Vegetable Science (2026) 53(1): 60-67
doi: 10.61180/vegsci.2026.v53.i1.08
ISSN- 0970-6585 (Print), ISSN- 2455-7552 (Online)
www.isvsvegsci.in

RESEARCH ARTICLE

Genetic analysis of fruit shape, bearing habit and colour in brinjal (*Solanum melongena* L.)

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Abstract

The present investigation aimed to dissect the genetic architecture and mode of inheritance of key qualitative fruit traits (shape, bearing habit, and colour) in brinjal, in order to bridge the existing gap in integrated genetic information and enable the formulation of precise and efficient breeding strategies. The inheritance pattern of fruit shape, bearing habit and colour was studied in six genetic populations (P_1, P_2, F_1, F_2, BC_1P_1, BC_2P_2) generated from three crosses (Utkal Anushree × Bidhan Suphala; Utkal Anushree × Garia and Utkal Madhuri × Bidhan Super) involving parents bearing different fruit colour, bearing habit and shape. The inheritance pattern affecting the expression of a particular qualitative trait varied in different crosses. Monogenic inheritance with oblong/medium-long fruit dominant over oval/round fruit was involved in three crosses. However, the involvement of both major and minor genes in the expression of length and breadth of the fruit cannot be neglected. Fruit-bearing habit segregation of three crosses indicated solitary fruit-bearing habit was dominant over cluster-bearing habit and was controlled by a single dominant gene. The inheritance pattern of fruit colour in brinjal was rather complicated and conditioned either by monogenic dominant or dominant epistatic action with supplementary effects, where the genes responsible for purple and green colour display incomplete dominance that led to a reduction in the intensity of fruit colour. For the improvement of qualitative fruit traits, specific parental genotypes can be crossed and selections can be practiced for the desired genotypes.

Keywords: Brinjal, fruit colour, fruit shape, fruit bearing habit, $\chi 2$ test

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Citation: Bhattacharjee, T., Baul, D., Sengupta, S., & Chattopadhyay, A. (2026). Genetic analysis of fruit shape, bearing habit and colour in brinjal (*Solanum melongena* L.). Vegetable Science, 53(1), 60-67.

Source of support: Nil

Conflict of interest: None.

Received: 01/08/2025; **Revised:** 04/05/2026; **Accepted:** 20/05/2026

Introduction

Brinjal (*Solanum melongena* L.) can be grown round the year in almost all parts of the world except higher altitudes and plays a major role as source of stable income for the small and marginal farmers predominantly present in the tropics (Shende et al., 2016). Occurrence of wide diversity of local landraces of brinjal, and its wild relatives exists in India (Karihaloo et al., 2002, Shivashankar et al., 2025). Fruit colour, size, shape and taste are traits that show differences among diverse germplasm (Chattopadhyay et al., 2011; Dutta et al., 2018). Flower colour, hairiness, leaf shape, parthenocarpy, spines, resistance to pest and diseases exhibit a wide range of diversity in brinjal (Hazra et al., 2003; Daunay et al., 2001). Although numerous varieties have been developed through extensive breeding efforts over the past few decades, their adoption varies across regions due to differences in culinary requirements and consumer preferences for fruit colour, size, and shape (Maher et al., 2020).

For the improvement of market-oriented traits, a suitable breeding method with definite objectives can aid in the selection of desired genotypes (Sidhu et al., 2022). The breeder can only proceed for genetic improvement of such traits with confirmed knowledge about the mode of their inheritance. For a systematic breeding programme in any crop plant, an understanding of the inheritance pattern of qualitative characters is essential so that segregation populations can be handled effectively (Kamini et al., 2007). Although several studies have attempted to elucidate the inheritance of fruit shape, bearing habit, and fruit colour in brinjal (Kamani et al., 2007; Patidar, 2015; Prasad et al., 2015; Maher et al., 2020), the available information remains limited and often inconsistent.

