International Journal of Plant & Soil Science

Volume 37, Issue 9, Page 88-94, 2025; Article no.IJPSS.142194
ISSN: 2320-7035

Evaluation of Chilli Hybrids for Growth, Yield and Quality Traits in Agro-Climatic Conditions of Andhra Pradesh, India

C. Sarada [a*] and Majjiga Komala [b]

[a] Quality Testing Center, Lam, Dr.Y.S.R. Horticultural University, Andhra Pradesh, India.
[b] College of Horticulture, Chinalataripi, Dr.Y.S.R. Horticultural University, Andhra Pradesh, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijpss/2025/v37i95688

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://pr.sdiarticle5.com/review-history/142194

Original Research Article

Received: 26/05/2025
Accepted: 13/08/2025
Published: 22/08/2025

ABSTRACT

Chilli (*Capsicum annum* L.) is one of the most prominent vegetable and spice crop with high demand in India because of its pungency, colour, flavour and agreeable taste as well as nutritional value. Chilli holds a special place among other vegetables in Indian and worldwide cuisine. To meet the demand, there is a need to study the performance of F_1 hybrids with higher yields. Keeping this in view, the performance of eleven chilli hybrids was studied for growth, yield and quality characters using Randomized Block Design with three replications in vertisols of Andhra Pradesh. The standard recommended package of practices and need-based plant protection measures was followed for raising the crop. The observations on plant height (cm), total number of branches per plant, plant spread (N-S and E-W) (cm) and days to 50% flowering, the fruit characteristics like number of fruits per plant, fruit length (cm), fruit girth (cm) and average fruit weight (g) and the yield

**Corresponding author: E-mail: saradarao.chavali@gmail.com;*

Cite as: *Sarada, C., and Majjiga Komala. 2025. "Evaluation of Chilli Hybrids for Growth, Yield and Quality Traits in Agro-Climatic Conditions of Andhra Pradesh, India". International Journal of Plant & Soil Science 37 (9):88-94. https://doi.org/10.9734/ijpss/2025/v37i95688.*

and quality parameters ascorbic acid, oleoresin, capsanthin, Cy, Cr was recorded. All the hybrids showed significant differences for all the characters studied. Based on the overall performance of various hybrids under study, the hybrids LCH-111, KHPH-229, NCH-1754, ARCH-228 recorded maximum yield with medium pungency and colour value under the Agro-climatic conditions of Andhra Pradesh.

Keywords: Capsicum annuum L.; pungency; oleoresin; fruit yield; quality.

1. INTRODUCTION

Chilli (*Capsicum annuum* L.), belonging to family-Solanaceae with 2n=2x=24, is mainly grown as vegetables and valued as spice crop. Chilli, commonly known as hot pepper is used all over the world mainly for its green fruits and pungency. Chillies are a rich source of vitamins A, C & E. The red colour in chilli is due to capsanthin and pungency is due to crystalline acrid volatile alkaloid i.e., capsaicin, which is present in placenta of fruit. The seed oil of chilli called oleoresin, is mainly used in food industries and pharmaceutical industries (Andrews, 1984). Chilli's popularity stems from its diverse form, size, and sensory characteristics such as colour, pungency, and piquancy, which make otherwise bland mass nutritious meat, cereal, and vegetable dishes more appealing. The majority of the kinds cultivated in the nation are pungent, with a range of pungency from highly strong to moderate. Chilli is employed in the food and beverage sectors as an oleoresin, which allows for improved colour and flavour dispersion in food. The presence of capsaicin causes the pungency (Kumar et al., 2023). In world, India is the largest producer, consumer and exporter of chillies. India is the world leader in chilli production, followed by China. Indian chilli is considered to be the world-famous for two important qualities of colour and pungency level. Andhra Pradesh, leading in area and production, contributes 25 per cent of the total area and 40 to 50 per cent of the total production. There is a further huge scope to increase in chilli production in order to promote exports, which may help in price stabilization of the country. To meet the higher demand of chilli due to increased population, necessary efforts should be made in order to increase the production and productivity. Increased chilli growing area is one key to increase production but one should consider alternate solution for increasing productivity of the crop instead viz., cultivation of local adopted and high yielding cultivars. Although the crop is available throughout the year, the demand of chilli is further increasing with the expanding population. A wide range of variability reportedly exists in this crop with respect to growth and yield attributes (Kishorkumar et al., 2024).

