The Pharma Innovation Journal 2023; 12(12): 3840-3843

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 3840-3843

www.thepharmajournal.com
Received: 16-09-2023
Accepted: 21-10-2023

KB Nagargoje
M.Sc. (Horti) Department of Horticulture (Vegetable Science), VNMKV, Parbhani, Maharashtra, India

VS Khandare
Head of Department, Department of Horticulture, VNMKV, Parbhani, Maharashtra, India

VP Nadre
M.Sc. (Horti) Department of Horticulture (Vegetable Science), VNMKV, Parbhani, Maharashtra, India

MP Wankhade
Assistant Seed Research Officer, Seed Technology Research Unit, VNMKV, Parbhani, Maharashtra, India

SP Shirale
M.Sc. (Agri) Department of Agronomy, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
KB Nagargoje
M.Sc. (Horti) Department of Horticulture (Vegetable Science), VNMKV, Parbhani, Maharashtra, India

Genetic variability and performance evaluation of chilli (*Capsicum annuum* L.) F_5 progenies for growth and yield attributes in the Marathwada region, India

KB Nagargoje, VS Khandare, VP Nadre, MP Wankhade and SP Shirale

Abstract
This research paper assesses the comparative performance of F5 progenies of chilli in the Marathwada region of India, focusing on growth, yield, and yield attributing characteristics. The study involves the transplantation of 40-day-old chilli seedlings with specific spacing, utilizing a random sampling technique to examine parameters such as days to first harvest, days to last harvest, harvesting duration, number of pickings, average fruit weight, number of fruits per plant, fruit yield per plant, and fruit yield per hectare. Statistical analysis and comparisons with prior studies highlight significant variations among progenies. Notably, progeny PBNC-14 exhibits the minimum days to first harvest, while PBNC-18 records the maximum. The study identifies three promising progenies, PBNC-16, PBNC-15, and PBNC-17, recommending them for commercial cultivation due to their high green fruit yield. The findings contribute valuable insights into genetic variability, aiding efforts to enhance chilli cultivation and promote regional agricultural and economic development.

Keywords: Chilli progenies, growth performance, yield attributes, genetic variability

Introduction
Capsicum annuum var. *annuum* L., commonly known as chilli or hot pepper, holds significant economic and agricultural importance in India, serving as a widely cultivated vegetable crop. Its utility spans the consumption of green fruits as a vegetable and the red variant as a spice. Belonging to the Solanaceae family, the origin of chilli can be traced back to New Mexico, Guatemala, and Bulgaria in Latin America. It is extensively cultivated in various tropical regions, with India, Mexico, Japan, Ethiopia, Uganda, Nigeria, Thailand, Turkey, Indonesia, China, and Pakistan being key contributors. Additionally, Italy, Spain, and the United States engage in limited cultivation. The composition (per 100 g of edible portion) of green chilli includes 85.7 g of moisture, 2 g of protein, 0.2 g of fats, 1.5 g of fiber, and 9.5 g of carbohydrates. The vitamin composition in green chilli comprises 24% vitamin A and 40% vitamin C. The nutrient content in green chilli includes 7 mg of sodium, 7% iron, and 2% calcium. The capsaicin content in green chilli is reported to be 138.5 mg/g.
Vegetables, including chillies, constitute a vital component of daily dietary intake due to their rich content of vitamins, minerals, proteins, fats, carbohydrates, and organic acids, all at a relatively modest cost. Furthermore, vegetables are recognized as "protecting foods" owing to their ability to safeguard against various deficiency disorders. In the context of Maharashtra, diverse chilli varieties with distinct characteristics are prevalent. However, the existing knowledge base on the systematic selection and evaluation of suitable chilli types is insufficient and warrants further research efforts for yield improvement. Consequently, there is a critical need to assess chilli types in the Marathwada region for superior quality, yield, growth performance, and resilience to biotic and abiotic stress. Considering this, the present study aims to investigate the comparative performance of F5 progenies of chilli, specifically focusing on growth, yield, and yield attributing characteristics.

