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QUALITY PARAMETERS IN HOT CHILLI *(CAPSICUM CHINENSE* JACQ.)

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Abstract: Thirty two accessions of hot chilli *(Capsicum chinense* Jacq.) were evaluated in a randomized block design with three replications during September 2000 to May 2001 for quality parameters namely, capsaicin, oleoresin and ascorbic acid contents. Analysis of variance revealed significant differences among the accessions. High phenotypic and genotypic coefficients of variation along with high heritability and genetic advance was observed for all the characters. Correlation studies indicated a positive association of capsaicin with oleoresin, primary branches per plant and pollen viability and a negative association with pedicel length and fruit weight.

Key words: Ascorbic acid, capsaicin, *Capsicum chinense,* oleoresin.

INTRODUCTION

Hot chilli *(Capsicum chinense* Jacq.) is grown in the homesteads of Kerala for domestic and export purposes. Characterized by its typical flavour and aroma, the species is noted for its richness in oleoresin, pungency and ascorbic acid contents. Because of the unique qualities, it can find application in food, pharmaceutical and cosmetic industries. But so far, there is no commercial variety having desirable qualities available in the species, which can be recommended for extraction purposes. A critical estimate of genetic variability in the population is a pre-requisite for the effective selection of superior genotypes. With this objective, a study was undertaken at the Department of Olericulture, College of Agriculture, Trivandrum on the available germplasm of *Capsicum chinense.*

MATERIALS AND METHODS

Thirty-two accessions of hot chilli *(Capsicum chinense)* collected from different parts of Kerala were evaluated in randomized block design with three replications during September 2000 to May 2001. Each accession was raised in 6.75 m^2 plots accommodating 15 plants, planted at a spacing of 75 cm x 60 cm. The crop received timely management practices as per the package of practices recommendations of the Kerala Agricultural University (KAU, 1996). Capsaicin, oleoresin and ascorbic acid contents were estimated from five randomly selected plants in each replication. Capsaicin content (%) was determined by Folin-Dennis method (Mathew *et al.,* 1971). Oleoresin was extracted in a Soxhlet's apparatus using solvent acetone. Ascorbic acid content of fruits at red ripe stage was estimated by 2,6-dichlorophenol indophenol dye method (Sadasivam and Manickam, 1992).Analysis of variance and covariance in respect of the various characters was done (Panse and Sukhatme, 1967). Phenotypic and genotypic coefficients of variation were estimated as per Singh and Choudhary (1985). Heritability (broad sense) and genetic advance (as percentage of mean) were calculated using the formula suggested by Hanson *et al.* (1956) and Lush (1949) respectively. Correlation coefficients were worked out according to the procedure suggested by Singh and Choudhary (1985).

RESULTS AND DISCUSSION

Analysis of variance showed significant differences among the accessions for the three characters studied, indicating the presence of wide variation. Capsaicin, the pungent principle of chilli was found to vary from 1.20 (CC 1) to 3.74 (CC 16) per cent (Table 1). This variation could probably be due to the presence of gene modifying factors for pungency and the ratio of placental tissue to seed and pericarp (Sreelathakumary, 2000).

Varietal variation in capsaicin content in hot chilli *(Capsicum chinense)* was also reported by Cherian (2000). All the accessions evaluated in the study had high capsaicin content (>1 per cent), which are particularly valued for their pungency and for the manufacture of capsaicin and oleoresin. In this context, CC 9 and CC 27, which are yellow-fruited can be of high value in pharmaceutical and cosmetic industries, where high pungency and low colour are desirable.

Oleoresin, which represents the total flavour extract of the ground spice is now being

extensively used in processed foods and pharmaceutical products. The current investigation revealed considerable variation for oleoresin from 4.92 (CC 21) to 24.25 (CC 16) per cent with an overall mean of 12.44 per cent. This was in agreement with the results obtained by Pradeepkumar (1990). The nutritive value of chilli is largely determined by the content of ascorbic acid. The variation of ascorbic acid content was from 61.83 (CC 12) to 136.33 (CC 7) mg per 100 g fresh fruit weight. Such wide variation was also reported by Rani (1994) in *Capsicum annuum*. Accessions high in ascorbic acid content are suitable for vegetable purpose.

