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Quality parameters of chilli (*Capsicum annumm* L.) germplasm under Konkan condition

Ashwini Pardeshi, Pooja Sawant, PB Sanap and SB Dodake

Abstract
Hundred chilli germplasm *viz*., pure germplasm, F_2 generation, F_5 generation and F_6 generation cultivated in Konkan region were studied for quality parameter *viz*., pungency and natural pigments *viz*., anthocyanine and chlorophyll content in Vegetative Improvement Scheme, Central Reaserch Station, Wakawali, Dapoli. WKLC-1 of F_5 generation showed highest pungency (1.26%), while Konkan Kirti of pure germplasm showed lowest pungency (0.21%). The anthocyanin content ranged from 21.36 to 31.57 mg 100 g^{-1} with maximum content (31.57 mg 100 g^{-1}) in Konkan kirti of pure germplasm. Among hundred chilli germplasm, chlorophyll 'a', chlorophyll 'b' and total chlorophyll content were found to be maximum in DPLC-2 of pure germplasm.

Keywords: Chilli germplasm, pungency, natural pigments

1. Introduction
Chillies (*Capsicum annuum* L.) belong to the family *Solanaceae*. Cultivated chillies are of American origin and have been discovered in the pre-historic remains of Peru. Chilli is the third important crop of family *Solanaceae* after tomato and potato (Naz, 2006). It is rich source of vitamin A and C. Chili fruits having deep red colour, without pungency are used as paprika colour is the principal criterion for assessing its quality. The main functional properties of chilli are pungency, antioxidant activity, vitamin C and natural pigments (Staryth and Nosova, 1982; Garcia *et al*., 1998; Jagadeesh, 2000) [13, 3, 5]. Color of ripe pepper fruits originate from carotenoids, and two red carotenoids, capsanthin and capsorubin, naturally found only in Capsicum (Govindarajan, 1986; Levy *et al*., 1995; Deli *et al*., 2001; Pino *et al*., 2006) [4, 7, 2, 9]. Thus, the present work aims to study the some of the quality parameter of hundred chilli germplasm under Konkan condition.

2. Materials and methods
The present investigation entitled "Quality parameter of chilli (*Capsicum annumm* L.) germplasm under Konkan condition" was conducted during 2018-2019 at Vegetable Improvement Scheme, Central Experiment Station, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Wakawali, Dapoli. The experiment was laid out in a completely randomised block design with three replication.

2.1 Quality Parameters
2.1.1 Capsaicin (Green chilli)
Determination of Capsaicin content was done by Colorimetric method as described by Quagliotti (1971) [10]. In a glass-stoppered test tube or volumetric flask, 0.5 g sample (dry chilli powder) was taken. 10 mL dry acetone was pipetted out into the flask and placed it for 3 h in a mechanical shaker. The contents wer allowed to settle down or centrifuged (10,000 *rpm* for 10 min). 1 mL of the clear supernatant was pipetted out into a test tube and evaporated to dryness in a hot water–bath. The residue in 5 mL of 0.4% sodium hydroxide solution was dissolved and 3 mL of 3 % phosphomolybdic acid was added to it. The contents were shaken and allowed to stand for 1 h. The solution was filtered quickly into centrifuge tubes to remove any floating debris and centrifuged at about 5,000 *rpm* for 10-15 min. The clear blue coloured solution was transferred directly into the cuvette and the absorbance read at 650 nm.

$$\% \text{ capsaicin} = \frac{\mu\text{g capsaicin}}{1000\times1000} \times \frac{100}{1} \times \frac{100}{2} = \frac{\mu\text{g capsaicin}}{100}$$

