Characterization of *Capsicum* spp. Germplasm

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A total of 53 accessions of *Capsicum* spp. collected from Kanyakumari district of Tamil Nadu was characterized for 38 characters. The frequency was very high for four characters *viz*. absence of anthocyanin spots over fruits, neck at base of fruit and fruit blossom end appendage, and lanceolate-shaped cotyledonous leaf. Predominance of single descriptor state was found in more than 50 per cent accession for 25 characters. Wide variability was exhibited in all the quantitative characters studied except for the trait fruit bearing period. Importance of studied characters in utilization is narrated.

Key words: Chilli, Characterization, Utilization, Western Ghats

Hot pepper (Capsicum annuum L.) is one of the most commercially grown vegetables in the tropics. It was probably introduced by Portuguese into southern parts of India as evidenced by the fact that there were only three races of chilli being cultivated in India by the year 1642 AD (Heiser, 1976). Cultivation spread throughout the country by the end of 19th century. Due to continuous selection, long history of cultivation and popularity of the crop, sufficient genetic variability has been generated. Now India is believed to be one of the secondary centres of diversity for Capsicum annuum L. (Gupta et al., 1996). Other species occurring in India include C. frutescens L. (Hooker, 1885) and C. baccatum L. var. pendulum (IBPGR, 1983). Rich variability in morphological traits in hot pepper occurs throughout India particularly in the south Peninsular region, north eastern foothills of Himalayas and Gangetic plains. Gupta et al. (1996) reported that the germplasm collection of chilli is prioritised owing to its cultivated status, widespread distribution, high variability and moderate genetic erosion status. Kanyakumari district of Tamil Nadu (8°03' to 8°35'N latitude & 77°15' to 77°36'E longitude) lies relatively nearer to equator and covers a part of Western Ghats, experiencing typical tropical humid climate with an average rainfall of 1450mm. Under National Agricultural Technology Project on Plant Biodiversity (1999-2004), a huge variation in plant, leaf, flower and seed characters available in the entire district was collected. In this study, the germplasm accessions assembled in the Department of Vegetable Crops, Horticultural College and Research Institute (HC&RI), Coimbatore were characterized for 38 traits.

Indian J. Plant Genet. Resour. 19(2): 180-183 (2006)

Investigation was carried out at the orchard of Horticultural College and Research Institute, TNAU, Coimbatore during December 2001 and May 2002. All the 53 accessions collected from Kanyakumari district of Tamil Nadu were included in the study. The experiment was laid out in a completely randomized design (pot culture) involving three replications with a minimum of ten plants per treatment (accession). Forty five day old seedlings were transplanted into pot (one seedling/pot) which consists of four kg substrate containing a mixture of loam soil and farmyard manure in the ratio of 3:1. Recommended cultural practices were taken up during the study period. A total of 38 characters (Tables 1 & 2) including few quantitative ones useful for management, maintenance and utilization of germplasm were characterized by adopting the descriptor jointly developed by IPGRI, AVRDC and CATIE (1995). In case of quantitative characters, mean value of five observations in each treatment was taken into account. Frequency distribution of various qualitative characters and variability parameters for quantitative characters were worked out.

Characterization of germplasm indicated that out of 32 qualitative characters studied, the frequency was very high (96.23%) for four characters *viz.* absence of anthocyanin spots over fruits, neck at base of fruit and fruit blossom end appendage followed by lanceolate cotyledonous leaf shape (94.34). Frequency was high (>80%) in traits like purple hypocotyl, number of locules per fruit and lengthy placenta i.e. placenta more than half the length of fruit. More than 50 per cent of germplasm accessions exhibited solitary erect flowers, white-coloured corolla spot, campanulate-shaped corolla,