Table 1. Varietal variation for quality traits in *C. chlnense*

Sl. No.	Accession No.	Source	Capsaicin, %	Oleoresin, %	Ascorbic acid (mg/100g)
1	CC 1	Vellayani, Thiruvananthapuram	1.20	13.09	119.60
2	CC 2	Anchal, Kollam	2.41	17.86	94.20
3	CC 3	Neyyattinkara, Thiruvananthapuram	3.59	10.91	120.37
4	CC 4	Veliyam, Kollam	2.85	16.38	106.20
5	CC 5	Venganoor, Thiruvananthapuram	2.36	22.18	94.53
6	CC 6	Nemom, Thiruvananthapuram	1.72	9.17	91.07
7	CC 7	Vithura, Thiruvananthapuram	2.73	16.25	136.33
8	CC 8	Vithura, Thiruvananthapuram	1.43	9.33	104.10
9	CC 9	Indian Cardamom Research Institute, Saklespur, Karnataka	1.75	7.26	85.93
10	CC 10	Paudikkonam, Thiruvananthapuram	2.69	10.79	85.60
11	CC 11	Vithura, Thiruvananthapuram	3.03	13.05	105.53
12	CC 12	Kumarapuram, Thiruvananthapuram	2.23	12.64	61.83
13	CC 13	Vithura, Thiruvananthapuram	3.03	13.94	102.70
14	CC 14	Neyyattinkara, Thiruvananthapuram	1.43	8.66	109.60
15	CC 15	Vilavoorkal, Thiruvananthapuram	1.98	10.38	102.70
16	CC 16	Venganoor, Thiruvananthapuram	3.74	24.25	68.50
17	CC 17	Paudikkonam, Thiruvananthapuram	2.48	11.07	102.70
18	CC 18	Neyyattinkara, Thiruvananthapuram	2.48	11.66	89.00
19	CC 19	Venganoor, Thiruvananthapuram	2.83	7.16	82.20
20	CC 20	Sreekaryam, Thiruvananthapuram	3.15	8.19	75.30
21	CC 21	Sreekaryam, Thiruvananthapuram	2.17	4.92	89.00
22	CC 22	Vithura, Thiruvananthapuram	3.10	16.24	99.30
23	CC 23	Nemom, Thiruvananthapuram	1.59	9.25	102.70
24	CC 24	Vithura, Thiruvananthapuram	2.97	13.35	98.60
25	CC 25	Vithura, Thiruvananthapuram	1.25	8.33	82.20
26	CC 26	Vithura, Thiruvananthapuram	2.97	13.96	102.70
27	CC 27	Vithura, Thiruvananthapuram	2.37	10.68	130.10
28	CC 28	Pothankode, Thiruvananthapuram	2.53	20.30	123.30
29	CC 29	Pothankode, Thiruvananthapuram	3.41	11.66	71.90
30	CC 30	Nemom, Thiruvananthapuram	2.32	7.89	102.70
31	CC 31	Nemom, Thiruvananthapuram	2.53	12.24	109.60
32	CC 32	Neyyattinkara, Thiruvananthapuram	3.43	15.01	106.20

Table 2. Coefficients of variation, heritability and genetic advance for quality characters

Sl. No.	Character	PCV, %	GCV, %	Heritability, %	Genetic advance as percentage of mean
1	Capsaicin, %	27.57	27.52	99.62	56.58
2	Oleoresin %)	36.07	35.46	96.65	71.81
3	Ascorbic acid (mg per 100 g)	17.07	17.04	99.71	35.05

PCV = Phenotypic coefficient of variation; GCV = Genotypic coefficient of variation

Table 3. Phenotypic and genotypic correlation coefficients with quality parameters