The inheritance pattern of fruit colour was reported as monogenic, digenic, or polygenic (Kamini et al., 2007; Patidar, 2015; Liu et al., 2016) based on the colour of parents involved in the crosses. Fruit shape was under the control of a single gene with partial dominance of elongated or long fruits over round fruits (Aravindakshan, 2003). However, the involvement of one basic gene in complementation to the other three genes for fruit shape was also reported (Kamini et al., 2007). With regard to fruit bearing habit, monogenic dominance inheritance of solitary bearing habit over cluster bearing was observed (Kamini et al., 2007). However, Khapre et al. (1987) reported that solitary fruit bearing habit in brinjal was controlled by four complementary genes. Thus, there exists variation in opinions among the previous workers regarding the inheritance pattern of qualitative traits which necessitates further verification. The present investigation was undertaken with a view to study the inheritance of fruit shape, bearing habit and colour in three contracting crosses (Utkal Anushree × Bidhan Suphala, Utkal Anushree × Garia and Utkal Madhuri × Bidhan Super) involving parents bearing different fruit colour, bearing habit and shape in brinjal.

Materials and Methods

Plant materials and crossing method

Four bacterial wilt-tolerant lines, Utkal Anushree, Utkal Madhuri, Utkal Jyoti, and Utkal Tarini obtained from OUAT, Odisha, India, and five testers, Bidhan Suphala, Bidhan Supreme, Bidhan Super and Garia obtained from Bidhan Chandra Krishi Viswavidyalaya, West Bengal, and Punjab Sadabahar, obtained from Punjab Agriculture University, Ludhiana, India, were crossed in line × tester fashion without reciprocals during the autumn-winter season of 2020–2021. Twenty hybrids were transplanted in the 1st week of July 2020 in a research field of the All India Coordinated Research Project on Vegetable Crops, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India, at 23.5°N latitude and 89°E longitude at an elevation of 9.75 m above the mean sea level.

The F_1 hybrids derived from the three crosses, exhibiting contrasting qualitative fruit traits, were backcrossed to their respective parental lines (P_1, female and P_2, male) during September 2020-February 2021 in the following fashion to obtain backcross progenies BC_1 and BC_2, and were selfed to obtain F_2 progenies separately for the inheritance study of fruit shape, fruit colour, and fruit-bearing habit. Where, Cross-I: Utkal Anushree (oval-shaped, cluster-bearing, green-coloured fruit) × Bidhan Suphala (oblong-shaped, solitary-bearing, purple-coloured fruit); Cross-II: Utkal Anushree (oval-shaped, cluster bearing, green-coloured fruit) × Garia (oblong shaped, solitary-bearing, purple-coloured fruit); and Cross-III: Utkal Madhuri (medium long-shaped, cluster-bearing, green-coloured fruit) × Bidhan Super (round-shaped, solitary-bearing, deep purple-coloured fruit).

Field growing

The final experiment was arranged with the populations P_1, P_2, F_1, F_2, BC_1, and BC_2 of the crosses during July 2021-February 2022. Seed beds were prepared in a sandy loam soil that was 20 cm high and 1.0 m wide. Weathered cow manure was applied at 4 kg·m^{-2} into beds, which were drenched with chlorothalonil (2 g) + carbendazim (1 g·L^{-1}) to avoid damping off disease. Seeds, after treatment with Thiram (3 g·kg^{-1} of seed), were sown during the 1st week of August 2019 at a depth 1 cm, at 5 cm apart, and covered with finely sieved well-rotted leaf mold (leaves left to decompose for 2 year) to add organic matter and prevent soil from drying. After sowing, beds were covered with straw until germination, which normally takes 5 to 7 days and were hand watered everyday up to 3rd week of August 2021. Nursery beds were covered with a 200 µm ultraviolet (UV)-stabilized clear polyethylene film supported by bamboo poles with open sides to protect seedlings from rain and direct sunlight. Seedlings were hardened by withholding water 4 days before transplanting.

