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Evaluation of various Chilli (*Capsicum annuum* L.) genotypes grown for quality parameters under Konkan agro-climatic condition

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Abstract
Thirteen chilli genotypes were evaluated for yield and quality aspects such as β –carotene, ascorbic acid and capsaicin content at the Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (MS.) during 2014-2015. The study revealed that genotypes T_5 and T_8 showed cluster fruiting habit while rest of the genotypes showed solitary fruiting habit. The treatment T_1, T_2, T_5, T_7, T_8, T_9, T_{10}, T_{11}, T_{12} and T_{13} had elongate fruits while T_3, T_4 and T_6 had triangular fruit. The fruits of T_1, T_2, T_4, T_6, T_7, T_{12} and T_{13} had light green colour while T_3, T_5, T_8, T_9, T_{10} and T_{11} had dark green colour. Highest fruit length (7.93 cm) observed in genotype T_8, maximum fruit diameter (1.47 cm) in T_{11}. Average fruit weight (3.70 g) was observed highest in genotype T_1. Data on β – carotene (µg /100 g) content in chilli fruits observed was significant. The β – carotene was maximum in T_9 (594.00 µg /100 g). Variation observed in ascorbic acid was significant. The ascorbic acid content in fruit was maximum in T_{13} (160.8 mg/100 g). The data on capsaicin content in chilli fruits was also significant. The capsaicin content in fruit was maximum in T_9 (0.254 mg/100 g). Genotype T_6 recorded maximum number of fruits (173.99) per plant. Overall yield was highest (23.43 t/ha) in genotype T_{11}.

Keywords: Chilli, β – carotene, ascorbic acid, capsaicin, yield

Introduction
Chilli (*Capsicum annuum* L.) belongs to the family Solanaceae having diploid species with mostly 2n = 2x = 24 chromosomes, but wild species with 2n = 2x = 26 chromosomes have been reported (Pickersgill, 1991) [8]. The main functional property of chilli is pungency, antioxidant activity, vitamin C and natural pigments. Green chillies are rich source of Vitamin A and Vitamin E. It is widely used in the curry powder, curry paste, all kinds of pickles and preparing sauce, soups, *etc*. The quality of dried chilli is assessed by a number of different parameters such as colour, hotness, ascorbic acid content and volatile flavour compounds (Henderson, 1992) [1]. In India, at many places local cultivars are grown due to regional preference and adoption of local varieties in the area. Konkan is not recognized as commercial chilli growing area. Mostly the local chilli genotypes are preferred for cultivation which are short with conical shape and having thick pericarp. The mature green chillies of these genotypes are popularly used for value addition especially for preparation of chilli pickle, mixed pickle as well as for preparation of salted and spiced chillies which is locally known as *Bharleli Mirchi* and is popular in Konkan region. Moreover, these genotypes can also be grown under high rainfall areas during *kharif* season. However, no systematic efforts have been made so far to find out the growth and yield performance of these genotypes under Konkan agro climatic condition. Hence, there is a need to evaluate chilli genotypes under Konkan condition for its qualitative characters.

Materials and Methods
The field experiment was conducted at Nursery No. 4, Educational Research Farm, Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (MS.). Present experiment was undertaken during the *rabi* season consecutive years *i.e.* 2014-15 for evaluating chilli (*Capsicum annuum* L.) genotypes grown under konkan agro climatic condition. The experiment was laid out in Randomized Block Design with three replications. The soil of experimental plot was lateritic and acidic in reaction with pH ranging from 5.6 to 6.5. The samples of fully grown green chilli fruits were taken from each plot and were

analyzed for the following constituents. The observations regarding various parameters were recorded at 30 days interval. The projected yield per hectare was calculated on the basis of yield per plot, occupied by chilli in the present experiment. Data recorded on different quality parameters of chilli was analyzed statistically to express the results.

Treatment Details

Treatment	Progenies	Treatment	Progenies
T_1	DPL CA- 1.1	T_8	DPL CA- 11.1
T_2	DPL CA- 2.1	T_9	DPL CA- 13.1
T_3	DPL CA- 3.1	T_{10}	DPL CA- 14.1
T_4	DPL CA- 4.1	T_{11}	DPL CA- 15.1
T_5	DPL CA- 5.1	T_{12}	DPL CA- 7.1
T_6	DPL CA- 6.1	T_{13}	Konkan Kirti

β– carotene analysis

Total carotenoid pigments (expressed as β–carotene) were determined as per the method described by Roy and Susantha (1973) [10]. The results were expressed in terms of β– carotene as µg/100g sample.

