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Effect of different spacing on varieties of Brinjal (*Solanum melongena* L.)

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Abstract

The present investigation entitled “Effect of different spacing on varieties of brinjal (*Solanum melongena* L.)” was carried out during Late *Kharif* season of 2020-21 at College Farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana, Gujarat. There were four levels of spacing 90 cm × 90 cm, 90 cm × 60 cm, 60 cm × 60 cm, 45 cm × 45 cm and three levels of variety *viz.*, GJB 3, GRB 5 and Doli 5. The experiment was laid out in Split Plot Design with three replications. Among four spacing, 45 cm × 45 cm performed significantly superior over other spacings with respect to maximum plant height at 60 DAT (30.02 cm), at last harvest (55.64 cm), minimum days taken to first picking after transplanting (97.56), maximum number of fruits per plant (28.24), fruit yield per plot (32.85 kg) and fruit yield per ha (20.28 tones). In case of varieties, GRB 5 was found significantly superior with respect to maximum plant height at 60 DAT (28.88 cm) and at last harvest (61.28 cm), plant spread at 90 DAT (E-W) (49.86 cm) and (N-S) (49.75 cm), minimum days to flower initiation (79.75) and days taken to first picking after transplanting (101.83), maximum number of pickings (11.00), fruit yield per plant (1.24 kg), fruit yield per plot (22.49 kg), fruit yield per ha (13.88 tones) and total soluble solids (7.92 °Brix). The highest B: C ratio (1:2.52) was recorded under s_{4v_2} (45 cm × 45 cm and GRB 5) rest of treatment.

Keywords: Brinjal, spacing, varieties, yield, replication, fruits picking

Introduction

Brinjal or Eggplant (*Solanum melongena* L.) is a member of the Solanaceae family and having the chromosome number is $2n=24$. It is also known as ‘Aubergine’ or ‘Guinea squash’ an economically important vegetable crop widely cultivated in the tropics and subtropics regions. Brinjal is probably originated from Hindustan centre of origin. In India, brinjal is cultivated 736 ('000 ha) with a produced of 12777 ('000 MT) and productivity (17.36 t/ha) (Anonymous, 2020) [2]. While, Gujarat occupied 71370 ha area and produced 1437801 MT and productivity (20.14 t/ha) brinjal (Anonymous, 2020) [2]. Brinjal is mainly cultivated in all the states, but mostly in West Bengal, Odisha, Jharkhand, Gujarat and Bihar. Uttar Pradesh had the highest productivity followed by Karnataka and Himachal Pradesh. Brinjal is named as “Poor man’s vegetable” because of its low cost of production, ease of culture and availability throughout the year. As fruits are widely used in various culinary preparations *viz.*, sliced *bhaji*, stuffed curry, *bhartha*, chutney, pickles *etc.* and immature fruit as vegetable.

The plants grown with wider spacing produce maximum number of branches per plant, number of leaves per plant, canopy spread, total dry matter production, yield and nutrient uptake. Optimum plant spacing ensures proper growth and development of plant resulting maximum yield of crop and economic use of land. Lesser competition between plants and larger amount of available nutrients and soil moisture for vigorous growth of fruit parameters in widely space plants as compare to closer spacing. Further, brinjal higher spacing record significantly lower shoot and fruit borer infestation compare to closer spacing (Sollapur and Hiremath, 2016a) [9].

Methodology

The present investigation entitled, “Effect of different spacing on varieties of brinjal (*Solanum melongena* L.)” was carried out under open field condition from October 2020 to April 2021 at the College Farm, College of Horticulture, S. D. Agricultural University, Jagudan, Dist. Mehsana, Gujarat. In the present experiment four spacing and three variety of brinjal were evaluated in field conditions. The experiment comprised of two factors and was laid out in split plot design. First factor or main plot treatment was spacing and Second factor as sub plot

