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# Performance Studies of Chilli (*Capsicum annuum* L.) Hybrids for Growth and Yield Traits under Hill Zone of Karnataka

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## ABSTRACT

The performance of twenty chilli hybrids were studied for growth and yield characters using Randomized Block Design with three replications. All the hybrids showed significant differences for all the characters studied. The maximum plant height (66.30 cm), total number of branches (11.93), plant spread (N-S) (59.40 cm), fruit yield per plant (1.41 kg) and yield (38.40 t/ha) was recorded in the hybrid H-20. The hybrid CO (Ch)-1 had maximum plant spread (E-W) (59.57 cm) and it took minimum of 30.27 days for first flowering. The maximum fruit length (12.46 cm) and average fruit weight (7.27 g) was seen in LHC-Diya. Fruit diameter was highest in CHT-201 (1.62 cm). The maximum number of fruits per plant was registered in Arka Gagan (256.67). Based on the yield the hybrids like H-20 (38.40 t/ha), H-25 (37.44 t/ha), Arka Gagan (36.85 t/ha), CO (Ch)-1 (31.68 t/ha) and Arka Yashasvi (31.63 t/ha). Can be recommended for commercial cultivation under hill zone of Karnataka.

**Keywords** Chilli, Fruit length, Hybrids, Yield, Growth.

## INTRODUCTION

Chilli (*Capsicum annuum* L.) is the most important vegetable as well as spice crop, belongs to the family Solanaceae with chromosome number 2n=24. It is valued for its aroma, taste, flavor and pungency grown in all parts of the world. However, it is basically a crop of tropical and subtropical region. Chilli also known as hot pepper introduced into India from Brazil in 16$^{th}$ century by Portuguese. Chilli is native of Tropical America where it was domesticated around 7000 BC. The genus *Capsicum* includes about 30 species, among these species, *Capsicum annuum* L. is the most widely cultivated species.

India is the world's largest producer, user and exporter of chillies. India is the world leader in chilli production, followed by China, Thailand, Ethiopia and Indonesia. In India, chilli is cultivated under 3,63,000 ha and contributes 30% of world chilli production (4.2 mt). Andhra Pradesh (0.67 mt), Karnataka (0.66 mt) and Madhya Pradesh (0.44 mt) are the top contributing states in India (Anon 2020).

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**Table 1.** Growth and flowering characters of chilli hybrids.

| Sl. No. | Treatments | Plant height (cm) | Total number of branches | Plant spread (N-S) | Plant spread (E-W) | Days to first flowering |
|---|---|---|---|---|---|---|
| 1 | Arka Yashasvi | 61.43 | 11.20 | 55.30 | 55.20 | 35.67 |
| 2 | Arka Saanvi | 64.47 | 11.47 | 54.63 | 52.60 | 44.67 |
| 3 | Arka Gagan | 62.43 | 11.27 | 53.07 | 53.27 | 39.40 |
| 4 | Arka Tejasvi | 65.43 | 11.80 | 52.97 | 53.33 | 46.40 |
| 5 | Arka Tanvi | 59.13 | 10.67 | 55.33 | 56.63 | 36.27 |
| 6 | H-7 | 58.67 | 10.60 | 56.13 | 54.53 | 34.00 |
| 7 | H-20 | 66.30 | 11.93 | 59.40 | 59.33 | 35.00 |
| 8 | H-25 | 57.20 | 10.33 | 53.27 | 54.03 | 35.40 |
| 9 | H-43 | 56.93 | 9.73 | 53.17 | 50.60 | 34.27 |
| 10 | CO (Ch)-1 | 58.13 | 10.53 | 56.73 | 59.57 | 30.27 |
| 11 | LHC-Raina | 58.80 | 10.67 | 51.97 | 52.23 | 41.13 |
| 12 | LHC-Manish | 62.40 | 11.20 | 53.33 | 54.57 | 34.13 |
| 13 | LHC-Diya | 55.87 | 9.67 | 50.83 | 52.07 | 36.20 |
| 14 | Trikas | 61.60 | 11.13 | 53.57 | 53.07 | 52.47 |
| 15 | AK-47 | 57.40 | 10.33 | 55.60 | 55.33 | 44.47 |
| 16 | HCH-6570 | 60.40 | 11.07 | 54.97 | 55.17 | 43.00 |
| 17 | CHT-188 | 60.33 | 10.87 | 51.93 | 54.73 | 35.27 |
| 18 | CHT-201 | 52.73 | 9.53 | 52.83 | 50.30 | 38.13 |
| 19 | CHT-202 | 49.13 | 9.53 | 48.67 | 47.57 | 50.93 |
| 20 | Arka Harita (Check) | 57.07 | 9.73 | 49.60 | 52.63 | 34.73 |
| | SEm± | 1.78 | 0.28 | 1.60 | 1.81 | 1.60 |
| | CD at 5% | 5.10 | 0.81 | 4.58 | 5.18 | 4.59 |