Materials and Methods
The field experiment was conducted during the Kharif season of 2022-23 at the experimental farms of the Horticulture Research Scheme (Vegetable), College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. Thirteen F5 progenies and three standard checks obtained from the Horticulture Research Scheme (Vegetable), Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, constituted the experimental materials.

The experimental design employed a Randomized Block Design, encompassing 13 F5 progenies and 2 standard checks with two replications. Each F5 progeny was treated as an individual treatment and randomly replicated. Planting involved five rows, each comprising eight plants, with a spacing of 60 cm x 45 cm.

Uniform 40-day-old seedlings, with an average height of 15 cm, were selected and immersed in a solution composed of 10 ml of Trichoderma and 25g of Carbendazim in 10 liters of water to mitigate the risk of pests and diseases. Chilli seedlings were transplanted with a spacing of 60 x 45 cm. A random sampling technique was employed, selecting five plants from each treatment in all replications for a comprehensive investigation into yield and yield attributing characters. Various yield parameters, including days to first harvest, days to last harvest, harvesting duration, number of pickings, average weight of fruit (g), number of fruits per plant, fruit yield per plant (g), and fruit yield per hectare (q), were evaluated. The mean values for all considered traits were utilized for subsequent statistical analysis. The statistical analysis employed standard methods described by Panse and Sukhatme (1985) [13]. Standard errors (S.E.) of means were calculated, and critical differences (CD) at a 5% significance level were determined when the results exhibited significance. Individual plant characters data were subjected to the method of analysis of variance commonly applicable to the randomized block design.

Results and Discussion

Data presented in Table 1 indicate that the days required for the first harvest in chilli progenies varied non-significantly, ranging from 63.28 days to 74.57 days, with a general mean of 69.90 days. Progeny PBNC-14 exhibited the minimum days required for the first harvest (63.28 days), significantly superior to all other progenies, while progeny PBNC-18 recorded the maximum (74.57 days) days for the first harvest.

Days to the first harvest is a crucial yield attributing character from a commercial cultivation perspective. Farmers benefit from early harvesting as it leads to early returns. The observed variation in chilli progenies for days to the first harvest aligns with studies conducted by Barche and Nair (2014) [2] and Datta and Jana (2014) [4] in their investigations on chilli genotypes.

Data in Table 1 also show that the days to the last harvest did not significantly vary. The days to the last harvest ranged from 118.16 to 133.17 days, with a general mean of 126.76 days. Progeny PBNC-19 exhibited the lowest days (118.16) to the last harvest, while progeny PBNC-16 (133.17) and PBNC-15 had the highest days (129.65) to the last harvest. The variation in days to the last harvest among different progenies is attributed to the highly genetic characteristics of the progenies, with a low impact of environmental factors in the Marathwada region. These variations are consistent with the findings of Sharma *et al*. (2010) [14], Manju and Sreelatha Kumary (2002) [10], and Shiva *et al*. (2013) [15].

Harvesting duration is an important trait, especially in vegetable crops consumed at the immature tender stage. Therefore, harvesting duration is considered a favorable character and given due consideration during selection. Data in Table 1 reveal that the harvesting duration was also non-significantly varied, ranging from 45.48 days to 61.52 days, with a general mean of 52.92 days. Progeny PBNC-7 exhibited the shortest harvest duration (45.48 days), while the longest harvest duration (61.52 days) was observed in progeny PBNC-16.

The variation in harvesting duration was attributed to the initiation of flowering, 50% flowering, and the number of fruits per plant, reflecting moderately genetic characteristics of the progenies with a lesser influence of environmental factors. Similar variations related to harvesting duration were observed by Modak (1989) [11] and Sharma *et al*. (2010) [14].

Number of pickings, an essential yield attributing character indicating the longevity or harvesting duration, showed a range from 4.20 to 11.93 in Table 1, with a general mean of 7.62. Progeny PBNC-16 exhibited the significantly highest number of pickings per plant (11.93), while the lowest (4.20) was recorded in progeny PBNC-10. A higher number of pickings is beneficial for induction of new flowers and extends the period of fruit availability in the market. Variations in the number of pickings among chilli progenies may result from differences in the number of days required for initiation of flowering, days to first harvest and last harvest, as well as the harvesting span. These variations in genetic makeup and its interaction with environmental factors were also observed by Manju and Sreelathakumary (2002) [10], Modak (1989) [11], Sharma *et al*. (2010) [14].