Cow manure @5 Mt·ha^{-1} and 150N:75P:75K kg·ha^{-1} was applied as per recommendation (Chattopadhyay et al., 2007). The entire quantity of manures along with P and K, and half of the N were applied at final soil preparation and the remainder of N top-dressed at 30 and 45 days after transplanting. Seedlings of all generations were transplanted in the main field at 75 × 75 cm spacing in a compact family block design with 3 replications. All crosses were treated as separate experiments, and randomization was within crosses between rows. Standard agronomic practices were followed to grow the crop (Chattopadhyay et al., 2007). The number of plants raised per generation and per replication for data recording was: 35 for P_1, P_2, and F_1; 150 for F_2; and 35 for BC_1 and BC_2.

Observations recorded

Observations on number of plants with fruit shape (long/oblong/round), number of plants with solitary vs. cluster fruit bearing habit, and number of plants with fruit colour (purple/deep/light green) color at marketable stage maturity were recorded from all plants of each plot in each replication.

Statistical analysis

Segregation of different fruit characters in F_2 and backcross generations was computed with chi-square (χ^2) following the software package INDOSTAT (ver. 8.1, Indostat services, Ameerpet, Hyderabad, India).

Results and Discussion

Inheritance pattern of fruit shape in brinjal

In the present study, 3 crosses were evaluated for fruit shape inheritance pattern. In the first cross, Utkal Anushree (oval shaped) × Bidhan Suphala (oblong shaped), the results of the inheritance pattern are given in Table 1. All F_1 plants showed oblong-shaped fruits which came from the parent Bidhan Suphala, indicating dominance nature of oblong-shaped fruit over oval-shaped fruit shape. A total of 150 F_2 plants were observed for fruit shape, out of which 121 plants had oblong fruits and 29 plants had oval fruits (Figure 1). These F_2 frequencies gave goodness of fit (χ^2 =2.568, p = 0.10-0.20) and BC1 (χ^2 = 0.257, p = 0.60–0.70) for expected ratio of 3:1 and 1:1, respectively, which suggested monogenic inheritance with oblong fruit dominant over round fruit (Table 1).

In the second cross Utkal Anushree (oval shaped) × Garia (oblong shaped), where in $F_{2,}$ out of 150 plants, 117 plants had oblong fruits and 33 plants had oval shaped fruits (Figure 1). These F_2 frequencies gave goodness of fit (χ^2 = 0.72, p = 0.30–0.40) for expected ratio of 3:1, thereby indicating involvement of single dominant gene with oblong fruit dominant over oval fruit.

In the third cross, Utkal Madhuri (medium-long shaped) × Bidhan Super (round shaped), all F_1 plants expressed medium-long shaped fruit which has come from the female parent, Utkal Madhuri. Out of 150 F_2 plants, 115 plants had oblong fruits and 35 plants had round fruits. These F_2 frequencies gave goodness of fit (χ^2 = 0.222, p = 0.60–0.70) and for expected ratio of 3:1 indicating the involvement of a single dominant gene with medium-long fruit dominant over round (Figure 1), which was further supported by an expected segregation pattern in BC_1 and BC_2 (χ^2 = 0.714, p = 0.30–0.40) generations in this cross.

Fruit shape is an important quantitative agronomic trait in many fruit bearing vegetable crops (Mangino et al., 2021). Although fruit shape can be affected by the environment, it is largely genetically determined (Wu et al., 2018; Pan et al., 2020). Together with fruit size, fruit shape was among the major traits under selection during the domestication of fruit-bearing crops, resulting in a broad diversity of fruit shapes in most of this cultivated species. The accurate study of the fruit shape requires objective

Table 1: Chi-square test for different genetic ratios in crosses involving different fruit shapes of brinjal

