

Evaluation of chilli (*Capsicum annuum* L.) genotypes for yield related traits

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Received : 10-02-2017 ; Revised :14-11-2017 ; Accepted : 16-12-2017

ABSTRACT

Chilli (*Capsicum annuum* L.) is regarded as one of the main commercial vegetable and spice crops at the global level. The present study on evaluation of chilli with fifteen chilli genotypes was carried out at Vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during 2014-2015. The mean of the different traits for 15 genotypes of chilli with three replications treatment were tried in Randomized Block Design. On the basis of fifteen genotypes studied, for different characters genotype 12CHIVAR-1 was found superior in terms of yield related characters, like numbers of branches 150 DAT, days to first anthesis, numbers of fruits plant⁻¹, average fruit weight, ascorbic acid, capsaicin content, fruit diameter, days to 50% flowering, days to first harvest. Result also showed that 12CHIVAR-1 performed the best than in relation to most of the characters like plant height, number of branches plant⁻¹, plant spread, days to flower first anthesis, days to 50% flowering, day to first harvest.

Keywords : Chilli (*Capsicum annuum* L.), evaluation, genotypes, yield.

Chilli (*Capsicum annuum* L.) is grown worldwide both as a spice and as a vegetable crop for small and marginal farmers in Asia, Africa, and South America and is world's second most important solanaceous vegetable after tomato. Both in the green and ripe stages of chilli is used for imparting pungency as condiment, which is due to an active principle 'capsaicin', an alkaloid present in the placenta, which can directly scavenge various free radicals (Reddy and Lokesh, 1992; Kogure *et al.*, 2002; Bhattacharya *et al.*, 2010). It is considered a good source of vitamin C (ascorbic acid) in food and beverage industries (Bosland and Votava, 1999). Due to the presence of 'oleoresin' it acquired a great importance for flavour and better distribution of colour. The consumption of chilli in small amount enriches our diet as and considered good sources of minerals, vitamins and other food components. Besides conventional nutritional food uses, a number of versatile food (paprika oleoresin) and non-food (defense, spiritual, ethnobotanical) uses of chillies are known (Kumar *et al.*, 2006a; Meghavansi *et al.*, 2010). Under tropical, sub-tropical and temperate climates it is grown for use as a vegetable (green chilli), spice (dry chilli), condiment, sauce and pickle (Hazra *et al.*, 2011). Among the 5 cultivated species of the genus *Capsicum*, *C. annuum* is the most widely cultivated in India for its pungent (chilli syn. hot pepper) and non-pungent (sweet pepper syn. capsicum, bell pepper) fruits.

In the post-Mendelian era of crop improvement, the systematical chilli breeding research started in the 1930s in India with efforts to understand inheritance of important traits such as pungency *etc.* (Deshpande, 1933; 1935; Ramaiah and Royappa, 1935). The establishment of All-India Coordinated Research Project (AICRP) on

Vegetables at Indian Agricultural Research Institute (IARI), New Delhi in 1971, paved the way for research coordination and multilocation evaluation of chilli cultivars. Public sector institutions are mostly involved in strategic research to develop improved varieties with limited dissemination efforts on seed multiplication, while private seed companies are mostly involved in development, promotion and commercialization of hybrid cultivars. India ranks first in chilli production, representing 45 per cent of the world acreage, but its productivity is quite low (1 t ha⁻¹ dry chilli) as compared to China, USA, Taiwan, South Korea *etc.* (3-4 t ha⁻¹ dry chilli) as reported by Reddy *et al.* (2002). The use of open pollinated varieties, with only 2.6 per cent of cultivated areas using hybrid varieties is the main reason of low productivity in India (Hundal, 2000). In chilli, a large number of genotypes are available for cultivation but all are varying in different characters such as plant type, fruit size, No. of fruits, foliage colour, flower colour, fruit colour at green as well as red ripen stages and their performance is also different from season to season and environment to environment; due to genetic constitution of the genotypes. All the genotypes show variable performance in different environments. India has immense potential to export different types of chillies around the world. However, the average yield is low due to various constraints such as non-availability of suitable cultivars/ hybrids, biotic and abiotic stresses and genetic drift in cultivars. Hence the present study was undertaken to evaluate the performance of genotypes of chilli for yield and related traits.