Chilli hybrids give higher yield per unit area in comparison with local variety, which improve the economic status of small and marginal farmers in turn increasing the export potential and contributing in rising the agricultural GDP of India. Keeping this in view, the evaluation of F_1 hybrids is very essential to improve crop improvement further. However, there is large variability is present with respect to fruit size, shape, colour and growth habits. The performance of chilli hybrids and genotypes can differ based on agro-climatic conditions. Selecting suitable hybrids for specific regions and segments of chilli is crucial. Hence, there is a need to evaluate chilli hybrids in vertisols of Andhra Pradesh for their yield and quality aspects. In view of this, the present investigation was undertaken in chilli with an objective to study the different F_1 hybrids for their morphological characters, yield attributing parameters, yield and quality.

2. MATERIALS AND METHODS

The experiment was conducted at HRS, Lam Dr.YSRHU for three years with eleven hybrids from public and private sector during 2014 to 2016 in a Randomized Block Design with three replications. The details of the hybrids studied were LCH-111, NCH-1773, NCH-1754, KHPH-229, NCH-2902, ARCH-177, CCH-12, NCH-1122, Arch-228, BSS-453 and Kasi Anmol (Table 1). The nursery was raised as per the procedure and 40-45 days old seedlings were transplanted in a randomized complete block design with spacing at 60 cm x 30 cm in 4 X 3 mt plot irrigated through furrows. The standard recommended package of practices and need-based plant protection measures was followed for raising the crop. The observations on plant height (cm), total number of branches per plant, plant spread (N-S and E-W) (cm) and days to 50% flowering, the fruit characteristics like

number of fruits per plant, fruit length (cm), fruit girth (cm) and average fruit weight (g) and the yield and quality parameters ascorbic acid, oleoresin, capsanthin, Cy, Cr was recorded. The data were analyzed with the appropriate statistical method suggested by Panse and Sukhatme (1967) and pooled analysis was done as per Gomez and Gomez 1984.

3. RESULTS AND DISCUSSION

Among the chilli hybrids studied, significant variations were observed for all the characters studied indicating that, all the hybrids are genetically diverse from each other (Table 1). The hybrids NCH-1773, KHPH-229, NCH-2902, NCH-1122, BSS-453 are light green in colour with medium pungency, while LCH-111 was dark green with medium pungency. The remaining hybrids were dark green with high pungency. Fruits were categorized into short (<5 cm), long (5-10 cm) and very long (>10 cm) based on length. NCH-1773, KHPH-229, NCH-2902, NCH-1122 were categorized into very long-sized fruits while reaming hybrids were long in size.

Among the chilli hybrids evaluated, ARCH-177 recorded the highest plant height (91.7 cm) being on par with NCH-1754 (89.9 cm) and NCH-1773 (89.2cm) where whereas Kasi Anmol recorded the least plant height (48.2 cm) (Table 2). The variation observed in plant height among the hybrids might be due to specific genetic makeup, inherent properties, hormonal factors and vigour of the crop as reported earlier by Sharath et al. 2023. Similar results of variation in plant height among the chilli cultivars were reported earlier by Pawar *et al.* 2022, Arain and Sial (2022). With regard to number of branches, more branches were recorded in ARCH-177 (4.32) and the less were in the hybrid ARCH-228 (3.5) Among the hybrids evaluated CCH-12 recorded maximum plant spread (125.63 cm) being on par with ARCH-228 (123.73 cm) and NCH-2902 (120.47 cm) (Table 2). Variation in the number of branches per plant might be due to genetic makeup, differences in plant height as well as photosynthetic potential of each genotype. Nivedha et al. (2019), Purad et al. (2019) and Awasthi *et al.* (2021) also recorded similar results in their studies. Plant ideotype is crucial in determining if a cultivar is suitable for a particular purpose (Meena *et al.,* 2020). Further, the vigour of the hybrid is also indicated by the plant spread and primary branches, which results in a higher number of secondary and tertiary branches. The days to 50% flowering is a crucial trait to determine the earliness. The hybrids LCH-111(57.6 days) and NCH-1122 (57.9) were earlier in flowering. Similar results of variation in hybrids with regard to flowering were observed by Khapte *et al.,* 2023.