2.1.2 Anthocyanin (Red chilli)

Anthocyanin content was determined as described by Ranganna, (1997) [11] using Spectrophotometer. To 10 g of fruit sample 20 ml ethanolic HCl was added and the mixture was ground. Then 15 ml ethanolic HCL was added for washing blender. Then it was stored overnight in a refrigerator at 4 ºC. The extract was filtered by using whatman filter paper no. 1. The exctract was then transferred in 50 ml volumetric flask and volume made upto the mark with ethanolic HCL. Then it was read on spectrophotometer at 533 nm.

$$\text{Total Absorbance (mg 100 g}^{-1}) = \frac{\text{Absorbance at 533 nm} \times 10 \times 50 \times 100}{2 \times 10}$$

2.1.3 Chlorophyll Content

Chlorophyll was extracted in 80% acetone and the absorption at 663 nm and 645 nm were read in a spectrophotometer. Using the absorption coefficients, the amount of chlorophyll was calculated (Arnon, 1949) [1].

Chlorophyll 'a', 'b' and total chlorophyll were estimated by taking 1 g of finely cut and well mixed representative sample of leaf or fruit tissue into a clean mortar. The tissues were ground to a fine pulp with the addition of 20 mL of 80 % acetone. The pulp was centrifuged (5,000 *rpm* for 5 min) and the supernatant was transferred to 100 mL volumetric flask. The residue was ground with 20 mL of 80% acetone, centrifuged and the supernatant was transferred to the same volumetric flask. This procedure was repeated until the residue became colourless. The mortar and pestle were washed thoroughly with 80% acetone and the clear washings were collected in the volumetric flask. The volume was made up to 100 mL with 80% acetone. The absorbance of the solution was read at 645, 663 and 652 nm against the solvent (80% acetone) blank.

$$\text{Chlorophyll a (mg g}^{-1}\text{ tissue)} = 12.7\,(A_{663}) - 2.69\,(A_{645}) \times \frac{V}{1000} \times W$$

$$\text{Chlorophyll b (mg g}^{-1}\text{ tissue)} = 22.9\,(A_{645}) - 4.68\,(A_{663}) \times \frac{V}{1000} \times W$$

$$\text{Total chlorophyll (mg g}^{-1}\text{ tissue)} = 20.2(A_{645}) + 8.02(A_{663}) \times \frac{V}{1000} \times W$$

2.1.4 Statistical analysis

The experimental data was analyzed statistically by the technique of analysis of variance as applicable to randomized block design. The significance of treatment difference was tested by 'F' (Variance ratio) test. Critical difference (CD) at 5 per cent level of probability was worked out for comparison and statistical interpretation of the treatment means (Panse and Sukhatme, 1967) [8].

Table 1: Details of chilli germplasms used for the study.

Sr. No.	Germplasm
1.	DPLC – 1
2.	DPLC – 2
3.	DPLC – 3
4.	DPLC – 4
5.	DPLC – 5
6.	DPLC – 6
7.	DPLC – 7
8.	DPLC – 8
9.	DPLC – 9
10.	DPLC – 10
11.	DPLC – 11
12.	DPLC – 12
13.	DPLC – 13
14.	DPLC – 14
15.	DPLC – 15
16.	Jwala
17.	Jayanti
18.	Pb. Gucchedar
19.	BC – 24
20.	BC – 28
21.	Konkan Kirti
22.	Sangam
23.	Wakawali-13
24.	Wakawali-19
25.	Wakawali-20
26.	ACS – 9818
27.	R.H.R. – 16 – 5
28.	R.H.R. – 57
29.	Pant-C3
30.	P. Tejas
31.	LCA-206
32.	LCA-283
	F_2 Generation
33.	WKLC – 1
34.	WKLC – 2
35.	WKLC – 3
36.	WKLC – 4

