Journal of Spices and Aromatic Crops 10 (1) : 41-43 (2001)

Transfer of clustered and upright fruit characters into two popular chilli cultivars of Tamil Nadu

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Received 10 November 2000; Revised 14 September 2001; Accepted 12 November 2001.

Abstract

Transfer of two agronomically desirable characters from CA-33 and CA-219 to two popular chilli cultivars, G-4 and CO-2, was attempted. The F_1 hybrids and their segregating population, F_2, BC_1 and BC_2 were raised to determine the gene action in respect of the fruit orientation and clustered fruit character. The results revealed that genes responsible for the clustered fruit character are monogenic while, the upright fruit character is digenic, controlled by two genes with dominant and recessive epistasis.

Key words: chilli, digenic, gene action, monogenic, segregation.

Intervarietal transfer of genes for desirable characters has been a standard practice in several crops. This approach enables the breeder to determine the inheritance of specific characters and to manipulate the genes. Commercial chilli varieties, G-4 and CO-2 are high yielders and popular in Tamil Nadu with dichotomous growth pattern resulting in the production of solitary fruit at each node which have to be harvested individually, requiring more time and labour force, ultimately increasing the cost of cultivation. CA-33 (KAU-cluster) and CA-219 (Ujwala) are cluster fruit bearing accessions and fruits of these genotypes are upright and borne mainly in the periphery and suited for mechanical harvest (Saccardo 1984; Syed & Bagavandass 1980). In the present study an attempt was made to transfer these characters from the chilli varieties CA-33 and CA-219 to popular chilli varieties and to study the nature of their inheritance.

Field experiments were carried out during 1999-2000, at Department of Botany, Bharathiar University, Coimbatore. The seeds of G-4 and CO-2 varieties were procured from Tamil Nadu Agricultural University, Coimbatore and that of CA-33 and CA-219 from Kerala Agricultural University, Vellanikkara, Kerala. Crosses involving these four parents G-4, CO-2 (female parents) and CA-33, CA-219 (male parents) were made during May- June 1999. Part of the F_1 was utilized to raise BC_1 and BC_2 by crossing the F_1 and BC_1 hybrids with respective recurrent parents during October-January 1999-2000 and May-June 2000. The F_1, F_2, BC_1 and BC_2 generations were studied to know the inheritance of these characters and the data are presented in Table 1.

All the F_1 plants in the four cross combinations namely, G-4 x CA-33, G-4 x CA-219, CO-2 x CA-33 and CO-2 x CA-219 were solitary fruit

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Table 1. Inheritance of fruit characters in chilli (*Capsicum annuum* L.)

Cross	Observed number of plants			Gentetic ratio	X^2	P*	Observed number of plants			Genetic ratio	X^2	P*
	Solitary	Clustered	Total				Pendulous	Upright	Total			
G-4 x CA-33 F_1	52	0	52	-	-	-	28	0	28	-	-	-
F_2	281	92	373	3:1	0.0223	0.80-0.90	176	61	237	3:1	0.069	0.70-0.80
BC_1	197	6	203	1:0	-	-	155	7	162	1:0	-	-
BC_2	145	127	272	1:1	1.191	0.20-0.30	121	98	219	1:1	2.415	0.10-0.20
G-4 x CA-219F_1	57	0	57	-	-	-	62	0	62	-	-	-
F_2	247	76	323	3:1	0.3725	0.50-070	306	91	397	13:3	4.536	0.02-0.05
BC_1	311	14	325	1:0	-	-	277	6	283	1:0	-	-
BC_2	188	136	324	1:1	8.344	0.001-0.01	99	116	215	1:1	1.344	0.20-0.30
Co-2 x CA-33F_1	22	0	22	-	-	-	39	0	39	-	-	-
F_2	135	44	179	3:1	0.016	0.80-0.90	148	43	191	3:1	0.629	0.30-0.50
BC_1	117	9	126	1:0	-	-	116	0	116	1:0	-	-
BC_2	90	51	141	1:1	10.78	0.001-0.01	103	102	215	1:1	0.377	0.50-0.70
Co-2 x CA-219 F_1	46	0	46	-	-	-	50	0	250	-	-	-
F_2	195	64	259	3:1	0.012	0.90-0.95	278	72	350	13:3	0.762	0.30-0.50
BC_1	108	5	113	1:0	-	-	253	4	257	1:0	-	-
BC_2	126	134	260	1:1	0.246	0.50-0.70	116	121	237	1:1	0.105	0.70-0.80

