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EFFECT OF FERTILIZER COMBINATION ON FRUIT YIELD OF Bt. BEGUN AT NORTHERN DINAJPUR DISTRICT OF BANGLADESH

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ABSTRACT

The experiment was conducted at the research field of Agricultural Research Station, Rajbari, Dinajpur during rabi season of 2016-17 and 2017-18 to develop a profitable and economic fertilizer dose for Bt. begun and to increase the productivity and yield of begun in the northern region of Bangladesh . Five different treatments were employed in this study viz. T_1= STB Recommended dose i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+3 tha^{-1}poultry manure (FRG' 2012), T_2= T_1+25% of NPK i.e. 141-29-93-15-2-1kg/ha of NPKSZnB+3 tha^{-1}poultry manure, T_3 = T_1+50% of NPK i.e. 169-34-111-15-2-1kg/ha of NPKSZnB+ 3 tha^{-1}poultry manure, T_4 = T_1+25% of NPK+3 tha^{-1}poultry manure i.e. 141-29-93-15-2-1 kg/ha of NPKSZnB+6 tha^{-1}poultry manure, T_5 = T_1+3 tha^{-1}poultry manure i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+6 tha^{-1}poultry manure. The experiment revealed that the highest fruit yield (43.47tha^{-1}) was recorded in T_3. This was due to the positive influence of poultry manure on the growth and yield of brinjal in respect of the elongation of brinjal plant, availability of other macro and trace elements, improvement in soil physical structure and water holding capacity. The highest gross return (Tk. 347760 ha^{-1}), gross margin (Tk. 255170 ha^{-1}) and BCR were also obtained in T_3, whereas the lowest gross return (Tk.55300 ha^{-1}), gross margin (Tk.143840 ha^{-1}) and BCR were obtained from the treatment T_1.
Key words: BARI Bt. Begun-1, Poultry manure, Fertilizer, Yield

Introduction

Bangladesh is one of the major horticultural countries in South Asia (Ali, 2000). Agriculture, including horticulture, is the largest single sector of the economy, accounting for about 13 percent of the country's GDP (BER, 2006). Brinjal (*Solanum melongena* L.) is an important vegetable for its commercial and nutritional value in the world as well as in Bangladesh. "Begoon" (Brinjal or Eggplant) is a very common and favorite vegetable in Bangladesh which has a link with the social, cultural and economic lives of rural people. Brinjal has been a staple vegetable in our diet since ancient times. It is one of the major vegetables and its production ranks third among all vegetables in the world. It is grown all over the world, though there is a heavy concentration in Asia. China is the largest producer followed by India. China has a 60.67 percent share of world production, while India's share stands at 25.70 percent (Meherunnahar and Paul, 2012). Vegetables in much of Asia and the Pacific region are grown by small-scale farmers who are unorganized and scattered in different locations (Shin, 2001), Although Bangladesh produced huge amount of brinjal it is only a fraction of the world's production. Brinjal is second most important vegetable in Bangladesh in terms of both, production area and yield, only surpassed by potatoes. In Bangladesh, over 1,15,424 hectare of total cultivable land is devoted to brinjal cultivation (BBS, 2011). It is cultivated in the agricultural fields as cash crop in the commercial vegetable growing areas and almost every rural household has few brinjal plants in the kitchen garden. In Bangladesh brinjal is classified into two categories in respect of production period such as rabi brinjal and Kharif brinjal. Though it is more or less available throughout the year, its peak supply comes during December to April. Brinjal grown in Bangladesh are of different varieties with differing in size, shape and color as well.

However, Bangladesh is obtained the food sufficiency but the nutritional point of view; it has far away from achieved the safety and quality food production. Now Bangladesh introduced Bt. brinjal, has the

potential to bump up agricultural productivity. From two years demonstration in farmer's field, it was observed that Bt. begun requires some additional fertilizer than recommended doses. Optimum rate of fertilizer application may provide better yield and economic benefits to vegetable growers which will vary in the different AEZs of Bangladesh. So, the present experiment was taken to develop a profitable and economic fertilizer dose for Bt. begun and to increase the productivity and yield in the northern district of Bangladesh.

