International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 150-153

Received: 21-07-2018
Accepted: 25-08-2018

Harish Kumar TG
Dept. of Vegetable Science, College of Horticulture, Bagalkot, Karnataka, India

HB Patil
Dean, College of Horticulture, Bagalkot, Karnataka, India

PS Ajjappalavara
Assistant Professor, Dept. of Vegetable Science, HRES, Devihosur, Haveri, Karnatka, India

Devihosur, Haveri
Ph. D Scholar, Dept. of Vegetable Science, College of Horticulture, Bagalkot, Karnataka, India

Megharaj KC
Ph. D Scholar, Dept. of Vegetable Science, College of Horticulture, Bagalkot, Karnataka, India

Satish D
Assistant Professor, Dept. of Crop improvement and Biotechnology, UHS, Bagalkot, Karnataka, India

Revanappa
Professor, Dept. of Vegetable Science, College of Horticulture, Bagalkot, Karnataka, India

Correspondence
Harish Kumar TG
Dept. of Vegetable Science, College of Horticulture, Bagalkot, Karnataka, India

Performance of chilli (*Capsicum annuum* L.) genotypes for green chilli yield and quality

Harish Kumar TG, HB Patil, PS Ajjappalavara, Megharaj KC, Satish D and Revanappa

Abstract
The performance study of thirty seven advanced lines of green chilli (*Capsicum annuum* L.) was carried out for important yield and yield related traits during the *kharif* season of 2016-2017 at Horticulture Research and Extension Station, Haveri (Devihosur). The data pertaining to yield characters revealed that genotype ST-16 recorded higher yield per plant (939.30 g), followed by ST-33 (879.37 g) and ST-13 (882.27 g). The genotype ST-16 (26.46 kg) recorded significantly higher yield per plot followed by ST-13 (25.18 kg) and ST-33 (24.29 kg). The genotype ST-28 recorded higher plant height (84.46 cm) and plant spread (58.51cm) while genotype ST-37 (4.40) for primary branches and higher number of secondary branches per plant recorded in ST-36 (9.60). The genotype ST-07 has taken minimum number of days (22.50) for first flowering and also days to 50 per cent flowering. Number of fruits per plant recorded maximum in genotype ST-33 (198), fruit length in ST-25 (12.62cm) and fruit diameter in ST-20 (1.59 cm). Whereas maximum fruit weight was recorded in ST-14(7.85 g), lowest stalk length in ST-22 (1.80 cm) of stalk to fruit ratio in ST-01 (0.021).

Keywords: chilli, genotypes, performance, yield, quality

Introduction
Chilli (*Capsicum annuum* L., 2n=2x=24) belongs to family Solanaceae. The genus *Capsicum* is believed to be one of the earliest domesticated plant genera and had been dated back to around 7000 years ago based on archaeological data. Presently, it is grown extensively throughout India under both rainfed and irrigated conditions. Chillies are considered to be rich source of ascorbic acid (vitamin-C) and minerals. Apart from this, chilli is credited with many virtues, since it has a great medicinal value (Nadakarni, 1927) [9].

India is the major green chilli growing country in the world having an area of 140.04 thousand hectare with production of 1687.83 thousand tons. In India, Karnataka is the major growing state where area under green chilli is 43.66 thousand hectare with the production of 596.13 thousand tons followed by Bihar (39.49 thousand hectare and 478.1313 thousand ton) and Andhra Pradesh (10.88 thousand ha and 167.24 thousand tons).

The national and state productivity of the green chilli is very low as much of area is occupied by the local, low yielding genotypes and the area under hybrids or improved varieties is very limited. The productivity is low due to unsuitable cultivars, biotic and abiotic stresses, genetic drift in cultivars and development of new races of pathogens. In chilli, yield is a complex character (quantitative character) controlled by the large number of yield contributing characters. In the breeding of pepper, the production and quality are of main interest. It is not only influenced by a number of related characters which are governed by a few number of genes, but is also influenced to great extent by environment. Hence, there is a prime need for identifying the lines which are having high green fruit yield with superior quality to increase the national and state productivity of the green chilli and also for identification of consumer based types for their domestic use. Therefore, evaluation of chilli lines is necessary with reference of morphological descriptors like plant height, plant spread, fruit length, orientation and yield.