The chilli hybrids evaluated differed significantly in terms of fruit characters. Number of fruits were maximum in LCH-111(229.5) followed by KHPH-229 (179.7) (Table 2). This could be mainly attributed to the genetic makeup of the hybrid, the difference in percentage fruit set and environmental factors. These results are in line with Chowdhury et al. (2017) and Arain and Sial (2022). Fruit length and fruit girth (Table 2). Fruit length was highest in the hybrid NCH-2902 (15.0 cm) followed by NCH-1122 (13.3 cm) (Table 2). These outcomes are consistent with those of Srinivas et al. (2017) and Jeevitha et al. (2021) who noted variance in fruit length among several cultivars in their studies. and fruit girth was maximum in (4.4 cm) followed by NCH-2902 (3.9 cm). Fruit length and girth in chilli is a major contributing trait directly related NCH-1122 to the fruit weight (Ben-Chaim and Paran,2000). Differences in fruit girth across hybrids are mostly ascribed to genetic potential and also due to variations in plant's ability for dry matter partitioning. singh *et al.,* (2023) and noticed variations in fruit diameter. Among the hybrids, maximum fruit weight was recorded in NCH-1122 (15.0 gm) and NCH-1122 (14.8 gm) (Table 2). The fluctuation in fruit weight is likely caused by the differences in the accumulation of photosynthates that are transported from the source (leaves) to sink (fruits). Also, fruit weight at maturity varies according to cultivars, time of harvest, soil fertility and cultural management. Awasthi et al. (2021) and Jeevitha et al. (2021) found similar findings.

Chilli fruit yield is a dependent trait that several factors can influence. The chilli hybrids differed significantly in terms of green and red fruit yield (Table 3). Among the hybrids highest yield was recorded in LCH-111(58.92q/ha) followed by KHPH-229 (47.32q/ha). The variations in fruit yield among the hybrids are mainly because of the adaptability and performance of the variety to the prevailing local environmental conditions. It is also reported that it might be due to the inherent genetic nature of the hybrid and also due to a larger number of fruits per plant, higher fruit weight as well as excess primary and secondary branches. This is in harmony with the results of Sharath et al. (2023) and Molonaro et al. (2022).

Table 1. Details of Chilli hybrids used along with observed morphological parameters

S.No.	Chilli Hybrid	Source of the entry	Fruit shape (short<5 cm, long 5-10 cm, very long >10 cm)	Pungency (Low/ medium/ High)	Colour
1.	NCH-1773	Nirmal seeds	Very Long	Medium	Light green
2.	NCH- 1754	Nirmal seeds	Long	High	Dark green
3.	KHPH-229	Kaveri seeds	Very Long	Medium	Light green
4.	NCH-2902	Nuziveedu seeds	Very Long	Medium	Light green
5.	ARCH-177	Ankur seeds	Long	High	Dark green
6.	CCH-12	IIVR	Long	High	Dark green
7.	LCH-111	HRS, Lam	Long	Medium	Dark green
8.	NCH-1122	Nuziveedu seeds	Very Long	Medium	Light green
9.	Arch-228	Beejo shhethal	Long	High	Dark green
10.	BSS-453	Ankur seeds	Long	Medium	Light green
11.	Kasi Anmol	IIVR	Long	High	Dark green

Table 2. Mean Performance of chilli hybrids for growth, yield attributing and yield parameters

S.No	Chilli Hybrid	Plant height (cm)	No. of branches	Plant spread (cm)	Days to 50% flowering	No. of Fruit /plant	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Dry chilli Yield (q./Ha)
1.	NCH-1773	89.2	4.222	122.19	63.0	135.7	12.7	3.1	11.1	39.91
2.	NCH- 1754	89.9	3.689	112.53	58.9	168.4	10.0	3.1	7.9	46.09
3.	KHPH-229	77.9	3.867	118.36	60.0	179.7	9.6	3.0	7.3	47.32
4.	NCH-2902	86.8	3.822	120.47	59.1	113.7	15.0	3.9	14.8	39.38
5.	ARCH-177	91.7	4.322	114.47	62.9	144.9	7.1	2.6	5.9	36.82
6.	CCH-12	86.1	3.978	125.63	62.2	151.2	9.7	3.3	7.6	29.83
7.	LCH-111	80.9	4.068	112.06	57.6	229.5	10.8	2.8	10.7	58.52
8.	NCH-1122	75.1	3.644	105.06	57.9	96.5	13.3	4.4	15.0	36.81
9.	Arch-228	81.0	3.5	123.73	58.9	155.7	10.5	3.1	9.7	45.51
10.	BSS-453	81.3	3.822	118.98	61.9	171.1	9.8	2.9	8.8	40.08
11.	Kasi Anmol	48.2	4.044	91.73	58.8	148.0	6.9	2.4	2.3	24.92
	CD	18.4	1.19	27.46	2.209	71.418	2.1	0.772	5.913	14.49