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treatment was varieties. Thus, there were twelve treatment combinations under study. The raised bed nursery was prepared (15-20 cm height), 1.0 m wide and of convenient length were well prepared by mixing fully decomposed FYM (4-5 kg/m²). Water was applied by using sprinkler irrigation method. The heights of five randomly selected plants were measured at 60 DAT and at last harvest. The plant height was measured in centimeter from the base of the plant near ground level to the main growing tip with measuring scale and average worked out. Plant spreading of five tagged plant was measured at 90 DAT. Plant spread was measured in centimeter by scale from East-West and North-South direction and average was worked out. Total numbers of branches were counted at time of final harvesting of the crop from the five tagged plants. The number of days from the date of transplanting to date on which first flower was appeared and accordingly the days to first flower initiation. The number of days taken from the first picking of harvestable maturity fruits picking in each plots were recorded.

The fruits were harvested from each tagged plants at each picking and weigh (g) for each fruit separately with the help of digital electronic balance. Based on these data the average was calculated. The total numbers of fruits from the five tagged plants were counted of each picking and they were summed up. The total numbers of pickings per plant in five tagged plants under each treatment of all replications were counted and then number of picking in each treatment was worked out for statistical analysis. The fruit weight in kilogram from all picking of five tagged plants were summed up and average out calculate the fruit yield per plant. The marketable fruits were harvested at every picking from each gross plot were weighed in kilogram. The final fruit yield was obtained by summing up. Total yield per hectare was calculated by multiplying the multiple factors with yield per plot of each treatment of each replication.

Total phenol content compounds are slightly water soluble and form complexes with protein by hydrogen bonding. They are highly susceptible to enzyme oxidation by specific phenolase. Phenols can be estimated by various methods. Estimation of phenols using Folin-Ciocalteu reagent. A total soluble solid (TSS) was recorded by using hand refractometer (HI 96801). The brinjal fruit were cut in to small pieces, crushed mixed thoroughly to make of homogenous extract. Then results were expressed in term of °Brix. Volume of fruits was measured by the water displacement method. Five marketable fruits were taken for the determination of volume. The fruits were immersed one by one into the beaker fully filled with water. The water displaced by the individual fruit was collected into the graduated measuring cylinder and volume of the fruit was obtained by averaging and recorded in terms of (cm³).

Results and Discussion

Data presented in Table 1 showed that among different spacing, significantly maximum plant height at 60 DAT (30.02 cm) and at last harvest (55.64 cm) was recorded with treatment s₄ (45 cm × 45 cm). With respect to varieties, significantly maximum plant height at 60 DAT (28.88 cm) and at last harvest (61.28 cm) was recorded with treatment v₂ (GRB 5). This might be due to the fact that the closest spacing would have led to the greatest inter competition of adjacent plants for available nutrients and encouraged the apical dominance resulting in the tallest plants. These results are in

conformity with Ndereyimana *et al.* (2014)^[4] in brinjal. Whereas, significantly maximum at plant spread (East-West) (52.28 cm) and (North-South) (53.34 cm) was recorded at 90 DAT with treatment s₁ (90 cm × 90 cm) and maximum plant spread (East-West) (49.86 cm) and (North- South) (49.75 cm) was recorded at 90 DAT with treatment v₂ (GRB 5). The ultra-density crop facilitate in maintaining the soil fertility status which leads to proper growth and development of crop with producing maximum plant spread. The results corroborate the findings made by Ughade and Mahadkar (2015)^[11] in brinjal. Maximum number of branches per plant (4.21) at last harvest was recorded with treatment s₁ (90 cm × 90 cm). With respect to varieties, significantly maximum number of branches per plant (3.99) at last harvest was recorded with treatment v₃ (Doli 5). The widest spacing recorded the highest number of branches per plant. These results are in agreement with Ndereyimana *et al.* (2014)^[4] in brinjal. Significantly minimum days for flower initiation (79.75) was recorded with treatment v₂ (GRB 5) which was at par with v₃ (Doli 5) (81.52). The results pertaining to early flowering compared to wider spacing. There was a marked difference among the varieties in the days to first flowering. This result is in conformity with Rahul *et al.* (2017)^[6] in brinjal. The significantly minimum days taken to first picking after transplanting (79.75) was recorded with treatments₄ (45 cm × 45 cm) which was at par with s₂ (90 cm × 60 cm) (83.09) and s₃ (60 cm × 60 cm) (80.33) whereas, respect to varieties, significantly minimum days taken to first picking after transplanting in (101.83) was recorded with treatment v₂ (GRB 5). Islam *et al.* (2011)^[3] was observed that the first harvest was earlier at the closest spacing in sweet pepper.