Material and Methods
The investigation was carried out during *kharif* season in 2016-2017 at Horticulture Research and Extension Center, Haveri (Devihosur) with thirty two new genotypes and 5 checks (Byadgi Dabbi, Byadgi Kaddi, G4, Pusa Jwala, GC-96/68) in Randomized Complete Block

Design (RCBD) with two replication. These thirty two new lines were evolved by using the parents *viz*., Spice Paprika, Tejaswini, Kt.PI-19, GPM 106, GPM 80, Punjab gucchedar, GPM 324, GPM 46, GPM 342, GPM 303, GPM 57, GPM 177, Byadgi Dabbi, Kusgal Dabbi, Byadgi Kaddi, VN2 series (VN2, VN2-28, VN280, VN2-66, VN2-31, VN2-53) and ASR series (ASR-1, ASR-9, ASR-10, ASR-14, ASR-6, ASR-3, ASR-13, ASR-141, ASR--8) in different cross combinations and selection in the advanced generation for the development of these inbred lines (ST1-ST32) and evolved as new lines. Observations were recorded from five randomly selected plants in each experimental plot. The selected plants were tagged for taking observations on various growths and green chilli yield parameters like plant height (cm), plant spread (cm), number of primary branches, number of secondary branches, days to first flowering, days to fifty percent flowering, total number of fruits per plant, total fruit yield per plant (g), fruit length (cm), fruit weight (g), fruit diameter (cm), stalk length (cm) and stalk to fruit ratio and quality parameters like ascorbic acid (mg/100g), capsaicin (%), and chlorophyll content (mg/100g) were also estimated. Biochemical parameters of green chilli, chlorophyll content of fruits (mg/g) and ascorbic acid content of fruits (mg/g) were estimated by following the methods suggested by Thimmaiah (1999) [11]. Capsaicin content (per cent) was estimated in green chilli by the procedure proposed by Palacio (1977) [10], and it was converted to SHU (Scoville Heat Units) as per the suggestion of Todd *et al*., (1977) [12] and genotypes pungency classified using Scoville Heat Units (Weiss, 2002) [13].

Results and Discussion

Among the 37 lines evaluated, genotype ST-12 recorded maximum plant height at 60, 90 DAT, followed by ST-13 and the lowest plant height was recorded in ST-03 at 60, 90 and 120 DAT (Table 1). The genotype ST-28 recorded higher plant height at 120 DAT. The genotype ST-12 recorded highest plant spread at 60, 90 and 120 DAT whereas the lowest plant spread was recorded in ST-01 at 60, 120 DAT, and ST-03at 90 DAT. The genotypeST-37 recorded higher number of primary branches per plant, while lowest number of primary branches per plant was recorded in ST-03.The genotype ST-36 recorded higher number of secondary branches per plant, while the lowest number of secondary branches per plant was recorded in ST-02.With respect to earliness, ST-07 has taken minimum number of days for first flowering, followed by ST-28, while the genotype ST-10has taken maximum number of days for first flowering. With respect to days to 50 per cent flowering, the genotype ST-09, ST-11, ST-23 and ST-27 took least number of days followed by ST-08 and ST-28.

Perusal of data for yield attributes revealed that ST-33 recorded highest number of fruits per plant while the lowest recorded in ST-01. Highest fruit length was found to be in ST-25 while lowest in ST-02.The fruit diameter was higher in ST-20. The average fruit weight was higher in ST-14 while the lowest was observed in ST-35 and ST-37. The lowest stalk length was observed in ST-22 compared to highest in ST-14. ST-01 recorded highest stalk to fruit ratio and the lowest in ST-16. Among the 37 genotypes evaluated, ST-16 recorded highest yield per plant, yield per plot, and yield per hectare while the lowest yield per plant, yield per plot, and yield per hectare was observed in ST-01.The yield mainly depends on yield attributing characters like number of fruits per plant and weight of the fruit. These yield attributing characters in turn depend on the morphological characters for contribution towards yield. For higher yield in other genotypes either number of fruits per plant or average fruit weight or both have contributed as evidenced by positive correlation among these parameters. The variation in yielding ability of varieties is attributed to genetic makeup, as yield is a complex character which is governed by polygenes. Existence of such variations in yield traits were also been reported by Datta and Chakraborty (2013) [1], Datta and Jana (2016) [2] and Jaisankar *et al*. (2015) [3] in chilli. The parameters like days to first flowering, days to 50 per cent flowering, are the indicators of earliness. The high yielding genotypes namely ST-16 and ST-13 were early in nature and indicated by negative correlation with yield. This indicates that high yielding early genotypes were efficient utilizers of photosynthates by translocating higher photosynthates to sink over longer picking period.

