield contributing characters, insect and disease status. Number of aphids was counted from the randomly selected plants. Number of infested shoots was counted form each plot separately. All data were tabulated and analyzed by using SPSS (version 11.5) data analyzing computer software and treatment means were compared following DMRT.

Results and Discussion

Rate of infestation by insect pests

It was found that the plants were predominantly affected only by eggplant shoot and fruit borer (ESFB). Other insects were less abundant and thus not included in this study (Table 1). The highest number of shoot was attacked by ESFB in the Treatment 1 (0.24±.06) followed by Treatment 6 (0.20±.04) where, the lowest infestation was occurred in the Treatment 3 (0.07±.04). Treatment 5 showed the second highest number of infested shoots (0.19±.03) by ESFB, where the significant differences among the treatments were found at 1% ($p<0.01$) level (Table 1). According to Nayer *et al.* (1995) eggplant (*Solanum melongena*) is attacked by as many as 53 species of insect pests, among which the eggplant shoot and fruit borer (ESFB), *Leucinodes orbonalis* Guenee (Lepodoptera: Pyralidae) is the most destructive in Bangladesh (Alam, 1969; Chattopadhyay, 1987). Due to attack by BSFB yield loss may go up to 85% in stated by Ali *et al.* in 1980. The present study also showed that eggplant shoot and fruit borer is major problem of eggplant. The highest number of non-infested fruits by ESFB plant^{-1} was obtained from Treatment 2 and Treatment 3 (9.06 ± 0.69 and 8.97 ± 0.68, respectively). The lowest number (5.21 ± 1.72) of non-infested fruits were recorded in Treatment 4 (5.21 ± 1.72).

Table 1. Incidence of aphid, eggplant shoot and fruit borer (Mean ± SE or SD) in shoot and fruits of eggplant

Treatments	Number of Aphids plant^{-1}	Number of Infested Shoot plant^{-1}	Number of Non-infested Fruits plot^{-1}
T1= Chemical Fertilizer (CF)	0.00±.00	0.24±.06^{a}	5.57 ± 0.27^{bc}
T2 = Poultry Refuse (PR)	0.00±.00	0.10±.03^{cd}	9.06±0.69^{a}
T3= Mustard Oil Cake (MOC)	0.00±.00	0.07±.04^{d}	8.976±0.68^{a}
T4 = Vermi Compost (VC)	0.00±.00	0.13±.07^{c}	5.21±1.72^{c}
T5= Cow-dung (CD)	0.00±.00	0.19±.03^{ab}	5.61±0.95^{b}
T6= Trichoderma (AT)	0.00±.00	0.20±.04^{a}	5.51±0.91^{bc}
F-value	-	10.51	12.37
P-value	NS	0.01	0.01

Disease severity on eggplant shoot and fruits

The status of different diseases by which the plants were attacked was counted in the trial. It was found that the plants were attacked by *Phomopsis*, bacterial wilt and root knot in different treatments, but statistically there were no significant differences (Table 2) among the treatments. There was no plant that attacked by *Sclerotium*.

Table 2. Incidence of diseases (Mean ± SE or SD) on shoot and fruits of eggplant

Treatments	Number of infected plants by				Number of infected fruits by
	Bacterial wilt plot^{-1}	*Phomopsis* plot^{-1}	*Sclerotium* plot^{-1}	Root knot plot^{-1}	*Phomopsis* plot^{-1}
T1= Chemical Fertilizer (CF)	1.50±1.22	1.67±1.21	0.00±0.00	1.17±.75	4.17±3.65
T2 = Poultry Refuse (PR)	0.67±.81	0.67±.81	0.00±0.00	0.50±.83	1.50±1.51
T3= Mustard Oil Cake (MOC)	0.33±.51	0.50±.54	0.00±0.00	0.17±.40	1.67±1.36
T4 = Vermi Compost (VC)	1.67±1.36	1.00±.89	0.00±0.00	1.17±1.16	2.83±1.72
T5= Cow-dung (CD)	0.83±.98	1.50±1.22	0.00±0.00	0.17±.40	2.67±2.16
T6= Trichoderma (AT)	0.83±.98	0.67±.81	0.00± 0.00	0.83±.98	2.00±2.09
F-value	1.36	1.34	-	2.26	1.12
P-value	NS	NS	NS	NS	NS

Yield attributes of eggplant

Yield and yield attributes of eggplant like plant height (cm), number of branching, number of flowering were recorded and data were analyzed. Insect and disease pest status at its different growing stage was also considered to know the effects different organic matters on eggplant. Most of the cases effect of poultry refuses @ 80 g pit^{-1} gave the better result than other application of organic matters. Effect of mustard oil cake was also good which may be considered for well growth, yield and pest management. For more confirmation about the result this trial may be repeated in the same or different locations. Materials for compost will also have to be considered for availability.