Data in Table 2 showed that, significantly maximum fruit weight (64.36 g) was recorded with treatments₁ (90 cm × 90 cm). With respect to varieties, significantly maximum fruit weight (80.04 g) was recorded with treatment v₁ (GJB3). Ughade and Mahadkar (2015)^[11] nicely briefed the, wider spacing recorded statistically higher values of average weight of fruit under study. The maximum number of fruits per plant (28.24) was recorded in treatment s₁ (90 cm × 90 cm) and varieties, significantly maximum number of fruits per plant (32.14) was recorded with treatment v₃ (Doli 5). The results of more number of fruit per plant in closer spacing were observed by Thakur *et al.* (2018)^[10] in capsicum, Rajendra *et al.* (2013)^[7] in tomato and Rashid *et al.* (2016)^[8] in tomato. Maximum number of pickings (11.00) was recorded with treatment v₂ (GRB 5) which was at par with v₁ (GJB 3) (10.83) treatment. Significantly maximum fruit yield per plant (1.35 kg) was recorded with treatment s₁ (90 cm × 90 cm) and treatment v₂ (GRB 5) (1.24kg). This might be due to the higher number of flowers, fruits and maximum extent of fruit set were noticed and reported by Thakur *et al.* (2018)^[10] in capsicum. The maximum fruit yield per plot (32.85 kg) and fruit yield per hectare of (20.28 tones) was recorded with treatment s₄ (45 cm × 45 cm). With respect to varieties, significantly maximum fruit yield per plot (22.49 kg) and fruit yield per hectare (13.88 tones) was recorded with treatment v₂ (GRB 5). The increase in plant population was leads to increase in total yield were noticed and reported by Thakur *et al.* (2018)^[10].

Data in Table 3 showed that, varieties also brought the change in total phenols content and significantly maximum total phenols content of (66.24 mg/100g) was recorded in treatment v₃ (Doli 5). Whereas, maximum total soluble solids of (7.92

°Brix) was recorded in treatment v₂ (GRB 5). Total soluble solids were found significantly different among the various cultivars of tomato. These results are in line with Ali *et al.* (2016)^[1] in tomato. The maximum volume of fruit of (233.92

cm³) was recorded in treatment v₁ (GJB 3). The above results showed that wide variability was observed in the cultivars for various attributes was reported by Pundir and Porwal (1999)^[5] in chilli.

Table 1: Effect of different spacing and varieties on growth parameters of brinjal

Treatment	Plant height at 60 DAT (cm)	Plant height at last harvest (cm)	Plant spread (E-W) (cm) at 90 DAT	Plant spread (N-S) (cm) at 90 DAT	Number of branches per plant at last harvest	Days to flower initiation	Days taken to first picking after transplanting
Spacing (s)							
90 cm × 90 cm (s ₁)	22.62	46.76	52.28	53.34	4.21	85.92	116.89
90 cm × 90 cm (s ₁)	24.42	48.92	46.74	45.60	3.72	83.09	105.00
90 cm × 90 cm (s ₁)	26.13	50.59	44.79	42.85	3.54	80.33	107.89
90 cm × 90 cm (s ₁)	30.02	55.64	40.91	41.48	3.21	78.49	97.56
S. Em. ±	0.82	0.81	0.77	0.84	0.12	1.54	3.63
C. D. 5%	2.84	2.82	2.68	2.91	0.41	NS	12.57
C. V. %	9.56	4.84	5.03	5.51	9.66	5.62	10.20
Varieties (v)							
GJB 3 (v ₁)	25.38	45.98	44.42	43.05	3.61	84.61	108.25
GRB 5 (v ₂)	28.88	61.28	49.86	49.75	3.42	79.75	101.83
Doli 5 (v ₃)	23.14	44.17	45.26	44.65	3.99	81.52	110.42
S. Em. ±	0.54	0.60	0.73	0.88	0.06	1.73	1.71
C. D. 5%	1.62	1.79	2.19	2.63	0.17	3.61	5.11
C. V. %	7.24	4.09	5.49	6.65	5.35	5.09	5.53
Interaction (s × v)							
S. Em. ±	1.08	1.19	1.46	1.76	0.06	2.41	3.41
C. D. 5%	3.23	3.58	NS	NS	0.17	NS	10.23
C. V. %	7.24	4.09	5.49	6.65	5.35	5.09	5.53

