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PERFORMANCE OF CHILLI (*CAPSICUM ANNUUM* L.) GENOTYPES FOR YIELD AND YIELD ATTRIBUTING TRAITS

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Abstract

An experiment was conducted during *kharif* 2012-13 at Horticultural Research Station, Lam, Guntur, Andhra Pradesh (India) to identify potential genotypes for ten quantitative traits among sixty three genotypes of chilli (*Capsicum annuum* L.). The analysis of variance revealed significant differences among the genotypes for all the ten characters indicating the presence of genetic variability among the genotypes. Among sixty three genotypes, the genotype LCA-720 recorded maximum plant height whereas the genotypes, Pusa Sadabahar and Pandava recorded the highest number of primary branches per plant. The genotype LCA-709 recorded earlier flowering while the maximum fruit set per cent was observed for LCA-746. The genotype LCA-706 recorded maximum fruits per plant, whereas the maximum fruit length was observed for the genotype LCA-740. The genotype Warangal Chapatta recorded highest fruit diameter, dry fruit weight and number of seeds per fruit, whereas the genotype LCA-625 recorded highest dry fruit yield per plant.

Key words : *Capsicum annuum* L., chilli, genotypes, yield.

Introduction

Chilli (*Capsicum annuum* L.) is a member of the Solanaceae family, originated from South and Central America. Chilli is an indispensable spice due to its pungency, taste, appealing colour and flavor and has its unique place in the diet as a vegetable cum spice crop. India is the largest producer, consumer and exporter of chilli in the world with an annual production of 1.30 million tonnes from 0.79 million ha with production share of 22.72% (N. H. B., 2012-13). Andhra Pradesh leads the country in its production, productivity and export followed by Karnataka, West Bengal, Madhya Pradesh and Orissa.

The alkaloid 'capsaicin' present in placenta of the chilli fruit responsible for its pungency has diverse prophylactic and therapeutic uses in Allopathic and Ayurvedic medicine (Sumathy and Mathew, 1984) and directly scavenge various free radicals (Reddy and Lokesh, 1992; Kogure *et al*., 2002; Bhattacharya *et al*., 2010) and has wide applications in the food, medicine and pharmaceutical industries. Chilli is a good source of vitamin C (ascorbic acid) used in food and beverage industries (Bosland and Votava, 2000). It has also acquired a great importance because of the presence of 'oleoresin', which permits better distribution of color and flavor in foods.

The assessment of nature and magnitude of variability in the available germplasm is the prerequisite of any breeding programme. The effectiveness of selection and development of improved varieties depends on the nature of variability expressed for yield and its contributing characters in the gene pool. High yield and yield contributing characters with improved quality parameters have been the major objective of chilli breeding programme. The importance of genetically diverse genotypes with desirable combinations has also been realized by several workers (Peter and Rai, 1978; Das *et al*., 1998). Keeping in view the above facts, the present investigation was undertaken to observe the performance of genotypes of chilli for quantitative traits and to screen the best performing genotypes for utilization in further breeding programme.

Materials and Methods

The investigation was carried out during *kharif* 2012-13 at Horticultural Research Station, Lam, Guntur with 63 genotypes of chilli (*Capsicum annuum* L.) (table 1)

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Table 1 : List of chilli genotypes used in the experiment and their source.