Plant height

Plant height (cm) was measured after two months of transplanting of seedling and presented in Fig. 1. The height was recorded at every 30 days interval and it was in 60, 90 and 120 days after planting (DAP) and found significant differences at 1% level. After 60 DAP the Treatment 2 had highest plant height (27.54 ±5.53 cm) with the lowest in the Treatment 1, 3 and 4 with insignificant differences between them. The second height (24.48±5.11 cm) was found in the Treatment 5.

After 90 DAP was found that the Treatments 3 (50.85±5.2 cm) and Treatment 4 (50.06±5.57 cm) statistically produced the highest plant heights followed by the Treatment 2 (49.00 ±7.3 cm). Treatment 5 gave the lowest (35.50±3.20 cm) plant height. The differences showed by Treatment 1 (40.73 ± 4.29 cm) were statistically significant at 1% level.

After 120 DAP statistically insignificant differences were found among the treatments. According to Rashid (1993) plant height of eggplant may range from 30-150 cm depending on variety and climate. The highest plant height of eggplant was as high as 74.27 cm in this experiment performed by the Treatment 2, which was within the range as stated by Rashid (1993).

Number of branches plant^{-1}

Number of branches plant^{-1} is considered as yield contributing character, counted for three times (Table 3). After 60 days, it showed a significant differences among the treatments. The highest number of branches were observed by the Treatment 2 (6.58±1.04) and the lowest number of branches was performed by the Treatment 3 (2.32±1.40) and Treatment 1 (2.32 ± 1.40). The second highest number of branches plant^{-1} was found in the Treatment 4 (3.98 ± 1.28) and Treatment 5 (4.13 ± 1.00).

After 90 days of transplanting, no significant differences was found among the treatments. It might be due to a juvenile stage for plants of all treatments. There was a third counting (after 120 days) for branches plant^{-1} and it showed significant differences ($p < 0.01$) among the treatments. The highest number of branches was found in the Treatment 4 (19.66 ± 3.21), where the Treatment 1 (11.70 ± 2.31) gave lowest number of branches plant^{-1}. The

Treatment 3 showed the second highest number of branches (17.55 ± 2.98). Treatment 5 (14.76±3.10), Treatment 6 (14.31 ± 2.91) and treatment 2 (13.05 ± 5.93) exhibited statistically insignificant variation in number of branches plant^{-1}.

