

Morphological Characterization of Brinjal (*Solanum melongena* L.) Landraces of Southern Transitional Zone of Karnataka under Organic Conditions

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Abstract The present investigation was conducted under organic condition. The material for the present study comprised of 19 land races of brinjal collected in southern transitional zone of Karnataka. Observations were recorded on 21 qualitative traits viz. stem anthocyanin coloration, leaf margin type, leaf blistering, color of leaf blade, leaf vein, flower, stigma, style, anther, fruit and thorns ; number of thorns on calyx, stem and leaves ; plant growth habit, size of the flower, fruiting habit, shape of fruit, fruit apex ; fruit stripes, glossiness at harvest maturity and six quantitative traits viz., plant height, leaf length, petiole length, leaf width, fruit length, stalk length. Results revealed the presence of considerable variability for most of the qualitative and quantitative traits. The land race ‘Thailand badane’ has thorns all over the plant which could be exploited in the improvement for biotic stresses. The characterization of landraces helps in varietal identification, conservation and protection of germplasm. Since these are the treasure mines for valuable biotic and abiotic genes, they could be exploited in different breeding programs for devel-

opment of biotic and abiotic stress resistant varieties for sustainable yield coupled with good fruit qualities.

Keywords Brinjal, Characterization, Landraces, Morphological, Organic condition.

Introduction

Brinjal (*Solanum melongena* L.) which is called as the “King of vegetables” [1] is an indigenous plant of India [2]. It is one of the most important and popular Solanaceous crops grown in India for vegetable purpose. The global interest in the development of cultivar has encouraged scientists for germplasm collection and preservation. An apparent priority can be recognized in the staple foods while it is difficult to ensure that valuable vegetable genetic resources are not lost because of their worldwide diversity in genera and species. Hence, these resources are of immense importance to plant breeders as reservoirs of genetic variation [3]. It is essential to characterize the brinjal genetic resources for the sake of developing strong and effective brinjal breeding programs [4]. While, it is impossible to identify a set of growth, floral and fruit characters for general characterization of brinjal due to high diversity in genus *Solanum* [5]. In open field cultivation using germplasm accessions as parents the resultant brinjal hybrids were competitive in production when compared with commercial hybrids. Furthermore, it also participates to boost up

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Table 1. Characterization of 19 landraces of brinjal for leaf and stem related qualitative traits.

Sl. No.	Land race name	Stem anthocyanin coloration	Leaf margin	Leaf blistering	Leaf blade color	Leaf vein color	Thorns on calyx	Thorns on stem	Thorns on leaves	Thorn color	Plant growth habit
1	Biliudda Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
2	Mullagai Badane	Absent	Sinuate	Absent	Green	Green	Present	Absent	Present	Green	Semi spreading
3	Bili Chendu Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
4	Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Semi spreading
5	Annigeri Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Semi spreading
6	Dodda Mullina Badane	Present	Sinuate	Absent	Green	Purple	Absent	Absent	Present	Purple	Semi spreading
7	Nati Badane	Absent	Dentate	Absent	Green	Green	Absent	Absent	Present	Purple	Semi spreading
8	Hasiru Kempu Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
9	Holesalu Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
10	40A Badane	Absent	Sinuate	Absent	Green	Green	Present	Absent	Absent	Absent	Semi spreading
11	Thailand Badane	Absent	Sinuate	Absent	Green	Green	Present	Present	Present	Green	Erect
12	Desi Jawari Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
13	Dorrel Badane	Absent	Sinuate	Absent	Green	Green	Present	Absent	Present	Green	Erect
14	Bili Gundu Badane	Present	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Erect
15	Bili Gundu Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Present	Green	Erect
16	Dodda Badane	Absent	Sinuate	Absent	Green	Green	Present	Absent	Absent	Absent	Erect
17	Sathaliya Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Present	Green	Erect
18	Sakaleshwar Badane	Absent	Sinuate	Absent	Green	Green	Present	Absent	Present	Green	Erect
19	Apple Badane	Absent	Sinuate	Absent	Green	Green	Absent	Absent	Absent	Absent	Spreading

biodiversity [6]. The characterization of 16 genotypes of local and exotic germplasms of brinjal helps to study variation present among them [7]. Morphological characterization of 94 solanum accessions for morphological parameters was helpful in assessing similarities or differences among accessions [8]. Considering the above facts, the present study was undertaken to characterize the brinjal landraces on the basis of morphological characters.