Treatment	Accession number	Source
T_1	G-3	HRS, Lam farm, Guntur
T_2	G-4	HRS, Lam farm, Guntur
T_3	G-5	HRS, Lam farm, Guntur
T_4	LCA-206	HRS, Lam farm, Guntur
T_5	LCA-235	HRS, Lam farm, Guntur
T_6	LCA-305	HRS, Lam farm, Guntur
T_7	LCA-315	HRS, Lam farm, Guntur
T_8	LCA-353	HRS, Lam farm, Guntur
T_9	LCA-357	HRS, Lam farm, Guntur
T_{10}	LCA-424	HRS, Lam farm, Guntur
T_{11}	LCA-436	HRS, Lam farm, Guntur
T_{12}	LCA-620	HRS, Lam farm, Guntur
T_{13}	LCA-625	HRS, Lam farm, Guntur
T_{14}	LCA-702	HRS, Lam farm, Guntur
T_{15}	LCA-703	HRS, Lam farm, Guntur
T_{16}	LCA-704	HRS, Lam farm, Guntur
T_{17}	LCA-705	HRS, Lam farm, Guntur
T_{18}	LCA-706	HRS, Lam farm, Guntur
T_{19}	LCA-707	HRS, Lam farm, Guntur
T_{20}	LCA-708	HRS, Lam farm, Guntur
T_{21}	LCA-709	HRS, Lam farm, Guntur
T_{22}	LCA-710	HRS, Lam farm, Guntur
T_{23}	LCA-711	HRS, Lam farm, Guntur
T_{24}	LCA-712	HRS, Lam farm, Guntur
T_{25}	LCA-713	HRS, Lam farm, Guntur
T_{26}	LCA-714	HRS, Lam farm, Guntur
T_{27}	LCA-715	HRS, Lam farm, Guntur
T_{28}	LCA-716	HRS, Lam farm, Guntur
T_{29}	LCA-718	HRS, Lam farm, Guntur
T_{30}	LCA-720	HRS, Lam farm, Guntur
T_{31}	LCA-722	HRS, Lam farm, Guntur
T_{32}	LCA-724	HRS, Lam farm, Guntur
T_{33}	LCA-726	HRS, Lam farm, Guntur
T_{34}	LCA-728	HRS, Lam farm, Guntur
T_{35}	LCA-730	HRS, Lam farm, Guntur
T_{36}	LCA-732	HRS, Lam farm, Guntur
T_{37}	LCA-734	HRS, Lam farm, Guntur
T_{38}	LCA-736	HRS, Lam farm, Guntur
T_{39}	LCA-738	HRS, Lam farm, Guntur
T_{40}	LCA-740	HRS, Lam farm, Guntur
T_{41}	LCA-742	HRS, Lam farm, Guntur
T_{42}	LCA-744	HRS, Lam farm, Guntur
T_{43}	LCA-746	HRS, Lam farm, Guntur
T_{44}	LCA-748	HRS, Lam farm, Guntur
T_{45}	LCA-750	HRS, Lam farm, Guntur
T_{46}	LCA-752	HRS, Lam farm, Guntur
T_{47}	LCA-754	HRS, Lam farm, Guntur
T_{48}	LCA-756	HRS, Lam farm, Guntur
T_{49}	LCA-758	HRS, Lam farm, Guntur
T_{50}	LCA-760	HRS, Lam farm, Guntur
T_{51}	LCA-762	HRS, Lam farm, Guntur
T_{52}	CA-960	HRS, Lam farm, Guntur
T_{53}	HC-28	HAU, Hisar
T_{54}	KT-I	IARI, Katrain
T_{55}	Aparna	HRS, Lam farm, Guntur
T_{56}	Pandava	Local collection, Guntur
T_{57}	Pant C-1	GBPUA&T, Pantnagar
T_{58}	Phule Jyoti	MPKV, Rahuri
T_{59}	Punjab Gucchedar	PAU, Ludhiana
T_{60}	Pusa Sadabahar	IARI, New Delhi
T_{61}	Super-10	Local collection, Guntur
T_{62}	Warangal Chapata	Local collection, Warangal
T_{63}	LCA-334	HRS, Lam farm, Guntur

in a randomized block design with two replications. The nursery was raised during last week of July and the seedlings were transplanted at a spacing of 75 cm × 30 cm in a row of 4 m length during first fortnight of September. Each row consisted of 12 plants, of which five competitive plants were selected at random for recording the observations on plant height (cm), number of primary branches per plant, days to 50 per cent flowering, fruit set per cent, number of fruits per plant, fruit diameter (cm), fruit length (cm), average dry fruit weight (g), number of seeds per fruit and dry fruit yield per plant (g). The crop was raised as per the recommended package of practices. Analysis of variance was carried out as per the procedure given by Panse and Sukhatme (1985).

Results and Discussion

The analysis of variance (table 2) revealed significant differences among the genotypes for all the ten characters studied indicating the presence of genetic variability in the genotypes and considerable scope for their

Table 2 : Analysis of variance for quantitative characters in chilli (*Capsicum annuum* L.).

S. no.	Character	Mean sum of squares		
		Replications	Genotypes	Error
1.	Plant height (cm)	28.097	563.376**	43.543
2.	Number of primary branches per plant	0.701	1.117**	0.219
3.	Days to 50 per cent flowering	1.341	25.422**	3.954
4.	Fruit set per cent	176.198*	501.725**	39.198
5.	Number of fruits per plant	409.320	9125.453**	634.339
6.	Fruit diameter (cm)	0.024**	0.276**	0.0007
7.	Fruit length (cm)	0.956*	6.022**	0.234
8.	Average dry fruit weight (g)	0.00002	0.369**	0.028
9.	Number of seeds per fruit	1.28	580.326**	80.323
10.	Dry fruit yield per plant (g)	2143.226	3553.576**	541.662

*: Significant at 5% level, **: Significant at 1% level.

improvement. These results are in conformity with earlier reports of Vani *et al*. (2007), Farhad *et al*. (2008), Gupta *et al*. (2009), Suryakumari *et al*. (2010), Kumar *et al*. (2012) and Rajyalakshmi and Vijayapadma (2012) in chilli.