Many of the farmers are growing low yielding chilli genotypes which are highly susceptible to many pest and diseases. Farmers were unaware about new high yielding hybrids which are resistant to pest and diseases and having superior quality features. Hence an assessment on chilli hybrids for growth and yield traits under hill zone of Karnataka was carried out.

## MATERIALS AND METHODS

The present experiment was conducted at Department of Vegetable Science, College of Horticulture, Mudigere during 2021-22. The experiment was laid out in Randomized Complete Block Design with twenty hybrids as treatments with three replications. Ten hybrids were collected from Indian Institute of Horticulture (IIHR), Bengaluru. One from Tamilnadu Agriculture University (TNAU) and the rest were from private sectors. The hybrids included in the present study were Arka Yashasvi, Arka Saanvi, Arka Gagan, Arka Tejasvi, Arka Tanvi, H-7, H-20, H-25, H-43, CO (Ch)-1, LHC- Raina, LHC- Manish, LHC- Diya, Trikas, AK-47, HCH-6570, CHT-188, CHT-201, CHT-202 and Arka Harita (Check).

The seeds were sown in portrays with coco peat as a media. 35-40 days old healthy and disease free seedlings were transplanted on the side of the ridges with a spacing of 75 cm × 45 cm. The recommended dosage of fertilizers were applied as per the package of practices. Hand weeding was done once in 30 days to keep the plots weed free. Regular sprays were taken to control major pest and diseases that affects 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 first flowering, the fruit characteristics like fruit length (cm), fruit diameter (cm) and average fruit weight (g) and the yield and yield contributing characters such as number of fruits per plant, yield per plant (kg) and yield (t/ha) was also recorded. The data were analyzed with appropriate statistical method suggested by Panse and Sukhatme (1967).

## RESULTS AND DISCUSSION

Among the hybrids studied significant variations were observed for all the characters studied at five per cent significance level. According to Table 1 the highest plant height (66.30 cm) was noticed in the hybrid H-20, followed by Arka Tejasvi (65.43 cm) and the least was in CHT-202 (49.13 cm). Based on the literature, the variation in plant height might be due to specific genetic makeup, inherent properties, hormonal factor and vigour of the crop (Pawar *et al.* 2022). Hasan *et al.* (2014), Jaisankar *et al.* (2015), Arain and Sial (2022) and others also noted the variance in plant height among the chilli cultivars.

Similarly, more number of branches were seen in H-20 (11.93) and the less were in the hybrid CHT-202 (9.53) (Table 1). According to available findings, the 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.

