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Influence of natura one and neem oil on growth and yield of brinjal (*Solanum melongena*)

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ABSTRACT

An experiment was accomplished at the horticultural farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during to evaluate the effect neem oil and natura one for brinjal production. The experiment conducted with four treatments viz. Control (T_0), Natura-one (T_1), Neem oil (T_2) and Neem oil+ Natura one (T_3) following Randomized Complete Block Design (RCBD) with three replicates. This study was carried out to examine different characters like plant height, number of branch, infested branch, branch infestation (%), number leaves/plant, chlorophyll percentage, number of flower/plant, number of fruit/plant, infested fruit, fruit infestation (%), yield/plant (kg), yield/ha (ton) and yield increase (%) over control of brinjal. Lower infested shoot and fruits (0.2 and 0.2 plant⁻¹, respectively) and percentage (11.9 and 16.9, respectively) were found in T_3 . Highest yield (57.3 t ha⁻¹) and increased yield percentage over control (13.47%) were also found in T_3 treatment. In view of overall performances, foliar application of neem oil and natura one has potentiality to combat the insect damage as well increase yield.

Key Words: *Neem oil, Natura one, Infestation, Shoot and fruit borer*

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I. Introduction

Brinjal (*Solanum melongena*) known as eggplant belongs to the *Solanaceae* family and is one of the most common and popular vegetable in the world (Harish et al. 2011). In Bangladesh, brinjal is considered as the second most important vegetables crop in respect of production. Brinjal production is increasing day by day. Its yield potential is very low compared to other countries due to incidence of insect pests (Das et al. 2000). Farmers shows tendency of chemical fertilization to increase yield as well as control the insect pests. To control the insect as well as improve the crop growth and development, application of pesticides and chemicals against insects is not cost effective and environment friendly. Nowadays, a great consideration is focused on the possibility of fertilization for promoting growth and yield of vegetables crop especially for brinjal.

Organic fertilizers and manure or thermophilic compost have long been recognized as effective means of production (Zaller et al. 2004) and suppressing plant diseases (Hoitink and Fahy, 1986). Organic fertilizers contain high amount of nutrients, it is reasonable that these fertilizers could also be used as foliar fertilizers. The application of aqueous compost extracts has been shown to most prominent to increase yield (Al-Dahmani et al. 2003). In addition, foliar spray is an effective way of supplying nutrients to higher plants in a rapid manner rather than methods of involving soil and root application (Marschner, 1995). Foliar application of nutrient is much more effective than soil application (Grundon, 1980) and increase yield (Powlson et al. 1989). Furthermore, one of the prominent factors to reduce yield and quality of vegetables is insect and pest attack. Brinjal shoot and fruit borer (*Leucinodes arbonalis*) is the serious insect for brinjal production which damage brinjal fruit more than 31-86% in Bangladesh (Alam, 2003). Farmers spray insecticides which are expensive and also harmful for farmers and consumers health as well as the whole environment. Neem oil is responsible for the toxic, repellent, antifeedant, growth-inhibiting, oviposition-inhibiting and sterilizing effects in insects (Mordue and Nisbet, 2000). Therefore, present investigation was designed to evaluate the neem oil and natura-one for quality brinjal production.

II. Materials and Methods

The experiment was conducted at the horticultural farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during July 2018 to December 2018 to evaluate the neem oil and natura one following Randomized Complete Block Design (RCBD) with three replicates. Charki brinjal variety was used in this experiment. The experiment comprised with four treatments viz. Control (T₀), Natura-one (T₁), Neem oil (T₂) and Neem oil+ Natura-one (T₃). Natura one, a liquid biofertilizer, was collected from japan and 25 days old seedlings and neem oil were collected from local market. There were 8 seedlings transplanted in each plot and the size of each unit plot was 3.0 m × 1.0 m; line to line and plot to plot distances were 0.5 m and 1.0 m respectively while plant to plant distance was 60 cm. Manure and fertilizers were applied according to the recommendations of Bangladesh Agricultural Research Institute (BARI) (Mondal et al. 2011). Intercultural operations and watering was done as and when necessary. In case of foliar application, natura one @ 10 ml L⁻¹ and neem oil @ 5ml L⁻¹ with liquid soap were applied as treatment. Data on plant height, number of branch, infested branch no., branch infestation (%), no. of leaves/plant, chlorophyll percentage (using SPAD-5 Chlorophyll meter), no. of flower/plant, no. of fruit/plant, no. of infested fruit, fruit infestation (%), fruit length (cm), fruit diameter (mm), single fruit weight(g), yield/plant (kg), yield/ha (ton) and yield increase (%) were recorded and arranged accordingly for analysis done by MSTAT-C computer program. Differences between varieties were evaluated by Least Significance Difference Test (LSD) at 5% level of significance (Gomez and Gomez, 1984).