Among the 37 genotypes evaluated, ST-01 recorded highest ascorbic acid content followed by ST-04 and ST-06 whereas, the lowest ascorbic acid content was observed in ST-19 which were in accordance with Datta and Jana. (2016) [2], Jaisankar *et al*. (2015) [3] and Maurya *et al*. (2017) [8] in chilli. The genotype ST-09 had higher chlorophyll content followed by ST-11 and ST-15 and the lower chlorophyll content was observed in ST-02. This difference in chlorophyll content is might be due variation in genotype and influence of environmental conditions and the similar findings were reported by Datta and Jana. (2016) [2], Karak *et al*. (2015) [6] and Chowdhury *et al.* (2015) in chilli. The genotype ST-15 recorded highest capsaicin content that was grouped under very high pungent group and followed by ST-22, and ST-19 whereas, the lowest capsaicin content was observed in ST-12. The differences in capsaicin contact is due to variation of capsaicin compound present in seed and placenta of different genotypes and also by environmental fluctuations. Similar results on capsaicin content were reported by Khyadagi *et al*. (2012) [7] and Janaki *et al*. (2015) [4, 5].

For grouping of chilli genotypes based on pungency, the genotypes per cent pungency was converted to Scoville Heat Units (SHU) as per the suggestion of Todd *et al*., (1977) and genotypes pungency classified using Scoville Heat Units (Weiss, 2002) [13]: Thirty seven (Table 3) genotypes, analysed for capsaicin content in green chilli were grouped based on SHU. Among 37 genotypes, the genotypes ST-16 and ST-13 were grouped as moderately pungent types and with respect to yield these genotypes were on par with check *i.e* ST-33 which is moderately pungent and included in this group. The genotypes ST-24, ST-22 and ST-26 were included in highly pungent group and these genotypes were on par with check *i.e.*, ST-36 with respect to yield, where ST-36 is highly pungent type. The evaluation of different chilli genotypes showed wide variation in yield, quality and yield attributing characters in green chilli. Among the genotypes evaluated the data pertaining to yield characters, ST-16 recorded higher yield per plant, yield per plot followed by ST-33and ST-13. The genotypes ST-13 and ST-16 are on par for fruit yield with ST-33 which is a check variety and these are included in moderately pungent group and these can be commercially exploited. The genotypes included in highly pungent group are ST-24, ST-22 and ST-26 along with one of the check *i.e.*, ST-36 which is also having comparatively higher yield and these were promising genotypes.