Cross combinations	*Generation*	*Number of plants with long/oblong fruits*	*Number of plants with oval or round fruits*	*Total plant population*	*Genetic ratio long : oval*	*X²*
Utkal anushree × bidhan suphala (Oval × long)	P_1	0	35	35	-	-
	P_2	35	0	35	-	-
	F_1	35	0	35	-	-
	F_2	121	29	150	3:1	2.568
	Bc_1[a]	27	8	35	1:0	∞
	Bc_2	19	16	35	1:1	0.257
Utkal anushree × garia (Oval × long)	P_1	0	35	35	-	
	P_2	35	0	35	-	
	F_1	35	0	35	-	
	F_2	139	11	150	15:1	0.300
	Bc_1	29	6	35	1:0	∞
	Bc_2	33	2	35	1:0	∞
Utkal madhuri × bcb-30 (Long × round)	P_1	35	0	35	-	-
	P_2	0	35	35	-	-
	F_1	35	0	35	-	-
	F_2	115	35	150	3:1	0.222
	Bc_1	30	5	35	1:0	∞
	Bc_2	15	20	35	1:1	0.714

[a]BC_1 = Back cross with P_1; BC_2 = Back cross with P_2

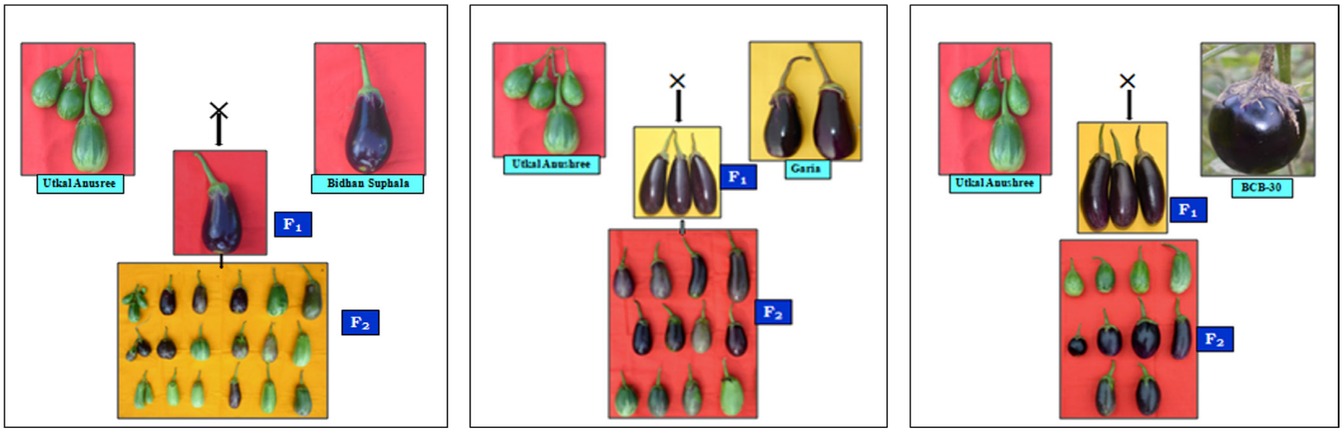

Figure 1: F_1 and F_2 segregates of the cross Utkal Anushree × Bidhan Suphala; Utkal Anushree × Garia and Utkal Anushree × BCB-30 for fruit shape and colour

and precise phenotypic analysis, requiring a detailed set of morphological descriptors (Brewer et al., 2006). However, fruit shape is frequently evaluated by measuring fruit length and width, and by identifying shape patterns that could be matched with qualitative descriptors (UPOV, 2017). Although these traits provide relevant information and are easily measurable, they do not allow a detailed characterization of the fruit shape (Costa et al., 2011).