Ascorbic acid analysis

Determination of ascorbic acid was done by 2, 6-dichlorophenolindophenol dye method of Johnson (1948) [2] as described by Ranganna (1997) [9]. A known quantity of sample was blended with 3 percent metaphosphoric acid (HPO_3) to make the final volume of 100 ml and then filtered. A known quantity of aliquot was titrated against 0.025 percent 2, 6 - dichlorophenolindophenol dye to a pink colour end point. The ascorbic acid content of the sample was calculated taking into consideration the dye factor and expressed as mg Ascorbic acid per 100g fruit pulp.

Capsaicin Analysis

Capsaicin content in the samples was estimated by spectrophotometric measurement by Sadasivam and Manikkam (1992) [11]. Weigh 0.5g chilli powder into a glass-stopper test tube of volumetric flask. Pipette out 10 ml of dry acetone into the flask and shake it for 3 hr. in a mechanical shaker. Let the contents settle down or centrifuge (10000 rpm for 10 min). Pipette out 1ml of the clear supernatant into a test tube and evaporate to dryness in a hot water bath. Dissolve the residue in 5ml of 04% sodium hydroxide solution. Add 3ml of 3% phosphomolybdic acid. Shake the content and let stand for 1hr. Filter the solution quickly into centrifuge tubes to remove any floating debris. Centrifuge at about 500 rpm for 10-15min.Transfer the clear blue coloured solution into the cuvette and read the absorbance at 650nm. Run a regent blank along with the test samples. Prepare a standard graph using 0-200 µg capsaicin simultaneously i.e. pipette out 0.2, 0.4, 0.6, 0.8, and 1ml of working standard solution and proceed as above. The statistical analysis of the data was done by using the standard methods as described by.

Result and Discussion

The data pertaining fruit characters are summarized in Table 1, respectively. Fruiting habit of chilli genotypes were observed under the study. The genotypes T_1, T_2, T_3, T_4, T_6, T_7, T_9, T_{10}, T_{11}, T_{12} and T_{13} showed solitary fruiting habit while the genotypes T_5 and T_8 showed cluster fruiting habit. Similar type of variations related to fruiting habit was also reported in chilli by Mahmood *et al.* (2002) [5].

Among the various fruit characters, the fruits were categorized as per its shape. The treatment T_1, T_2, T_5, T_7, T_8, T_9, T_{10}, T_{11}, T_{12} and T_{13} had elongate fruits while T_3, T_4 and T_6 had triangular fruit. Thus, 10 chilli genotypes noticed elongate fruits, while 3 chilli genotypes noticed triangular fruits. Variation in fruit colour among different chilli genotypes was observed under study. Colours observed were light green and dark green. The fruits of T_1, T_2, T_4, T_6, T_7, T_{12}, T_{13} had light green colour while T_3, T_5, T_8, T_9, T_{10} and T_{11} had dark green colour. The variation in chilli in fruit length, diameter, shape, size and colour was also reported by Sreelathakumary and Rajamony (2004) [14].

Fruit characters such as fruit length, fruit diameter and average fruit weight of mature green chilli genotypes have been presented in Table 1. Genotypes showed significant variation. Treatment T_8 recorded highest fruit length (7.93 cm) whereas it was lowest in treatment T_6 (3.84). Maximum fruit diameter was observed in the treatment T_{11} (1.47 cm), whereas the minimum fruit diameter was observed in treatment T_8 (0.95 cm). Average fruit weight was maximum in treatment T_1 (3.7 g) respectively.

Data pertaining chemical composition and yield performance are summarized in Table 2. The samples of fully grown green chilli fruits of various genotypes were taken under study and were analyzed for the following components. The Variation in data on β – carotene (µg /100 g) content in chilli fruits observed was significant. The β – carotene was maximum in T_9 (594.00 µg /100 g) and minimum β- carotene was recorded in T_8 (446.67 µg /100 g). The variation in β – carotene (µg /100 g) content in chilli was also noticed by Naseem *et al*. (2011) [6] and Sarker (2012) [12].

Variation observed in ascorbic acid was significant. The ascorbic acid content in fruits was in range of 105 to 160.8 mg/100 g. It was maximum in T_{13} (160.8 mg/100 g) and minimum ascorbic acid found in T_3 (105mg/100 g). The variation in Ascorbic acid (mg /100 g) content in chilli was also noticed by Kumar and Tata (2009) [4].