Table 1: Performance of genotypes for growth parameters

Genotype	PH@ 60DAT	PH@90 DAT	PH@120 DAT	PS@60 DAT	PS@90 DAT	PS@120 DAT	PB	SB	DFF	DFTT
ST-01	47.42	51.09	52.69	25.27	30.66	34.26	2.43	4.93	28	50
ST-02	46.62	54.45	56.12	29.02	31.16	35.1	2.5	4.9	29.5	47
ST-03	38.58	43.54	45.27	25.15	30.36	38.66	2.4	5.3	29	44.5
ST-04	52.65	59.21	61.84	36.24	38.78	44.17	3.2	6.6	28	45
ST-05	54.12	65.01	66.03	36.44	39.89	42.28	3.8	8.1	27	47
ST-06	62.05	66.89	68.74	38.93	40.09	46.5	3.6	7.7	23.5	46
ST-07	68.42	78.19	83.93	41.37	46.63	48.58	3.1	8	22.5	43.5
ST-08	64.9	70.76	73.61	44.79	49	49.98	3	6.6	30.5	42.5
ST-09	59.05	65.69	66.37	39.96	44.69	47.26	3.1	6.8	28	42
ST-10	65.4	71.54	72.83	47.04	49.83	50.89	2.7	5.7	31.5	42.5
ST-11	63.05	73.7	74.43	44.17	47.46	48.14	2.7	6.5	30.5	42
ST-12	70.9	82.35	83.05	57.68	58.14	58.51	2.8	7.9	31	44
ST-13	70.6	79.51	81.06	48.95	54.16	54.8	2.4	6.8	26.5	48
ST-14	59.95	64.64	66.05	47.68	48.54	48.87	2.7	6.4	28	44
ST-15	54.95	66.32	67.99	37.91	40.27	41.25	2.5	5.1	27	43
ST-16	67.3	81.55	82.15	54.15	55.9	56.68	2.4	7	28.5	43.5
ST-17	64.45	74.8	77.19	41.48	43.9	44.26	2.7	6.1	30	44
ST-18	59.25	63.49	66.82	37.27	39.1	39.8	2.6	5.9	23.5	45.5
ST-19	59.95	70.45	72.2	42.41	46.02	46.4	2.7	6.3	29.5	44.5
ST-20	58.9	60.71	67.86	42.87	43.71	44.77	2.5	5.1	28	43.5
ST-21	56.8	64.81	67.17	42.52	44.47	45.43	2.5	5.9	27	43.5
ST-22	64.6	75.18	78.86	47.64	50.6	51.71	2.8	6.2	26	43.5
ST-23	64.05	71.88	67.45	45.25	49.69	50.21	3	7	23	42
ST-24	61.5	66.56	70.08	44.38	47.43	47.91	2.7	7.3	24	45.5
ST-25	63.5	71.7	71.89	45.73	48.13	48.62	2.7	7.4	25	43
ST-26	62.65	68.32	71.66	51.48	52.09	52.32	2.7	7.2	24.5	43
ST-27	63.35	68.01	70.56	46.21	46.66	47.35	2.9	7.9	28.5	42
ST-28	61.82	80.94	84.46	55.61	56.26	56.9	2.7	6.5	23	42.5
ST-29	59.65	68.83	69.65	45.36	45.97	46.36	2.7	6.6	26	44
ST-30	68	77.06	78.14	45.63	48.4	49.23	2.7	6.7	27	44.5
ST-31	62.35	67.34	67.86	41.37	41.92	42.1	2.6	5.9	26.5	44.5
ST-32	64.34	70.81	73.66	51.05	51.4	52.1	4.2	8.4	30.5	48.5
ByadgiKaddi	65.7	69.08	76.12	49.28	55.19	55.95	2.6	7.6	24	45
ByadgiDabbi	65.6	70.42	70.83	40.93	56.37	56.75	2.7	6.8	26.5	48.5
G-4	61.65	69.51	74.61	49.96	50.31	50.8	2.5	6.8	27.5	46
PusaJwala	63.3	71.27	72.47	42.64	48.84	49.55	3.5	9.6	27	46.5
GCS-94/68	58.85	60.26	65.03	38.31	41.27	42.19	4.4	8.1	26.5	48
Mean	60.98	68.54	70.32	43.3	46.3	47.75	2.86	6.75	27.09	44.66
SEm±	4.13	4.77	4.57	5.13	5.21	4.3	0.32	0.77	1.73	1.43
CD (0.05)	11.86	13.69	1 3.1	14.72	14.93	12.34	0.91	2.21	4.96	4.1
CV %	9.59	9.85	9.19	16.77	15.9	12.74	15.73	16.18	9.03	4.53

ST- Station trail, PH-Plant height, PS-Plant spread, PB-Primary branches, SB-Secondary branches,
DAT-Days after transplanting, DFF-Daysto first flowering, and DTFF-Days to 50% flowering

