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Evaluation on growth and yield attributing characters of local brinjal genotypes of Karbi Anglong district of Assam

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Abstract
For maintaining a healthy germplasm and improvement of any crop, the need for documentation and analysing the characteristics of the existing local genotypes, landraces, cultivars or farmer's variety is very important. Therefore, the present investigation is carried out to evaluate and characterize seven brinjal genotypes along with one check variety during two consecutive *rabi* season of 2021-2023. A randomized block design with tree replication was adopted for conducting the experiment. The recorded data were analysed as per Panse and Sukhatme (1967) using the mean values at random plots in each replication from all genotypes to find out the significance of genotype effect. The results revealed significant variation among the genotypes. This might be due to the effect of genotype, environment or their interaction. The genotypes V5 and V2, are the highest yielder/plant for two seasons in terms of fruit per plant and yield per hectare. So, V5 and V2 are promising genotypes that can be used as parents for future hybridization programmes to develop superior types with higher yield.

Keywords: Local brinjal, genotypes, growth, yield, production and yield

Introduction
Brinjal (*Solanum melongena* L.) is an important crop in India. Vavilov (1928) [16] regarded India as the centre of origin for Brinjal crop and the crop is variable in India. In India it is grown in an area of 0.61 mha with a production of 13.37 million tonnes and a productivity of 17.3 tonnes per hectare. Brinjal is a good source of calcium, phosphorus, iron and vitamins B. But the local brinjal are degrading as the farmers preferred HYV hybrid varieties or Bt. brinjal which give higher yield and more profit. Therefore, attention and efforts are needed for the conservation of local brinjal (Sharma *et al* 2016) [14]. Thorough evaluation of genotypes is needed to know the performance in terms of yield and other yield attributing characters. There is ample scope for local brinjal to explore and identify for its improvement. The genotypes with good performance can be released as a variety and it can be further used in the breeding programme as a breeding line by the breeder. Many local varieties are well known to the farmers but their improvement is still needed. Being the centre of origin, India is a place of great genetic variation and vast diversity of brinjal with regard to vegetative and fruit morphology, yield and yield components. So, keeping in view of the above facts, the present investigation was undertaken with the objective to identify the variety with higher yield and other yield attributing characters.

Materials and Methods
The field experiment was carried out at Assam Agricultural University-Zonal Research Station, Diphu, Karbi Anglong, Assam during mid-winter 2021-2022 and 2022-2023. Seven brinjal genotypes collected in and around Diphu, Karbi Anglong region including one check variety were taken to analyse their growth and characteristics. The different varieties with local name and source of collection is given in (table 1). The experiment was laid out in a randomized block design with three replications. The plot size is 2 m x 2 m with a spacing of 60 cm x 60 cm were followed. A total of 12 plants were accommodated in each plot in all the three replications.

Randomly five plants were considered for recording observations in each replication. Other management practices are followed as per package of practices of Assam Agricultural University, Jorhat. Data were analysed as per Panse and Sukhatme (1967) [9] using the mean values at random plots in each replication from all genotypes to find out significance of genotype effect.

Table 1: Name and source of genotypes

Genotypes	Local name	Source
V_1	Hipi voret	Karbi Anglong, Assam
V_2	Hipi kelok	Karbi Anglong, Assam
V_3	Phantau gishim	Karbi Anglong, Assam
V_4	Hipi bonglong	Karbi Anglong, Assam
V_5	Phantau mehrang	Karbi Anglong, Assam
V_6	Phantau maisah	Karbi Anglong, Assam
V_7	Phantau daosip	Karbi Anglong, Assam

Results and Discussion

Growth characters

Plant height

Plant height is considered as one of the important traits for growth and yield of the plant. In the present investigation it is revealed from Table 1 that the highest plant height (69.33 cm) was observed in the genotype V_6 followed by genotypeV_2 (68 cm) and V_8 (66 cm). There is no significant difference between those genotypes. The genotype V_7 (46.33 cm) recorded the minimum plant height followed by V_4 (47 cm) and V_1 (51 cm). The genotype V_7 is significantly different from V_1 but not with other genotypes. The results is similar to the findings of Kumar *et al*. (2011) [6] and Ahmed *et al*. (2014) [1] who obtained similar trend of result.