Table 3. Mean Performance of chilli hybrids for quality parameters

S. No	Chilli Hybrid	Vitamin C content (mg/ 100 g)	Oleoresin (%)	Total colour Value (ASTA units)	Red Carotenoid (mg/ 100 g)	Yellow Carotenoid (mg/ 100 g)
1.	NCH-1773	105.3	11.9	84.10	1.78	0.36
2.	NCH- 1754	136.7	11.8	82.09	1.36	0.37
3.	KHPH-229	94.0	11.1	96.43	1.44	0.45
4.	NCH-2902	83.3	9.4	66.70	1.25	0.40
5.	ARCH-177	86.0	11.2	20.90	0.34	0.27
6.	CCH-12	144.0	10.3	64.24	1.40	0.54
7.	LCH-111	99.7	10.4	74.39	1.51	0.59
8.	NCH-1122	95.7	9.5	84.63	1.83	0.37
9.	Arch-228	158.0	13.8	58.73	0.31	0.28
10.	BSS-453	73.3	10.4	67.14	1.81	0.23
11.	Kasi Anmol	60.0	12.4	51.64	0.89	0.41
	CD	18.8	7.062	12.89	0.61	0.04

Among the chilli hybrids, ARCH-228 (158.0%) recorded the maximum ascorbic acid content while the lowest was recorded in BSS-453 (73.3%) (Table 3). Variation in ascorbic acid content in chilli genotypes was recorded by Mukesh Awasthi et al., (2021).

Similar results of variation were observed with respect to oleoresin content. Capsicum oleoresin is a natural food additive/ dietary supplement used by many food industries. Among the hybrids under evaluation, ARCH-228 maximum oleoresin (13.8%) while the lowest oleoresin was recorded in BSS-453(10.4%). Similar results of variation in oleoresin content was reported by Vinay Verma et al. (2022), Khushpreet Kaur Dhaliwal et al. (2020), Sharma et al. (2017). Maximum colouring matter (ASTA) was observed in KHPH-229 (96.43 ASTA units) while Kasi Anmol recorded the lowest colouring matter (51.64 ASTA). Among the hybrids evaluated, maximum red carotenoids was observed in NCH-1122 (1.83) followed by BSS-453 (1.81) where as maximum yellow was observed in LCH-111 (0.59) followed by CCH-12 (0.54) (Table 3). Similar results of variation in colouring matter, quality parameters and carotenoids were recorded by Khushpreet Kaur Dhaliwal *et al.* (2020), Kashibai Khyadagi et al. (2012).

4. CONCLUSION

In the present study, a wide range of variation was recorded for growth, yield and quality traits among the chilli hybrids tested. Based on the overall performance, the chilli hybrids such as LCH-111, KHPH-229, NCH-1754 and ARCH-228 recorded higher fruit yield under Agro climatic conditions of Andhra Pradesh with medium pungency and colour value.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. Y.S.R. Horticulture University, Andhra Pradesh, India, for providing all research and infrastructure facilities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Arain, S. M., & Sial, M. A. (2022). Association analysis of fruit yield and other related attributes in four chilli (*Capsicum annuum* L.) genotypes grown in Sindh province, Pakistan. *Pak J Bot, 54*(3), 817–822.

Awasthi, M., Singh, D., & Bahadur, V. (2021). Varietal evaluation of chilli (*Capsicum annuum*) for growth, yield, and quality in Prayagraj Agro-climatic condition. *The Pharma Innovation Journal, 10*(10), 1267–1269.

Ben-Chaim, A., & Paran, I. (2000). Genetic analysis of quantitative traits in pepper (*Capsicum annuum*). *J. Am. Soc. Hortic. Sci., 125*, 66–70.

Chowdhury, M. S. N., Sarkar, S., Uddin, A. J., Sultana, T., Roni, M. Z. K., & Islam, R. (2017). Morpho-physiology, yield and quality assessment on five local landrace chilli germplasms. *Asian J Agric Rural Dev, 7*(11), 233–243.

Dhaliwal, K. K., Ghai, N., & Jindal, S. K. (2020). Variations in fruit quality parameters of chilli genotypes during early and timely sown conditions. *Int. J. Curr. Microbiol. Appl. Sci, 9*(6), 2178–2186.

Gomez, K. A., & Gomez, A. A. (1984). *Statistical procedures for agricultural research* (2nd ed.). John Wiley and Sons.