The plant height ranged from 49.95cm to 127.75cm with a mean of 87.17 cm. The genotype LCA-720 recorded maximum plant height (127.75 cm) followed by LCA-707 (117.30cm) while the genotype LCA-305 recorded the minimum plant height (49.95cm). The number of primary branches per plant was in the range of 2.3 to 5.3 with a mean of 3.61. The genotypes, Pusa Sadabahar and Pandava recorded the highest number of primary branches (5.3) followed by LCA-710 (5.2), while the lowest was observed for LCA-708 (2.3) (table 3). These results are in line with findings of Munshi *et al*. (2010) and Nehru *et al*. (2012), who also reported highest variability for above traits.

Days to 50 per cent flowering ranged from 24 to 42 with a mean of 31.42 days. The genotype HC-28 recorded maximum no. of days to 50 per cent flowering (42) followed by LCA-756 (39), while LCA-709 (24) and Pusa Sadabahar (25.50) were the earliest to flower (table 3). Bharadwaj *et al*. (2007), Tembhurne *et al*. (2008) and Arup *et al*. (2011) reported same trends of flowering in chilli. The fruit set per cent varied from 17 to 87 with a mean of 50.50. The maximum fruit set per cent was observed for LCA-746 (87) followed by LCA-720 (78.5) and LCA-353 (78), whereas the minimum per cent was recorded G-3 (17) preceded by LCA-728 (18) and LCA-707 (19) (table 3). These results are in agreement with findings of Krishna *et al*. (2007), who also reported wider range for fruit set per cent.

The number of fruits per plant ranged from 49.8 to 480 with a mean of 172.48. This trait exhibited maximum mean value for the genotype LCA-706 (480) followed by LCA-625 (334.30) while the minimum mean value was recorded for Warangal Chapatta (49.8) preceded by LCA-707 (71.90). The fruit length had the range of 4.06cm to 12.97cm with a mean of 8.65cm. The maximum fruit length was observed for the genotype LCA-740 (12.97cm) followed by KT-1 (11.83cm) and LCA-742 (11.81cm) while the minimum was recorded by Pant C-1 (4.06cm) preceded by G-5 (4.66cm) and HC-28 (4.89cm) (table 3). Padhar and Zaveri (2010), Arup *et al.* (2011), Lakshmi and Padma (2012) and Vijaya *et al*. (2014) also reported same trend of range for number of fruits and fruit length.

The range of fruit diameter varied from 0.76cm to 3.17cm with a mean of 1.35 cm. The maximum diameter was recorded by the genotype Warangal Chapatta (3.17cm) followed by LCA-702 (2.12cm) and LCA-708 (2.04cm), whereas the minimum diameter was recorded by LCA-756 (0.76cm) preceded by LCA-724 (0.82cm). The range of dry fruit weight varied from 0.5g to 3.35g with a mean of 1.09g. The maximum fruit weight was noticed in Warangal Chapatta (3.35g) followed by LCA-720 (1.93g) and LCA-702 (1.86g) and the minimum was in LCA-756 (0.50g) preceded by Punjab Gucchedar (0.51g), LCA-710 (0.54g) and LCA-714 (0.55g) (Table 3). These findings were in accordance with earlier reports of Singh *et al*. (2009) and Gupta *et al*. (2009). The number of seeds per fruit was ranged from 32.8 to 152.5 with a mean of 61.36. The highest mean performance for this trait was recorded for genotype Warangal Chapatta (152.5) followed by LCA-762 (93.30) whereas the lowest for LCA-712 (32.8) preceded by LCA-758 (35) (table 3). Similar range was reported by Shirshat *et al*. (2007) and Arup *et al.* (2011).

The range of dry fruit yield per plant varied from 83.95g to 295.10g with a mean of 146.82g. The maximum mean performance was observed for genotype LCA-625 (295.10g) followed by LCA-620 (249.93g) and LCA-722 (244.24g) while the minimum value was observed for LCA-707 (83.95g) preceded by CA-960 (92.77g) (table 3). Suryakumari *et al.* (2010) and Kumar *et al*. (2012) were also observed wider range of variation between the genotypes studied.

Table 3 : Mean performance of ten quantitative characters in chilli (*Capsicum annuum* L.) genotypes.