37.	WKLC – 5
38.	WKLC – 6
39.	WKLC – 7
40.	WKLC – 8
41.	WKLC – 9
42.	WKLC – 10
43.	WKLC – 11
44.	WKLC – 12
45.	WKLC – 13
46.	WKLC – 14
47.	WKLC – 15
48.	WKLC – 16
49.	WKLC – 17
50.	WKLC – 18
51.	WKLC – 19
52.	WKLC – 20
53.	WKLC – 21
54.	WKLC – 22
55.	WKLC – 23
56.	WKLC – 24
57.	WKLC – 25
58.	WKLC – 26
59.	WKLC – 27
60.	WKLC – 28
61.	WKLC – 29
6.	WKLC – 30
63.	WKLC – 31
64.	WKLC – 32
65.	WKLC – 33
66.	WKLC – 34
	F_5 Generation
67.	WKLC – 1
68.	WKLC – 2
69.	WKLC – 3
70.	WKLC – 4
71.	WKLC – 5
72.	WKLC – 6
73.	WKLC – 7
74.	WKLC – 8
75.	WKLC – 9
76.	WKLC – 10
77.	WKLC – 11
78.	WKLC – 12
79.	WKLC – 13
80.	WKLC – 14
81.	WKLC – 15
82.	WKLC – 16
83.	WKLC – 17
	F_6 Generation
84.	WKLC – 1
85.	WKLC – 2
86.	WKLC – 3
87.	WKLC – 4
88.	WKLC – 5
89.	WKLC – 6
90.	WKLC – 7
91.	WKLC – 8
92.	WKLC – 9
93.	WKLC – 10
94.	WKLC – 11
95.	WKLC – 12
96.	WKLC – 13
97.	WKLC – 14
98.	WKLC – 15
99.	WKLC – 16
100.	WKLC – 17

3. Results and Discussion

The result of the experiment are presented. Among the hundred chilli germplasm, capsaicin content ranged from 0.21 to 1.26%. Highly capsaicin content noticeable in WKLC-1 (1.26%) of F_5 generation. The findings of the study agree with the findings of Manju and Sreelathakumary (2002) and Pandiyaraj *et al*. (2016) who have reported the capsaicin content in chilli germplasm in the range of 1.20 to 3.74% and 0.32 to 1.26, respectively. Maximum anthocyanin content observed in Konkan kirti (31.57 mg 100 g^{-1}) of pure germplasm. While WKLC-22 (21.36 mg 100 g^{-1}) of F_2 generation showed minimum anthocyanin content. Taleb and Abu-zahra (2014) have reported an anthocyanin content of 38.54 mg 100 g^{-1} in sweet pepper fruits. DPLC-2 of pure germplasm showed highest chlorophyll 'a'(0.53 mg g^{-1}), Chlorophyll 'b'(0.92 mg g^{-1}) and total chlorophyll (1.44 mg g^{-1}) content over the hundred chilli germplasm. The findings are in line with the study conducted by Adhikari and Pradhan (2014) who have reported the chlorophyll content of chilli varieties to be in the range of 0.13 to 2.10 mg 100 g^{-1} fruits.