* Probability : P = 0.05%

bearing plants indicating the dominance of solitary fruit character over the clustered fruit character. In G-4 x CA-33 cross, the F_2 plants segregated into 281 plants with solitary and 92 plants with clustered fruit that fitted the expected genetic ratio of 3 : 1. In BC_1 generation, out of 203 plants, 197 plants were with solitary fruits and only 6 plants were with clustered fruits, which fitted the segregation ratio of 1 : 0. BC_2 generation segregated into 145 solitary fruited plants and 127 clustered plants fitting 1 : 1 genetic ratio. In case of the cross G-4 x CA-219, F_2 plants segregated in to 247 solitary and 76 clustered fruit plants, exhibiting the expected ratio of 3 : 1. BC_1 plants segregated in to 311 solitary and 14 cluster fruit plants which fitted 1 : 0 ratio. In BC_2 generation the expected ratio of 1 : 1 was obtained from 188 solitary and 136 clustered fruit plants. In case of CO-2 x CA-33, F_2 plants segregated into 135 solitary and 14 clustered fruit plants giving the expected ratio of 3 : 1 while BC_1 plants segre-gated into 117 solitary and 9 cluster fruited plants exhibiting 1 : 0 ratio. The BC_2 generation showed 1 : 1 ratio with 90 solitary and 51 clustered fruited plants. In the cross of CO-2 x CA-219, F_2 plants expressed the genetic ratio of 3 : 1 from 195 solitary and 64 cluster fruited plants while in BC_1, 108 solitary and 5 cluster fruited plants exhibited genetic ratio of 1 : 0. In BC_2 generation the segregation ratio obtained was 1 : 1 from 126 solitary and 134 cluster fruited plants. The present results confirmed monogenic recessive nature of clustered fruit bearing character. These results are in agreement with earlier reports of Mc Common & Honma (1984), Okitsu *et al.* (1984), Gopalakrishnan *et al.* (1989) and Ahamed *et al.* (1994).

Inheritance of the upright fruit character reveals that all the F_1 hybrids obtained from the four cross combinations namely, G-4 x CA-33, G-4 x CA-219, CO-2 x CA33 and CO-2 x CA-219 were pendulous which indicated its dominance over the upright fruit character (Table1). In F_2 generation of the cross G-4 x CA-33, a total 237 plants segregated into 176 pendulous and 61 upright fruited plants fitting the ratio of 3 : 1, while 162 BC_1 plants fitted the ratio of 1 : 0 from 155 pendulous and 7 upright fruit plants. In BC_2, 121 pendulous and 98 upright fruit plants fitted the ratio of 1 : 1. However, in the cross involving G-4 x CA-219, out of 397 F_2 plants, 306 were pendulous and 91 were upright fruited plants expressing a digenic ratio of 13 : 3 indicating that the fruit habit in chilli is controlled by two genes with dominant and recessive epistasis. In CO-2 x CA-33, out of 191 F_2 plants, 148 were pendulous and 43 upright fruited exhibiting 3 : 1 ratio and all the 166 BC_1 plants were pendulous fruited plants thus fitting into the ratio of 1 : 0, while the BC_2 produced 103 pendulous and 112 upright fruited plants fitting in to the ratio of 1 : 1. However, in the crosses involving CO-2 x 219, among the 350 F_2 plants, 278 were having pendulous and 72 were with upright fruits suggesting the genetic ratio of 13 : 3, which again indicated the epistatic gene interaction and out of 257 BC_1 plants, 253 planting with pendulous and four were with upright fruits, clearly fitting in to the ratio of 1 : 0. The BC_2 fitted 1 : 1 ratio from 166 pendulous and 121 upright fruits.

References

Ahamed N, Tanki M I & Bhat M Y 1994 Genetics of fruit habit and clusterness in chilli (*Capsicum annuum* L.). Veg. Sci. 21 (2) : 148-150.

Gopalakrishnan T R, Gopalakrishnan P K & Peter K V 1989 Inheritance of clusterness and fruit orientation in chilli (*Capsicum annuum* L.) Indian J. Genet. 49 : 219-222.

Mc Common K R & Honma S 1984 Genetics of the umbrella branching habit in *Capsicum annuum* L. Theor. Appl. Genet. 68 : 541-545.

Okitsu S, Honda F, Yamato M, Niiuchi K & Ota S 1984 Breeding of new cultivars of hot pepper (*Capsicum annuum* L.). Veg.Ornamental Crop Res. Sta. C. Kurume Bull. 7 : 25-33.

Saccardo F 1984 The latest on breeding peppers for processing. Informat Agric. 37 : 18287-18290.

Syed S & Bagavandass M 1980 Inheritance studies in chilli (*Capsicum annuum* L.). South Indian Hort. 28 : 31.