Materials and Methods

The experiment was conducted at the research field of Agricultural Research Station, Rajbari, Dinajpur during rabi season of 2016-17 and 2017-18. The experiment was laid out in randomized complete block (RCB) design with three replications. BARI Bt. Begun-1 was used as test crop. Thirty days old seedlings were transplanted on 05-10 November and fruits were harvested from 20-22 February to 25-27 April in each year. The unit plot size was 5.4m×4.0m. Plant spacing was 90×80 cm. Five different treatments were employed in this study viz. T_1= STB Recommended dose i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+3 tha^{-1}poultry manure (FRG' 2012), T_2= T_1+25% of NPK i.e. 141-29-9315-2-1kg/ha of NPKSZnB+3 tha^{-1}poultry manure, T_3 = T_1+50% of NPK i.e. 169-34-111-15-2-1kg/ha of NPKSZnB+3 tha^{-1}poultry manure, T_4 = T_1+25% of NPK+3 tha^{-1}poultry manure i.e. 141-29-93-15-2-1 kg/ha of NPKSZnB+6 tha^{-1}poultry manure, T_5 = T_1+3 tha^{-1}poultry manure i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+6 tha^{-1}poultry manure. The land of the experimental plot was prepared with a power tiller by ploughing and cross ploughing followed by laddering and the soil was brought into good tilth. All of poultry manure, phosphorus, sulphur, zinc and boron were applied at the time of final land preparation. Nitrogen and potassium were applied in four equal splits at 20, 40, 60 and 80 DAT as ring method around the plants and mixed thoroughly with the soil. Intercultural operations like watering, weeding and pest control were done as and when required. First harvesting of brinjal was done at 110 days after planting (DAP) and the harvesting was continued up to 160 DAP both the years. Yield components of brinjal were taken from randomly selected 10 plants from each plot. Plant as well as hectare based fruit yields were taken from the experiment. Collected data were analyzed statistically by using MSTAT software packages and mean differences for each character were compared by Least Significant Difference (LSD) test (Gomez and Gomez, 1984).

Results and Discussion

Morphological and phenological parameters: Plant height, branch/plant, fruit $plant^{-1}$ showed significant variation among the fertilizer doses except days to flowering (Table 1). Plant required 108-112 days for flowering. Plant height was found the highest (105.13 cm) in T_3 which was statistically similar to T_2 and T_4. The results indicated that higher fertilizer doze enhanced crop growth. Similar trend was observed in the case of branch/plant and fruit/plant (Table 1). Branch/plant was the highest (7.36) in T_3 which was statistically similar to T_2 and T_4 but the lowest in T_1. The results indicated that higher fertilizer dose enhanced crop growth resulting higher branch/plant and fruit/plant. Fruits/plant was observed the highest (55.16) in T_3 followed by T_4 (51.33) while in lowest (30.00) in T_1. More number of fruits/ plant is related with the vegetative growth of the plant. When the plants have increased number of leaves (food factory) this will result in vigorous growth of plants. Hence nutrition is responsible for the vigorous growth of plants (vegetative) and resulted in more number of leaves, which gives more number of fruits/plant ultimately. Similar results have been reported by Aminifard *et al*. (2010) and Biswas *et al*. (2015).

Yield and yield attributes: Higher fruit length (11.50-13.08 cm) of Bt. brinjal was observed in T_2, T_3, T_4 but diameter was noticed higher in T_3 and T_4 (7.65-8.73cm) (Table 2). Fruit weight/plant was the highest in T_3 (2620.87) and lowest in T_1 (1949.13). Fruit yield was recorded the highest in T_3 (43.47t/ha) followed by T_4 (35.02t/ha) and T_2 (31.08 t/ha) and producing the lowest in T_1 (17.98 t/ha). The results expressed that higher fertilizer dose increased fruit yield of Bt. brinjal as compared to recommended dose of fertilizers. The results are in agreement with the findings of others (Anonymous, 2017). Functional relationship

between applied nutrients and fruit yield of Bt. brinjal indicated that the effect of nutrient on the fruit yield of Bt. was 91% (Fig. 1).

Table 1. Morphological and phenological characters of Bt. Brinjal as influenced by fertilizer level (Pooled data of 2 years)

Treatments	plant height (cm)	Branch/plant	Days to flowering	Fruit/plant
T_1	90.53	4.77	112	30.00
T_2	97.77	6.30	113	46.06
T_3	105.13	7.36	110	55.16
T_4	99.07	6.53	113	51.33
T_5	97.49	4.87	112	37.33
LSD(0.05)	6.34	1.07	NS	10.83
CV(%)	3.44	9.53	1.58	13.20

Table 2. Yield and yield attributes of Bt. brinjal as influenced by fertilizer level (Pooled data of 2 years)

Treatments	Fruit Length (cm)	Fruit Diameter (cm)	Fruit wt./plant (no.)	Fruit yield (t/ha)
T_1	10.23	7.48	1949.13	17.98
T_2	11.50	7.50	2172.27	31.08
T_3	13.08	8.73	2620.87	43.47
T_4	12.32	7.65	2059.93	35.02
T_5	11.12	7.54	2208.47	25.07
LSD(0.05)	0.74	0.35	288.47	5.40
CV(%)	3.37	2.41	6.95	9.38