The data on capsaicin content in chilli fruits was significant. The capsaicin content in fruit was maximum in T_9 (0.254 mg/100 g). The minimum capsaicin found in T_6 (0.084 mg/100 g). The variation in capsaicin (mg/100 g) content in chilli was also noticed by Uma *et al.* (2008) [15].

The mean performance of various chilli genotypes for yield have been presented in Table 2. Yield per plant (0.47 kg) and yield per hectare (23.43 t) were highest in treatment T_{11}. Variation in fruit yield per hectare of chilli genotypes was also noticed by Smitha and Basavaraja (2006) [13]. Treatment T_1, T_6, T_7, T_9, T_{10} and T_{12} had noticed more yield per plant than the general mean under Konkan agro climatic conditions.

Table 1: Mean performance of different green chilli genotypes for fruit character

Treatment	Fruiting habit	Fruit shape	Fruit colour	Fruit length (cm)	Fruit diameter (cm)	Average Fruit weight (g)
T_1	Solitary	Elongate	Light Green	6.75	1.04	3.7
T_2	Solitary	Elongate	Light Green	5.92	1.3	2.63
T_3	Solitary	Triangular	Dark Green	4.79	1.36	2.43
T_4	Solitary	Triangular	Light Green	5.71	1.35	2.43
T_5	Cluster	Elongate	Dark Green	5.4	1.25	2.4
T_6	Solitary	Triangular	Light Green	3.84	1.45	2.2
T_7	Solitary	Elongate	Light Green	6.79	1.09	3.57
T_8	Cluster	Elongate	Dark Green	7.93	0.95	1.57
T_9	Solitary	Elongate	Dark Green	4.78	1.33	2.8
T_{10}	Solitary	Elongate	Dark Green	5.45	1.14	2.53
T_{11}	Solitary	Elongate	Dark Green	5.17	1.47	2.73
T_{12}	Solitary	Elongate	Light Green	5.27	1.36	3.3
T_{13}	Solitary	Elongate	Light Green	6.4	1.02	2.53
Range	-	-	-	3.84-7.93	0.95-1.47	1.57 - 3.7
Mean	-	-	-	5.71	1.24	2.68
Result	-	-	-	Sig	Sig	Sig
S.Em ±	-	-	-	0.09	0.01	0.017
CD @ 5%	-	-	-	0.27	0.05	0.05

Table 2: Mean performance of different green chilli genotypes for chemical composition and yield

Treatment	β –carotene (µg /100 g)	Ascorbic acid (mg/100 g)	Capsaicin (mg/100 g)	Fruit yield per plant (Kg)	Yield per hectare (t)
T_1	448.67	117.50	0.164	0.34	17.25
T_2	457.67	132.50	0.113	0.24	11.92
T_3	459.67	105.00	0.202	0.28	13.85
T_4	513.67	120.00	0.085	0.31	15.72
T_5	533.67	120.00	0.203	0.28	14.31
T_6	559.67	108.33	0.084	0.38	18.92
T_7	506.33	111.67	0.243	0.45	22.33
T_8	446.67	140.83	0.228	0.16	8.37
T_9	594.00	116.67	0.254	0.39	19.51
T_{10}	450.33	121.67	0.129	0.36	18.16
T_{11}	517.67	155.83	0.188	0.47	23.43
T_{12}	531.33	151.67	0.18	0.37	18.45
T_{13}	470.33	160.83	0.096	0.31	15.44
Range	446.67 - 594	105.00 -160.83	0.084 – 0.254	0.16-0.47	8.37 - 23.43
Mean	499.20	127.88	0.166	0.33	16.74
Result	Sig	Sig	Sig	Sig	Sig
S.Em ±	4.91	1.51	0.0019	0.007	0.39
CD @ 5%	14.33	4.42	0.0056	0.023	1.14

Conclusion

The present investigation on thirteen chilli genotypes could be concluded on the basis of fruit characters, chemical composition, yield and yield attributing characters and also on consumer's preference. Genotype T_8 recorded highest fruit length, maximum fruit diameter was observed in the genotype T_{11} and average fruit weight was maximum in genotype T_1. The overall performance of genotype T_9 showed the maximum β – carotene and capsaicin content in the fruit. Whereas ascorbic acid content was found maximum in genotype $T_{13.}$ These genotypes showed promising qualitative characters as far as β – carotene, ascorbic acid and capsaicin content. Genotypes $T_{11,}$ T_7, T_9, T_6, T_{12} and T_{10} were found promising as far as yield is concerned under konkan agroclimatic condition.

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