**Table 2.** Fruit characteristics of chilli hybrids.

| Sl. No. | Treatments | Fruit length (cm) | Fruit diame-ter (cm) | Average fruit weight (g) |
|---|---|---|---|---|
| 1 | Arka Yashasvi | 7.63 | 1.19 | 4.09 |
| 2 | Arka Saanvi | 9.05 | 1.19 | 4.54 |
| 3 | Arka Gagan | 8.13 | 1.03 | 4.22 |
| 4 | Arka Tejasvi | 9.34 | 1.03 | 3.87 |
| 5 | Arka Tanvi | 8.35 | 0.99 | 3.56 |
| 6 | H-7 | 7.82 | 1.30 | 5.38 |
| 7 | H-20 | 9.13 | 0.91 | 5.25 |
| 8 | H-25 | 9.23 | 1.06 | 5.38 |
| 9 | H-43 | 11.96 | 1.02 | 5.10 |
| 10 | CO (Ch)-1 | 9.15 | 1.00 | 4.66 |
| 11 | LHC-Raina | 8.64 | 1.18 | 4.28 |
| 12 | LHC-Manish | 7.95 | 1.18 | 5.83 |
| 13 | LHC-Diya | 12.46 | 1.26 | 7.27 |
| 14 | Trikas | 11.83 | 1.07 | 4.84 |
| 15 | AK-47 | 7.89 | 1.04 | 3.45 |
| 16 | HCH-6570 | 9.20 | 0.85 | 3.07 |
| 17 | CHT-188 | 7.19 | 1.11 | 3.08 |
| 18 | CHT-201 | 11.99 | 1.62 | 6.38 |
| 19 | CHT-202 | 8.40 | 0.76 | 3.14 |
| 20 | Arka Harita (Check) | 11.43 | 1.00 | 4.51 |
| | SEm± | 0.41 | 0.05 | 0.20 |
| | CD at 5% | 1.17 | 0.13 | 0.58 |

Table 1, revealed that the H-20 had maximum plant spread (N-S) (59.40 cm) and CO (Ch)-1 had maximum plant spread (E-W) (59.57 cm) followed by H-20 (59.33 cm) and the minimum plant spread in both the directions were observed in CHT-202 (48.67 cm and 47.57 cm, respectively). Different varieties/ genotypes, nutrition, soil moisture availability and age of seedlings during transplanting are frequently linked to variations in plant spread among chilli hybrids. In the case of chilli, Herison *et al.* (2014), Yatagiri *et al.* (2017) and Parulekhar *et al.* (2020) also got similar results.

The hybrid CO (Ch)-1 took minimum of 30.27 days for first flowering followed by H-7 (34.00) and the hybrid Trikas took maximum of 52.47 days for first flowering (Table 1). Such earliness may have been caused by the plant's innate ability to deliver more readily available assimilates to the apex during the sensitive period before flowering normally begins. Early and late flowering may be attributed purely to genetic differences between the hybrids. These results are in conformity with the findings of Singh *et al.* (2019), Dhumal *et al.* (2020) and Molonaro *et al.* (2022).

According to Table 2, the highest fruit length (12.46 cm) was seen in LHC-Diya which was followed by CHT-201 (11.99 cm) and the least was in CHT-188 (7.19 cm). In addition to the inherent genetic makeup of the plant, the length of the fruit is closely correlated with the quantity of nutrients consumed and the plant's vegetative state. These outcomes are consistent with those of Amit *et al.* (2014), Srinivas *et al.* (2017) and Jeevitha *et al.* (2021) who noted variance in fruit length among several cultivars in their studies. Fruit diameter was highest in CHT-201 (1.62 cm) followed by H-7 (1.30 cm) and the least in CHT-202 (0.76 cm). Differences in fruit diameter across hybrids are mostly ascribed to genetic potential and also due to variations in plant's ability for dry matter partitioning. Herison *et al*. (2014) and Awasthi *et al.* (2021) noticed variations in fruit diameter.

LHC-Diya had maximum average fruit weight of 7.27 g followed by CHT-201 (6.38 g) and the minimum in HCH-6570 (3.07 g) (Table 2). The fluctuation in fruit weight is likely caused by the differences in the accumulation of photosynthates that are transported from 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.

