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Evaluation of F_1 hybrids for yield and yield attributing characters in chilli (*Capsicum annuum* L.)

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Abstract
The present study entitled "Evaluation of F_1 hybrids in chilli (*Capsicum annuum* L.)" was carried out to study the growth, yield and yield attributing characters in chilli. The field trial comprise thirty F_1 hybrids, 13 parents and 3 checks sown in Randomized Block Design with two replications, during *kharif* 2020-2021.

Among the thirty F_1 hybrids, the maximum yield per hectare was observed in P_2 X P_5 (608.64 qt) compared to parents and checks. Taking growth, yield and yield attributing characters along with incidence of pest and diseases into consideration, the hybrids P_2 X P_5, P_1 X P_8, P_1 X P_{13}, P_2 X P_{13} and P_2 X P_9 were found superior to parents and checks. These hybrids can be used for further improvement in chilli.

Keywords: Chilli, hybrids, yield, harvest, weight

1. Introduction
Chilli (*Capsicum annuum* L.) is one of the most important vegetable cum spice crops belonging to the family Solanaceae with chromosome number 2n=24. Chilli originated from Tropical America, where it was domesticated around 5000 BC. Chilli has attained a status of high value crop in India and occupies a unique place among vegetables in Indian cuisine because of its delicate taste and pleasant flavor coupled with rich content of ascorbic acid and other vitamins and minerals. There are more than 400 different varieties of chillies found all over the world. The genus *Capsicum* has five domesticated species namely *C. annuum*, *C. frutescens*, *C. chinense*, *C. pubescens*, *C. baccatum*, of which *C. annuum* is the most widely cultivated species worldwide (Andrews, 1984). Chilli has a very beneficial effect on the circulatory system. It also lowers high blood pressure and increase peripheral circulation. Hence chilli has diverse uses as spice, condiment, culinary supplement, medicines, vegetable and ornamental plant. Chillies are used in both green and dry form in all culinary preparation.

2. Material and Methods
The experimental material for the study comprise thirty F_1 hybrids, three standard checks and thirteen parents which are collected from Horticulture Research Scheme, (Vegetable), Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment was laid out in a Randomized Block Design with 30 F_1 hybrids, 13 parents and 3 standard checks with two Replications. The individual F_1 hybrids were treated as treatment and replicated randomly. The treatments consisted of T_1- P_1 X P_4, T_1- P_1 X P_5, T_3- P_1 X P_6, T_4- P_1 X P_7, T_5- P_1 X P_8, T_6- P_1 X P_9, T_7- P_1 X P_{10}, T_8- P_1 X P_{11}, T_9- P_1 X P_{12}, T_{10}- P_1 X P_{13}, T_{11}- P_2 X P_4, T_{12}- P_2 X P_5, T_{13}- P_2 X P_6, T_{14}- P_2 X P_7, T_{15}- P_2 X P_8, T_{16}- P_2 X P_9, T_{17}- P_2 X P_{10}, T_{18}- P_2 X P_{11}, T_{19}- P_2 X P_{12}, T_{20}- P_2 X P_{13}, T_{21}- P_3 X P_4, T_{22}- P_3 X P_5, T_{23}- P_3 X P_6, T_{24}- P_3 X P_7, T_{25}- P_3 X P_8, T_{26}- P_3 X P_9, T_{27}- P_3 X P_{10}, T_{28}- P_3 X P_{11}, T_{29}- P_3 X P_{12}, T_{30}- P_3 X P_{13}, T_{31}- PBNC-6, T_{32}- PBNC-26, T_{33}- PBNC-17, T_{34}- Parbhani Tejas, T_{35}- PBNC-1, T_{36}- Kokan Kirti, T_{37}- Phule Jyoti, T_{38}- G-4, T_{39}- Byadgi, T_{40}- Byadgi-341, T_{41}- Teja, T_{42}- Pusa Jawala, T_{43}- Pusa Sadabahar, T_{44}- BSS 378 (C1), T_{45}- BSS 273 (C2) and T_{46}- BSS 273 (C3). Each treatment was planted at a plant spacing of 60 cm x 45 cm. The recommended cultural practices, raising of seedling, seed treatment, transplanting, weeding, fertilizer, irrigation and plant protection were done. The observations on vegetative growth and yield attributes were recorded from randomized selected five plants in each treatment. The results obtained along with relevant discussion are presented.

3. Results and Discussion

3.1 Flowering attributes

3.1.1 Days to 50 percent flowering

The hybrid P_1 X P_6 (38.92 days) took minimum days to produce 50 percent flowering which was on par with P_1 X P_{11} (39.33 days) compared to parents and checks while, the maximum days were taken by the parent P_{13} (74.82 days) followed by P_2 X P_{13} (64.19 days). The variation in days to 50 percent flowering is mainly attributed to the genetic factor of the genotypes and also due to environmental factors.