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1 2

					11	Anther colour		
S.	Descriptor state	Descriptor	Absolute	Relative		White	1	-
No.	,	code	frequency	percentage		Yellow	2	-
1	2	3				Pale blue	3	36
• 	2	5	4			Blue	4	7
l	Hypocotyl colour					Purple	5	10
	White	1		-		Other	6	-
	Green	2	8	15.09	12	Filament colour		
	Purple	3	45	84.91		White	1	19
2	Hypocotyl pubescence					Yellow	2	5
	Sparse	3	25	47.17		Green	3	-
	Intermediate	5	26	49.06		Blue	4	-
	Dense	7	2	3.77		Light purple	5	-
3	Cotyledonous leaf colour					Purole	6	20
	Light green	1	-	-		Other	7	23
	Green	2	20	37 74	13	Calvy nigmontation	/	-
	Dark green	2	20	51.14	15	A baant	0	2
	Light purple	4	14	26.42		Absent	0	.34
	D sala	4	14	20.42	• •	Present	1	IS
	Purple	5	6	11.32	14	Calyx margin		_
	Dark purple	6	13	24.53		Entire	1	2
	Variegated	7	-	-		Intermediate	2	22
	Yellow	8		-		Dentate	3	29
	Other	9		-		Other	4	-
4	Cotyledonous leaf shape				15	Anthocyanin spots or st	ripes over	fruits
	Deltoid	1	-	-		Absent	0	51
	Ovate	2	_	-		Present	1	2
	Lanceolate	3	50	94.34	16	Fruit colour at intermed	liate stage	
	Elong-deltoid	4	3	5.66		White	ı	_
5	Stem colour		5	5.00		Yellow	2	10
	Green	1	13	24.53		Green	3	11
	Green with purple stripes	2	15	40.06		Orange	4	
	Dumle	2	20	49.00		Purple	5	37
	Purple	3	14	26.42		Deen purple	6	52
	Other	4	_			Other	7	-
6	Number of flowers per ax	11			17	Eruit sot	/	-
	One	1	32	60.38	17	Fruit Set	2	10
	Two	2	12	22.64		Low	3	10
	Three or more	3	8	15.09		Intermediate	2	.30
	Many flowers in bunch	4	-	-		High	/	13
	Others	5	1	1.89	18	Fruit colour at mature	stage	
7	Flower position					White	I	
	Pendant	3	7	13.21		Lemon-yellow	2	-
	intermediate	5	10	18.87		Pale orange-yellow	3	
	Frect	7	36	67.92		Orange-yellow	4	1
8	Corolla colour	•	50	07.72		Pale Orange	5	
0	White		10	22.06		Orange	6	3
		1	10	33.90		Light red	7	5
	Light yenow	2	15	28.3		Red	8	28
	reliow	3	-			Dark red	9	16
	Yellow-green	4	_			Purple	10	_
	Purple with white base	5	9	16.98		Brown	11	_
	White with purple base	6	-	-		Black	12	_
	White with purple margin	7	-	-		Other	12	
	Purple	8	20	37.74	10	Emit shape	15	
	Other	9		_	19	Fluit shape		10
9	Corolla spot colour					Elongate	i 2	18
	White	1	27	50.94		Almost round	2	10
	Yellow	2	3	5 66		Triangular	3	12
	Green-vellow	3	16	30.19		Campanulate	4	1
	Green	4	10	50.17		Blocky	5	12
	Dumlo	4	-	-		Other	6	-
		3	1	13.21	20	Fruit shape at pedicel a	ttachment	
	Other	6	-	-		Acute	I	-
10	Corolla shape					Obtuse	2	20
	Rotate	I	21	39.62		Truncate	3	30
	Campanulate	2	32	60.38		Cordate	4	3
	Other	3	-	_		Labata		

Table 1. Frequency distribution of 53 accessions of Capsicum spp. for different descriptors