Materials and Methods

The material for the present study composed of 19

land races of brinjal collected in southern transitional zone of Karnataka. The experiment was conducted during *kharif* of 2015, at the experimental plots of Department of Genetics and Plant Breeding, University of Agricultural and Horticultural Sciences, Shivamogga. The experiment was carried out under organic condition where no chemical fertilizers and pesticides were applied. All the genotypes were maintained in three rows consisting 20 plants each with spacing of 75 × 60 cm. Observations were recorded on 21 qualitative traits—Leaf and stem related traits viz., stem anthocyanin coloration, leaf margin, leaf blistering, leaf blade color, leaf vein color, thorns on calyx, stem and leaves ; thorns color, plant growth

Table 2. Characterization of 19 landraces of brinjal for flower related qualitative traits.

Sl. No.	Land race name	Flower color	Stigma color	Style	Anthers	Flower size
1	Biliudda Badane	Purple	Parrot green	White	Dark yellow	Medium
2	Mullagai Badane	Purple	Parrot green	White	Dark yellow	Medium
3	Bili Chendu Badane	Purple	Parrot green	White	Dark yellow	Medium
4	Badane	Purple	Parrot green	White	Dark yellow	Large
5	Annigeri Badane	White	Parrot green	White	Dark yellow	Medium
6	Dodda Mullina Badane	Purple	Parrot green	White	Dark yellow	Medium
7	Nati Badane	Purple	Parrot green	White	Dark yellow	Medium
8	Hasiru Kempu Badane	Purple	Parrot green	White	Dark yellow	Medium
9	Holesalu Badane	Purple	Parrot green	Green	Dark yellow	Large
10	40 A Badane	Purple	Parrot green	White	Dark yellow	Medium
11	Thailand Badane	Purple	Parrot green	White	Dark yellow	Medium
12	Desi Jawari Badane	Purple	White	White	Dark yellow	Medium
13	Dorrel Badane	White	Parrot green	White	Dark yellow	Large
14	Bili Gundi Badane	Purple	Parrot green	White	Dark yellow	Medium
15	Bili Gundu Badane	Purple	Parrot green	White	Dark yellow	Medium
16	Dodda Badane	Purple	Parrot green	White	Dark yellow	Medium
17	Sathaliya Badane	Purple	Parrot green	White	Dark yellow	Medium
18	Sakaleshwar Badane	Purple	Parrot green	White	Dark yellow	Small
19	Apple Badane	Purple	Parrot green	White	Dark yellow	Medium

habit. Flower related traits viz., color of flower, stigma, style, anther, size of the flower. Fruit related traits viz., fruit color, fruiting habit, shape of fruit and fruit apex, fruit stripes, fruit glossiness at harvest maturity and six quantitative traits viz., plant height, leaf length, petiole length, leaf width, fruit length, stalk length.

Table 3. Characterization of 19 landraces of Brinjal for fruit related qualitative traits.

Sl. No.	Land race name	Fruiting habit	Fruit color	Fruit shape	Shape of fruit apex	Fruit stripes	Fruit glossiness at harvest maturity
1	Biliudda Badane	Solitary	White	Oblong	Rounded	Absent	Strong
2	Mullagai Badane	Solitary	Purple with green striped	Oblong	Rounded	Present	Strong
3	Bili Chendu Badane	Solitary	Green with white striped	Round	Rounded	Present	Weak
4	Badane	Solitary	Green with white striped	Oblong	Indented	Absent	Strong
5	Annigeri Badane	Solitary	Green color	Oblong	Flattened	Present	Medium
6	Dodda Mullina Badane	Solitary	Purple with green striped	Oblong	Flattened	Absent	Medium
7	Nati Badane	Solitary	Green with purple striped	Oblong	Flattened	Present	Weak
8	Hasiru Kempu Badane	Solitary	Green with purple striped	Oblong	Indented	Present	Strong
9	Holesalu Badane	Solitary	White	Oblong	Pointed	Absent	Weak
10	40A Badane	Solitary	Green with purple striped	Round	Indented	Present	Strong
11	Thailand Badane	Solitary	Green with white striped	Oblong	Rounded	Present	Medium
12	Desi Jawari Badane	Solitary	Green with white striped	Oblong	Flattened	Present	Weak
13	Dorrel Badane	Solitary	Green with white striped	Oblong	Indented	Present	Strong
14	Bili Gundi Badane	Solitary	White	Round	Indented	Present	Medium
15	Bili Gundu Badane	Solitary	Green with white striped	Round	Indented	Present	Strong
16	Dodda Badane	Solitary	Purple with white striped	Oblong	Indented	Present	Medium
17	Sathaliya Badane	Solitary	Purple with white striped	Round	Indented	Present	Strong
18	Sakaleshwar Badane	Cluster	Green with white striped	Cherry shape	Pointed	Present	Weak
19	Apple Badane	Solitary	Purple with white striped	Apple shape	Flattened	Absent	Medium