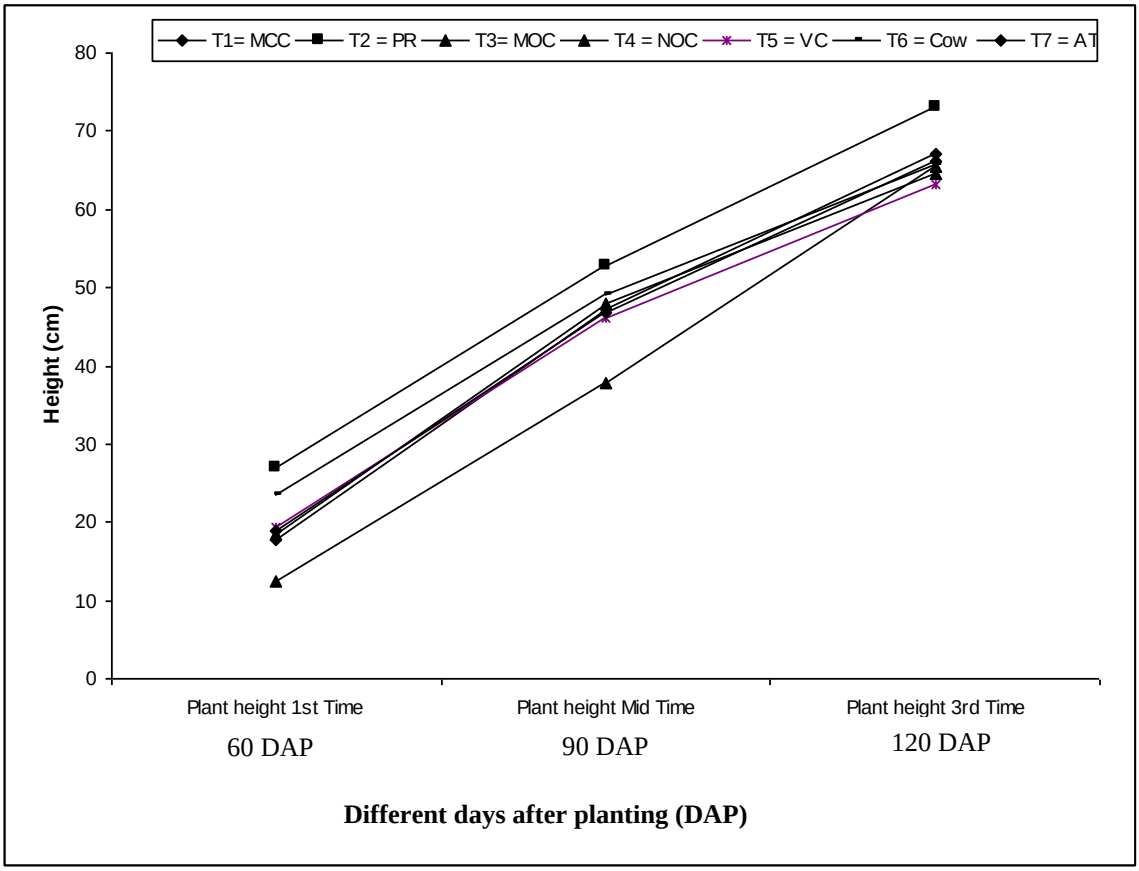

Fig. 1. Showing plant height (cm) at different days after planting in all six treatments

Number of flower at different growth stages

Data were recorded at different growth stages to know the effects of different composts on flowering. There were significant differences at 1% level among different treatments in producing number of flowers plant^{-1} (Table 3). After 60 days, the highest number of flowers were recorded in Treatment 1 (3.78 ± 0.65) followed by the Treatment 2 (3.63 ± 0.56). The third, fourth and fifth highest number of flowers were found in the Treatment 6 (2.68 ± 1.55), Treatment 5 (2.26 ± 1.63) and Treatment 3 (2.13 ± 0.77). The lowest number of flower was performed by the Treatment 4 (1.10 ± 1.04).

After 90 days, significant differences were found among the treatments at 1% level. The highest number of flowers were found in Treatment 2 (20.94 ± 4.15) followed by the Treatment 5 (17.49 ± 4.95). The lowest number of flowers was performed by the Treatment 3 (11.88 ± 3.50) preceded by Treatment 1 (13.27 ± 4.75).

After 120 DAP the number of flowers varied significantly ($p<0.01$) among the treatments. The highest number of flower plant^{-1} was recorded in the Treatment 4 (8.41±3.02) followed by Treatment 2. The lowest number of flowers plant^{-1} was found in the Treatment 1 (6.62 ± 1.99) preceded by Treatment 6.

Yield of eggplant

Statistically there was a significance difference ($p<0.01$) in yield of eggplant produced by different treatments (Fig. 2). The highest yield was obtained from the Treatment 2 (39.98±6.49 t ha^{-1}) where the lower yield was performed by the Treatment 6 (23.25 ± 4.57 t ha^{-1}). Treatments 3, 4, 5 and 6 statistically performed insignificant variation among them. Second highest yield was performed by the Treatment 1 (33.04 ±3.03 t ha^{-1}) and statistically it showed a difference ($p<0.01$) with other treatments. In an experiment according to Bodabi and Van Damme (2003) nitrogen supplied at 200 kg N ha^{-1} produced the highest number of flowers $plant^{-1}$, fruits $plant^{-1}$ and yield (32.24 t ha^{-1}) over the untreated control plants. In this experiment the highest yield (39.98±6.49 t ha^{-1}) produced by the Treatment 2 (use of poultry refuses) was higher than the stated yield by Bodabi and Van Damme (2003).

Table 3. Yield and yield attributes (Mean ± SE or SD) of eggplant as affected by different organic farming components

Treatments	Number of branches at			Number of flowers at		
	60 DAP	*90 DAP*	*120 DAP*	*60 DAP*	*90 DAP*	*120 DAP*
T1= Chemical Fertilizer (CF)	2.32±1.40^{d}	12.61±2.39	11.70±2.31^{c}	3.78±0.65^{a}	13.27±4.75^{bc}	6.62±1.99^{c}
T2 = Poultry Refuse (PR)	6.58±1.04^{a}	12.22±1.93	13.05±5.93^{bc}	3.63±0.56^{ab}	20.94±4.15^{a}	8.22±2.65^{b}
T3= Mustard Oil Cake (MOC)	2.32±1.40^{d}	9.45±3.32	17.55±2.98^{ab}	2.13±0.77^{cd}	11.88±3.50^{c}	13.77±3.45^{a}
T4 = Vermi Compost (VC)	3.98±1.28^{bc}	11.72±1.56	19.66±3.21^{a}	1.10±1.04^{d}	16.14±3.23^{abc}	8.41±3.02^{b}
T5= Cow-dung (CD)	4.13±1.00^{bc}	11.99±1.61	14.76±3.10^{bc}	2.26±1.63^{bcd}	17.49±4.95^{ab}	7.67±3.78^{bc}
T6= Trichoderma (AT)	3.00±0.63^{cd}	9.88±2.43	14.31±2.91^{bc}	2.68±1.55^{abc}	14.55±3.49^{bc}	6.65±3.13^{c}
F-value	9.81	1.70	3.97	4.5	3.47	3.84
P-value	0.01	NS	0.01	0.01	0.01	0.01