Genotype	PH	NPBP	DFF	FSP	NFP	FD	FL	ADFW	NSF	DFYP
G-3	88.20	2.80	31.00	**17.00**	116.70	1.32	6.69	0.87	59.50	96.35
G-4	112.50	2.70	31.50	44.50	229.00	1.13	6.89	0.86	60.80	196.91
G-5	66.95	3.00	32.50	28.00	129.50	1.98	4.66	1.25	68.10	142.77
LCA-206	71.50	4.50	29.00	59.00	183.00	1.28	9.83	0.87	60.00	142.06
LCA-235	64.90	3.50	36.00	34.00	197.70	0.97	8.12	0.83	43.60	99.66
LCA-305	**49.95**	2.90	34.00	46.00	167.70	1.37	6.41	1.01	42.40	129.91
LCA-315	80.40	2.90	30.50	55.00	140.80	1.52	9.25	1.21	57.50	153.46
LCA-353	89.05	3.90	28.50	78.00	266.80	1.00	9.17	0.70	48.00	171.02
LCA-357	86.30	3.60	29.50	62.00	181.20	1.27	10.94	0.91	61.80	199.98
LCA-424	84.55	3.00	35.00	41.00	253.60	1.34	9.28	0.88	48.80	163.22
LCA-436	68.10	3.10	32.00	76.00	133.65	1.46	8.81	1.42	57.70	160.67
LCA-620	81.65	4.50	31.50	54.00	228.00	1.48	9.57	1.09	76.70	249.93
LCA-625	99.80	3.10	28.00	70.00	334.30	1.05	8.42	1.23	74.05	**295.10**
LCA-702	101.80	2.90	30.00	47.00	82.40	2.12	10.81	1.86	64.50	120.40
LCA-703	98.85	4.10	32.00	44.00	156.80	1.26	8.59	0.98	42.60	160.12
LCA-704	98.85	3.60	33.00	37.00	124.80	1.41	8.71	0.95	60.60	105.56
LCA-705	90.30	3.70	32.50	49.00	137.30	1.38	9.24	1.14	57.00	132.93
LCA-706	107.35	3.00	28.50	48.00	**480.00**	1.24	6.98	0.77	73.30	204.18
LCA-707	117.30	3.60	28.50	19.00	71.90	1.72	8.73	1.40	50.20	**83.95**
LCA-708	60.60	**2.30**	25.00	58.00	89.40	2.04	7.41	1.62	73.70	124.32
LCA-709	90.90	3.60	**24.00**	23.00	263.80	1.40	6.98	0.69	58.10	142.17
LCA-710	64.90	5.20	27.00	38.00	169.00	1.03	8.31	0.54	39.40	101.68
LCA-711	78.00	2.90	30.50	64.50	144.00	1.86	7.79	1.43	73.30	156.75
LCA-712	83.50	3.30	32.50	38.00	187.00	1.27	9.84	0.98	**32.80**	165.02
LCA-713	83.50	4.40	29.00	61.00	210.60	1.32	10.35	1.22	72.40	145.52
LCA-714	68.10	3.30	34.00	77.00	158.30	0.90	5.57	0.55	51.30	95.25
LCA-715	74.80	4.10	34.00	69.00	176.80	1.35	8.90	1.37	58.30	185.33
LCA-716	81.60	3.70	28.00	64.00	185.60	0.98	8.04	1.18	60.50	186.11
LCA-718	79.40	3.20	28.00	73.00	192.20	1.31	10.33	1.25	73.30	166.49
LCA-720	**127.75**	2.70	31.00	78.50	101.40	1.76	10.63	1.93	65.30	160.56
LCA-722	107.55	3.90	28.50	63.00	220.30	1.24	8.34	1.32	76.40	244.24
LCA-724	83.15	5.10	28.00	43.00	206.10	0.82	8.70	0.57	41.00	112.82
LCA-726	92.50	4.80	28.00	37.00	194.80	1.05	10.34	1.01	63.10	170.53
LCA-728	113.30	3.30	28.00	18.00	179.60	1.20	7.84	0.77	62.00	151.88
LCA-730	116.95	3.70	29.50	46.00	162.40	1.26	7.94	0.96	62.10	158.23
LCA-732	78.80	3.30	35.00	47.00	176.00	1.69	7.18	1.32	56.30	166.11
LCA-734	86.45	3.10	36.00	37.00	102.70	1.31	11.34	1.52	57.70	115.06
LCA-736	115.75	2.90	35.00	56.00	169.70	1.23	10.43	1.51	77.00	190.86
LCA-738	99.90	3.50	26.00	46.00	137.20	1.08	11.08	1.23	60.00	151.12
LCA-740	100.85	3.70	35.00	42.00	179.00	1.17	**12.97**	1.08	76.00	141.76
LCA-742	94.55	3.90	35.50	39.50	193.60	1.25	11.81	0.87	70.70	171.99

Table 3 continued....