III. Results and Discussion

Plant height

Different treatment showed significant impact on plant height of brinjal. The tallest brinjal plant (85.3 cm) was attained from natura one and neem oil combination whereas the shortest plant (68.7 cm) was recorded from control treatment (Figure 01). Height of the plant studied significant variation applied bio-fertilizers (Doifode and Nandkar, 2014). The foliar application of combination of vermiwash with neem oil, increased the brinjal plant growth (Tiwari and Singh, 2015).

Number of leaves

Number of leaves expressed significant inequality in brinjal plants grown under different foliar application. Plants with natura one and neem oil (T₃) treatment showed maximum number of leaves (41.0) whereas the minimum (29.0) was found in control (T₀) treatment (Figure 01).

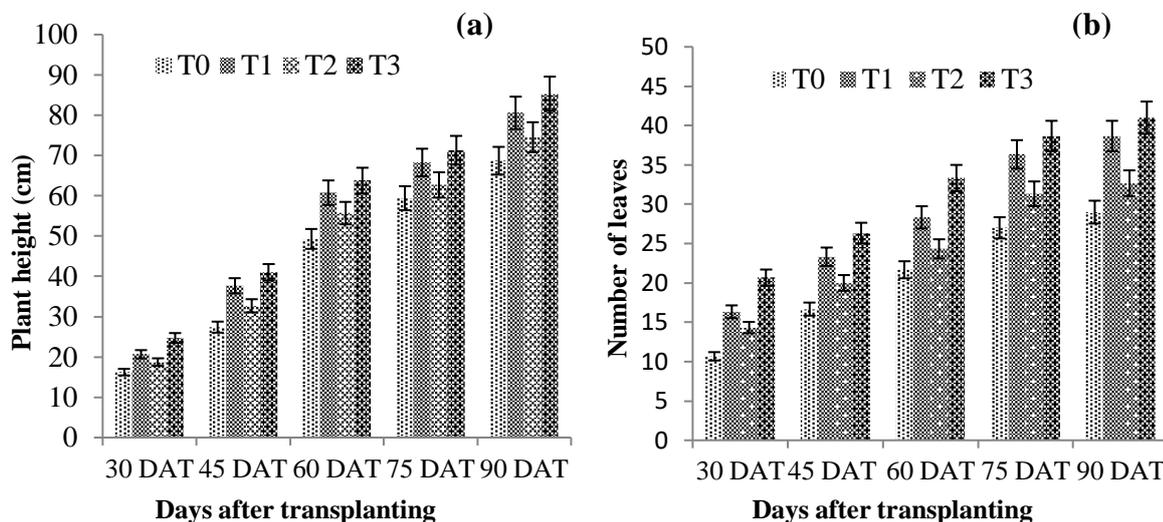


Figure 01. Influence of Neem oil and Natura one on (a) brinjal plant height and (b) number of leaves at different days after transplanting.

Table 01. Influence of different treatment application on branch and fruit characteristics in brinjal

Treatment	Chlorophyll (%)	Number of Branch	Infected branch	Infestation (%)	No. of Fruit/plant	No. of Infected Fruit	Infestation (%)
T ₀	37.5 d	9.0 d	3.0 a	37.0 a	11.0 b	4.3 a	38.0 a
T ₁	44.2 b	12.7 b	2.3 b	24.9 b	12.7 a	3.3 b	30.9 b
T ₂	40.2 c	10.7 c	1.8 b	21.9 c	11.7 b	2.8 b	24.2 c
T ₃	48.5 a	14.7 a	0.2 c	11.9 d	13.3 a	0.2 c	16.9 d
CV%	9.1	4.9	16.0	2.2	3.1	9.8	2.9
LSD	1.7	1.2	0.7	1.0	0.7	0.7	1.6

Number of branch

Different foliar application significantly affected on producing the total number of branch. More effective treatment to produce maximum number of branch was found from T₃ (14.7) and minimum (9.0) from T₀ (Table 01). Eifediyi et al. (2015) was also found the similar result.