Character	Correlation co-efficient	Plant height	Primary branches per plant	Pollen viability	Fruit length	Pedicel length	Fruit weight	Oleoresin
Capsaicin	P	-0.0654	0.4058*	0.3051	0.1551	-0.2990	-0.3551*	0.4255**
	G	-0.0667	0.6510**	0.3072	0.1586	-0.3022	-0.3604*	0.4341**
Oleoresin	P	0.2029	0.1731	0.3307*	0.2989	0.1056	0.0924	1.0000
	G	0.2136	0.2930	0.3364*	0.3136	0.1054	0.0941	1.0000
Ascorbic acid	P	0.3204*	-0.0449	0.4774*	0.4292**	0.0423	0.2458	0.1238
	G	0.3369	-0.0718	0.4803	0.4420**	0.0436	0.2498	0.1281

P = Phenotypic correlation coefficient; G = Genotypic correlation coefficient
* Significant at 5 per cent level; **Significant at 1 per cent level

Analysis for genetic parameters revealed high phenotypic and genotypic coefficients of variation (PCV and GCV respectively) for capsaicin, oleoresin and ascorbic acid contents (Table 2), offering good scope for selection. Similarly, high heritability (>90 per cent) coupled with high genetic advance was also recorded for these characters (Table 2) indicating the presence of fixable additive factors and hence these traits can be improved by selection.

Correlation studies revealed that capsaicin was found to be positively associated with oleoresin, primary branches per plant and pollen viability and negatively with pedicel length and fruit weight (Table 3). Selection based on this can improve capsaicin and oleoresin contents. But since capsaicin was negatively correlated with fruit weight, selection for small-fruited accessions will reduce the fruit yield and ultimately reduces the total capsaicin output from unit area. Hence selection of accessions with medium fruit size and moderate pungency may be done. Ascorbic acid was found positively correlated with most of the yield component characters.

The present study indicated the availability of genotypes possessing desirable quality characteristics namely, CC 16 for high capsaicin and oleoresin and CC 7 for high ascorbic acid contents. The breeders can make use of them in the production of cultivars with outstanding quality attributes.

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REFERENCES

Cherian, E.V. 2000. Genetic variability in *Capsicum chinense* Jacq. M.Sc.(Hort.) thesis, Kerala Agricultural University, Thrissur, p.82

Hanson, C.H., Robinson, H.F. and Comstock, R.E. 1956. Biometrical studies on yield in segregating population of Korean lespedesa. *Agron. J.* 48 : 268-272

KAU. 1996. *Package of Practices Recommendations – Crops 1996*. Directorate of Extension, Kerala Agricultural University, Thrissur, p. 267

Lush, J. L. 1949. *Animal Breeding Plans.* Iowa State University Press, Annes, p.473

Mathew, A.G., Nambudiri, E. S., Ananthakrishna, S. M., Krishnamurthy, N. and Lewis, Y.S. 1971. An improved method for estimation of capsaicin in capsicum oleoresin. *Lab. Practice* 1: 23-26

Panse, V.G. and Sukhatme, P.V. 1967. *Statistical Methods for Agricultural Workers.* Indian Council of Agricultural Research, New Delhi, p.381

Pradeepkumar, T. 1990. Interspecific hybridization in *Cpasicum.* M.Sc. (Hort.) thesis, Kerala Agricultural University, Thrissur, p. 101

Rani, P. U. 1994. Screening gene bank for quality parameters in chilli *(Capsicum annuum* L.). *S. Indian Hort.* 42 : 381-383

Sadasivam, S. and Manickam, A. 1992. *Biochemical Methods for Agricultural Sciences.* Wiley Eastern Ltd., Madras, p. 246

Singh, R.K. and Choudhary, B.D. 1985. *Biometrical Methods in Quantitative Genetic Analysis.* Kalyani Publishers, New Delhi, p. 318

Sreelathakumary, I. 2000. Genetic analysis of shade tolerance in chilli *(Capsicum* spp.). Ph.D. thesis, Kerala Agricultural University, Thrissur, p. 153