



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(9): 1767-1772  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 01-06-2022

Accepted: 03-08-2022

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## Studies on yield potentiality and yield contributing characters of different chilli genotypes

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### Abstract

The field experiment conducted at the College of Horticulture, Anantharajupeta, Dr. Y.S.R. Horticultural University, Andhra Pradesh, during *Kharif* 2021. Thirty-six (36) chilli (*Capsicum annum* L.) genotypes were evaluated for yield and yield attributing characters using Randomized Block Design with two replications. The analysis of variance revealed the significant differences between the genotypes for all characters indicating the presence of genetic variability among the genotypes. Among 36 genotypes maximum plant height was recorded in LCA 657(124.5 cm) while minimum was recorded in LCA 235(55.3 cm), whereas the genotype LCA 808 recorded maximum number of fruits per plant (245.5), fresh fruit yield (1449.5g) and dry fruit yield per plant (230.8 g). The maximum fruit length (20.4) and minimum days to fruit maturity (83.0) were observed in Byadagi Kaddi. The maximum number of seeds per fruit (191.3), seed weight per fruit (1.37 g), 1000 seed weight (9.16 g) and fruit diameter (11.9 cm) was recorded in Warangal Chappatta Single Patti. Among the 36 genotypes LCA-808, LCA-620, LCA-625, LCA-680 and LCA-806 were recorded to be promising based on yield. Hence, these lines can be used in further crop improvement.

**Keywords:** *Capsicum annum* L., genotypes, growth, yield and yield attributing characters, WDP-Warangal Chappatta double Patti, WSP- Warangal Chappatta single Patti

### Introduction

Chilli (*Capsicum annum* L.,  $2n=2x=24$ ) member of the Solanaceae family, it is considered to be a universal spice crop with immense economic significance and is commercially cultivated as a spice, condiment, vegetable, culinary supplement, medicine and ornamental plant throughout the world (Dias, 2013). The chilli originated from Mexico and Central America and it was first introduced into India by the Portuguese traders towards the end of the 15th century and its farming became popular in the 17th century (Nagaraju *et al.*, 2018). India is the world's largest producer and exporter of chilli and contributes 33% of world's total chilli production and in India, chilli cultivation has spread to the states of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Kerala, West Bengal and Madhya Pradesh, Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Delhi and Punjab with an area of 1.43 lakh ha and production 6.66 lakh tonne (NHB, 2021). It is considered as capsules of vitamins as they are rich sources of vitamin C (ascorbic acid), provitamin A, E, P (citric), thiamine (B1), riboflavin (B2) and niacin (B3), minerals like molybdenum, manganese, folate, potassium and copper, phenols, flavonoids and carotenoids determine the high nutritional and health value of the plant. The pungency is due to the presence of an alkaloid called capsaicin ( $C_{18}H_{27}NO_3$ ) in the placenta and pericarp of ripened fruit. Carotenoid pigments present in the thylakoid membranes of chloroplast influence colour *i.e.* red, orange, and yellow of pepper. Chlorophyll a & b are responsible for the production of the green colour of chilli, the yellow-orange colour due to lutein, zeaxanthin, violaxanthin, antheraxanthin, beta-cryptoxanthin and beta carotene and the red colour due to capsanthin, capsorubin and cryptocapsin.

Higher productivity and improvement of fruit quality for the international global export market is a goal of plant breeders worldwide in any commercial crop. To meet this demand, it is necessary to breed and select the lines of pepper accordingly. A wide range of variability is available in chilli genotypes which provide great scope for improving fruit yield and quality aspects through systematic breeding. Hence, this study was undertaken to screen chilli genotypes for yield and yield attributing characters.

## Materials and Methods

The field experiment was conducted during September 2021 to April 2022 at College farm, College of Horticulture, Anantharajupeta, Y.S.R Kadapa, Dr. Y.S.R Horticultural University, Andhra Pradesh with 36 chilli genotypes (Table 1) in a randomized block design with 2 replications. The nursery was raised in the last week of September and the 40 days old seedlings were transplanted at a spacing of 75 cm X 45 cm during the month of October. Each plot consisted with 18 plants, of which five plants were selected at randomly for

recording observations of Plant height (cm), Plant spread (cm), Number of primary branches, Days to 50% flowering, Days to maturity, Fruit length (cm), fruit diameter (cm), Number of fruits per plant, Number of seeds per fruit, Seed weight per fruit (g), 1000 seed weight (g), Fresh fruit yield (g), Dry fruit yield (g). All the recommended package of practices and all the crop protection measures followed as per the recommendations of Dr. Y.S.R. Horticultural University. Analysis of variance was carried out as per the procedure given by Panse and Sukhatme (1961).