Average fruit weight was non-significantly varied, ranging from 4.40 g to 8.10 g in Table 4.9, with a mean of 5.27 g. Progeny PBNC-16 exhibited the heaviest fruit weight (8.10 g), significantly superior to all progenies, while the lightest fruit weight (4.40g) was observed in progeny PBNC-20. This variation in fruit weight may be due to differences in the accumulation of photosynthates transported from source (leaves) to sink (fruits), as suggested by Tesfaw *et al*., (2013) [20], and supported by similar results reported by Jabeen *et al*. (2011) [6], Amit *et al*. (2014) [1], and Jamal *et al*. (2015) [7].

Number of fruits per plant, a crucial yield attributing character, exhibited a range from 175.25 to 405.37, with a mean of 273.79, as shown in Table 1. Progeny PBNC-16 recorded the highest number of fruits per plant (405.37), on par with progeny PBNC-15 and PBNC-17. The lowest number of fruits (175.25) was observed in progeny PBNC-4. This variation is mainly attributed to the genetic makeup of the plant and aligns with the findings of Mohanty (2003), Amit *et al*. (2014) [1], and Jyothi *et al*. (2011) [8].

Significant differences in fruit yield per plant were observed in Table 2, with progeny PBNC-16 recording the highest fruit yield per plant (1824.16 g), on par with progeny PBNC-15, PBNC-17, PBNC-16, PBNC-17, PBNC-19, and PBNC-20. The lowest fruit yield per plant (1033.97 g) was recorded in progeny PBNC-4. Fruit yield per plant is an important trait for selecting chilli progenies, influenced by the adaptability and performance of the progenies to different environmental conditions. This could be due to the inherent genetic nature of the hybrid and factors such as the number of fruits per plant, higher fruit weight, and the number of primary and secondary branches, as supported by Jamal *et al*. (2015) [7] and Zhani *et al*. (2015) [19].

Fruit yield per plot ranged from 43.42 kg to 76.61 kg, with a general mean of 59.87 kg, as evident from the data in Table 2. Progeny PBNC-16 exhibited the maximum fruit yield per plot (76.61 kg), followed by progeny PBNC-15 (75.08 kg) and PBNC-17 (73.96 kg). Progeny PBNC-4 had the minimum fruit yield per plot (43.42 kg), followed by progeny PBNC-7 (45.67 kg). The overall mean fruit yield per plot was 59.87 kg.

The fruit yield per hectare ranged from 320.53 q to 565.48 q, with an overall mean of 441.98 q, as observed in Table 2. Progeny PBNC-16 recorded the maximum fruit yield per hectare (565.48 q), followed by progeny PBNC-17 (542.77 q) and PBNC-15 (532.08 q). The minimum fruit yield per hectare was recorded in PBNC-4 (320.53 q), followed by progeny PBNC-7 (336.93 q). Variations in fruit yield per hectare may be due to factors such as the number of fruits per plant, fruit length, and fruit weight, having a direct positive correlation with yield, as observed by Sharma *et al*. (2010) [14], Chattopadhyay *et al*. (2011) [3], and indirect effects on yield, number of branches per plant, and plant spread, as reported by Tembhurne *et al*. (2008) [18].

Table 1: Performance of different chilli progenies in respect of Days to first harvesting, Days to last harvesting, No. of fruits per plant, Average weight of fruit and No. of pickings per plant.