The experiment was conducted in the Vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of

Variety	Plant height (cm)	Number of branches plant ⁻¹	Plant spread	Days to flower first anthesis	Days to 50% flowering	Day to first harvest	Fruit length (cm)	Fruit diameter (cm)	1000 seed weight (g)	Fruit girth (cm)
LCA-334(C)	48.67	18.60	42.56	58.13	67.18	81.52	7.08	0.95	5.52	3.28
KA-2(C)	45.32	15.87	45.22	65.33	75.73	91.18	6.36	1.17	5.15	2.58
12CHIV AR-1	81.77	28.27	50.58	69.93	79.52	94.01	6.34	1.11	5.32	2.72
12CHIV AR-2	48.13	15.53	42.25	56.53	66.44	80.64	7.61	0.76	5.73	3.07
12CHIV AR-3	40.12	22.73	39.98	61.00	72.72	87.80	6.85	0.92	5.12	3.10
12CHIV AR-4	43.30	20.07	44.03	48.47	59.94	74.15	6.23	1.20	4.26	2.30
12CHIV AR-5	54.67	17.47	40.67	55.00	63.19	78.65	6.35	0.81	5.65	2.85
12CHIV AR-6	39.16	18.87	42.14	62.93	72.10	88.41	8.48	1.44	5.71	3.63
12CHIV AR-8	34.28	14.93	45.80	50.07	66.47	82.05	9.07	1.26	5.61	3.29
IIHR- 2006	49.03	16.47	48.01	64.20	75.53	90.62	5.59	0.57	5.74	3.23
ACS- 08-09	43.68	14.47	46.58	57.87	64.27	77.48	6.23	0.49	5.62	2.95
HC- 50	51.37	13.87	44.26	56.67	67.51	83.22	8.44	0.87	6.75	3.97
KASHI ANMOL	41.64	20.33	40.03	50.00	60.97	77.43	6.69	1.05	5.61	3.08
HC- 68	52.12	16.60	35.44	57.13	70.27	83.81	4.72	0.69	6.02	3.30
G4 (Local)	61.17	16.93	37.63	51.87	63.09	79.25	5.43	0.65	6.75	3.5
Mean	48.96	17.40	42.34	56.34	66.86	81.95	6.76	0.93	5.63	3.12
S.E.	1.60	0.51	0.27	1.14	1.23	1.20	0.10	0.11	0.229	0.099
F test	S	S	S	S	S	S	S	S	S	S
LSD(0.05)	3.73	1.47	2.78	2.40	3.67	5.58	0.28	0.32	0.456	0.199
Min	34.28	13.87	35.44	48.47	59.94	74.15	4.72	0.49	4.26	2.30
Max.	81.77	28.27	50.58	69.93	79.52	94.01	9.07	1.44	6.75	3.97

Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh) during 2014-2015. Which is situated at an elevation of 78 meters above sea level at 25.87 degree North latitude and 81.15 degree E longitude. This region has a sub-tropical climate prevailing in the south-east part of U.P. with both the extremes in temperature, *i.e.* the winter and the summer. The fifteen chilli genotypes were LCA-334(C), KA-2(C), 12CHIV AR-1, 12CHIV AR-2, 12CHIV AR-3, 12CHIV AR-4, 12CHIV AR-5, 12CHIV AR-6, 12CHIV AR-8, IIHR- 2006, ACS- 08-09, HC- 50, KASHI ANMOL, HC- 68, G4 (Local). The experiment was laid out in Randomized Block Design with three replications having plot size of 4.725 sq m providing a spacing of 60 × 45 cm. Manures and fertilizers were applied as per recommended dose. Weeding was done as and when necessary to keep the crop free from weeds. Irrigation was given to the plants when necessary. To record the biometric observations, sampling technique was used. Five plants from the net plot were selected randomly from each treatment per replication for ten characters *viz.* plant height, number of branches plant⁻¹, plant spread, days to flower first anthesis, days to 50% flowering, day to first harvest, fruit length, Fruit diameter, fruit girth and 1000 seed weight. The selected plants were marked by labelling. The growth parameters were recorded at (60, 90, 120, 150 days) of all the labelled plants and mean values for each observation were used for statistical analysis.