**Table 1:** List of chilli genotypes used in the experiment and their source.

Genotypes	Name	Source
Paprika type	LCA-440, LCA-448, LCA-454, LCA-455, LCA-473, LCA- 474, LCA-477, LCA- 478, LCA-479, LCA-481, LCA-483, LCA -484, LCA-485, LCA-486, LCA-487, LCA-424, LCA-436, Byadagi Kaddi, Byadagi Dabbi Warangal chapatta single patti,	Lam, Guntur
Released varieties	LCA-206, LCA-235, LCA-334, LCA-353, LCA-620, LCA-625.	Lam, Guntur
Pre released Varieties	LCA-657, LCA-680, LCA-684.	Lam, Guntur
Yellow types	LCA-804, LCA-805, LCA-806, LCA-807, LCA-808, Aparna.	Lam, Guntur

## Results and Discussion

**Table 2:** Analysis of variance for growth, yield and quality traits in ripen chilli genotypes

Sl. No.	Source	Replication	Treatment	Error	S.Em	CD 5%
	Degrees of freedom	1	35**	35		
1	Plant height (cm)	27.43	616.55**	13.81	2.63	7.54
2	Plant spread (cm <sup>2</sup> )	10.61	31.39**	11.70	2.42	9.32
3	No of primary branches	0.10	0.39**	0.03	0.12	0.35
4	Days to 50% flowering	18	18**	8.80	2.10	6.02
5	Days to first harvest	10.59	24.66**	13.64	2.61	7.50
6	No of fruits per plant	0.22	5022.9**	31.25	3.95	11.35
7	Fruit diameter (cm)	0.00	6.35**	0.04	0.14	0.41
8	Fruit length (cm)	0.07	13.41**	0.12	0.25	0.72
10	Number of seeds per fruit	0.71	1356.85**	25.44	3.57	10.24
11	Seed weight per fruit (g)	0.01	0.12**	0.01	0.06	0.16
12	1000 seed weight (g)	0.01	3.28**	0.06	0.17	0.50
13	Fresh fruit yield per plant (g)	1768.14	106207.52**	1116.90	23.61	67.85
14	Dry fruit yield per plant (g)	11.82	4227.35**	65.83	5.74	16.47