Table 2: Quality Parameters of pure chilli germplasm

Pure germplasm	Capsaicin % (Green chilli)	Anthocyanin (mg 100 g^{-1}) (Red chilli)	Chlorophyll 'a' (mg g^{-1})	Chlorophyll 'b' (mg g^{-1})	Total Chlorophyll (mg g^{-1})
DPLC-1	1.12	24.40	0.45	0.79	1.28
DPLC-2	0.44	21.48	0.53	0.92	1.44
DPLC-3	0.76	29.59	0.38	0.62	1.00
DPLC-4	0.67	28.27	0.39	0.71	1.10
DPLC-5	0.41	27.48	0.42	0.75	1.18
DPLC-6	0.25	25.74	0.38	0.63	0.98
DPLC-7	0.51	22.94	0.40	0.75	1.15
DPLC-8	0.77	26.83	0.42	0.85	1.28
DPLC-9	0.75	25.64	0.42	0.82	1.21
DPLC-10	0.34	28.44	0.43	0.76	1.19
DPLC-11	0.46	26.51	0.42	0.77	1.18
DPLC-12	0.37	24.75	0.37	0.62	0.99
DPLC-13	0.36	26.59	0.41	0.61	1.02
DPLC-14	0.37	30.96	0.44	0.82	1.26
DPLC-15	0.43	29.15	0.46	0.86	1.33
Jwala	0.88	31.53	0.47	0.84	1.34
Jayanti	0.75	28.39	0.41	0.85	1.26
Pb. Gucchedar	0.33	23.48	0.38	0.60	0.98
BC-24	0.29	21.51	0.50	0.90	1.40
BC-28	0.34	26.54	0.48	0.83	1.35
Konkan Kirti	0.21	31.57	0.35	0.69	1.04
Sangam	0.35	27.61	0.42	0.83	1.25
Wakawali-13	0.60	28.53	0.42	0.84	1.27
Wakawali-19	0.25	22.45	0.45	0.81	1.26
Wakawali-20	0.50	26.73	0.39	0.56	1.06
ACS-9818	0.43	26.25	0.41	0.80	1.22
RHR-16-5	0.50	27.33	0.39	0.83	1.23
RHR-57	0.37	23.88	0.45	0.79	1.24
Pant-C3	0.88	25.45	0.42	0.86	1.27
P. Tejas	0.71	25.47	0.40	0.63	1.04
LCA-206	0.23	29.37	0.42	0.63	1.20
LCA-283	0.36	28.57	0.47	0.72	1.27
SE ±	0.009	0.026	0.002	0.005	0.004
CD (P=0.05)	0.025	0.072	0.006	0.014	0.011

Table 3: Quality Parameters of F_2 generation of chilli germplasm

F_2 Generation	Capsaicin % (Green chilli)	Anthocyanin (mg 100 g^{-1}) (Red chilli)	Chlorophyll 'a' (mg g^{-1})	Chlorophyll 'b' (mg g^{-1})	Total Chlorophyll (mg g^{-1})
WKLC-1	1.24	23.74	0.41	0.76	1.17
WKLC-2	0.65	27.42	0.39	0.78	1.17
WKLC-3	0.67	26.76	0.43	0.83	1.26
WKLC-4	0.26	29.95	0.46	0.84	1.31
WKLC-5	0.66	25.26	0.45	0.82	1.27
WKLC-6	0.25	26.23	0.40	0.78	1.18
WKLC-7	0.38	23.93	0.41	0.78	1.19
WKLC-8	0.41	22.47	0.38	0.68	1.06
WKLC-9	0.57	25.60	0.45	0.82	1.28
WKLC-10	0.25	30.37	0.40	0.70	1.10
WKLC-11	0.35	25.32	0.44	0.83	1.26
WKLC-12	0.47	27.34	0.42	0.80	1.21
WKLC-13	0.26	23.64	0.44	0.77	1.22
WKLC-14	0.24	29.60	0.42	0.81	1.22
WKLC-15	0.56	25.36	0.48	0.84	1.32

WKLC-16	0.21	22.74	0.42	0.81	1.23
WKLC-17	0.16	22.43	0.45	0.81	1.26
WKLC-18	0.26	27.40	0.45	0.84	1.28
WKLC-19	0.34	25.38	0.41	0.79	1.20
WKLC-20	0.19	22.89	0.41	0.54	1.18
WKLC-21	0.29	21.36	0.51	0.88	1.39
WKLC-22	0.20	26.69	0.48	0.86	1.35
WKLC-23	0.24	24.48	0.44	0.80	1.24
WKLC-24	0.30	29.38	0.43	0.79	1.22
WKLC-25	0.22	23.46	0.46	0.81	1.27
WKLC-26	0.66	26.01	0.46	0.82	1.28
WKLC-27	0.32	26.42	0.42	0.77	1.18
WKLC-28	0.17	23.27	0.41	0.78	1.19
WKLC-29	0.84	30.43	0.45	0.82	1.27
WKLC-30	0.49	23.76	0.44	0.82	1.26
WKLC-31	0.29	22.59	0.44	0.83	1.27
WKLC-32	0.68	28.52	0.45	0.87	1.32
WKLC-33	0.65	31.13	0.41	0.78	1.22
WKLC-34	0.94	29.33	0.42	0.81	1.23
SE ±	0.009	0.023	0.007	0.008	0.003
CD (P=0.05)	0.026	0.064	0.021	0.022	0.010