In column, similar letter(s) do not differ significantly at 1% ($p<0.01$) level of significance, NS=Not Significant

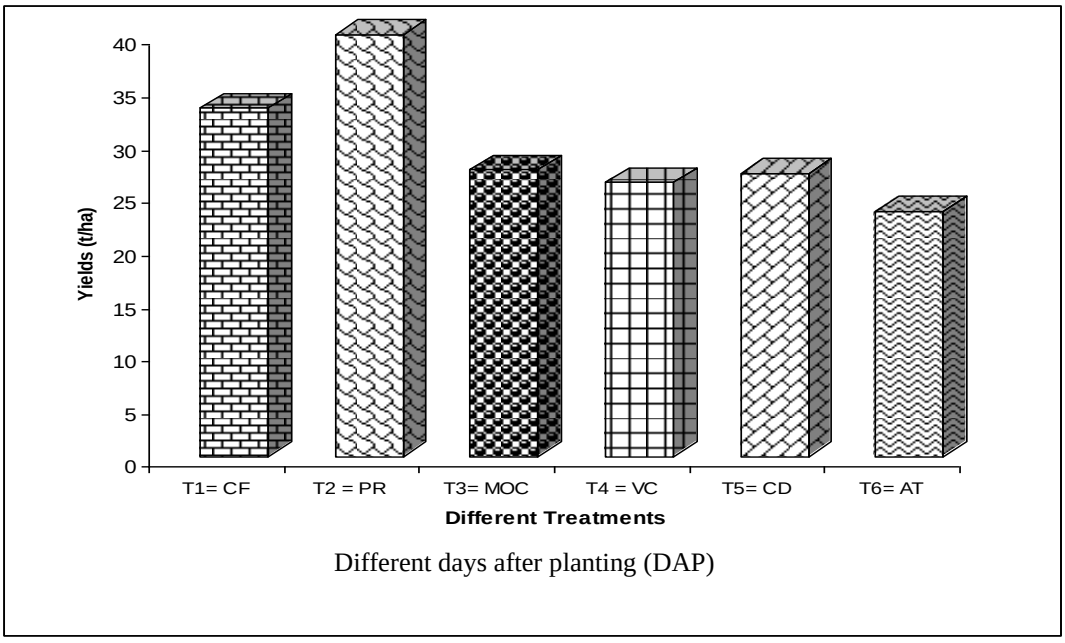

Fig. 2. Showing yield of eggplant (t ha^{-1}) in all six treatments

References

Alam M Z. 1969. Insect pests of vegetables and their control in East Pakistan. Agric. Info. Service, Department of Agriculture, Dacca, East Pakistan. 146p.

Ali M I, Ali M S and Rahman M S. 1980. Field observation of wilt disease and fruit borer on different cultivars of Brinjal. Bangladesh J. Agril. Sci. 7(2):193-194.

Bodabi S and Van Damme P. 2003. Effect of nitrogen application on flowering and yield of eggplant (Solanum melongena L.). Communications in Agricultural and Applied Biological Science. Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen, 68(1):5-13.

Chattopadhyay P. 1987. Entomology, Pest control and crop protection (in Bangla). West Bengal Text Book Board, Arjo Mansion (9th Floor), Calcutta, India. 304p.

Nayer K K, Anathakrishnan T N and David B V. 1995. General and applied entomology. 11th ed. Tata McGraw-hill Publ. Co. Ltd. New Delhi. 557p.

Rahman K M A and Debnath S C. 2015. Agrochemical Use, Environmental and Health Hazards in Bangladesh. International Research Journal of Interdisciplinary and Multidisciplinary Studies (IRJIMS); 1(4):75-79.

Rashid M M. 1993. Sabji Biggyan. Text Book Division, Bangla Academy, First edition, Dhaka, Bangladesh.