\*Significant at 5% level \*\*significant at 1% level

**Table 3:** Mean performance of Chilli genotypes for yield and yield attributing characters

Sl. NO	PH	PS	NPB	DFP	DM	NFP	FL	FD	NSP	SWF	1000SW	FFY	DFY
LCA 454	103.8	86.4	3.25	58.0	135.5	88.0	12.7	4.23	53.66	0.57	7.11	618.00	93.00
LCA436	71.3	86.5	2.75	40.0	87.0	125.0	11.1	4.27	67.91	0.46	7.25	715.75	138.40
LCA424	117.9	79.9	2.41	47.5	100.5	85.0	13.4	4.50	90.91	0.46	6.49	464.20	64.50
BD	84.1	78.5	2.00	40.0	127.0	39.0	14.5	8.16	55.41	0.40	7.25	358.15	115.95
LCA 484	65.9	66.7	2.58	41.0	87.0	108.5	11.8	4.19	74.33	0.61	6.17	629.30	128.35
BK	95.4	71.0	3.00	44.0	83.0	55.5	20.4	4.91	90.16	0.74	6.96	423.25	69.65
LCA 808	89.8	82.1	3.40	41.5	102.5	245.5	16.4	3.72	63.75	0.28	5.01	1449.5	230.80
LCA 657	124.5	77.7	2.00	42.5	117.5	107.0	11.8	4.29	63.91	0.32	4.60	600.15	170.00
LCA 680	101.2	71.7	2.50	46.5	116.0	178.5	12.2	3.99	93.33	0.43	5.50	742.60	152.50
LCA 625	108.2	71.8	2.80	39.5	121.0	148.0	12.3	3.19	96.75	0.57	6.66	716.95	180.00
LCA 620	108.7	80.8	2.75	38.0	106.0	145.5	13.5	4.37	99.50	0.67	7.30	824.50	210.10
LCA 235	55.3	55.1	2.50	38.0	87.0	116.5	7.9	2.86	44.75	0.17	3.85	179.80	30.50
LCA 206	110.9	65.0	2.75	41.0	101.0	168.5	12.0	3.61	74.75	0.32	5.72	496.75	103.45
APARNA	73.3	60.5	2.10	45.5	95.0	115.0	10.8	3.72	75.25	0.41	4.42	466.50	80.00
LCA 684	94.6	75.7	2.40	48.0	120.0	171.0	12.8	3.72	74.75	0.42	5.21	605.00	172.50
LCA 473	92.1	83.7	2.30	56.0	119.5	96.5	14.1	4.32	59.25	0.49	5.72	645.00	108.00
LCA 474	75.0	72.9	2.10	50.0	108.5	83.0	10.5	4.78	83.83	0.56	5.95	348.50	103.50
LCA 806	65.6	65.1	2.41	44.0	99.0	199.5	14.5	4.26	30.83	0.16	5.31	650.90	147.90
LCA 353	89.4	72.6	2.00	56.5	109.5	185.5	14.0	3.95	78.83	0.32	4.62	553.60	133.50
LCA 334	93.9	65.3	2.00	50.5	107.5	148.5	16.0	3.59	79.08	0.34	4.75	395.55	137.00
LCA 804	99.4	66.2	3.50	42.5	98.5	117.0	9.3	3.46	65.75	0.35	5.15	202.90	67.50
LCA 486	80.6	60.7	2.40	57.0	115.0	89.0	13.2	5.10	80.33	0.44	6.02	467.25	129.50
LCA 487	72.0	43.4	2.10	47.0	114.0	56.5	13.1	4.57	77.25	0.52	6.26	429.00	136.50

LCA 483	69.3	60.3	2.50	58.5	108.5	90.5	11.5	4.02	59.00	0.32	6.00	326.80	59.00
LCA 481	59.6	46.0	2.40	48.5	105.0	109.5	18.3	5.13	100.00	0.53	7.15	565.90	149.50
LCA 448	76.3	51.0	2.00	57.5	124.0	59.5	14.6	4.89	87.50	0.77	7.41	330.75	102.00
LCA 455	76.8	45.5	2.00	56.5	118.5	53.0	14.7	5.22	92.41	0.59	6.79	357.70	129.50
WDP	115.5	46.3	2.00	59.5	123.5	21.0	9.9	9.76	123.08	1.15	9.16	164.00	35.00
WDP	108.8	52.5	2.00	52.5	126.5	37.0	11.7	11.98	191.33	1.37	7.03	204.50	49.00
LCA478	79.9	50.3	2.00	41.5	98	128.5	11.3	4.25	91.83	0.51	5.35	679.50	113.50
LCA 477	69.9	32.6	3.00	57.5	123	64.5	10.9	4.44	68.25	0.49	6.55	421.65	72.50
LCA 479	73.1	47.5	3.00	58.5	116	82.5	10.9	4.90	98.60	0.82	7.33	542.50	86.00
LCA 485	83.8	58.9	2.50	44.5	114.5	71.5	13.9	4.04	80.41	0.47	2.08	459.25	79.50
LCA 807	78.0	63.0	2.00	45	103.5	89.0	18.7	4.095	99.66	0.75	6.76	628.90	128.50
LCA 440	90.9	63.2	2.10	60	119.5	79.5	12.8	6.22	86.41	0.64	5.30	633.30	137.50
LCA 805	98.1	61.33	2.00	48.5	95	138.0	11.7	3.65	78.00	0.38	5.80	539.55	102.00
MEAN	87.5	64.4	2.43	48.4	109.2	108.2	13.0	4.73	81.41	0.52	6.00	523.26	115.18

Analysis of variance results revealed the significant differences among thirty-six genotypes of chilli for all qualitative and quantitative characters studied (Table 2). Which specified that variability has existed in the germplasm

and there is considerable scope for improvement. The mean performance of thirty-six chilli genotypes for various growth and yield characters is described below.