Genotype	Days to start first harvesting	Days to last harvesting	Harvesting duration	No. of fruit per plant	Average weight of fruit (g)	No. of pickings per plant
	Mean	Mean	Mean	Mean	Mean	Mean
PBNC-4	73	125.37	49.29	175.25	5.09	5.83
PBNC-7	63.28	119.35	45.48	181.15	6	4.37
PBNC-10	68.21	126.09	53.88	225.23	5.8	4.2
PBNC-13	72.27	125.87	57.04	278.58	5.2	8.75
PBNC-14	67.55	120.38	46.91	275.38	5.6	5.3
PBNC-15	70.18	129.65	59.62	399.09	4.4	9.81
PBNC-16	70.37	133.17	61.52	405.37	4.5	11.93
PBNC-17	70.59	126.17	56.78	397.93	4.4	10.59
PBNC-18	74.57	125.43	51.2	222.52	6	6.23
PBNC-19	70.43	118.16	53.31	250.97	4.95	7.48
PBNC-20	73.84	121.52	54.01	305.26	4.8	7.08
PBNC-22	68.15	126	52.17	257.19	5	7.24
PBNC-23	69.95	124.64	51.5	206.19	6.1	8.04
BYDGI- 341	68.57	122.98	49.63	248.13	5.45	8.8
BSS-355	67.56	123.69	51.47	287.55	5.7	8.61
Mean	69.9	126.76	55.22	273.79	5.27	7.62
Range	63.28-74.57	118.16-133.17	45.48-61.52	175.25 - 405.37	4.40 - 6.10	4.20 - 11.93
Result	NON-SIG	NON-SIG	-	SIG	NON-SIG	SIG
SE(m)	0.94	10.53	-	2.88	0.4	0.72
CD	N-S	N-S	N-S	7.89	1.22	2.19

Table 2: Yield parameter recorded in different chilli progenies in the study.

Genotype	Green fruit yield per plant (g)	Green fruit yield per plot (kg)	Green fruit yield per ha (q)
	Mean	Mean	Mean
PBNC-4	1033.97	43.42	320.53
PBNC-7	1086.09	45.64	336.93
PBNC-10	1306.33	54.86	404.96
PBNC-13	1448.61	60.84	449.07
PBNC-14	1542.12	64.76	478.05
PBNC-15	1796.39	75.08	558.08
PBNC-16	1824.16	76.61	565.48
PBNC-17	1782.89	73.96	552.77
PBNC-18	1335.12	56.07	413.88
PBNC-19	1229.75	51.64	381.22
PBNC-20	1465.24	61.54	454.22
PBNC-22	1285.95	54.00	398.64
PBNC-23	1257.75	52.82	389.90
BYDGI-341	1463.96	61.48	453.82
BSS-355	1639.03	68.83	508.10
Mean	1425.69	59.87	441.98
Range	1033.97-1824.16	43.42-76.61	320.53-565.48
Result	SIG	SIG	SIG
SE(m)	15.69	0.51	5.01
CD	43.02	1.56	14.31

Conclusion

Chilli (*Capsicum annuum* L.) is one of the most important cash crops grown extensively in Maharashtra and it has received great consumer acceptance for its characteristic pungency and flavour. Though chilli is more demanding vegetable, productivity of the crop is less. One of the first step in increasing productivity is introduction of F5 hybrids, which are genetically superior, high yielding, pest and disease free and having other value-added traits. Hence, the study was under taken to evaluate performance of genetic variability of chilli F5 progenies for growth, yield and quality traits and an attempt was made to find out the most suitable chilli F5 progenies for growing in Maharashtra. Out of thirteen F5 progenies and two check evaluated, three F5 progenies

namely PBNC-16, PBNC-15 and PBNC-17 progenieshave recorded green fruit yield of more than 550 q/ha compared to other F5 progenies. The progenies PBNC-16 had recorded highest green fruit yield of 565.48 q/ha followed by PBNC-16 (558.08 q) and PBNC-17 (552.77 q). these F5 progenies can be recommended for commercial cultivation under Maharashtra region.