T_1= STB Recommended dose i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+3tha^{-1} poultry manure (FRG' 2012), T_2= T_1+25% of NPK i.e. 141-29-93-15-2-1 kg/ha of NPKSZnB+3tha^{-1} poultry manure, T_3= T_1+50% of NPK i.e. 169-34-111-15-2-1 kg/ha of NPKSZnB+3tha^{-1} poultry manure, T_4 =T_1+25% of NPK+3tha^{-1} poultry manure i.e. 141-29-93-15-2-1 kg/ha of NPKSZnB+6tha^{-1} poultry manure, T_5 = T_1 +3 tha^{-1} poultry manure i.e. 113-23-74-15-2-1 kg/ha of NPKSZnB+6tha^{-1} poultry manure

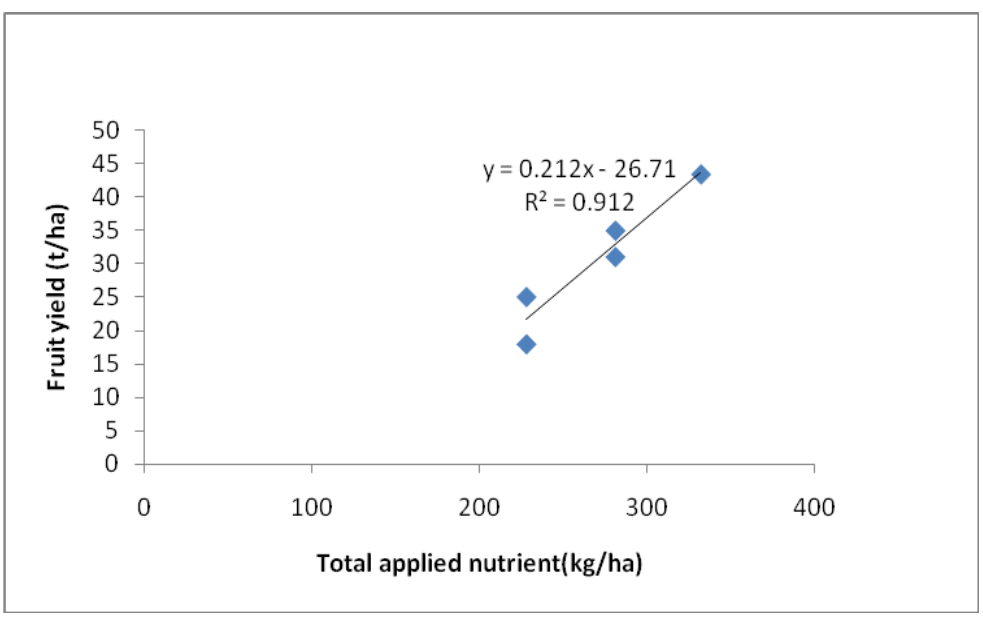

Fig. 1: Functional relationship between applied nutrient and fruit yield of Bt. brinjal

Cost and Return: The cost and return analysis of different treatments are presented in Table 3. Gross return (347760), gross margin (255170) and BCR (3.75) were found the highest in T_3 followed by T_4 and T_2. The result revealed that higher fertilizer dose gave higher monitary advantage. Higher fertilizers dose (T_3) application into soil enhanced crop growth and TDM resulting the highest nutrient uptake from soil. The lowest gross return (Tk. 143840 ha^{-1}), gross margin (Tk. 55300 ha^{-1}) and BCR (1.62) were obtained from the treatment T_1.

Table 3. Cost and return of BARI Bt begun-1 as influenced by different treatments as influenced by fertilizer level (Pooled data of 2 years)

Treatments	Fruit yield (t ha^{-1})	Gross return (Tk.ha^{-1})	Cost of production (Tk.ha^{-1})	Gross margin (Tk.ha^{-1})	BCR
T_1	17.98	143840	88540	55300	1.62
T_2	31.08	248640	90565	158075	2.74
T_3	43.47	347760	92590	255170	3.75
T_4	35.02	280160	93565	186595	2.99
T_5	25.07	200560	91540	109020	2.19

Market price of Brinjal @ Tk. 8 kg^{-1}

Conclusion

The experiment revealed that the highest fruit yield (43.47tha^{-1}) was recorded in T_3 treatment which resulted from the highest number of fruits $plant^{-1}$, fruit length and diameter. The highest gross return (Tk. 347760 ha^{-1}), gross margin (Tk. 255170 ha^{-1}) and BCR were also obtained in T_3 treatment whereas the lowest gross return (Tk.55300 ha^{-1}), gross margin (Tk.143840 ha^{-1}) and BCR were obtained from the treatment T_1. The overall results indicated that among the treatments T_3 was found suitable for total productivity and economic return of the system.

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