**Fig 1:** Colour and fruit variability among chilli genotypes

The plant height in chilli genotypes ranged from 55.30 cm to 124.5 cm with an average mean of 87.58 cm (Table 3). Among the 36 genotypes, 19 genotypes recorded significantly maximum plant height than the grand mean of genotypes. The genotype LCA 657 has recorded significantly maximum plant height (124.5 cm) at the time of final harvesting followed by Warangal chapatta double patti (115.5cm), LCA 206 (110.9 cm), LCA 620 (108.8 cm) and LCA 625 (108.2cm). The minimum plant height was recorded in LCA 235 (55.3cm) and it is on par with LCA 481(59.6 cm). Similar results were reported by Dhumal *et al.* (2019), Janaki *et al.* (2015) [6, 7, 8]. The plant spread in chilli genotypes ranged from 32.6 cm<sup>2</sup> to 86.5 cm<sup>2</sup> with an average mean of 64.42 cm<sup>2</sup> (Table 3). Nineteen genotypes recorded significantly maximum plant spread when compared to the average of the genotype mean. The genotype LCA 436 (86.5 cm<sup>2</sup>) was recorded maximum plant spread and it is on par with LCA 454 (86.4), LCA 474(83.7cm<sup>2</sup>), LCA 657 (82.1cm<sup>2</sup>) and LCA 620 (80.8cm<sup>2</sup>). The lowest plant spread were recorded in LCA 477 (32.6 cm<sup>2</sup>)

followed by LCA 487 (43.4 cm<sup>2</sup>), LCA 455 (45.5 cm<sup>2</sup>) and LCA 481 (46.0 cm<sup>2</sup>). The results were comparable to the findings of Nagaraju *et al.* (2018).

The number of primary branches in 36 chilli genotypes ranged from 2 to 3.5, with an average mean of 2.43 (Table 3). Fourteen genotypes recorded the maximum number of primary branches than the average mean of the genotypes. The genotype LCA 804 (3.5) has noticed the maximum number of primary branches and it is statistically on par with LCA 808 (3.4), and LCA 454 (3.25). The lowest number of primary branches were recorded in LCA 804, LCA 806, LCA 478, LCA 448, Warangle chappata single patti, Warangle chappata double patti, LCA 455, LCA 334, LCA 353, Byadagi dabbi and LCA 657. The results are in agreements with Janaki *et al.* (2015) [6, 7, 8].

The days to 50% flowering in all 36 genotypes ranged from 38 to 60 days with an average mean of genotypes is 48.41 days (Table 3). Fifteen genotypes taken least number of days to 50% flowering than the grand mean. The genotypes LCA

620 and LCA 235 were taken minimum (38 days) for 50% flowering and it is on par with LCA 625 (39.5 days), LCA 436 (40 days), Byadagi dabbi (40 days) and LCA 484 (41 days). The genotype LCA 440 was taken maximum (60 days) for 50% flowering and it is on par with Warangle chappata double patti (59.5 days), LCA 479 (58.5 days), LCA 483 (58.5 days), LCA 477 (58.5 days), LCA 454 (58 days) and LCA 448 (57.5 days). Arup *et al.* (2011), Janaki *et al.* (2015)<sup>[6, 7, 8]</sup>, and Nagaraju *et al.* (2018) also recorded parallel results. The genotypes with early flowering more desirable for early yields in the season and also early lines are escape from pest and diseases.

The average number of days taken for fruit maturity in all 36 chilli genotypes ranged from 83-135.5 days with an average mean of genotypes 109.25 days (Table 3). Nineteen genotypes recorded a lesser number of days to fruit maturity compared to the grand mean. Byadagi Kaddi was taken as a minimum number of days for fruit maturity (83 days) and it is on par with 87 days for LCA 436, LCA 484, and LCA 235 genotypes. The genotypes with early maturity is desirable, which reduces the duration of crop in the field. The genotype LCA 454 were taken maximum number of days for fruit maturity 135.5 days followed by LCA 424 (127 days), Warangle Chappata single Patti (126.5 days) and LCA 625 (121 days). Nagaraju *et al.* (2018) report ed. the same trend of fruit maturity.