Leaf blade length and width

The highest leaf blade length was recorded both in the genotype V_6 (15.33 cm) and V_7 (15.33 cm) which is statistically *at par*. The minimum leaf blade length was observed in V_5 (9.83 cm) followed by V_1 (10.73 cm), V_2 (11.06 cm) and V4 (12 cm). From Table 2 it is evident that the genotype V_5 is significantly different from V_4 but not from V_1 and V_2. The highest leaf blade width was recorded in V_4 (11cm) followed by V_3 (10.33 cm) and V_6 (10.66 cm) which are statistically *at par*. The minimum leaf blade width was observed in V_7 (7 cm) followed by the genotype, V_2 (7.16 cm), V_8 (7.3 cm), V_1 (8.66 cm) and V_5 (9.33 cm). V_7 is significantly different from V_5 but not with genotype V_2 and V_8. The results is in contrast with that of Begum *et al*. (2013) [2] who reported smaller leaf length and leaf width in Bangladesh.

Terminal thickness of shoot

The maximum terminal thickness was observed in V_6 (0.43 cm) followed by V_5 (0.36cm), V_2 (0.33 cm), V_8 (0.33 cm) and V_3 (0.3 cm). And the least thickness was recorded in V_7 (0.23 cm) followed by V_1 (0.25 cm) and V_4 (0.26 cm). For both the cases they were, however, statistically *at par*.

Table 2: Growth characters

Genotype	Plant height (cm)	Leaf blade length (cm)	Leaf blade width (cm)	Terminal thickness (cm)
V_1	51	10.73	8.66	0.25
V_2	68	11.06	7.16	0.33
V_3	58.66	12.66	10.66	0.30
V_4	47	12	11.0	0.26
V_5	61	9.83	9.33	0.36
V_6	69.33	15.33	10.66	0.43
V_7	46.33	15.33	7	0.23
V8 (check)	66	12.33	7.3	0.33
SED (±)	1.22	0.5	0.43	0.01
CD at 5%	2.67	1.1	0.93	0.04

Fruit characters

Fruit initiation (Days after transplanting)

As brinjal flowering is primarily influenced by temperature and humidity, a particular variety may produce variable number of clustered fruits in different seasons. But be it spring-summer or autumn-winter or even rainy season, long styled flowers set 70-87% fruits (Prasad and Prakash 1968) [11]. The least time required for fruit initiation was recorded in V_7 (60.33 DAT) followed by V_6 (61 DAT) which are however, statistically *at par*. The maximum days required for fruit initiation was observed in V_1 (72.66 DAT) followed by V_2 (71.33 DAT) and V_4 (71 DAT) and there was no significant difference among the genotypes. Similar findings were reported by Vandana *et al.* (2014) [15], Sanas *et al.* (2014) [12], Dhaka and Soni *et al.* (2012) [13], Gavade and Ghadge (2015) [4].

Fruit peduncle length

The highest fruit peduncle length was recorded in V_3 (4.3 cm) followed byV_6 (4.16 cm), V_5 (3.76 cm) and V_2 (3.24 cm). The genotype V_3 was found to be significantly different from that of genotype V_2. The lowest fruit peduncle length was observed to be significantly *at par* in the genotype V_4 (2.66 cm) and genotype V_7 (2.76 cm). These results are in confirmatory with those of Kumar *et al*. (2013) [7], Vandana *et al*. (2014) [15].

Fruit length

From Table 3 it can be seen that the maximum length of fruit was recorded in V_6 (12 cm) which was followed by V_3 (9.3 cm) and V_5 (6.3 cm) and V_6 is found to be significantly different with that of V_5. The lowest fruit length was recorded in the genotype V_4 (3.36 cm), V_1 (4 cm) and V_2 (4.1 cm) which are *at par* with each other. The similar pattern of result was reported by Begum *et al* (2013) [2], Vandana *et al*. (2014) [15], Uddin *et al*. (2014) [13] and Kumar *et al*. (2011) [6].

