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Effect of different doses of nitrogen on growth and yield of brinjal (*Solanum melongena* L.) *Cv.* Pusa purple long Kanpur, India

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Abstract
The present research titled "Effect of different doses of nitrogen on growth and yield of brinjal (*Solanum melongena)* Rama University, Mandana, Kanpur was undertaken with the objective of assessing the effect of different doses of nitrogen on growth and yield of brinjal from February to June, 2021. The experiment was carried out in Randomized Complete Block Design. There were 5 treatments comprising T_1 (0 kg N/ha), T_2 (50 kg N/ha), T_3 (100 kg N/ha), T_4 (150 kg N/ha) and T_5 (200 kg N/ha) which was replicated four times. Application of 150 kg N/ha showed maximum plant height and plant spreading at 30 DAT (38.825 cm and 137.85 cm), 60 DAT (38.825 cm and 52.40 cm) and 90 DAT (93.95 cm and 94.04 cm respectively) along with highest number of branches per plant (14.02) followed by 200 kg N/ha compared to control treatment. Least days taken to first flowering (48.45 days), and days taken to 50% flowering (77.50 days) was observed in T_4 (150 kg N/ha) with highest fruit length (25.34 cm), average weight of fruit (175.4 g), and fruit diameter (3.890 g). Application of 150 kg N/ha also recorded higher yield per plant (7.937 g) and yield per hectare (38.693 t/ha) compared to control treatment. The results showed that the Nitrogen showed significant effect on all growth and yield parameter of brinjal. It is also suggested that 150 kg N/ha is more favourable for production of brinjal and maintenance of soil environment.

Keywords: Brinjal, nitrogen. growth and yield

Introduction
Brinjal (*Solanum melongena* L.), also known as Aubergine or Guinea squash is one of the non-tuberous species of the night shade family Solanaceae (Kantharajah *et al.*, 2004) [12]. The varieties of *Solanum melongena* L. show a wide range of fruit shapes and colors, ranging from oval or egg-shaped to long club-shaped; and from white, yellow, green through degrees of purple pigmentation to almost black. It is an economically important crop in Asia, Africa and the sub-tropics (India, Central America) and it is also cultivated in some warm temperate regions of the Mediterranean and South America (Sihachkr D. *et al.*, 1993)

Nitrogen, being a key nutrient in the physiology of the plant, improves the photosynthetic efficiency of the plant and ultimately the yield. Nitrogen application gradually increased flower production in, however, with excessive nitrogen supply there was decline in flower as well as fruit production and fruit size was also reduced (Assami and Kadata, 1933). The increased nitrogen doses result in increased plant height due to increased cell division and cell elongation (Ingle *et al.*, 2000).

Nitrogen (N) is an element highly demanded by vegetables and presents a low availability, mainly in tropical soils (Pimentel, 1998). Nitrogen is important for the biosynthesis of amino acids which form proteins. In addition, it is necessary for the synthesis of chlorophyll and photosynthesis (Lopes 1998, Bhuvaneswari *et al.* 2014). Nitrogen stands out among the main nutrients related to the increase in yield and for playing a fundamental role in crop yield and growth (Aminifard *et al.*, 2010) [3].

Nitrogen is considered as one of the essential macronutrients required by the plants for their growth, development and yield (Singh *et al.*, 2003). Moreover, nitrogen is the main constituent of all amino acids in proteins and lipids that acting as structural compounds of the chloroplast (Basela *et al*, 2008). The productivity of brinjal is highly responsive to N fertilization. Pal *et al.* (2002) reported that brinjal fruit yield increased with increase in N up to 187.5 kg N/ha. Sat and Saimbhi (2003) observed that increasing the nitrogen significantly delayed flowering of brinjal and increased the number of days taken to fruit setting of brinjal. Nitrogen fertilizer

affected seed number, fruit pH, crude protein, total solid and ascorbic acid of brinjal; and nitrogen deficiencies reduced both physical and chemical properties (Akanbi *et al*, 2007).

Materials and Methods

The field experiment was conducted at Rama University, Mandhana, Kanpur, UP, India from February 2021 to June 2021.