The number of ripened fruits per plant in 36 chilli genotypes ranged from 21 to 245.5 fruits with an average mean of 108.22 in number (Table 3). Seventeen genotypes recorded significantly maximum number of fruits per plant when compared to the average mean of the 36 genotypes. The genotype LCA 808 was recorded with highest number of ripened fruits per plant (245.5 fruits) followed by LCA 806 (199.5 fruits) and LCA 353 (185.5 fruits) both were on par with one another. While the lowest number of ripened fruits per plant was noticed in Warangle Chappata double Patti (21.00 fruits) followed by Warangle Chappata single Patti (37.00 fruits).

The fruit length in 36 chilli genotypes ranged from 7.9 to 20.4 cm with an average mean of 13.07 cm (Table 3). Fifteen genotypes recorded maximum fruit length at ripen stage when compared to the grand mean. The maximum fruit length (20.42 cm) was exhibited by Byadagi Kaddi followed by LCA 807 (18.75 cm), LCA 481 (18.30cm) and LCA 334 (16.0 cm). Whereas minimum fruit length was recorded in LCA 235 (7.9 cm) followed by LCA 804 (9.30 cm) and Warangle Chappata double Patti (9.9 cm).

The fruit diameter in chilli genotypes showing highly significant differences, ranged from 2.8 to 11.9 cm an average mean of 4.7 cm (Table 3). Twelve genotypes were found to record maximum fruit diameter when compared with a grand mean of 36 genotypes. The maximum fruit diameter was recorded in Warangle Chappata single Patti (11.9 cm) followed by Warangle Chappata double Patti (9.7 cm), Byadagi Dabbi (8.16 cm) and LCA 440 (6.2 cm) while minimum fruit diameter was recorded in LCA 235 (2.8 cm) and it is on par with LCA 625 (3.19 cm) followed by LCA 804 (3.46 cm). Similar results were recorded by Nagaraju *et al.* (2018).

The average number of seeds per fruit ranged from 30.8 to 191.3 an average mean of 81.41 (Table 3). Among 36 genotypes fifteen genotypes recorded a significantly highest number of seeds per fruit than the average mean. The

genotype Warangal chappati single patti was recorded with a maximum number of seeds (191.3) per fruit followed by Warangal chapatta double patti (123.08), LCA 481 (100) were on par with one another. The lines which have more number of seeds per fruit contributes mor to the seed weight. The minimum number of seeds per fruit was recorded in LCA 806 (30.83) followed by LCA 454(53.66), Byadagi Dabbi (55.41) and LCA 483 (59.00). Similar results were reported by Rekha *et al.* (2016), Janaki *et al.* (2015)<sup>[6, 7, 8]</sup>, and Nagaraju *et al.* (2018).

The average seed weight per fruit ranged from 0.16 to 1.37 g with an average mean of 0.52 g (Table 3). Thirteen genotypes were found to be recorded maximum seed weight per fruit than the grand mean. The genotype Warangle Chappata single Patti (1.37 g) was recorded the maximum seed weight followed by Warangle Chappata double Patti (1.15 g), LCA 479 (0.82 g), LCA 448 (0.77 g) and LCA 807(0.75 g) while minimum seed weight per fruit was recorded in LCA 806 (0.16 g) and it is on par with LCA 235 (0.17 g), LCA 808 (0.28 g), LCA 353 (0.32 g) and LCA 657 (0.32 g).The number of seeds and seed weight contributes to fruit yield, hence the genotypes with more seed weight are desirable. Similar results were reported by Raghuvver *et al.* (2022).

The 1000 seed weight in 36 chilli genotypes ranged from 3.85 g to 9.16 g with an average mean of 6.00 g (Table 3). Twenty genotypes were recorded significantly maximum test seed weight compared to the grand mean. Among 36 genotypes, the genotype Warangle Chappata single Patti (9.16 g) recorded maximum 1000 seed weight followed by 479 (7.33 g), LCA 436 (7.25 g) and Byadagi Kaddi (7.25 g) while LCA 235 was recorded (3.85 g) minimum seed weight and it is on par with LCA 485 (4.00 g) followed by Aparna (4.42 g), and LCA 353(4.62 g). Similar results were also reported by Rekha *et al.* (2016).