Table 2: Effect of different spacing and varieties on yield parameters of brinjal

Treatment	Fruit weight (g)	Number of fruits per plant	Number of pickings	Fruit yield per plant (kg)	Fruit yield per plot (kg)	Fruit yield per hectare (tonnes)
Spacing (s)						
90 cm × 90 cm (s ₁)	64.36	28.24	10.67	1.35	11.18	6.90
90 cm × 90 cm (s ₁)	57.79	25.05	10.67	1.16	14.85	9.17
90 cm × 90 cm (s ₁)	52.78	20.30	10.78	0.91	22.34	13.79
90 cm × 90 cm (s ₁)	47.38	19.45	11.00	0.89	32.85	20.28
S. Em. ±	1.39	0.61	0.10	0.04	0.71	0.44
C. D. 5%	4.81	2.10	NS	0.15	2.45	1.51
C. V. %	7.51	7.82	2.68	11.89	10.46	10.46
Varieties (v)						
GJB 3 (v ₁)	80.08	17.73	10.83	1.08	20.68	12.77
GRB 5 (v ₂)	60.39	19.91	11.00	1.24	22.49	13.88
Doli 5 (v ₃)	26.29	32.14	10.50	0.91	17.74	10.95
S. Em. ±	1.09	0.87	0.10	0.03	0.73	0.45
C. D. 5%	3.26	2.61	0.29	0.08	2.20	1.36
C. V. %	6.77	12.97	3.09	9.08	12.52	12.52
Interaction (s × v)						
S. Em. ±	2.17	1.74	0.19	0.06	1.47	0.91
C. D. 5%	6.52	NS	NS	NS	NS	NS
C. V. %	6.77	12.97	3.09	9.08	12.52	12.52

3: Effect of different spacing and varieties on quality parameters of brinjal

Treatment	Total phenols content (mg/100g)	Total Soluble Solids (°Brix)	Volume of fruit (cm ³)
Spacing (s)			
90 cm × 90 cm (s ₁)	45.92	7.13	171.33
90 cm × 90 cm (s ₁)	43.07	6.83	169.44
90 cm × 90 cm (s ₁)	40.36	6.83	168.44
90 cm × 90 cm (s ₁)	38.55	6.74	164.44
S. Em. ±	1.63	0.08	1.58
C. D. 5%	NS	NS	NS
C. V. %	11.62	3.69	2.81
Varieties (v)			
GJB 3 (v ₁)	35.65	7.57	233.92

GRB 5 (v ₂)	24.03	7.92	195.75
Doli 5 (v ₃)	66.24	5.18	75.58
S. Em. ±	0.72	0.05	2.04
C. D. 5%	2.16	0.16	6.12
C. V.%	5.96	2.61	4.20
Interaction (s × v)			
S. Em. ±	1.44	0.10	4.08
C. D. 5%	NS	NS	NS
C. V.%	5.96	2.61	4.20

Conclusion

Result of the presented study concluded that for getting higher yield and net return of brinjal, during late *kharif* season is preferable to planting at 45 cm × 45 cm spacing with GRB 5 variety.

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