Fruit width

The highest fruit width was obtained in the genotype V_6 (3.96 cm), V_8 (3.26 cm), V_4 (3.3 cm) and V_1 (3.23 cm) which significantly *at par* with each other. The lowest value of fruit width was obtained in the genotype V_7 (1.5 cm) followed by V_3 (2.56 cm) and the results are in accordance with that of Ahmed *et al*. (2014) [1].

Number of fruits/plants

The maximum number of fruits per plant produced was recorded in the genotype V_5 (25.33) which significantly higher than that of genotype V_3 (23), V_2 (22.33) and V_7 (22). However, the minimum number of fruits per plant was recorded in the genotype V_8 (16), V_6 (17.33) and V_4 (21) and are statistically *at par* with each other. The findings is similar pattern to the findings as reported by Negi *et al*. (2000) [8] and Vandana *et al*. (2014) [15].

Fruit weight

The weight of fruits varied significantly among different genotypes. The highest weight was recorded in V_6 (173 g) which was followed by V_8 (167.8 g), V_5 (138 g) and V_4 (105 g) while the lowest weight of fruit was found in the genotype V_7 (39 g) followed by V_1 (84) and V_3 (90 g). In both the cases the genotypes are significantly different from each other. Any deviation in the results with the findings of others is attributed to differences in the genotypes under study or due to environmental conditions and the stage of harvest of fruits. Generally, the increase in the fruit weight in the present investigation is attributed to higher fruit length and fruit circumference while, increase in the number of fruits per plant is attributed to higher plant height and number of primary branches.

Yield per plant

From the analysed data of Table 3 it was revealed that the yield per plant was recorded to be highest in the genotype V_8 (1.63 kg) followed by V_6 (1 kg) and V_5 (0.93 kg). The lowest yield was recorded in V_2 (0.31 kg) and V_2 (0.37 kg) which are statistically *at par*. Ghosh *et al*. (2011) [5], Prabhakaran *et al*. (2015) [10] and Dhaka and Soni (2012) [13] obtained similar trend of result with regard to the yield of fruit per plant.

Yield per ha (q)

The yield per plot was converted into yield per hectare and the highest yield per hectare was found in the genotype V_8 (151 q) which is followed by V_5 (120 q) and V_2 (105 q). From the data analysed and as given in Table 3 it was revealed that all the genotypes are significantly different with each other in terms of yield per hectare. The lowest yield was recorded in the genotype V_7 (34 q/ha) and V_1 (67.9 q/ha).

Table 3: Fruit characters

Genotype	Fruit initiation (DAT)	Fruit peduncle length (cm)	Fruit length (cm)	Fruit width (cm)	No. of fruits/plant	Fruit wt (g) 5 nos	Yld/plant (kg)	Yld/plot (kg)	Yld/ha (q)
V_1	72.66	3.18	4.0	3.23	20.00	84	0.37	2.1	67.9
V_2	71.33	3.24	4.1	2.86	22.33	101	0.31	3.4	105
V_3	67.66	4.30	9.3	2.56	23	90	0.66	2.83	86.4
V_4	71.00	2.66	3.36	3.3	21	105	0.37	3.2	99
V_5	68.66	3.76	6.4	2.9	25.33	138	0.93	3.5	120
V_6	61.00	4.16	12	3.96	17.33	173	1.06	2.7	83
V_7	60.33	2.76	4.9	1.5	22	39	0.74	1.1	34
V_8 (check)	67	3.03	6.06	3.26	16	167.8	1.63	3.9	151
SED (±)	15.19	0.07	0.45	0.15	0.81	37.42	0.03	0.13	1.76
CD at 5%	33.12	0.17	0.99	0.33	1.77	81.58	0.07	0.30	3.8