The fresh fruit yield per plant in 36 chilli genotypes ranged from 164.0 to 1449.5 g with an average mean of 523.26 g (Table 3). Seventeen genotypes were recorded significantly highest fresh fruit yield than the grand mean. Among the 36 genotypes, LCA 808 was recorded (1449.5 g) significantly maximum fresh fruit yield per plant due to the maximum number of fruits with moderate fruit weight followed by LCA 620 (824.5 g), LCA 680 (742.6 g), LCA 625 (716.92 g) and LCA 436 (715.75g) while the genotype Warangle Chappata double Patti was recorded (164.00) lowest fresh fruit yield per plant followed by LCA 235 (179.8 g), LCA 804 (202.9 g) and Warangle Chappata single Patti (204.5 g) both were statistically on par with each other. The genotypes with higher yields are contribute more to the dry fruit yield. These findings were in accordance with work carried out by Datta *et al.* (2016).

The average dry fruit yield per plant in 36 chilli genotypes ranged from 30.5 to 230.8g with an average mean of 115.18 g (Table 3). Eighteen genotypes were recorded significantly maximum dry fruit yield per plant when compared to the average mean. The genotype LCA 808 recorded a maximum fruit yield per plant (230.8 g) and it is on par with LCA 620 (210.1 g) followed by LCA 684 (172.5 g), LCA 680 (152.5 g) and LCA 807 (147.9 g) while the lowest dry fruit yield per plant was recorded in the genotype LCA 235 (30.5 g) followed by Warangle chappata double patti (35 g) both were statistically on par with each other. The findings were similar to the results of Janaki *et al.* (2015)<sup>[6, 7, 8]</sup>, Rekha *et al.* 2016, Kumar *et al.* (2017) and Nagaraju *et al.* (2018).

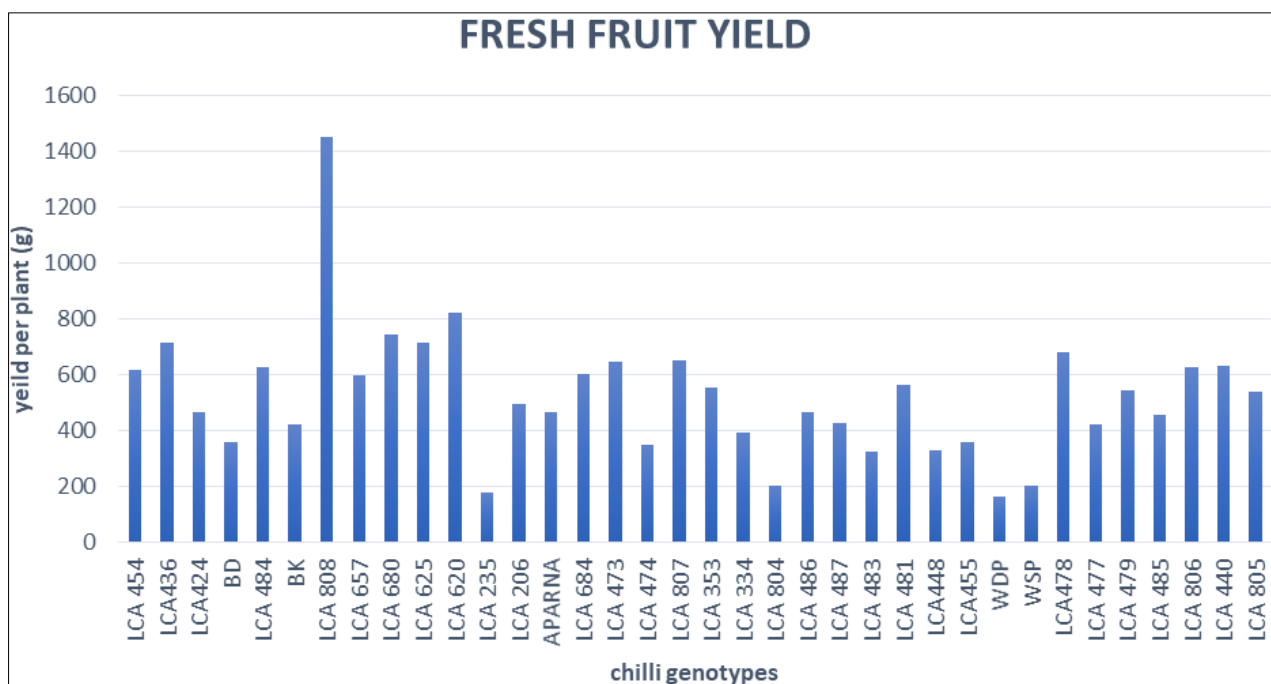


Fig 2: Graphical representation of Fresh fruit yield per plant (g)