In brinjal, fruit shape is also a relevant attribute that determines its commercial use and economic value. Brinjal fruits are fleshy berries commercially classified according to their shape. A wide diversity exists for fruit shape in eggplant (Wang et al., 2008; Hurtado et al., 2012). Current knowledge on the genetic basis of fruit shape in eggplant is largely derived from QTL mapping in a limited number of biparental populations and GWAS studies, which have consistently identified a few major loci. Notably, Doganlar et al. (2002) reported fruit shape QTLs on chromosomes E2 and E3, while Frary et al. (2014) detected major QTLs on chromosomes E2, E3, and E10 associated with fruit elongation and diameter. Portis et al. (2015), using both linkage mapping and GWAS approaches, identified significant QTLs on chromosomes E2, E3, E6, and E12, with a major and stable locus on E2 influencing fruit length-to-width ratio. Similarly, Wei et al. (2020) mapped key QTLs on chromosomes E2 and E8, further confirming the prominent role of E2 as a hotspot region controlling fruit shape. These studies collectively indicate that fruit shape in eggplant is largely governed by a few major QTLs, particularly clustered on chromosome E2, along with minor loci distributed across other chromosomes. Nunome et al. (2001) constructed a linkage map for fruit shape and colour development traits in brinjal based on RAPD and AFLP markers. The fruit shape showed a significant association with markers on linkage group 2 which is considered to be useful in marker assisted selection in brinjal breeding.

The present findings are in agreement with previous works done by Patil & More (1983) and Gopinath et al. (1986) who reported that oblong fruit shape was partially dominant over round fruit shape. Complicated gene expression (four complementary genes or possibly two supplementary genes as well as two genes in duplicate fashion) for this trait has also been reported (Kamani et al., 2007; Maher et al., 2020) which might be due to the varying number of genes among the parental lines used in an inheritance study depending on relationship between parents. The size of fruits in segregating populations was affected by the type of parents involved in the hybridization. For the generation of F_1 hybrids based on fruit shape, we should either select both the parents with oblong fruits or we can cross a parent with oval/round fruits to a parent with medium-long/long fruits for the oblong type. In quantitative inheritance in brinjal, fruit length and fruit breadth were strongly affected by dominant genes. It reveals more length and breadth of the fruit in parents, as in cross III [Utkal Madhuri (medium-long shaped) × Bidhan Super (round shaped)], is showing the dominance of both the traits. In contrast, crosses of parents with more length and less breadth, as in crosses I and II [(Utkal Anushree (oval shaped) × Bidhan Suphala (oblong shaped); Utkal Anushree (oval shaped) × Garia (oblong shaped)], are showing the dominance of fruit length only. Our results were in accordance with the findings of Sidhu et al. (2022) who observed the involvement of both major and minor genes in the expression of fruit shape that cannot be neglected. For the improvement of fruit shape, length and breadth specific parental genotypes such as long × long, round × round, round × long can be crossed and selections can be practiced for the desired genotypes.

Inheritance pattern of fruit bearing habit in brinjal

In the present study, all F_1 plants in three crosses Utkal Anushree × Bidhan Suphala, Utkal Anushree × Garia and Utkal Madhuri × Bidhan Super had solitary pattern of fruit bearing habit (Table 2). The F_2 generation of the first cross (Utkal Anushree × Bidhan Suphala) segregated into 119 solitary: 31 clustered fruits, which showed a good fit to 3

Table 2: Chi-square test for different genetic ratios in crosses involving different fruit bearing habits of brinjal

Cross combinations	*Generation*	*Number of plants with solitary fruit bearing habit*	*Number of plants with cluster fruit bearing habit*	*Total plant population*	*Genetic ratio solitary: cluster*	χ^2
Utkal Anushree × Bidhan Suphala (Cluster × Solitary)	P_1	0	35	35	-	-
	P_2	35	0	35	-	-
	F_1	19	16	35	-	-
	F_2	119	31	150	3:1	1.502
	BC_1[a]	31	4	35	1:0	∞
	BC_2	18	17	35	1:1	0.028
Utkal Anushree × Garia (Cluster × Solitary)	P_1	0	35	35	-	
	P_2	35	0	35	-	
	F_1	35	0	35	-	
	F_2	140	10	150	15:1	0.044
	BC_1	30	5	35	1:0	∞
	BC_2	31	4	35	1:0	∞
Utkal Madhuri × BCB-30 (Cluster × Solitary)	P_1	0	35	35	-	-
	P_2	35	0	35	-	-
	F_1	35	0	35	-	-
	F_2	141	9	150	15:1	0.016
	BC_1	34	1	35	1:0	∞
	BC_2	35	0	35	1:0	∞