Table 1: Performance of chilli parental genotypes and hybrids for flowering attributes

Treatment	Name of the treatment	Days to 50% flowering
T_1	P_1 X P_4	49.22
T_1	P_1 X P_5	51.70
T_3	P_1 X P_6	38.92
T_4	P_1 X P_7	45.87
T_5	P_1 X P_8	48.03
T_6	P_1 X P_9	45.42
T_7	P_1 X P_{10}	40.66
T_8	P_1 X P_{11}	39.33
T_9	P_1 X P_{12}	47.30
T_{10}	P_1 X P_{13}	51.61
T_{11}	P_2 X P_4	40.47
T_{12}	P_2 X P_5	52.91
T_{13}	P_2 X P_6	56.79
T_{14}	P_2 X P_7	49.67
T_{15}	P_2 X P_8	60.06
T_{16}	P_2 X P_9	46.99
T_{17}	P_2 X P_{10}	53.03
T_{18}	P_2 X P_{11}	55.24
T_{19}	P_2 X P_{12}	52.50
T_{20}	P_2 X P_{13}	64.19
T_{21}	P_3 X P_4	51.30
T_{22}	P_3 X P_5	53.06
T_{23}	P_3 X P_6	52.28
T_{24}	P_3 X P_7	47.71
T_{25}	P_3 X P_8	51.91
T_{26}	P_3 X P_9	54.40
T_{27}	P_3 X P_{10}	53.29
T_{28}	P_3 X P_{11}	59.30
T_{29}	P_3 X P_{12}	48.06
T_{30}	P_3 X P_{13}	57.07
T_{31}	P_1	40.26
T_{32}	P_2	49.23
T_{33}	P_3	47.97
T_{34}	P_4	47.96
T_{35}	P_5	54.40
T_{36}	P_6	53.67
T_{37}	P_7	54.63
T_{38}	P_8	52.77
T_{39}	P_9	47.12
T_{40}	P_{10}	60.36
T_{41}	P_{11}	59.08
T_{42}	P_{12}	58.19
T_{43}	P_{13}	74.82
T_{44}	C_1	43.19
T_{45}	C_2	54.84
T_{46}	C_3	45.37
	Grand Mean	51.35
	SE (m)	1.49
	CD @ 5%	4.26
	C.V.	4.1

3.2 Yield parameters

3.2.1 Days to first harvest

The number of days taken to start first harvesting were largest for the parent P_{13} (87.36 days) which was at par with the hybrid P_2 X P_{13} (77.72 days) whereas, the lowest number of days were taken by the hybrid P_1 X P_{10} (58.53 days) which was at par with P_1 X P_6 (59.56 days). The variation among genotypes is due to the genetic makeup of genotypes and effect of hormones and environment to a little extent.

3.2.2 Days to last harvest

The harvesting duration was maximum in the hybrid P_2 X P_{13} (77.19 days) which was on par with P_2 X P_5 (73.82 days) compared to parents and checks while, minimum harvesting duration was observed in P_3 X P_6 (66.37 days) which was on par with P_2 X P_9 (66.39 days). The harvesting duration is

influenced by the days to initiation of flowering and 50 percent flowering. The genotypes with maximum harvesting duration are desirable as they give prolonged yields.

Table 2: Performance of chilli parental genotypes and hybrids for yield parameters