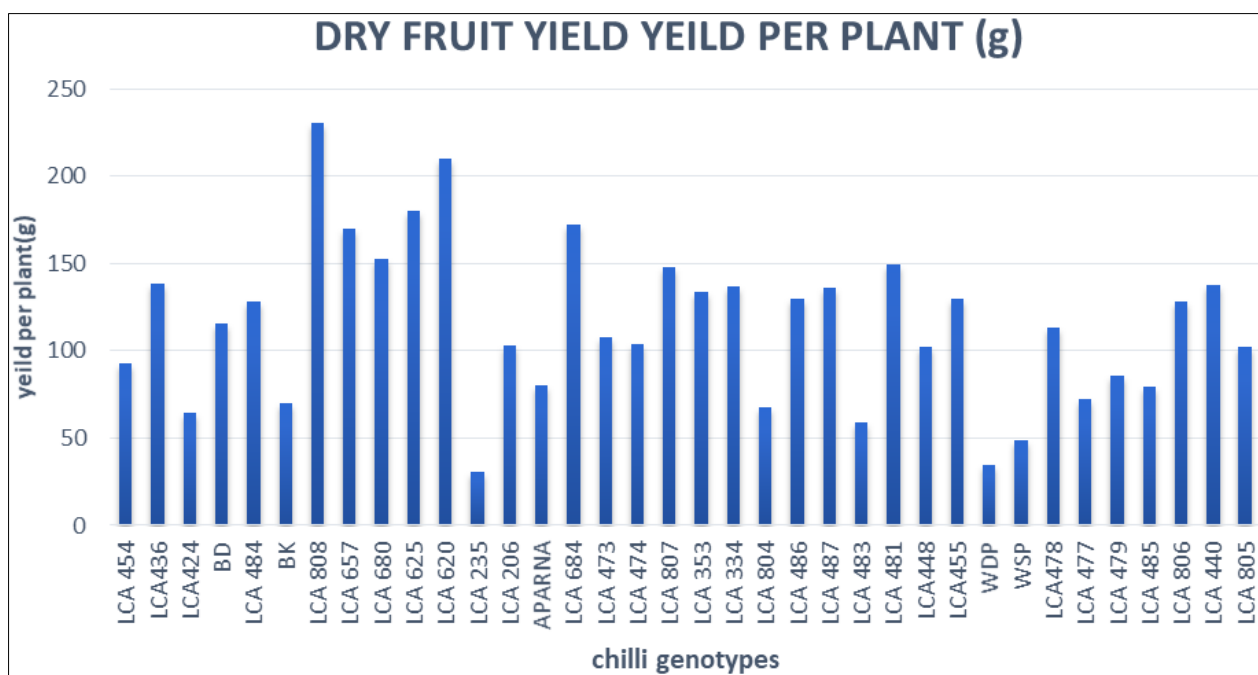


Fig 3: Graphical representation of Dry fruit yield per plant (g)

**Conclusion**

The findings on the average performance of 36 genotypes showed that there was a lot of variation in seventeen yield attributing and quality traits studied in chilli. In general, it was revealed that no single genotype was found to be better mean performance for all the attributes studied. The genotypes LCA 808 were found to be better in performance for the characters with maximum number of fruits per plant (245.5), fresh fruit yield (1449.5 g) and dry fruit yield per plant (230.8 g). For fruit length (20.4 cm), minimum days to fruit maturity (83 days) by Byadagi Kaddi showed better performance. The maximum number of seeds per fruit (191.3), seed weight per fruit (1.37 g), 1000 seed weight (9.16 g) and fruit diameter (11.9 cm) was recorded by Warangal Chappatta single Patti.

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