Table 4. Estimates of mean performance for quantitative traits in 19 landraces of brinjal.

Sl. No.	Land race name	Plant height	Leaf length	Petiole length	Leaf width	Fruit length	Stalk length
1	Biliudda Badane	71.00	10.63	1.62	4.91	12.17	3.83
2	Mullagai Badane	58.00	9.18	1.27	5.04	10.83	4.17
3	Bili Chendu Badane	78.80	10.17	1.30	5.63	10.17	3.70
4	Badane	53.80	10.78	1.39	5.94	11.17	2.83
5	Annigeri Badane	52.04	13.39	1.17	6.94	7.33	4.00
6	Dodda Mullina Badane	52.90	8.72	1.28	9.94	7.17	3.17
7	Nati Badane	50.40	9.83	1.33	5.17	8.33	3.17
8	Hasiru Kempu Badane	60.64	9.72	1.06	5.22	9.00	3.67
9	Holesalu Badane	59.00	10.81	1.41	6.09	8.33	3.33
10	40A Badane	50.80	10.37	1.82	4.58	9.33	4.00
11	Thailand Badane	52.60	10.10	1.92	5.17	6.33	2.17
12	Desi Jawari Badane	50.60	7.42	1.08	4.14	6.83	2.27
13	Dorrel Badane	63.20	12.32	1.03	6.92	9.00	3.07
14	Bili Gundi Badane	60.00	11.22	1.18	6.39	8.67	3.83
15	Bili Gundu Badane	55.40	9.11	1.23	4.74	5.67	2.50
16	Dodda Badane	60.20	11.52	1.59	5.11	6.80	3.50
17	Sathaliya Badane	65.40	8.36	1.16	4.59	6.17	2.37
18	Sakaleshwar Badane	58.00	8.17	1.06	4.61	8.17	3.50
19	Apple Badane	59.40	12.11	1.44	7.06	9.33	4.17

Average of 10 plants was considered for statistical studies on quantitative traits.

Results and Discussion

Qualitative traits

There was considerable variability observed for many qualitative traits.

Leaf and stem related traits

The details of leaf related traits in 19 genotypes were furnished in Table 1. The anthocyanin pigment is present in 'Dodda Mullina Badane' and 'Bili Gundi Badane' and absent in rest of the landraces. 'Nati

Badane' has dentate leaf margin and remaining all has sinuate type of leaf margin. Absence of leaf blistering is observed in all the genotypes. The leaf blade color was green. All genotypes have green leaf vein except 'Dodda Mullina Badane' which had purple veins. One of the most useful traits in brinjal is thorniness which is distributed all over the plant in stem, leaf, calyx. Nine landraces were thorn less and Thailand Badane has thorns all over its body, two genotypes had thorns on calyx and leaves, five had thorns on leaves only, two had thorns only on calyx. The land race 'Sakaleshwar Badane' had highest intensity of thorns on leaves. The color of the thorns was green in 8 genotypes and purple in two genotypes. These thorns will helps in pest control through non-preference mechanism. With respect to plant growth habit, 'Apple

Table 5. Estimates of descriptive statistics for quantitative traits in 19 landraces of brinjal.