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67.92

13.21

18.87

35.85

9.43

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54.72

-

64.15

35.85

3.77

41.51

54.72

96.23

3.77

_

18.87

20.75

60.38 _

18.87

56.60

24.53

_

_

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1.89

5.66 9.43

52.83

30.19

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-

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-

33.96

18.87 22.64

1.89

22.64

-

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37.74

56.60 5.66

-

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21 Neck at base of fruit Absent 0 51 96.23 Present 1 2 37 22 Fruit shape at blossom end 1 33 62.26 Blunt 2 19 35.85 Sunken 3 1 1.89 Sunken and pointed 4 - - - 0ther 5 - - 23 Fruit blossom end appendage . . Absent 0 51 96.23 Present 1 2 3.77 . 79.25 . Intermediate 5 9 16.98 Corrugated 3 42 79.25 .	ī	2	3	4	5				
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Wrinkled 3 12 22.64 31 Seed size 5 40 75.47 Intermediate 5 40 75.47 Large 7 6 11.32 32 Number of seeds per fruit		Rough	2	2	3.77				
31 Seed size Small 3 7 13.21 Intermediate 5 40 75.47 Large 7 6 11.32 32 Number of seeds per fruit - - <20 1 6 11.32 20-50 2 22 41.51 >50 3 25 47.17		Wrinkled	3	12	22.64				
Small 3 7 13.21 Intermediate 5 40 75.47 Large 7 6 11.32 32 Number of seeds per fruit - - <20 1 6 11.32 20-50 2 22 41.51 >50 3 25 47.17	31	Seed size							
Intermediate 5 40 75.47 Large 7 6 11.32 32 Number of seeds per fruit		Small	3	7	13.21				
Large 7 6 11.32 32 Number of seeds per fruit - - <20 1 6 11.32 20-50 2 22 41.51 >50 3 25 47.17		Intermediate	5	40	75.47				
32 Number of seeds per fruit 1 6 11.32 20-50 2 22 41.51 >50 3 25 47.17		Large	7	6	11.32				
<20	32	Number of seeds per fruit							
20-50 2 22 41.51 >50 3 25 47.17		<20	l	6	11.32				
>50 3 25 47.17		20-50	2	22	41.51				
		>50	3	25	47.17				

pale blue anther, purple filament colour, no pigmentation in calyx, dentate calyx margin, purple fruit color at intermediate stage, medium fruit set, red fruit color at maturity stage, truncate-shape at pedicel attachment with fruit, pointed fruits at blossom end, slightly corrugated fruits with smooth surface, medium pedicel persistence with ripe fruit, and deep yellow, medium sized and smooth seeds. All the descriptor states mentioned in IPGRI, AVRDC and CATIE (1995) were exhibited by characters viz. hypocotyl pubescence, flower position, calyx pigmentation, presence or absence of anthocyanin spots over fruits, neck at base of fruits and fruit blossom end appendages, fruit set, fruit crosssectional corrugation, fruit surface texture, seed size and number of seeds per fruit indicating wide diversity existed in the studied germplasm for those characters.

The study also showed that in the germplasm, wide variability (>15% CV) was exhibited in all the quantitative characteristics studied (Table 2) except for one character i.e. the fruit bearing period. Fruit length varied from 1.23 to 8.10cm whereas width from 0.83 to 3.10cm. The main objective of this characterization study is two fold viz. to have an easy and quick discrimination of phenotypes; the other is to simply correlate with practical utilization. In this regard, those traits expressed in seedling stage such as hypocotyl and cotyledonous leaf color, hypocotyl pubescence, stem color before transplanting can be utilized to know and discard any varietal admixture at a very early stage, or as a marker for early selection of hybrid provided genetics of these traits known. Thin walled fruits dry quickly hence may be of good use for dry chilli purpose. Smooth fruit surface is well preferred for canning purpose. Capsaicin content is more in placenta followed by seeds, and hence, accessions with lengthy placenta and more number of seeds per fruit may be useful in breeding for high pungency. Rajagopal and Muthukrishnan (1977) also reported the importance of high seed weight in breeding high pungent chilli.

Table 2. Variability parameters for different quantitative traits in 53 Capsicum spp. accessions

Feature	Fruit bearing period	Fruit length (cm)	Fruit width (cm)	Fruit pedicel length (cm)	Fruit wall thickness (mm)	Seed diameter (mm)
Mean ± SE	65.33 ± 0.76	3.26 ± 0.22	1.75 ± 0.07	2.46 ± 0.07	1.50 ± 0.07	3.15 ± 0.09
Range	80.00 - 54.33	8.10 - 1.23	3.10 - 0.83	3.60 - 1.37	2.50 - 0.50	4.53 - 2.03
CV (%)	8.62	50.47	29.46	22.25	33.62	20.25

Indian J. Plant Genet. Resour. 19(2): 180-183 (2006)

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