Table 4: Plant growth habit, spine and leaf characters of brinjal genotypes

Genotype	Plant growth habit	Orientation of leaf	Spine position	Leaf petiole pubescence	Leaf blade colour
V_1	Upright	Parallel	Petiole, Stem, Leaf lamina, Peduncle, Calyx	Yes	Greenish violet
V_2	Upright	Parallel	Calyx, Leaf lamina, stem	Yes	Light green
V_3	Upright	Parallel	Nil	Yes	Green
V_4	Upright	Parallel	Pedicel, Petiole, Stem, Leaf lamina, Calyx	Yes	Greenish violet
V_5	Upright	Parallel	Calyx, Leal lamina	Yes	Dark green
V_6	Upright	Parallel	Nil	Yes	Light Green
V_7	Intermediate	Parallel	Nil	Yes	Light green
V_8 (check)	Upright	Semi dropping	Nil	Yes	Green

Table 5: Morphological characters of fruit & seed

Genotype	Fruiting pattern	Fruit shape	Fruit apex	Fruit colour	Fruit colour distribution	Fruit length: breadth	Appearance (flesh colour)	Seediness	Seed Size	Seed colour
V_1	Solitary	oval	Rounded	Light green	Regular stripe	Slightly longer than broad	Cream	Many	Large	Brownish yellow
V_2	Solitary	oval	Rounded	Milky white	Uniform	Slightly longer than broad	White	Few	Large	Brownish yellow
V_3	Cluster	Long slender	Prostrate	Purplish white	Irregular stripe	Slightly longer than broad	White	Few	Small	Brownish yellow
V_4	Solitary	round	Rounded	Light green	Regular stripe	Broader than long	Cream	Few	Large	Brownish yellow
V_5	Solitary	Long, slender	Prostrate	Greenish Purple	Irregular stripe	Slightly longer than broad	Cream	Many	Large	Brownish yellow
V_6	Solitar	Long, slender	Prostrate	Light green	Uniform	Three times as long as broad	Cream	Few	Intermediate	Light brown
V_7	Cluster	Small slender	Rounded	Purple	Uniform	Several times long as broad	White	Few	Small	Light brown
V_8 (check)	Solitary	Round	Rounded	Purple	Uniform	Twice as long as broad	Cream	Few	Intermediate	Brown

Plant, fruit and seed morphology

Plant growth habit, spine and leaf characters of the genotype under study are described and presented in (Table 4). The growth study reveals that the genotypes varied from upright to intermediate (only one genotype). The leaf orientation is found to be parallel in most of the genotypes under study. Spine position has been reported in different parts of brinjal plants (Stem, petiole, leaf lamina, peduncle, calyx). Leaf blade colour varies from green to greenish violet and dark green with the of presence of pubescence. Pubescence shows structural defence against vectors which spreads viral disease. Only four genotypes show with presence of spines.

Morphological characters of fruit and seed is also studied and the results is given in Table 5. *Solanum melongena* has three botanical varieties namely., var. *esculentum* (round to oval fruit shape), var. *serpentina* (long and slender) and var. *depressum* (dwarf and oblong fruit shape). In the present study all the three basic types of fruit shape having a colour range from milky white to purplish white and light green to greenish purple and purple has been observed. Variation in fruit pattern i.e. solitary has been observed in six genotypes including check variety while cluster type was seen in genotype V_3 and V_7. The fruit shape (oval, round, long and slender) is found to be different for different genotypes. According to the fruit apex shape only round and prostrate were observed, while round is observed in five genotypes including check the prostrate type was observed in V_3, V_5 and V_6. The fruit colour distribution (uniform, regular stripped, irregular stripe), fruit length: breath, appearance of flesh colour, seediness (many, few), seed size (large, intermediate and small) and seed colour has also been studied and found to differ among the genotypes. The differences in morphological characters are due to mainly for varietal and environmental characteristics which are controlled and expressed by specific gene (s), climatic factors and their interaction.

Conclusion

From the findings of the present investigation, it can be concluded that genotypes of local brinjal differed significantly for most of the growth, morphological and yield attributing characters. The genotype V_6 has been found to perform highly satisfactorily in all the agronomically desired characters except in number of fruits per plant and was closely followed by V_2, V_3 and V_5. The higher yielder genotypes are V_2 and V_5 and also V_8, which is a check variety. The investigated genotypes in the present study showed higher level of variability for yield due to variation in yield attributing parameters. Promising genotypes particularly V_2 and V_5 can be used as parents in future hybridization programmes to develop superior types with high yield.

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