Jeevitha, J., Devi, H. U. N., Pugalendhi, L., & Premalatha, N. (2021). Performance assessment of various chilli species grown under shade net for growth, yield and quality characters in Coimbatore region, India. *J Pharm Innov, 10*(11), 625–630.

Khapte, P. S., Reddy, M. K., Ponnam, N., Boraiah, K. M., Wakchaure, G. C., & Gurumurthy, S. (2023). Evaluation of CGMS-based chilli F1 hybrids for morphometric, fruit quality, and yield traits. *Indian J. Hortic., 80*(4), 353–359.

Khyadagi, K., Jawadagi, R., & Wali, M. (2012). Evaluation of chilli cultivars (*Capsicum annuum* L.) for qualitative parameters at different maturity stages. *The Asian Journal of Horticulture, 7*(2), 488–492.

Kishorkumar, G. K., Ajjappalavara, P. S., Satish, D., Jawadagi, R. S., Nishani, S., Ravikumar, B., Vinaykumar, M. M., & Anusha, M. S. (2024). Evaluation of newly bred industrially valued elite chilli (*Capsicum annuum* L.) genotypes for growth, yield, and quality traits. *Int. J. Adv. Biochem. Res., 8*(10S), 662–665. https://doi.org/10.33545/26174693.2024.v8.i10Sh.2565

Kumar, S., Bahadur, V., Topno, S. E., Prasad, V. M., & Kerketta, A. (2023). Evaluation of different hybrids of chilli in Prayagraj agro-climatic condition. *International Journal of Environment and Climate Change, 13*(10), 1200–1208. https://doi.org/10.9734/ijecc/2023/v13i102771

Meena, O. P., Dhaliwal, M. S., & Jindal, S. K. (2020). Heterosis breeding in chilli pepper by using cytoplasmic male sterile lines for high-yield production with special reference to seed and bioactive compound content under temperature stress regimes. *Sci. Hortic., 262*, 109036.

Molonaro, A. O., Topno, S. E., & Kerketta, A. (2022). Varietal evaluation of chilli (*Capsicum annuum*) under Prayagraj agro-climatic conditions. *J Pharm Innov, 11*(2), 2454–2556.

Nivedha, P., Rajasree, V., Arumugam, T., Karthikeyan, M., & Thiruvengadam, V. (2019). Evaluation of parents and hybrids of chilli (*Capsicum annuum* L.) for yield and resistance to chilli leaf curl disease. *J Pharmacog Phytochem, 8*(3), 4763–4766.

Panse, V. G., & Sukhatme, P. V. (1967). *Statistical methods for agricultural workers* (2nd ed.). ICAR.

Pawar, A. P., Parulekar, Y. R., Haldavnekar, P. C., & Mali, P. C. (2022). Evaluation of various chilli (*Capsicum annuum* L.) genotypes grown under Konkan agro-climatic condition. *J Pharm Innov, 11*(5), 977–979.

Purad, P. B., Devi, H. U. N. D., Arumugam, T., & Karthikeyan, M. (2019). Growth and performance of different chilli genotypes for yield and yield attributing characters. *J Pharmacog Phytochem, 8*(4), 210–213.

Sharath, M. N., Srinivasa, V., Devaraju, D. L., Lakshmana, S. Y., Chandrashekar, M. N., & Nikhil Gowda, M. N. (2023). Performance studies of chilli (*Capsicum annuum* L.) hybrids for growth and yield traits under hill zone of Karnataka. *Environment and Ecology, 41*(1C), 732–736.

Sharma, A., Swain, D., & Sekhon, B. S. (2017). Breeding strategies based on diversity analysis in advanced breeding lines of chilli (*Capsicum annuum* var. annuum L.). *Electronic Journal of Plant Breeding, 8*, 1247–1257.

Srinivas, J., Reddy, K. R., Saidaiah, P., Anitha, K., & Pandravada, S. R. (2017). Performance of chilli genotypes for yield and yield attributes of fruit quality in Southern Telangana, India. *Int J Curr Microbiol Appl Sci, 6*(11), 469–477.

Verma, V., Vikram, A., Sharma, Y. P., Bhardwaj, R. K., Dogra, R. K., Gupta, M., & Singh, S. (2022). Performance of chilli (*Capsicum annuum* L.) hybrids for yield and quality traits. *Journal of Spices and Aromatic Crops, 31*(2), 157–165.

Peer-review history:
The peer review history for this paper can be accessed here:
https://pr.sdiarticle5.com/review-history/142194