References

1. Amit K, Ahad I, Kumar V. Genetic variability and correlation studies for growth and yield characters in chilli (*Capsicum annuum* L.) J. Spices and Aromatic Crops. 2014;23(2):170-177.
2. Barche S, Nair N. Evaluation of chilli genotypes for vegetative and fruit characters under Kymore plateau region of Madhya Pradesh. An Int. quarterly J. Environ. Sci. 2014;5:121-125.
3. Chattopadhyay AA, Sharangi AA, Dai N, Dutta S. Diversity of genetic resources and genetic association analyses of green and dry chillies of Eastern India. Chilean J. Agril, Res. 2011;71(3):124-132.
4. Datta S, Jana JC. Studies on stability of chilli genotypes at different fertility levels under Terai zone of West Bengal. J. Spices and Aromatic Crops. 2014;23(1):26-31.
5. Herison C, Handayaningsih M, Fahrurrozi, Rustikawati. Evaluation of growth and yield performance on inoculated chili pepper hybrids by cucumber mosaic virus. Agrivita. 2014;36:14-19.
6. Jabeen N, Shahnazmufti Khan SH, Hussain K, Tasaduk Shafi. Comparative performance of chilli genotypes and hybrids under Kashmir valley conditions (*Capsicum annum* L.). Asian J. Hort. 2011;6(2):471-473.
7. Jamal Uddin AFM, Hussain MS, Rahman SKS, Ahmad H, Roni MZK. Growth, yield and quality of SAU-Agni and SAU-Cayenne chilli variety. J. Bangladesh Res. Pub. 2015;11(3):198-203.
8. Jyothi UK, Kumari SS, Ramana VC. Variability studies in chilli (*Capsicum annuum* L.) with reference to yield attributes. J. Hort. Sci. 2011;6(2):133-135.
9. Kaur B, Singh D. Evaluation of hot Pepper (*Capsicum annum* L.) germplasm of diverse origin for various horticultural characters. J Plant Genetic Resour. 2008;21:3.
10. Manju PR, Sreelatha Kumary I. Genetic variability, heritability and genetic advance in hot chilli (*Capsicum chinese* L.). J. Tropical Agric. 2002;40:4-6.
11. Modak PV. Studies on growth yield and quality of chilli (*Capsicum annuum* L.) varieties under Konkan conditions. Thesis submitted to Dr. B.S.K.K.V., Vidyapeeth. Dapoli; c1989.
12. Orobiyi A, Loko YL, Sanoussi F, Adjatin A, Gbaguidi A, Dansi A, Sanni A. Horticultural practices and varietal diversity of chili pepper (*Capsicum annuum* L.) in Central and Northern Benin. Genetic resources and crop evolution. 2017;64:419-436.
13. Panse VG, Sukhatme PV. Statistical methods for agricultural workers; c1985.
14. Sharma VK, Semwal CS, Uniyal SP. Genetic variability and character association analysis in bell pepper (*Capsicum annuum* L.). J. Horti forestry. 2010;2(3):058-065.
15. Shiva KN, Zachariah TJ, Leela NK, Mathew PA. Performance of paprika and paprika alike chillies (*Capsicum annuum* L.). J. Spices and Aromatic Crops. 2013;22(2):222-227.
16. Sileshi D. Evaluation of elite hot pepper varieties (*Capsicum species*) for growth, dry pod yield and quality under Jimma condition, South West Ethiopia. M.Sc. Thesis, School of graduate studies of Jimma University, Ethiopia; c2011.
17. Sreelathakumary I, Rajamony L. Variability, heritability and genetic advance in Chilli (*Capsicum annum* L.). J. Tropical Agri. 2004;42(1-2):35-37.
18. Tembhurne BV, Revenappa, Kuchanur PH. Varietal performance genetic variability and correlation studies in chilli (*Capsicum annuum* L.). Karnataka J. Agri. Sci. 2008;21(4):541-543.
19. Zhani K, Hamdi W, Sedraoui S, Fendri R, Lajimi Q, Hannachi C. Agronomic evaluation of Tunisian accessions of chilli pepper (*Capsicum frutescens* L.). International Journal of Engineering Research and Technology. 2015;2(4):28-34.
20. Tesfaw L, Taye B, Alemu S, Alemayehu H, Sisay Z, Negussie H. Prevalence and antimicrobial resistance profile of Salmonella isolates from dairy products in Addis Ababa, Ethiopia. African Journal of Microbiology Research. 2013;7(43):5046-5050.