Number of infected branch

Minimum infected branch was found in T₃ (0.2) and the maximum infected (3.0) was found from control (T₀) treatment (Table 01). Ashadul et al. (2012) reported neem leaf extract @ 50 g l⁻¹ water were more effective to reduce shoot infestation.

Infestation (%)

Maximum shoot infestation was found from T₀ (37.0%), while the minimum from T₃ (11.9%) (Table 01). Rosaih, R. (2001) studied that different botanicals against pest complex of brinjal were evaluated where NSKE 5% recorded least shoot damage (15.61%). Sharma et al. (2010) found lesser infestation by *Leucinodes orbonalis* in brinjal due to application of neem oil.

Flower number per plant

Number of flower was significantly varied with different treatments. Plants bearing Maximum number (23.0) of flower found in T₃ (natura one + neem oil) and minimum number of flowers (15.3) observed in (T₀) control treatment (Table 02). Bahadoran et al. (2016) studied that foliar application of organic

fertilizers increase flower number and quality. [Sujay A. et al. \(2014\)](#) observed the numbers of flowers were significantly varied with neem oil treatment.

Number of fruits per plant

The number of fruits per plant of brinjal was observed the significant variation with different foliar application. Maximum number of fruits per plant was found from T₃ (13.3) and minimum number of fruits per plant (11.0) was found T₀ ([Table 01](#)). Fruit number varied with organic fertilizers treatment ([Mehraj et al. 2014](#)) and botanical extract like neem leaf ([Azad et al. 2012](#)).

Number of Infested Fruits per plant

The minimum number of fruit infestation was found from T₃ (0.2) and maximum number of infested fruits (4.3) found in T₀ ([Table 01](#)). [Umamahesh et al. \(2018\)](#) studied against brinjal shoot and fruit borer using neem cake, vermicompost and management practices and observed that, fruit infestation decreased due to neem cake.

Infestation (%)

The minimum fruits infestation percentage by *Leucinodes arbonalis* was observed from T₃ (16.9) whereas maximum from T₀ (38.0) ([Table 01](#)). Application of trap and peak neem afforded 47.70% protection against fruit damage ([Dutta et al. 2011](#)). [Eloy et al. \(2017\)](#) also studied the neem oil for insect management to reduce the fruit damage. This might be activity of bio-pesticides and organic fertilizer which decreases the infestation.

Yield per plant

The maximum weight of total fruit was found from T₃ (2.25 kg) and the minimum weight of total fruits was found from T₀ (1.81kg) which was statistically followed by T₂ (1.85 kg) ([Table 02](#)). Combination of natura one and neem oil treatment were more effective for obtaining the maximum production of brinjal fruit plant⁻¹. This is due to less infestation and more healthy branch and fruit were originated under this treatment which ultimately increases fruits yield.

Yield and yield increase over control

The minimum yield of brinjal was found from (50.5 t ha⁻¹) and maximum yield T₀ (57.3 t ha⁻¹) was found from T₃ which was (13.47%) higher yield over control treatment ([Table 02](#)). These result revealed that bio-fertilizers (natura one) produced the maximum yield of brinjal and due to application of neem oil combat the shoot and fruit damage against insect.

Table 02. Foliar application of different treatment on flower number and yield attributes of brinjal

Treatment	Flower/plant	Yield/ plant (kg)	Yield/ha (ton)	Yield increase over control/ha (%)
T ₀	15.3 d	1.81 b	50.5 d	-
T ₁	20.7 b	1.91 ab	54.2 b	7.33
T ₂	18.0 c	1.85 b	51.6 c	2.18
T ₃	23.0 a	2.25 a	57.3 a	13.47
CV%	5.1	9.31	0.3	
LSD	2.0	0.03	0.3	

IV. Conclusion

Neem oil showed effective performance to combat shoot and fruit borer and natura one (bio-fertilizer) to increase growth attributes among all the treatment. In addition, mixing of natura one and neem oil application showed superior performances to decrease infestation and increase the yield. So, it can be said that foliar spray of neem oil and natura one would be the prominent way to reduce the infestation as well as increase yield.

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