Pusa purple cluster variety was selected because it had shown better performance and commercial one under Kanpur condition. Seed was sown in nursery bed in 1st week of March and was mulched with straw and covered with white transparent plastic sheet during the day and night to warm-up the bed until seed germination. Irrigation, weeding, intercultural and plant protection measures were undertaken frequently till the seedlings were ready for transplanting. 25 DAS seedlings having 3-4 leaves were transplanted in experimental plots. The experiment was carried out in a Randomized completely Block Design (RCBD) with 5 treatments and four replication (Table No. 1).

Table 1: Detail of treatment used in study

Treatments	Nitrogen/hectare	Nitrogen/plot
T1	0kg(control)	0kg
T2	50kg	0.00567kg
T3	100kg	0.0317kg
T4	150kg	0.0578kg
T5	200kg	0.08393kg

Vegetative parameter like plant height, number of branches and plant spreading were measured. Plant heights was measured at 30, 60, 90 DAT. Number of branches were calculated by visual counting of branches. Plant spreading was measured in 45, 60, 90 DAT. Yield attributing character like fruit length, fruit diameter, fruit weight, total yield were measured. Fruit length was measured by scale, fruit diameter by vernier caliper, fruit weight by electric weighing machine and total yield was calculated.

The collected data were entered in the sheet of Microsoft Excel sheet and was analyzed by using GENSAT software package.

Result and Discussion

Effect of different dose of nitrogen on Plant height, Number of branches, plant spreading

The data presented in table no.2 demonstrate that the effect of nitrogen in vegetative parameter of brinjal i.e. plant height, number of branches and plant spreading.

Highest plant height was observed with 150 kg/ha of N (137.85 cm) which was followed by 200 kg/ha (135.10 cm), 100 kg/ha (132.35 cm) and 50 kg/ha (126.25 cm). Lowest plant height was observed in control treatment (123.15 cm). The increment in the plant height may be due to increased supply of nitrogen, which may accelerate synthesis of chlorophyll and amino acid resulting in the enhanced vegetative growth. The lower plant height at 200 kg/ha nitrogen is due to negative effect of higher nitrogen hindering food formation. Siddiue *et al.* 2005 found similar result at different doses of nitrogen. Agrawal *et al.* (2007); Toivenen *et al.* (1994) [17]; Bhardwaj *et al.* (2007) [7] and Nasreen *et al.* (1992) [13] also observed similar result.

Table 2: Effect of nitrogen on vegetative parameter of brinjal

Treatment (kg/ha)	Plant height(cm)	Number of branches	plant spreading(cm)
T1(control)	123.15	8.05	79.14
T2(50kg N/ha)	126.25	9.98	84.81
T3(100kg N/ha)	132.35	11.45	88.81
T4(150kg N/ha)	137.85	14.02	94.04
T5(200kg N/ha)	135.1	13.2	92.31
Grand mean	130.94	11.34	87.7
CV%	3.68189	14.84	2.9
SEM(±)	26.54	0.514	1.27
$LSD_{0.05}$	7.936982**	1.585**	3.914***

Plants treated with 150 kg/ha of N showed higher number of branches followed by 200 kg/ha of N (13.20), 100kr/ha of N (11.45) and 50 kg/ha of N (9.98). Least number of branches was observed in control treatment (8.05). Similar result was also observed in the study done by Bar *et al.* (2001) [6].

Highest plant spreading was observed with 150 kg/ha of N (94.04 cm) but at par with 200 kg/ha of N (92.31cm), which was followed by 100 kg/ha of N (88.81 cm) and 50 kg/ha of N (84.81 cm). Lowest plant height was observed in control treatment (79.14cm).The obtained results were in agreement with Bar *et al.* (2001) [6], Prabhu *et al.* (2003) and Wange and Kale (2004) [18] and Ge *et al.* (2008) [9].

Effect of different doses of nitrogen on Yield attributing characters (fruit length, fruit diameter, fruit weight, yield of brinjal)

The data presented in Table no.3 demonstrate that the effect of nitrogen in Yield attributing character of brinjal i.e. fruit length, fruit diameter, fruit weight and yield.

