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Estimation of *Per se* performace of chilli (*Capsicum annuum* L.) genotypes for yield and quality traits

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Abstract
The present experiment was carried out during spring summer season of 2014 at Vegetable Research Center of GBPUAT, Pantnagar (Uttarakhand) to estimate the performance of chilli genotypes for yield and qualitative traits in randomized block design with three replication. Observations were recorded on yield and various qualitative traits *viz*. number of primary branches, stem diameter, number of petals, days to 50% ripening, periferi of fruit, pericarp thickness, average fruit weight, number of seeds per fruit, weight of seeds per fruit, seed yield per plant, 100 seed weight and total dry fruit yield (q/ha) from five selected plants in each replication. There was found significant variation among all the genotypes for different characters under study. Maximum dry matter content was found in genotype PC 20131, oleoresin content in PC 20115 and Ascorbic acid content in PC 1. In case of fruit yield per plant genotype PC 20132 (89.79 g) produced maximum fruit yield.

Keywords: Chilli, yield, quality, oleoresin, ascorbic acid

Introduction
Chilli (*Capsicum annuum* L.) known as universal spice and having various utilities as a vegetable, spice, condiment, culinary purpose, ornamental plant and having medicinal properties due to rich source of various phytochemicals and other compounds. Immature chilli fruit contain the phytonutrients ascorbic acid, carotenoids, rutin etc. As a medicine it is used as a counter irritant in lumbago, neuralgia, and rheumatic disorders. It has a tonic and carminative action. The enzyme isolated from chilly is used in the treatment of certain type of cancers. It has also acquired a great importance because of the presence of oleoresin, which permits better colour distribution and flavour in foods. India is the major producer, consumer, and exporter of chilli, contributing almost 36 percent of the world production. Chilli contributes about 33% of the total spice export from India and accounts for about a 16% share of the world spice trade. In India Andhra Pradesh rank first in chilli production followed by Tamil Nadu. In view of the changing of food habits and health conscious, food quality particularly perishables like fruits and vegetables is gaining importance since improved quality not only facilitates remunerative market price for the producer and also improves health of the consumer (Janki *et al*., 2015) [5]. There are many constraints for getting good production like unsuitable cultivars/hybrids, biotic and abiotic stresses, genetic drift in cultivars, and development of new races of pathogens, among several factors, lack of improved varieties is the main constraints for getting production. Studies on chilli genotypes revealed that great variation exists in ability to flowering, fruit set, yield and other qualitative attributes under different agro-climates (Rani, 1996 and Maurya *et al.*, 2016) [13, 9]. Thus, the attempts towards improvement of yield coupled with quality characters in chilli have lot of significance which can increase the income of the farmer through premium price.

Material and Methods
The present experiment was carried out during spring summer season of 2014 at Vegetable Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand) in a randomized block design with three replications to evaluate most promising genotypes coupled with quality traits. Healthy and uniform seedlings were transplanted in plots with a spacing of 60 cm × 50 cm during the evening hours of March 2014. The crops were grown with standard package of practices. The observations on various characters were recorded from five randomly selected plants from each replication to collect fruit samples to estimate the ascorbic acid content, TSS, oleoresin content, seed husk ratio and dry fruit yield per plant. Fruit sample were harvested at full ripe stage except for ascorbic acid, for which

mature green fruit were harvested. The ascorbic acid content was measured by volumetric (2, 6- dichlorophenol indophenols dye) method described by Rangana (1986) [12]. For dry matter percent hundred-gram red ripe fruit were dried in hot air oven at 60 ºC until constant weight, and weighed to know the dry matter percentage. Total soluble solid was recorded for all the genotypes in each replication by using hand refractometer in ºbrix. Oleoresin content was measured as per procedure given by A.O.A.C. (1980) [1]. Analysis of variance was carried out as per the procedure given by Panse and Sukhatme (1985) [11].

Result and Discussion

The analysis of variance (table 1) revealed significant differences among the genotypes for all the six characters studied indicating the presence of vide range of genetic variability in

the genotypes and considerable scope for their improvement through selection. These results show conformity with findings of Farhad *et al.* (2008) [3], Naresh *et al.* (2013) [10] and Janki *et al.* (2015) [5].

Table 1: Analysis of variance for different characters in chilli

Characters	Mean sum of Squares		
	Genotypes	Replication	Error
Ascorbic Acid	4131.19**	0.75	0.65
TSS	6.65**	0.01	0.02
Oleoresin	1056.45**	2.46	4.96
Dry matter content	23.34**	0.86	0.71
Seed husk ratio	0.01**	2.27	0.006
Dry fruit yield/plant	12.87**	1350.68	31.89

*Significant at $p = 0.05$; ** Significant at $p = 0.01$

Ascorbic acid content among different genotypes ranged from 38.97 mg to 187.42 mg/100 g fruit with an average of 106.68 mg/100g. Among all the genotypes, it was highest in PC 1 (187.42 mg/100 g) followed by PC 20126 (163.36 mg/100 g) and lowest in PC 20123 (106.68 mg/100 g). The range indicated the variability in genotypes for ascorbic acid content. Similar results were also found by Farhad *et al.* (2008) [3], Sharma *et al*. (2010) [14] Chattopadhyay *et al.* (2011) [2] and Kumar *et al.* (2012) [6].