Treatment	Name of the treatment	Days to first harvest	Days to last harvest
T_1	P_1 X P_4	64.59	134.19
T_1	P_1 X P_5	68.41	137.25
T_3	P_1 X P_6	59.56	129.02
T_4	P_1 X P_7	63.64	131.85
T_5	P_1 X P_8	63.46	133.80
T_6	P_1 X P_9	65.49	137.18
T_7	P_1 X P_{10}	58.53	128.61
T_8	P_1 X P_{11}	59.68	130.09
T_9	P_1 X P_{12}	60.03	130.08
T_{10}	P_1 X P_{13}	68.69	139.55
T_{11}	P_2 X P_4	60.75	130.41
T_{12}	P_2 X P_5	70.58	144.40
T_{13}	P_2 X P_6	71.46	143.14
T_{14}	P_2 X P_7	65.55	138.51
T_{15}	P_2 X P_8	74.54	146.51
T_{16}	P_2 X P_9	64.69	131.07
T_{17}	P_2 X P_{10}	70.70	142.10
T_{18}	P_2 X P_{11}	71.06	143.18
T_{19}	P_2 X P_{12}	72.13	142.26
T_{20}	P_2 X P_{13}	77.72	154.91
T_{21}	P_3 X P_4	68.46	135.84
T_{22}	P_3 X P_5	68.83	135.91
T_{23}	P_3 X P_6	68.19	134.56
T_{24}	P_3 X P_7	66.42	136.51
T_{25}	P_3 X P_8	68.86	136.99
T_{26}	P_3 X P_9	70.49	142.04
T_{27}	P_3 X P_{10}	74.31	145.51
T_{28}	P_3 X P_{11}	75.96	145.94
T_{29}	P_3 X P_{12}	69.17	140.58
T_{30}	P_3 X P_{13}	70.73	140.54
T_{31}	P_1	60.51	130.65
T_{32}	P_2	69.11	139.96
T_{33}	P_3	66.55	136.50
T_{34}	P_4	65.04	135.53
T_{35}	P_5	70.54	142.23
T_{36}	P_6	72.53	142.51
T_{37}	P_7	74.33	144.94
T_{38}	P_8	72.95	144.12
T_{39}	P_9	66.70	134.16
T_{40}	P_{10}	74.89	143.66
T_{41}	P_{11}	76.80	144.64
T_{42}	P_{12}	74.65	142.56
T_{43}	P_{13}	87.36	154.20
T_{44}	C_1	65.74	134.05
T_{45}	C_2	68.19	137.73
T_{46}	C_3	63.72	133.66
	Grand Mean	68.74	138.77
	SE (m)	1.78	2.22
	CD @ 5%	5.09	6.35
	C.V.	3.66	2.26

3.2.3 Fruit yield per hectare (qt)

The fruit yield per hectare was maximum for the hybrid P_2 X P_5 (608.64 qt) which was on par with P_1 X P_8 (605.31 qt) compared with parents and checks, whereas yield per hectare was minimum for the parent P_6 (160.68 qt) which was at par with the hybrid P_1 X P_4 (209.38 qt). High yield per hectare is desirable at farmer's end. Fruit yield per hectare is highly influenced by number of fruits per plant, fruit length and fruit weight.

Table 3: Performance of chilli parental genotypes and hybrids for yield parameters

Treatment	Name of the treatment	Fruit yield per hectare (qt)
T_1	P_1 X P_4	209.38
T_1	P_1 X P_5	447.72
T_3	P_1 X P_6	518.33
T_4	P_1 X P_7	268.40
T_5	P_1 X P_8	605.31
T_6	P_1 X P_9	532.35
T_7	P_1 X P_{10}	290.25
T_8	P_1 X P_{11}	530.37
T_9	P_1 X P_{12}	528.89
T_{10}	P_1 X P_{13}	575.25
T_{11}	P_2 X P_4	287.54
T_{12}	P_2 X P_5	608.64
T_{13}	P_2 X P_6	319.39
T_{14}	P_2 X P_7	456.48
T_{15}	P_2 X P_8	522.35
T_{16}	P_2 X P_9	558.21
T_{17}	P_2 X P_{10}	286.67
T_{18}	P_2 X P_{11}	329.63
T_{19}	P_2 X P_{12}	367.97
T_{20}	P_2 X P_{13}	560.25
T_{21}	P_3 X P_4	343.27
T_{22}	P_3 X P_5	377.17
T_{23}	P_3 X P_6	383.03
T_{24}	P_3 X P_7	428.58
T_{25}	P_3 X P_8	434.70
T_{26}	P_3 X P_9	364.45
T_{27}	P_3 X P_{10}	441.48
T_{28}	P_3 X P_{11}	346.42
T_{29}	P_3 X P_{12}	357.10
T_{30}	P_3 X P_{13}	344.51
T_{31}	P_1	379.32
T_{32}	P_2	540.06
T_{33}	P_3	347.90
T_{34}	P_4	416.48
T_{35}	P_5	538.52
T_{36}	P_6	160.68
T_{37}	P_7	286.42
T_{38}	P_8	327.90
T_{39}	P_9	320.74
T_{40}	P_{10}	245.80
T_{41}	P_{11}	222.35
T_{42}	P_{12}	346.23
T_{43}	P_{13}	259.94
T_{44}	C_1	533.15
T_{45}	C_2	408.71
T_{46}	C_3	575.00
	Grand Mean	402.90
	SE (m)	37.37
	CD @ 5%	106.81
	C.V.	13.12

4. Conclusion

Observations were recorded on quantitative characters *viz*., plant height, days to 50 percent flowering, days to first harvesting, days to last harvesting and fruit yield/ha. Among the thirty F_1 hybrids evaluated in comparision to parents and checks, the hybrids P_2 X P_5, P_1 X P_8, P_1 X P_{13}, P_2 X P_{13} and P_2 X P_9 showed significantly higher yield and lower pest and disease attack.

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