Highest fruit length (25.34 cm) has been obtain in plot receiving the 150kg N/ha followed by 200 kg/ha (23.98 cm), 100 kg N/ha (21.43 cm), 50 kg/ha (18.08 cm) while lowest fruit length (16.45 cm) is obtains in control. This might be due to the translocation of more photosynthates from source to sink and also favorable microclimate that prevailed throughout the crop growth period. (Sharma and Peshin) observed increases in fruit length, number of fruit/plant and fruit yield of chilli with an increase in nitrogen level.

The maximum fruit diameter was recorded from 150 kg N/ha (3.890 cm) which was at par with the effect of 200 kg N/ha (3.654 cm), followed by 100 kg N/ha (3.564 cm). Lowest fruit diameter was obtained in control treatment (2.167 cm). Similar increase in fruit diameter by increase in fertility doses have also been reported by (Jilani *et al.*, 2008) [11] that Nitrogen application at 100kg/ha produced maximum fruit diameter/ha.

Highest fruit weight (175.4 g) was observed from 150 Kg N/ha treatment, while the lowest (128.67 g) related to control treatment. These results are consistent with those reported by Ali and Kelly (1992) [5], Devi *et al.* (2002) [8] and Aujla *et al.* (2007) [4] who also reported that increasing the rate of nitrogen fertilizers increased the average fruit weight and fruit volume.

The reason for increase in fruit weight was due to the accelerated mobility of photosynthates from source to sink and its accumulation in fruits at optimum doses of nutrient, increasing the rate of nitrogen fertilizers increases the average fruit weight and volume but at higher doses (excessive nitrogen) total weight start to decreases.

Highest yield per plant was recorded in 150 kg N/ ha (7.937 g) 200 kg N/ ha (6.092 g), 100 kg N/ ha (5.946 g), 50 kg N/ ha (4.897 g), control treatment (4.076 g). Similarly, significantly higher yield per hectare was recorded in 150 kg N/ ha (38.693 t/ha), 200 kg N/ ha (37.523 t/ha), 100 kg N/ ha (34.879 t/ha), 50 kg N/ ha (32.550 t/ha) and control treatment (30.897 t/ha). The lowest yield was obtained in the zero nitrogen application, i.e. the control that were in agreement with Rosati *et al.* (2002), Akanbi *et al.*(2007) and Aujla *et al.* (2007) [4] reported that increments in the nitrogen rate of the fertilizers increased the yield and number of fruits. Increasing the N doses of the fertilizers to 50 kg N ha-1 significantly increased the yield of eggplant while yield decreased at the highest rate of nitrogen. This decrease in yield might be due to excess doses in the plant. The marked effect of nitrogen on yield might be due to the cumulative stimulating effect of nitrogen on the vegetative growth characters which form the base for flowering and fruiting.

Table 3: Effect of nitrogen on yield attributing character

Treatment (kg/ha)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Yield per plant(kg)	Yield per hectare (t/ha)
T1(control)	16.45	2.167	128.67	4.076	30.897
T2(50kg N/ha)	18.08	2.998	137.34	4.987	32.55
T3(100kg N/ha)	21.43	3.564	155.68	5.946	34.879
T4(150kg N/ha)	25.34	3.89	175.4	7.937	38.693
T5(200kg N/ha)	23.98	3.654	168.3	6.092	37.523
Grand mean	21.056	3.2546	153.078	5.8076	34.9084
CV%	3.8	5.99	3.68189	8.52	9.49
SEM(±)	0.1854	0.04	26.54	0.27	2.27
$LSD_{0.05}$	0.5713**	0.16***	7.698***	0.84**	5.25**

Conclusion

Based on the results, of this study it can be realized that among the treatments, nitrogen @ 150kg N/ha was found effective in improving plant height, number of branches, plant spread, days to flower initiation and days to 50% flowering, length of fruit stalk, diameter of fruit, no. of fruit per plant, weight of fruit, yield per plant and yield per hectare.

From the study it can be concluded that the use of optimum doses of nitrogen is more profitable either in context of growth and yield of brinjal.

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