[a]BC_1 = Back cross with P_1; BC_2 = Back cross with P_2

solitary: 1 clustered ratio (χ^2 =1.502, p = 0.40-0.50). In second cross Utkal Anushree × Garia, F_2 generation of this cross segregated into 115 solitary and 35 clustered fruits (3:1) (χ^2 = 0.223, p = 0.60-0.70), and also in third cross Utkal Madhuri × Bidhan Super, F_2 generation segregated in the ratio of 112 solitary: 38 clustered (3:1) and gave good to fit (χ^2 = 0.009, p = 0.90–0.95), suggested the monogenic dominance inheritance of solitary fruit bearing character over cluster bearing habit. The backcrosses to the recessive parents (BC_1) produced the expected 1:1 ratio for a single dominant gene in all the three crosses (Table 2).

The inflorescence of brinjal is solitary, axillary, umbellate cyme or helicoid cyme. The flower is bracteate or ebracteate, pedicellate, complete, actinomorphic, pentamerous and hypognous. Dash et al. (2019) reported three flowering patterns (solitary, cyme and mixed) in brinjal. Brinjal flowers are divided into four types based on the length of style. These are long styled, medium styled, short styled and pseudo-short styled (Thamburaj & Singh, 2001).

The present findings corroborated with the results Kamani et al. (2007) and Stommel & Griesbach (2008) who also found solitary fruit bearing habit was dominant over cluster bearing habit in brinjal and was controlled by a single dominant gene. However, Khapre et al. (1987) reported that solitary fruit bearing habit in brinjal was controlled by four complementary genes.

Inheritance pattern of fruit colour in brinjal

In this present study, segregation ratio of different fruit colour segregates in F_2 and backcross generations of three crosses is presented in Table 3. Fruits of F_2 plants in cross-I [Utkal Anushree (green) × Bidhan Suphala (purple)] segregated into three phenotypic classes as the frequencies of 114 purple (P), 41 green (G) and 7 light green (LG) in colour, which gave the best fit for expected ratio of 12:3:1(P:G:LG) (Figure-1). These F_2 frequencies gave goodness of fit (χ^2 = 1.04, p = 0.50–0.60) for expected ratio of 12:3:1 and BC_1 (χ^2 = 0.371, p = 0.80–0.90) and BC_2 similarly gave goodness to fit with expected ratio of 2:1:1 and 1:0, respectively. Similarly, in the F_2 generation of the cross-II [Utkal Madhuri (green) × Bidhan Super (deep purple)], fruits of 150 plants segregated into 110 purple, 31 green and 9 light green in colour which also fitted good for 12:3:1 segregation ratio with F_2 frequencies gave goodness of fit (χ^2 = 0.364, p = 0.80-0.90) (Figure 1). These ratios demonstrated dominant epistasis inheritance for fruit colour. When a dominant allele at one locus can mask the expression of both alleles (dominant and recessive) at another locus, it is known as dominant epistasis.

