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Short Communication

Effect of Fruiting Habit Traits on Fruit Yield and Its Contributing Traits in Chilli (*Capsicum annuum* L.)

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ABSTRACT: *Chilli (Capsicum annuum L.) produces fruits with varying orientation and number at each node. They are considered as fruiting habit traits in chilli. Farmer, producer and consumer preference for fruiting habit traits varies from region to region. For increased acceptability by farmers and consumers, high yielding cultivars should be bred with preferred fruiting habit traits. An investigation was carried out to study the influence of fruiting habit traits on fruit yield and its components in chilli at Bengaluru, India. The F2 individuals derived from crosses involving parents differing for single or both fruiting habit traits were grouped into fruiting habit classes. The means of fruiting habit classes in F2 populations were compared and statistically tested. The non-significant mean differences of fruiting habit classes for fruit yield and its components indicated lack of influence of fruiting habit traits on fruit yield and its components.*

Keywords*: Fruiting habit traits, fruits per node, orientation, yield per plant*

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most important commercial and spice crops of India. Chilli produces fruits with varying orientation and number referred to as fruiting habit. Fruit orientation is either pendant or erect (Lee *et al*., 2008) and number of fruits at a node is either one (solitary) or more than one (clustered). The fruit orientation is inherited by a recessive gene in chilli (Lee, 1994). Farmer/producer and consumer preferences for fruiting habit varies from region to region in India. Hence, fruit yield, the edible/economic product need to be maximized under preferred fruit habit background. We hypothesize that fruit yield in chilli is not affected by fruit habit. Thus, it should be possible to develop high fruit yielding cultivars with preferred combination of fruit habit. Therefore, the present study was carried out to test the hypothesis.

METHODOLOGY

Evaluation of experimental material

Six genotypes (Utkal Awa (UA), CMS 6B, CMS 10B, Phule Jyothi (PJ), Pusa Sadabahar (PS) and Japani Long (JL)) showing four distinct fruiting habit traits, solitary erect (SE), solitary

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pendant (SP), clustered erect (CE) and clustered pendant (CP) (Table 1) were chosen for the study.

Experimental material

Six genotypes were used to generate four types of crosses (CE × SE, CP × SP, SE × CP and CE × SP) (Table 2) in a polyhouse during 2015 growing season. The plants of four types of crosses were grown and selfed to develop F_2 populations during 2016 summer at the experimental plots of the Department of Genetics and Plant Breeding (GPB), University of Agricultural Sciences (UAS), Bengaluru, India. The F_2 population derived from four types of crosses involving six parental genotypes were the experimental material.

Table 1. Fruiting habit traits of the genotypes used in the study

Genotype	Source	Fruiting habit
Utkal Awa	OUAT, Bhubaneshvar, India	Solitary and erect fruits
CMS 6B	AVRDC, Taiwan	Solitary and pendant fruits
CMS 10B	AVRDC, Taiwan	Solitary and pendant fruits
Phule Jyothi	MPKV, Rahuri, India	Clustered and pendant fruits
Pusa Sadabahar	Pusa, New Delhi, India	Clustered and erect fruits
Japani long	Pusa, New Delhi, India	Clustered and erect fruits

Evaluation of experimental material

Forty day old seedlings of F_2 generations were planted during the growing season in 2016 and 2017 by maintaining a spacing of 0.75 m between rows and 0.45 m between plants within a row at the experimental plots of the Department of GPB, UAS, Bengaluru, India. Upon fruiting, the plants in each F_2 population were grouped into different fruiting habit classes *i.e.* SE, SP, CE and CP based on visual assessment. Data were recorded on all individual plants in each fruiting habit class in F_2 generations for fruit length, average fruit weight, fruits per plant and green fruit yield. The two crosses (JL × UA and PJ × CMS 10B) which differed for single fruiting habit trait (fruits per node) segregated into two fruiting habit classes (3SE and 1CE, and 3SP and 1CP, respectively) in F_2 generation. On the other hand, other two crosses (UA × PJ and PS × CMS 6B) which differed for two fruiting habit traits (fruits per node and fruit orientation) segregated into four fruiting habit classes (9SP, 3CP, 3SE and 1CE).

Table 2. Types of crosses generated in the experiment

Crosses	Type of cross
Japani Long (JL) × Utkal Awa (UA)	Clustered Erect (CE) × Solitary Erect (SE)
Phule Jyothi (PJ) × CMS 10B	Clustered Pendant (CP) × Solitary Pendant (SP)
Utkal Awa (UA) × Phule Jyothi (PJ)	Solitary Erect (SE) × Clustered Pendant (CP)
Pusa sadabahar (PS) × CMS 6B	Clustered Erect (CE) × Solitary Pendant (SP)

Statistical analysis

The average fruit yield and its component traits of the F_2 individuals classified under two fruiting habit classes and four fruiting habit classes were computed. The significant differences in average fruit yield and its component traits between two fruiting habit classes namely, (1) cluster and single, and (2) pendent and erect were examined using two sample t-test. Significance of differences in fruit yield and its component traits between four fruiting habit classes namely, (1) clustered-erect, (2) clustered-pendent, (3) single-erect and (4) single-pendent was examined using F-test (Fisher, 1950). Non significance and significance of t and F tests indicate lack of influence and significant influence of fruiting habit traits on fruit yield and its component traits, respectively.