Sl. No.	Traits	Mean \pm SE	Range		Standardized range	Phenotypic variance
			Min	Max		
1	Plant height (cm)	58.54 \pm 1.70	50.40	78.80	77.94	24.23
2	Leaf length (cm)	10.21 \pm 0.35	07.42	13.39	12.66	02.34
3	Petiole length (cm)	1.33 \pm 0.60	01.03	01.92	01.15	00.06
4	Leaf width (cm)	5.69 \pm 0.31	04.14	09.94	09.21	01.82
5	Fruit length (cm)	8.11 \pm 0.60	05.67	12.17	12.17	06.90
6	Stalk length (cm)	3.14 \pm 0.22	02.17	04.17	04.17	01.00

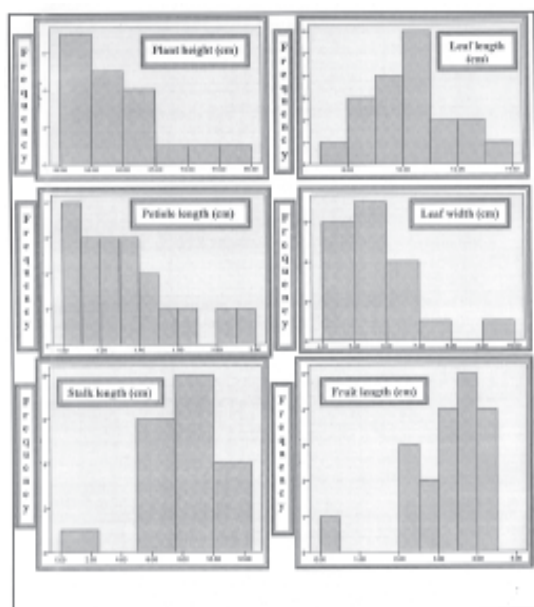


Fig. 1. Frequency distribution of 19 landraces of brinjal for six quantitative traits.

Badane' had spreading type, six were semi spreading and remaining 12 were erect type.

Flower related traits

The information regarding flower related qualitative traits is given in Table 2. The flower color of 17 genotypes was purple except 'Annigeri Badane' and 'Dorrel Badane' which was white colored; the stigma color of 18 genotypes was parrot green except 'Desi jawari Badane' which had white colored. Similarly 18 genotypes had white colored style with an exception of green color in 'Holesalu Badane'. The anther color of all the genotypes was found to be dark yellow. The size of the flower is found to be large in 3 genotypes, medium in 15 genotypes and only one had small flowers.

Fruit related traits

The complete detail of fruit related traits in 19 genotypes is furnished in Table 3. Among the 19 genotypes 18 had solitary and one had cluster type of fruit

habit. With respect to fruit color seven genotypes had green with white stripes, three genotypes fallen in each of white, green with purple, purple with white stripes respectively and only one had green fruits (Annigeri Badane). Fruit shape in 12 genotypes was oblong and five had round shape, one genotype had cherry shape and remaining had apple shaped fruits. In fruit apex shape, eight genotypes had indented, five had flattened, four had rounded and two had pointed shape. 14 had stripes on fruits. With respect to fruit glossiness at maturity eight were strong, six were medium and five were weak.

Quantitative traits

The estimates of mean performance of 19 landraces for six quantitative traits is furnished in Table 4. The descriptive statistics (Table 5) revealed that the plant height was ranged from 50.40 to 78.80 cm with an average 58.54 cm. The leaf length ranged from 7.42 to 13.39 cm with the mean of 10.21 cm. Petiole length ranged from 1.03 to 1.92 cm with the mean of 1.33 cm. The width of the leaf oscillated from 4.14 to 9.94 cm with the mean of 5.69 cm. The fruit length ranged from 5.67 to 12.17 cm with the mean of 8.11 cm whereas stalk length of fruits speculated from 2.17 to 4.17 cm with the mean of 3.14 cm. Highest standardized range and phenotypic variance was recorded for plant height indicated the presence high variability. Lowest standardized range and phenotypic variance recorded for petiole length indicated the lower variability. The frequency distribution of 19 landraces for six quantitative traits is shown in Figure 1; this will helps in graphical visualization of variability among the landraces. Similar studies were reported earlier [7, 8].

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