The analysis of variance (ANOVA) for yield, yield components and quality traits were presented which

revealed that significant differences existed among the genotypes for all the 10 characters. In any statistical analysis of data *per se* performance is the true realized mean of the recorded data and this is a direct estimate based on the observation and not on assumption. Selection of superior genotypes based on *per se* performance is more reliable data than any other parameter. The pertinent data on mean performance of genotypes are detailed in table 1.

Plant height 150 DAP

At 150 days after planting the maximum height was observed in genotypes 12CHIV AR-1 (81.77cm.) followed by G4 (Local) (61.17cm.) and the minimum plant height was recorded an 12CHIV AR-8 (34.28cm.) and followed 12CHIV AR-6 (39.16cm.) and 12CHIV AR-3 (40.12cm.) with an average mean of 48.96 cm.

Number of branches at 150 DAP

At 150 DAS after planning maximum number of branches was observed in genotypes 12CHIV AR-1 (28.27) followed by 12CHIV AR-3 (22.73) and KASHI ANMOL (20.33) where as minimum number of branches was found genotypes HC- 50 (13.87) followed by ACS- 08-09 (14.47) and 12CHIV AR-8 (14.93) with an average mean of 17.40.

Plant spread

At 150 DAS after planning maximum plant spread was observed in genotypes 12CHIV AR-1 (50.58)

followed by IIHR- 2006 (48.01) and ACS- 08-09 (46.58) where as minimum plant spread was found genotypes HC- 68 (35.44) followed by G4 (Local) (37.63) and 12CHIV AR-3 (39.98) with an average mean of 42.34.

Days to first anthesis

The minimum days to flower anthesis was showed in genotypes 12CHIV AR-4 (48.47) followed by 12CHIV AR-8 (50.07) and G4 (Local) (51.87) where as maximum days to flower anthesis were found in 12CHIV AR-1 (69.93) followed by KA-2(C) (65.33) and IIHR- 2006 (64.20) with an average mean of 56.34.

Days to 50% flowering

The minimum days to 50% flowering was showed in genotypes 12CHIV AR-4 (59.94) followed by KASHI ANMOL (60.97) and G4 (Local) (63.09) where as maximum days to 50% flowering were found in 12CHIV AR-1 (79.52) followed by IIHR- 2006 (75.53) and KA-2(C) (75.73) with an average mean of 66.86.

Day to first harvest

The maximum days of first harvest was showed in genotype 12CHIV AR-1 (94.01) followed by KA-2(C) (91.18) and IIHR- 2006 (90.62) and the minimum number days of first harvest was noticed in genotype 12CHIV AR-4 (74.15) followed by KASHI ANMOL (77.43) and ACS- 08-09 (77.48) with an average mean of 81.95.

Fruit length (cm)

The maximum fruit length was observed in genotypes 12CHIV AR-8 (9.07) followed by 12CHIV AR-6 (8.48) and HC- 50 (8.44) and the minimum fruit length was observed in genotypes HC- 68 (4.72) followed by G4 (Local) (5.43) and IIHR- 2006 (5.59) with an average mean of 6.76.

Fruit diameter (cm)

The maximum fruit diameter (cm) was noted in genotypes 12CHIV AR-6 (1.44) followed by 12CHIV AR-8 (1.26) and 12CHIV AR-4 (1.20) and minimum fruit diameter (cm) was showed in genotypes ACS- 08-09 (0.49) followed by IIHR- 2006 (0.57) and G4 (Local) (0.65) with an average mean of 0.93.

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