Table 2: Performance of chilli genotypes for green yield and quality traits

	yield and yield attributing characters									quality parameters		
Genotype	No. of fruits/plant	Fruit length (cm)	Fruit diameter (cm)	Avg. Fruit weight (g)	Stalk length(cm)	Stalk to fruit ratio	Yield per plant (g)	Plot yield (kg)	Yield/ha(t)	Chlorophyll content (mg/100g)	Ascorbic acid content (mg/100g)	Capsaicin content (%)
ST-01	38.47	7.88	1.01	4.4	2.4	0.021	159.92	4.52	4.18	0.55	390.91	0.15
ST-02	52.47	6.8	0.97	4.05	2.43	0.017	161.00	4.56	4.22	0.28	180.99	0.14
ST-03	70.29	8.13	1.13	4.1	2.56	0.013	297.74	8.51	7.88	0.30	270.22	0.11
ST-04	79.5	7.3	1.06	4.35	2.59	0.012	288.44	8.22	7.62	0.68	235.58	0.12
ST-05	59	7.78	1.07	4.63	2.24	0.015	249.67	6.99	6.48	0.30	232.58	0.09
ST-06	74	9	1.19	4.3	2.98	0.012	294.86	8.41	7.79	0.46	332.18	0.09
ST-07	78.9	7.76	1.08	5.5	2.15	0.009	400.86	11.45	10.61	0.30	207.12	0.12
ST-08	117.34	7.79	1.1	5.67	2.35	0.006	619.12	17.07	15.8	0.39	108.06	0.09
ST-09	96	7.56	1.16	6	2.36	0.007	523.91	14.45	13.38	2.02	309.60	0.10
ST-10	107	8.26	0.99	5.1	2.35	0.008	503.54	13.89	12.86	0.39	308.42	0.10
ST-11	104.74	8.69	1.32	6.9	2.68	0.005	692.01	19.09	17.68	1.31	146.68	0.11
ST-12	173.58	9.2	0.97	4.25	2.75	0.005	694.21	19.14	17.73	0.40	99.69	0.07
ST-13	135.94	9.5	1.51	7.05	2.45	0.004	882.27	25.18	23.32	0.33	295.55	0.10
ST-14	96.6	9.98	1.31	7.85	3.45	0.006	750.1	20.7	19.17	0.71	105.06	0.10
ST-15	87.89	8.48	0.96	5.08	2.97	0.008	463.05	12.79	11.84	1.05	173.33	1.05
ST-16	163.55	8.89	1.05	6.05	2.61	0.003	939.3	26.46	24.5	0.47	94.94	0.10

ST-17	72.73	6.54	1.13	4.7	2.84	0.011	307.8	8.7	8.05	0.36	177.66	0.15
ST-18	101.6	10.91	1.02	6.68	3.16	0.006	655.5	18.52	17.15	0.27	128.43	0.12
ST-19	79.75	8.94	1.25	6.8	2.78	0.009	507.39	14.34	13.28	0.72	47.09	0.28
ST-20	62.8	7.93	1.59	7.05	1.9	0.01	428.22	12.08	11.18	0.25	113.89	0.22
ST-21	92.6	7.63	1.19	5.25	1.85	0.008	447.4	12.6	11.66	0.38	87.87	0.19
ST-22	118.7	8.9	1.27	6.5	1.8	0.005	734.44	20.24	18.74	0.26	76.02	0.34
ST-23	111.65	8.78	1.22	5.8	2.47	0.006	599.39	16.56	15.34	0.31	56.63	0.11
ST-24	154.79	8.2	1.08	5.9	2.83	0.004	830.5	23.16	21.44	0.62	83.81	0.21
ST-25	114	12.62	1.11	5.58	2.59	0.006	595.1	16.42	15.21	0.50	65.07	0.09
ST-26	130.9	9.13	1.05	5.8	2.47	0.007	736.95	20.34	18.83	0.39	122.57	0.24
ST-27	126.34	7.55	0.98	5.15	2.59	0.005	490.7	13.82	12.8	0.64	109.50	0.19
ST-28	129.7	9.15	1.02	5.4	2.86	0.005	650.81	18.28	16.93	0.66	77.44	0.23
ST-29	136.83	8.25	1.09	5.1	2.35	0.004	629.39	17.77	16.45	0.47	80.38	0.20
ST-30	90.6	7.52	0.95	5.3	2.5	0.008	465.15	13.12	12.14	0.32	82.00	0.17
ST-31	82.7	7.78	1.52	7.6	1.93	0.006	603.39	16.7	15.47	0.79	66.32	0.15
ST-32	149.49	6.85	0.91	4.05	2.35	0.004	605.47	17.07	15.8	0.46	52.76	0.20
ByadgiKaddi	198.69	10.95	1.35	5.45	1.9	0.004	879.37	24.29	22.49	0.26	315.19	0.12
ByadgiDabbi	86.2	7.47	1.41	6.65	1.82	0.006	531.06	14.63	13.55	0.28	139.84	0.09
G-4	173.3	6.7	0.97	4	2.52	0.006	629.42	17.72	16.41	0.49	106.68	0.19
PusaJwala	135.31	7.45	1.02	5.5	2.47	0.006	683.39	19.27	17.84	0.24	191.60	0.23
GCS-94/68	88.2	6.87	1.03	4	2.79	0.01	316.95	8.93	8.27	0.48	57.81	0.24
Mean	109.29	8.35	1.14	5.5	2.49	0.008	547.24	15.29	14.16	0.51	154.85	0.18
SEm±	7.12	0.64	0.07	0.29	0.26	0.0007	39.23	1.59	1.56	0.02	3.42	0.01
CD (0.05)	20.41	1.84	0.21	0.84	0.75	0.0021	112.51	4.56	4.48	0.05	9.82	0.02
CV %	9.21	10.88	9.17	7.49	14.87	13.08	10.14	14.7	11.54	4.69	3.13	6.81