Table 3: Chi-square test for different genetic ratios in crosses involving different fruit colours of brinjal

Cross combinations	*Generation*	*Number of plants with purple colour fruits*	*Number of plants with deep green colour fruits*	*Number of plants with light green colour fruits*	*Total plant population*	*Genetic ratio solitary: cluster*	χ^2
Utkal Anushree × Bidhan Suphala (Deep green × Purple)	P_1	0	35	0	35	-	-
	P_2	35	0	0	35	-	-
	F_1	19	16	0	35	-	-
	F_2	108	33	9	150	12:3:1	1.04
	BC_1[a]	33	2	0	35	1:0	∞
	BC_2	19	16	0	35	1:1	0.257
Utkal Anushree × Garia (Deep green × Purple)	P_1	0	35	0	35	-	
	P_2	35	0	0	35	-	
	F_1	35	0	0	35	-	
	F_2	86	64	0	150	9:7	0.071
	BC_1	33	2	0	35	1:0	∞
	BC_2	16	19	0	35	1:1	0.257
Utkal Madhuri × BCB-30 (Deep green × Purple)	P_1	0	35	0	35	-	-
	P_2	35	0	0	35	-	-
	F_1	19	16	0	35	-	-
	F_2	110	31	9	150	12:3:1	0.364
	BC_1	34	1	0	35	1:0	∞
	BC_2	20	15	0	35	1:1	0.714

[a]BC_1 = Back cross with P_1; BC_2 = Back cross with P_2

In other words, the expression of one dominant or recessive allele is masked by another dominant gene. Such inheritance for fruit colour was also reported by Bhanushree et al. (2018) using different parental lines of brinjal.

In the cross Utkal Anushree (green) × Garia (purple), fruits of F_2 plants segregated into two phenotypic classes as the frequencies of 112 purple and 38 green in colour out of 150 plants, which gave goodness of fit ($\chi^2 = 0.009$, $p = 0.90$-0.95) for expected ratio of 3:1 and BC_1 ($\chi^2 = 0.258$, $p = 0.60$-0.70) and BC_2 similarly gave goodness to fit with expected ratio of 1:1 and 1:0, respectively (Figure 1). These findings are in agreement with the previous reports of More et al. (1982) and Kamaniet al. (2007) who observed purple fruit colour was governed by a single dominant gene.

Diverse fruit colours before physiological maturity are found in brinjal. Except white fruited type, two main pigments, anthocyanin and chlorophyll are involved in the fruit colour (Daunay et al., 2004). The violate colour of fruit is due to presence of anthocyanin pigments located in the cell vacuoles of the fruit skin. The more cell layers contain the pigments and the more pigments, darker the fruit. The main aglycone of anthocyanins is the delphinidol, of bluish-violate colour. Fruit colour is also influenced by the presence or absence of chlorophyll pigments (chlorophyll a and b) which are located in the sub-epidermal cell layers. In absence of anthocyanins or slight presence of chlorophyll pigments, the green colour of fruit can be seen directly. When anthocyanins are present in high concentrations, they obscure chlorophyll, making its detection difficult. If the distribution of both pigments is not uniform, the fruit colour may be reticulated (netted), striped, or irregular.

Different types of gene actions have been reported for inheritance of fruit colour in brinjal (Kamini et al., 2007; Pang et al., 2008; Patidar, 2015; Liu et al., 2016). In the present study, fruit colour showed dominant epistasis in two crosses and monogenetic inheritance in one cross. It is possible that gene interactions for fruit colour were lost and a monogenic control for fruit colour evolved in certain genotypic group of brinjal. Gopinath et al. (1986) also observed complex inheritance for fruit colour in brinjal utilizing different parental materials having contrasting fruit colour. Overall, the inheritance of fruit colour was complex in brinjal, but segregation behaviour of three crosses highlighted monogenic or trigenic (purple, green, and light green) control with supplementary effects, where the genes responsible for purple and green colour display incomplete dominance that led to a reduction in the intensity of colour in fruits. Therefore the homozygous and heterozygous condition of three genes in various combinations along with interactions results in different shades of the fruits in brinjal. For the improvement of fruit colour in brinjal, specific contrasting parents can be selected along with other horticultural traits. The combination of dark or shining purple and light green genotypes can give rise to the development of a variety of colours in F_2, but all these genotypes are not homozygous for colour at this stage. Therefore, the selection for this trait can be delayed to the F_3 or F_4 generation of selfing. The intensity of the purple colour can be increased by backcross with the dark coloured parent. For the development of white or green genotypes, parents involving these colours can be used.