Table 4: Quality Parameters of F_5 generation of chilli germplasm

F_5 Generation	**Capsaicin % (Green chilli)**	**Anthocyanin (mg 100 g^{-1}) (Red chilli)**	**Chlorophyll 'a' (mg g^{-1})**	**Chlorophyll 'b' (mg g^{-1})**	**Total Chlorophyll (mg g^{-1})**
WKLC-1	1.26	27.49	0.44	0.77	1.22
WKLC-2	0.79	24.53	0.49	0.85	1.34
WKLC-3	0.93	22.80	0.43	0.80	1.23
WKLC-4	0.82	26.79	0.42	0.78	1.20
WKLC-5	1.32	29.08	0.45	0.79	1.24
WKLC-6	0.69	24.39	0.44	0.83	1.27
WKLC-7	0.61	23.52	0.47	0.81	1.28
WKLC-8	0.72	22.55	0.42	0.76	1.18
WKLC-9	0.52	27.54	0.39	0.65	1.04
WKLC-10	0.69	25.57	0.42	0.75	1.18
WKLC-11	1.33	23.43	0.41	0.81	1.23
WKLC-12	0.75	22.76	0.45	0.81	1.26
WKLC-13	0.93	28.34	0.38	0.63	1.01
WKLC-14	0.45	23.52	0.48	0.85	1.34
WKLC-15	0.50	24.27	0.50	0.87	1.37
WKLC-16	0.78	30.51	0.52	0.88	1.40
WKLC-17	0.71	27.75	0.38	0.64	1.02
SE ±	0.006	0.035	0.003	0.003	0.004
CD (P=0.05)	0.017	0.101	0.010	0.009	0.011

Table 5: Quality Parameters of F_6 generation of chilli germplasm

F_6 Generation	**Capsaicin % (Green chilli)**	**Anthocyanin (mg 100 g^{-1}) (Red chilli)**	**Chlorophyll 'a' (mg g^{-1})**	**Chlorophyll 'b' (mg g^{-1})**	**Total Chlorophyll (mg g^{-1})**
WKLC-1	0.42	25.68	0.45	0.79	1.24
WKLC-2	0.62	27.25	0.43	0.80	1.23
WKLC-3	0.54	24.22	0.45	0.82	1.27
WKLC-4	0.70	30.53	0.46	0.83	1.30
WKLC-5	0.47	29.53	0.43	0.79	1.22
WKLC-6	0.94	27.40	0.42	0.78	1.20
WKLC-7	0.47	25.68	0.40	0.65	1.05
WKLC-8	0.74	26.53	0.47	0.83	1.30
WKLC-9	0.65	25.38	0.52	0.87	1.38
WKLC-10	0.87	24.94	0.40	0.80	1.20
WKLC-11	0.67	23.60	0.44	0.80	1.23
WKLC-12	0.38	29.48	0.46	0.80	1.26
WKLC-13	0.61	27.75	0.43	0.77	1.20
WKLC-14	0.42	25.20	0.42	0.82	1.24
WKLC-15	0.50	27.56	0.42	0.80	1.22
WKLC-16	0.50	28.51	0.46	0.78	1.24
WKLC-17	0.39	26.45	0.51	0.86	1.37
SE ±	0.006	0.033	0.013	0.003	0.004
CD (P=0.05)	0.018	0.096	0.036	0.008	0.010

4. Conclusion

From the above study it can be indicated that significant difference observed in quality parameter of hundred chilli germplasm.

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