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Short communication

Inheritance of corolla shape and fruit shape at blossom end in chilli (*Capsicum annuum* L.)

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Abstract

Fruit characteristics are important in chilli (*Capsicum annuum* L.) as it decides the market preference of the produce. Inheritance of the qualitative traits *viz*., corolla shape and fruit shape at blossom end, were studied in parental, F_1 and F_2 generationsof two selected chilli hybrids *viz*., Anugraha x KAU 445 and KAU 451 x KAU 445. Campanulate shaped corolla was dominant over rotate, and blunt fruit apex was dominant over pointed apex. Both these traits segregated in 9:7 ratio in F_2 generation revealing the complementary gene interaction involving two genes.

Keywords: Capsicum**,** Complementary gene interaction, Dominance, F_2 generation

Chilli (*Capsicum annuum* L.) is an important vegetable as well as spice crop grown in tropical and sub-tropical regions. It displays significant diversity and vast variability (Walsh and Hoot, 2001; Adetula and Olakojo, 2006; Bozokalfa et al., 2009). Huge diversity in this crop had often confused the taxonomists in the past. The diversity is prominent in the case of fruit size, shape, colour, and pungency. These differences are important in deciding the market preferences, and hence commercially significant. Thus, understanding the genetic diversity and phenotypic variability available in the germplasm and studying the genetics of fruit characteristics are important for chilli improvement (Thul et al., 2009). In chilli, corolla is commonly rotate or rarely campanulate shaped, with variation in colours (Walsh and Hoot, 2001). Fruit length ranges from 2 to 20 cm, with thin, long to conical, and blocky shapes (Joshi et al., 2020). Blossom end of fruit may be pointed, blunt or sunken (IPGRI, 1995). This communication discusses the inheritance of corolla shape and fruit shape at blossom end in chilli using parental, F_1 and F_2 generations.

The experiment was conducted at Kerala Agricultural University, Vellanikkara, Thrissur, located at 10°32’46" N latitude and 76°16’44" E longitude, 26 meters above mean sea level. Materials used in the study included one released variety Anugraha, two germplasm lines *viz*., KAU 445 and KAU 451, their F_1s and F_2 generations (Table 1, 2 and 3). All the parental lines, belonging to *C. annuum* were made homozygous by repeated self-pollination for five generations. Parental lines and F_1s were raised during July, 2023to January, 2024 in Randomized Block Design with four replications and observations were recorded from five plants from each replication. Individual plants in F_1 generation were ensured self-pollination to raise F_2 generation. F_2s of two

Table 1. Alternate phenotypes of parental lines for corolla shape and fruit shape at blossom end

Sl. No.	Qualitative character	Alternate phenotype	Parents
1	Corolla shape	Campanulate	Anugraha, KAU 451
		Rotate	KAU 445
2	Fruit shape at blossom end	Pointed	Anugraha, KAU 451
		Blunt	KAU 445

Table 2. Phenotypes of F_1 generation for corolla shape and fruit shape at blossom end

Sl. No.	Qualitative character	F_1 genotype	F_1 phenotype
1	Corolla shape	Anugraha x KAU 445	Campanulate
		KAU 445 x Anugraha	
		KAU 445 x KAU 451	
		KAU 451 x KAU 445	
2	Fruit shape at blossom end	Anugraha x KAU 445	Blunt
		KAU 445 x Anugraha	
		KAU 445 x KAU 451	
		KAU 451 x KAU 445	

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Table 3. Inheritance pattern of corolla shape and fruit shape at blossom end in selected F_2(Anugraha x KAU 445 and KAU 451 x KAU 445) generations

Sl. No.	Qualitative character	F_2 population of genotype	Phenotypes	$\times^2_{cal}$ value	$\times^2_{table}$ value (1, 0.05)
1	Corolla shape	Anugraha x KAU 445	60 Campanulate; 48 Rotate	0.88	3.84
		KAU 451 x KAU 445	49 Campanulate; 41 rotate	0.64	3.84
2	Fruit shape at blossom end	Anugraha x KAU 445	46 Blunt;40 Pointed	0.61	3.84
		KAU 451 x KAU 445	38 Blunt;25 Pointed	0.52	3.84

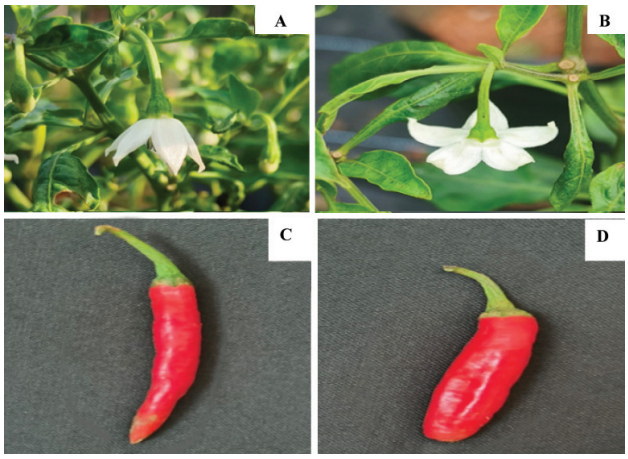

Figure 1. Variability in corolla shape and shape of fruit blossom end in F_2 plants of KAU 451 x KAU 445 **A**- Campanulate corolla **B**- Rotate corolla **C**- Pointed blossom end of fruit **D**- Blunt blossom end of fruit

selected crosses (Anugraha x KAU 445 and KAU 451 x KAU 445) were raised during March to August, 2024. Corolla shape and fruit shape at blossom end were recorded from 20 plants among parents and F_1s. Among F_2 generation of Anugraha x KAU 445, corolla shape and fruit shape at blossom end were recorded from 108 and 86 plants, respectively. With respect to F_2 generation of KAU 451 x KAU 445, observations were recorded from 90 and 63 plants, respectivelyfor corolla shape and fruit shape at blossom end. The segregation pattern in F_2 generation was analysed using the chi-square (χ^2) test to assess the conformity of observed segregation ratio with expected complementary epistasis ratio.

The corolla shape and fruit shape at blossom end in the parental lines and their F_1s are presented in Table 1 and 2, respectively. Campanulate corolla was dominant over rotate shaped and blunt fruit blossom end was dominant over pointed apex. F_2 generation segregated in 9:7 ratio for both traits revealing complementary epistasis involving two genes (Table 3). Campanulate corolla and blunt fruit blossom end would be expressed when dominant alleles of both genes were present together. Alternate phenotypes i.e., rotate corolla and pointed fruit blossom end would be expressed when alleles of either one or both genes were present in recessive condition.

Deshpande (1933) reported monogenetic inheritance of fruit shape at blossom end in chilli. Bal et al. (1995) reported 1 pointed: 2 mixed: 1 blunt segregation ratio in F_2 generation indicating incomplete dominance of two alleles of a single gene for the above trait. Srivastava *et al*. (2019) reported duplicate gene interaction for the same trait with 15 pointed: 1 blunt ratio. These findings highlight the genetic complexity and varying inheritance patterns of fruit shape at the blossom end in chilli due to differences in allelic expression pattern and varying gene operating mechanisms according to differences in genotypes studied.

Present study revealed that corolla shape and fruit shape at blossom end in chilli are controlled by two genes acting in complementary manner. Being oligogenic traits, selection for the desired phenotype in these traits is comparatively easy.

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