RESULTS AND DISCUSSION

The average fruit number, average fruit weight, fruit length and green fruit yield per plant in F_2 populations varied with the type of cross (parental combinations) and also with the fruit habit class in both seasons (Table 3). The magnitude of average fruit weight, fruit number per plant, fruit length and green fruit yield per plant were higher in F_2 generations derived from PJ × CMS 10B compared to those in the F_2 generations derived from three other crosses in both seasons. These results clearly indicated the need for preferential allocation of resources for evaluation of segregating generations derived from PJ × CMS 10B for selection of genotypes with desired combination of fruiting habit traits coupled with higher green fruit yield. In F_2 generations derived from JL × UA and PJ × CMS 10B crosses, the average fruit length, fruits per plant, average fruit weight and green fruit yield per plant were comparable between CE and SE, and SP and CP fruiting habit classes, respectively as indicated by non-significance of two sample t-test (Table 3, Fig.1).

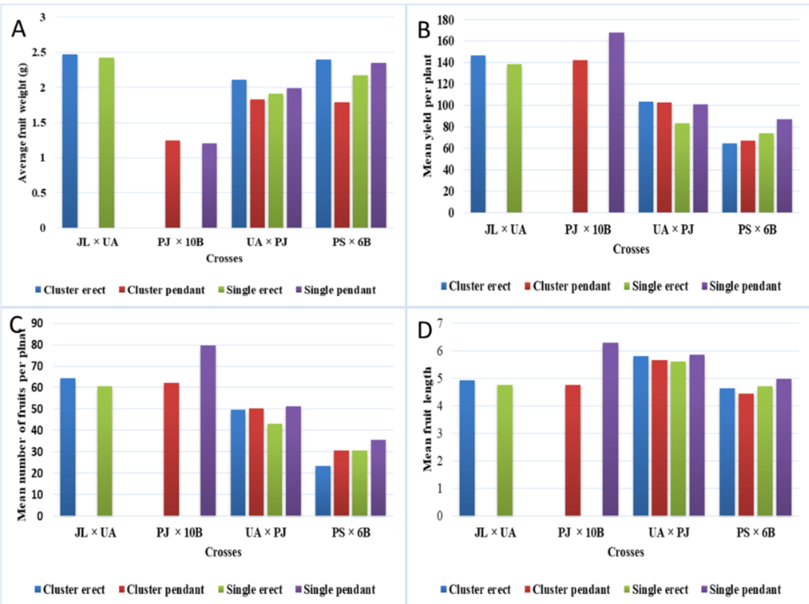

Figure 1. Average (A) fruit weight, (B) fruit yield, (C) number of fruits per plant and (D) fruit length of the F2 genotypes grouped under different fruiting habit classes

Table 1. Relationship of fruit habit traits with fruit yield and its component traits of four crosses in chilli over two seasons

Cross	Season	Phenotype Class	Fruit length (cm)		Fruits per plant		Average fruit weight (g)		Green fruit yield per plant (g)	
			Mean	P	Mean	P	Mean	P	Mean	P
JL × UA	2016	CE	3.80	0.73	47.76	0.88	3.09	0.78	147.96	0.96
		SE	3.86		48.57		3.07		148.83	
	2017	CE	6.13	0.01	80.84	0.28	1.90	0.18	153.95	0.07
		SE	5.64		72.60		1.79		127.97	
PJ × CMS 10B	2016	SP	8.10	0.14	77.94	0.46	2.08	0.94	166.61	0.60
		CP	7.58		86.35		2.07		182.44	
	2017	SP	6.69	0.82	102.26	0.40	2.12	0.12	214.18	0.73
		CP	6.74		93.27		2.28		206.10	
UA × PJ	2016	SP	5.84	0.61	50.20	0.77	2.00	0.25	100.38	0.45
		SE	5.72		51.36		1.89		94.60	
		CP	6.10		60.23		2.18		134.31	
		CE	5.73		60.90		1.95		118.75	
	2017	SP	5.88	0.57	52.23	0.39	1.99	0.11	101.83	0.52
		SE	6.02		39.62		2.11		80.82	
		CP	5.70		47.96		1.75		84.36	
		CE	5.92		38.61		2.28		84.36	
PS × CMS 6B	2016	SP	6.99	0.45	31.71	0.68	4.62	0.71	122.53	0.83
		SE	6.27		39.01		4.10		123.83	
		CP	7.08		28.29		4.02		109.20	
		CE	6.70		16.61		5.05		82.00	
	2017	SP	7.40	0.94	33.90	0.92	3.54	0.92	113.00	0.86
		SE	7.58		34.01		3.61		114.25	
		CP	7.32		30.10		3.64		101.17	
		CE	7.20		33.80		3.17		97.00	

Similarly, in F_2 generations derived from UA × PJ and PS × CMS 6B crosses, the average fruit length, fruits per plant, average fruit weight and green fruit yield per plant were comparable among SP, SE, CP and CE fruiting habit classes as indicated by non-significance of F-tests (Table 3 and Figure.1).

These results have significant bearing on developing high fruit yielding chilli cultivars. It is possible to develop high yielding cultivars with any fruiting habit trait as preferred by different consumer preference segments. Further, as both fruit orientation (Dhamayanthi and Reddy, 2001) and fruits per node (Gopalakrishnan *et al.*, 1989) are monogenically controlled, they could be used as diagnostic descriptors for germplasm characterization and purity assessment, for identifying duplicates in the germplasm, testing true hybridity of crosses and finger printing the varieties for protection of intellectual property associated with their development.

CONCLUSIONS

Our study suggested lack of effect of fruit habit traits on fruit yield and its component traits.

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