Table 3 continued....

LCA-744	90.05	3.40	35.00	62.00	151.60	1.08	9.85	1.04	62.30	136.64
LCA-746	103.00	5.00	27.00	**87.00**	197.60	1.52	9.32	1.32	73.30	218.29
LCA-748	93.00	4.30	33.00	61.00	248.50	1.04	8.74	0.86	56.70	187.27
LCA-750	62.60	2.60	28.00	52.00	120.70	1.27	8.80	0.91	46.20	95.10
LCA-752	74.65	2.80	34.00	49.00	141.70	1.43	8.40	1.15	61.80	121.86
LCA-754	88.65	2.70	31.00	56.00	145.30	1.36	9.11	1.06	57.30	133.95
LCA-756	114.30	3.80	39.00	49.00	313.30	**0.76**	6.84	**0.50**	48.20	145.25
LCA-758	73.40	4.40	28.00	56.00	134.80	0.99	8.72	0.67	35.00	103.80
LCA-760	75.30	4.80	33.00	26.00	217.90	0.96	9.12	0.81	54.50	145.61
LCA-762	80.25	3.00	36.00	38.00	96.10	1.53	9.21	1.57	93.30	125.82
CA-960	71.95	2.80	27.50	33.00	82.40	1.96	8.85	1.43	81.20	92.77
HC-28	104.10	3.80	**42.00**	48.00	160.20	1.41	4.89	1.13	84.80	126.20
KT-1	84.50	4.10	32.00	38.00	98.20	1.64	11.83	1.06	50.60	98.79
Aparna	82.00	3.60	31.00	56.00	159.00	1.32	9.92	1.05	58.40	132.34
Pandava	75.05	**5.30**	37.00	70.00	136.00	1.52	6.54	1.10	45.80	102.04
Pant C-1	56.85	2.90	34.00	51.00	194.30	1.10	**4.06**	0.72	44.20	100.71
Phule Jyoti	69.35	4.40	32.00	46.00	166.40	1.38	8.23	0.70	48.70	105.84
Punjab Gucchedar	77.10	4.10	34.00	50.00	125.00	1.25	7.82	0.51	51.70	96.97
Pusa Sadabahar	73.95	**5.30**	25.50	64.00	133.20	1.15	6.12	0.63	56.30	111.49
Super-10	99.15	4.10	35.50	56.00	179.70	1.51	8.74	1.24	70.20	185.86
Warangal Chapatta	106.30	2.80	34.00	32.50	**49.80**	**3.17**	8.71	**3.35**	**152.50**	107.30
LCA-334	95.55	3.20	30.00	74.00	200.00	0.98	8.42	0.95	65.00	164.10
Mean	**87.18**	**3.61**	**31.42**	**50.50**	**172.48**	**1.35**	**8.66**	**1.09**	**61.36**	**146.82**
F ratio	12.94	5.08	6.43	12.80	14.39	375.84	25.66	13.17	7.22	6.56
S.E.	4.67	0.33	1.41	4.43	17.81	0.02	0.34	0.11	6.33	16.45
C.V.	7.57	12.99	6.33	12.40	14.60	2.00	5.60	15.30	14.60	15.85
C.D. 5%	13.19	0.94	3.97	12.52	50.35	0.05	0.97	0.33	17.91	46.52

Bold values indicate maximum and minimum mean performance.

Where, **PH** – Plant Height (cm), **NPBP** – Number of primary branches per plant, **DFF** – Days to 50 per cent flowering, **FSP** – Fruit set per cent, **NFP** – Number of fruits per plant, **FD** – Fruit diameter (cm), **FL** – Fruit length (cm), **ADFW** – Average dry fruit weight (g), **NSF** – Number of seeds per fruit, **DFYP** – Dry fruit yield per plant (g).

Conclusion

In the present study, a high range of variability was observed for all the characters. It was maximum for number of fruits per plant (49.8 to 480) followed by dry fruit yield per plant (83.95 to 295.10g), number of seeds per fruit (32.8 to 152.5) and minimum fruit diameter (0.76 to 3.17cm) and dry fruit weight (0.5 to 3.35g). These results are in accordance with those reported by earlier workers like Smitha and Basvaraja (2007), Arup *et al.* (2011), Lakshmi and Padma (2012) and Vijaya *et al.* (2014). The characters showing wide range of variation provide an ample scope for selecting superior types and the selected genotypes can be used in further crossing programme for introgression of their desired genes and to obtain heterotic hybrids.

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