Table 3: Grouping of chilli genotypes based on SHU (Scoville Heat Units)

Pungency range (SHU)	Genotypes
Non-pungent (0-700 SHU)	-
Mildly pungent (700-3,000 SHU)	-
Moderately pungent (3,000-25,000 SHU)	ST-01, ST-02, ST-03, ST-04, ST-05, ST-06, ST-07, ST-08, ST-09, ST-10, ST-11, ST-12, ST-13, ST-14, ST-16, ST-17, ST-18, ST-23, ST-25, ST-31, ST-33, ST-34
Highly pungent (25,000-70,000 SHU)	ST-19, ST-20, ST-21, ST-22, ST-24, ST-26, ST-27, S T-28, ST-29, ST-30, ST-32, ST-35, ST-36, ST-37
Very highly pungent (80,000 SHU)	ST-15

References

1. Datta S, Chakraborty G. Studies on influence of genotypic diversity on yield, quality and incidence of white fly and yellow mite in chilli (*Capsicum annuum* L.) J Appl. Nat. Sci. 2013; 5(2):350-356.
2. Datta S, Jana JC. Growth, yield and important quality attributes chilli (*Capsicum* sp.) genotypes under the Sub Himalayan tracts of West Bengal. Indian J Hort. 2016; 73(1):66-73.
3. Jaisankar I, Shrawan S, Goutham RK, Velmurugan A, Singh AK, Dam Roy S *et al*. Performance of chilli genotypes for green fruit yield in andaman and nicobar islands J Andaman Sci. Assoc 2015; 20(1):744-105.
4. Janaki M, Naram Naidu L, Venkataramana, C, Paratpararao, M. Selection of promising genotypes for qualitative traits in chilli (*Capsicum annuum* L.). Plant Archives. 2015; 15(1):441-446.
5. Janaki M, Naram Naidu L, Venkataramana C, Paratpararao M. Performance of chilli (*Capsicum annuum* L.) genotypes for yield and yield attributing traits. Plant Archives. 2015; 15(2):661-666.
6. Karak PK, Pariari A, Karak C. Varietal evaluation of chilli in the saline belt of West Bengal. J Crop Weed. 2015; 11:86-89.
7. Khyadagi K, Jawadagi R, Wali SY. Evaluation of chilli cultivars (*Capsicum annuum* L.) for qualitative parameters at different maturity stages. Asian J Hort. 2012; 7(2):488-492.
8. Maurya AK, Kushwaha ML. Maurya SK, Ankit Panchbhaiya. Estimation of Per se performace of chilli (*Capsicum annuum* L.) genotypes for yield and quality traits. J. Pharmacognosy and Phytochemistry. 2017; 6(1):333-335.
9. Nadakarni KM. The Indian medica. J Society Chemical Industry. 1927; 48(5):116.
10. Palacio JJ R. Flavers and Non-alcoholic Beverages Spectrophotometric determination of capsaicin. J.A.O.A. C. 1977; 60(4):970-972.
11. Thimmaiah RR. Standard method of biochemical analysis, Kalyani publishers. New Dehli, 1999; 307-308.
12. Todd P, Bensinger M, Biftu T. Determination of Pungency due to *Capsicum* by Gas-Liquid Chromatography. J Food Sci. 1977; 42:660-665.
13. Weiss EA. Spice Crops. CABI Publishing International, 2002; 411.