Conclusion

The inheritance pattern indicated that fruit shape and bearing habit in brinjal were conditioned by single dominant gene. The dominance of oblong/long fruit shape over oval/round fruit and solitary bearing habit over cluster bearing habit was found. Involvement of at least one parent having oblong/long fruit shape with solitary bearing habit is the best option for developing desired hybrids in brinjal. Monogenic dominant or trigenic with dominant epistatic action were involved in inheritance pattern of fruit color. Manifestation of fruit colour in the segregating generations (F_2) of two crosses (Utkal Anushree × Bidhan Suphala and Utkal Madhuri × Bidhan Super) did not follow a simple Mendelian inheritance; hence, high selection pressure is expected in later generations due to successful exploitation of additive and dominance components for the concerned character. For the improvement of fruit colour, specific contrasting parents could be selected along with desirable horticultural traits and selections could be exercised for the desired genotypes.

Acknowledgments

We acknowledge the Project Coordinator, AICRP on Vegetable Crops, ICAR-IIVR, Varanasi, and Officer-in-Charge, AICRP on Vegetable Crops, OUAT, Bhubaneswar, India for providing genetic materials for the present study.

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सारांश

वर्तमान अध्ययन का उद्देश्य बैंगन में प्रमुख गुणात्मक फल लक्षणों (आकार, फलने की आदत और रंग) की आनुवंशिक संरचना और वंशागति के तरीके का विश्लेषण करना था, ताकि एकीकृत आनुवंशिक जानकारी में मौजूद कमी को दूर किया जा सके और सटीक एवं प्रभावी प्रजनन रणनीतियों को तैयार किया जा सके। फल के आकार, फलने की आदत और रंग की वंशागति का अध्ययन छह आनुवंशिक आबादी (P_1, P_2, F_1, F_2, BC_1P_1, BC_2P_2) में किया गया, जो तीन संकरणों (उत्कल अनुश्री × बिधान सुफला; उत्कल अनुश्री × गरिया और उत्कल माधुरी × बिधान सुपर) से उत्पन्न हुई थीं, जिनमें अलग-अलग रंग, फलने की आदत और आकार वाले जनक शामिल थे। एक विशिष्ट गुणात्मक लक्षण की अभिव्यक्ति को प्रभावित करने वाला वंशागति पैटर्न विभिन्न संकरणों में भिन्न था। तीन संकरणों में आयताकार/मध्यम-लंबे फल का अंडाकार/गोल फल पर प्रभुत्व वाला एकलिंगी वंशागति शामिल था। हालांकि, फल की लंबाई और चौड़ाई की अभिव्यक्ति में प्रमुख और गौण दोनों जीनों की भूमिका को नजरअंदाज नहीं किया जा सकता है। तीन संकरणों के फल धारण करने की प्रवृत्ति के पृथक्करण से पता चला कि एकल फल धारण करने की प्रवृत्ति गुच्छों में फल धारण करने की प्रवृत्ति पर प्रभावी थी और एक ही प्रभावी जीन द्वारा नियंत्रित थी। बैंगन में फल के रंग का वंशानुक्रम पैटर्न काफी जटिल था और यह या तो एकलिंगी प्रभावी या प्रभावी उपवंशानुगत क्रिया द्वारा पूरक प्रभावों के साथ निर्धारित होता था, जहां बैंगनी और हरे रंग के लिए जिम्मेदार जीन अपूर्ण प्रभाविता प्रदर्शित करते हैं, जिसके परिणामस्वरूप फल के रंग की तीव्रता में कमी आती है। मात्रात्मक लक्षणों में सुधार के लिए, विशिष्ट जनक जीनोटाइपों का संकरण कराया जा सकता है और वांछित जीनोटाइपों के लिए चयन प्रक्रिया अपनाई जा सकती है।