Arka Gagan had more number of fruits among the hybrids studied (256.67) which was on par with H-20 (255.27) and the less were in Trikas (76.33) (Table 3). This could be mainly attributed to the genetic makeup of the hybrid, difference in percentage fruit set and environmental factors. These results are in line with Mohanty (2005), who also reported the highest number of fruits per plant (233.97) in X-235 genotype of chilli. The results of Chowdhury *et al.* (2017) and Arain and Sial (2022) supported the present findings.

Fruit yield per plant was highest in H-20 (1.41 kg) followed by Arka Gagan and H-25 (1.29 kg) and the lowest in Trikas (0.4 kg). The hybrid H-20 (38.40 t/ha) recorded highest fruit yield followed by

**Table 3.** Yield and yield contributing characters of chilli hybrids.

| Sl. No. | Treatments | Number of fruits per plant | Yield per plant (kg) | Yield (t/ha) |
|---|---|---|---|---|
| 1 | Arka Yashasvi | 252.20 | 1.11 | 31.63 |
| 2 | Arka Saanvi | 162.33 | 0.81 | 23.20 |
| 3 | Arka Gagan | 256.67 | 1.29 | 36.85 |
| 4 | Arka Tejasvi | 218.27 | 0.88 | 25.28 |
| 5 | Arka Tanvi | 155.67 | 0.59 | 16.69 |
| 6 | H-7 | 170.87 | 0.78 | 22.50 |
| 7 | H-20 | 255.27 | 1.41 | 38.40 |
| 8 | H-25 | 230.27 | 1.29 | 37.44 |
| 9 | H-43 | 180.27 | 0.97 | 27.89 |
| 10 | CO (Ch)-1 | 230.13 | 1.11 | 31.68 |
| 11 | LHC-Raina | 131.13 | 0.60 | 16.95 |
| 12 | LHC-Manish | 92.93 | 0.61 | 17.23 |
| 13 | LHC-Diya | 88.60 | 0.70 | 20.15 |
| 14 | Trikas | 76.33 | 0.40 | 11.85 |
| 15 | AK-47 | 101.00 | 0.41 | 12.16 |
| 16 | HCH-6570 | 224.87 | 0.72 | 20.48 |
| 17 | CHT-188 | 194.80 | 0.65 | 18.77 |
| 18 | CHT-201 | 78.00 | 0.55 | 15.51 |
| 19 | CHT-202 | 252.20 | 0.85 | 24.53 |
| 20 | Arka Harita (Check) | 162.13 | 0.81 | 23.57 |
| | SEm± | 7.51 | 0.04 | 1.08 |
| | C.D at 5 % | 21.49 | 0.11 | 3.09 |

H-25 (37.44 t/ha) and Arka Gagan (36.85 t/ha) and the lowest in Trikas (11.85 t/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 more number of fruits per plant, higher fruit weight as well as excess primary and secondary branches. This is in harmony with the results of Herison *et al*. (2014) and Molonaro *et al.* (2022) (Table 3).

## CONCLUSION

Chilli is one of the important cash crop grown extensively in Karnataka and it has gained widespread consumer acceptance for its distinct pungency and flavor. In India, Karnataka has the largest area under chilli cultivation, next to Andhra Pradesh. Although chilli is more demanding vegetable in both domestic and export markets, productivity is still low. Huge reduction in the yield of green chilli is due to the infestation of many serious pest and diseases. Utilization of resistant hybrids for cultivation is most simple, effective and environmentally safe strategy to escape from the sufferings of biotic stresses. One of the greater initiative towards increasing productivity is the use of $F_1$ hybrids, which are genetically superior, high yielding, free from major pest and diseases and have other superior value added features. Thus, a study was conducted to assess the growth and yield attributes of chilli hybrids in an effort to determine suitable chilli hybrid for cultivation in Karnataka's hilly region. Twenty hybrids were assessed and many of them yielded more than 30 t/ha, namely, H-20 (38.40 t/ha), H-25 (37.44 t/ha), Arka Gagan (36.85 t/ha), CO (Ch)-1 (31.68 t/ha) and Arka Yashasvi (31.63 t/ha). Therefore, it is feasible to suggest these hybrids for commercial cultivation in hill zone of Karnataka.