TSS ranged from 4.9 to 10.77 with an average of 6.93. Among all the genotypes, it was found maximum in PC 20129 (10.77) followed by PC 20116 (10.00), PC 20119 (9.83) and minimum in PC 20123 (4.9). This result is in accordance with Smitha and Basavaraja (2006) [16].

Oleoresin content varied from 13.12 to 85.28 with an average of 42.79. The genotype PC 20115 (85.28) had maximum oleoresin content while it was found minimum in PC 56 and PC 20128 (13.12). Kumari *et al*. (2010) [7] also found high range of variability for oleoresin content and they found maximum oleoresin content in KTPL 19 and minimum in LCA 436. Manju and sreelathakumary (2002) [8], Singh *et al*. (2009) [15] and Gupta *et al*. (2009) [4], also reported variability in respect of oleoresin content.

Dry matter percent among genotypes ranges from 9.91 % to 19.08 % with an average of 14.66 %. Dry matter percent was found maximum in PC 20131 (19.08 %) followed by PC 2062 (18.73) and minimum in PC 20129 (9.91). Seed husk ratio of 30 genotypes ranged from 0.85 to 3.96 with an average of 2.11. Maximum seed husk ratio observed in PC 20118 (3.96) fallowed by PC 20134 (3.58) and minimum in PC 2062 (0.85). This result is in accordance with Kumari *et al*. (2010) [7] and Vijaya *et al*. (2014) [17].

Dry fruit yield per plant of all the genotypes ranged from 15.40 g to 89.78 g with an average of 52.99 g. It was found maximum in PC 20132 (89.79) followed by PC 20118 (86.80) and minimum in PC 20133 (15.40). This result is in accordance with finding of Vijaya *et al*. (2014) [17] who reported maximum dry fruit weight per palnt in Sankeshwar (97.33 g) and lowest in CA 960, similar result were also found by Chattopadhyay *et al*. (2011) [2].

Table 2: Mean performance of various genotypes for different characters

S. No.	Genotypes	Ascorbic acid (mg/100 g)	TSS (º Brix)	Oleoresin content	Dry matter (%)	Seed husk ratio	Dry fruit yield/plant (g)
1.	PC 20111	125.21	9.00	25.15	10.50	1.47	19.54
2.	PC 20112	107.55	5.50	51.39	11.48	1.24	23.66
3.	PC 20113	112.85	6.63	62.32	12.32	3.33	48.89
4.	PC 20115	76.31	5.97	85.28	19.01	1.94	29.60
5.	PC 20116	88.99	10.00	14.21	12.93	1.95	28.05
6.	PC 20117	117.14	8.77	51.39	11.58	2.33	42.98
7.	PC 20118	68.15	6.03	45.92	14.16	3.96	86.80
8.	PC 20119	119.90	9.83	21.87	11.50	1.54	31.59
9.	PC 20122	125.11	6.63	63.41	10.67	2.75	52.92
10.	PC 20123	38.97	4.90	55.76	13.62	3.35	58.40
11.	PC 20124	97.03	6.23	40.45	15.26	1.69	78.32
12.	PC 20125	63.74	5.77	53.57	16.56	3.32	57.08
13.	PC 20126	163.36	5.80	60.13	17.54	1.76	50.05
14.	PC 20128	81.41	6.63	13.12	13.39	1.76	53.56
15.	PC 20129	129.35	10.77	38.27	9.91	2.35	38.34
16.	PC 20131	84.83	7.87	27.33	19.08	3.03	26.42
17.	PC 20132	103.92	6.57	29.52	12.82	2.13	89.79
18.	PC 20133	151.24	7.37	32.80	13.07	2.77	15.40
19.	PC 20134	104.89	8.50	21.87	14.12	3.58	26.14
20.	PC 2062	52.47	6.60	48.11	18.73	0.85	62.92
21.	PC 25	71.12	5.47	21.87	18.69	1.18	61.44
22.	PC 10	66.42	5.20	37.41	17.52	1.07	79.20
23.	PC 2064	54.41	6.00	55.76	13.75	1.84	56.52
24.	PC 56	134.92	6.03	13.12	16.97	1.63	74.61
25.	PC 2057	158.28	6.07	68.88	14.78	1.06	72.13
26.	PC 7	154.81	6.90	51.39	17.50	1.09	71.21

27.	JCA 283	132.88	5.90	48.11	12.77	2.76	56.38
28.	LCA 334	138.47	7.37	69.97	15.53	2.66	47.45
29.	KA 2	89.28	7.13	50.29	16.72	1.83	71.29
30.	PC 1	187.42	6.53	25.15	17.51	0.98	78.93
	G Mean	106.68	6.93	42.79	14.67	2.11	52.99
	SE	0.46	0.09	1.29	0.49	0.04	3.26
	CD at 5%	1.28	0.24	3.60	1.36	0.12	9.13
	CV %	0.74	2.16	5.21	5.73	3.64	10.66

Summary and conclusion

In the present investigation, a high range of variability was observed for all the characters studied. It was found maximum for ascorbic acid content (38.97-187.42) and minimum for seed husk ratio (0.85-3.96). The characters showing wide range of variation provide an ample scope for selecting superior types and the selected genotypes can be used in breeding programme for introgression of their desired genes into the high yielding varieties. The genotypes which perform better for various quality or yield traits may be further evaluate to find the best one at other location to use in breeding programme.

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