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### REFERENCES

Amit K, Ahad I, Kumar V, Thakur S (2014) Genetic variability and correlation studies for growth and yield characters in chilli (*Capsicum annuum* L.). *J Spices Aromatic Crops* 23 (2) :170—177.

Anonymous (2020) https: //www.indiastat.com/data/agriculture/green-chillies/data-year/2012—2020.

Arain SM, Sial MA (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. *J Pharm Innov* 10 (10) : 1267—1269.

Chowdhury MSN, Sarkar S, Uddin AJ, Sultana T, Roni MZK, Islam R (2017) Morpho-physiology, yield and quality assessment on five local landrace chilli germplasms. *Asian J Agric Rural Dev* 7 (11) : 233—243.

Dhumal VT, Pharle NR, Kapse VD, Naik HP, Vaidya KP, Meshram NA, More SS, Dhopavkar RV (2020) Evaluation of $F_1$ progenies of chilli (*Capsicum annuum* L.) under Konkan agro-climatic condition. *J Pharm Innov* 9 (1) : 180—182.

Hasan M, Haider T, Chowdhury MSN, Ferdous M (2014) Study on morpho-physiological and yield performance of four chilli (*Capsicum* spp.) lines. *J Biosci Agric Res* 2 (1) : 1—7.

Herison C, Handayaningsih M, Fahrurrozi F, Rustikawati R (2014) Evaluation of growth and yield performance on inoculated

chilli pepper hybrids by cucumber mosaic virus. *Agrivita* 36 (1) : 14—18.

Jaisankar I, Singh S, Goutham RK, Velmurugan A, Singh AK, Roy SD, Parisa D, Soan S (2015) Performance of chilli genotypes for green fruit yield in Andaman and Nicobar Islands. *AVT J Andaman Sci Assoc* 20 (1) : 39—42.

Jeevitha J, Devi HUN, 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.

Mohanty BK, Prusti AM (2005) Assessment of chilli varieties in western undulating zone of Orissa. *Ind J Agric Res* 39 (1) : 76—78.

Molonaro AO, Topno SE, 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 VG, Sukhatme PV (1967) Statistical methods for Agricultural Workers. 2nd edn ICAR, New Delhi, pp 324.

Parulekar YR, Haldankar PM, Haldavnekar PC, Salvi BR, Sawardekar SV, Dalvi VV, Surve NR, Nirmal OA (2020) Field evaluation of Gundu chillies (*Capsicum annuum* L.) under konkan agro-climatic conditions for growth, yield and yield attributing characters. *Int J Curr Microbiol Appl Sci* 11 (6) : 1870—1883.

Pawar AP, Parulekar YR, Haldavnekar PC, Mali PC (2022) Evaluation of various chilli (*Capsicum annuum* L.) genotypes grown under Konkan agro-climatic condition. *J Pharm Innov* 11 (5) : 977—979.

Purad PB, Devi HUND, 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.

Singh P, Jain PK, Ahirwar MK (2019) Evaluation of different chilli genotypes for growth, phenological behavior and physical fruit parameters in Kymore plateau region of Madhya Pradesh. *J Pharm Innov* 8 (10) : 264—267.

Srinivas J, Reddy KR, Saidaiah P, Anitha K, Pandravada SR (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.

Yatagiri N, Sanap PB, Telugu RK (2017) Growth, flowering behavior and physical fruit parameters of chilli (*Capsicum annuum* L.) genotypes in coastal Maharashtra. *Int J Curr Microbiol Appl Sci* 6 (7) : 2230 —2237