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Evaluation of chilli (*Capsicum annum* L.) F₁ hybrid cultivars on biomass and fruit yield attributes, under southern zone of Karnataka

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Abstract

The present investigation entitled, Evaluation of Chilli F₁ hybrid cultivars (*Capsicum annum* L.) chilli F₁ hybrid suitable for green and dry chilli market under zone Southern zone of Karnataka. Eight chilli F₁ hybrid cultivar were evaluated during the year kharif 2021 at Agricultural & Horticultural Research Station, Kathalagere (Davangere district). The Chilli F₁ hybrid cultivar were collected from I I H R. Bangaluru eight cultivars. viz. Arka Yashasvi, Ark Saanvi, Arka Gagan, Arka Tejasvi, Arka Tanvi, H-23, H-25 and local check (Arka Harith). The results of the eight treatments revealed that all the hybrid cultivars are showed on par variation with respect to plant growth, yield and yield traits. Arka Sanvi was found superior plant height (66.83 Cm) the highest plant canopy direction was recorded, (41.75/41.44 Cm NS and EW respectively). The highest number branches (6.79 Nos) fruit length (10.5 cm) and diameter (0.516 cm) and twenty fruits weight (162.33 g) were recorded in the same F₁ hybrid cultivar. Individual treatment fruit yield per plant green / red chilli was recorded in the same F₁ hybrid cultivar (0.715/0.217 kg) meanwhile observed fruit yield /plot was also recorded in higher (11.964 /3.44 kg) and fruit yield per acre was recorded in (2991.083/3.5566 kg/acre) respectively. And overall marketing acceptance F₁ Hybrid Arka Saanvi cultivar is also superior (4.5 and above /5.00 points). Plants medium tall & spreading, canopy, firm fruit, medium pungent, green and turn red on maturity, smooth turn to medium wrinkled yield potential 30-35q dry chilli/ acre, recommended for Southern zone of Karnataka.

Keywords: Arka Gagan, Arka Sanvi, Arka Yashasvi, Arka Tejasvi, hybrid cultivar

Introduction

Chili (*Capsicum annum* L.) Chilli is one of the most important commercial crops of India. It is grown almost throughout the country. There are more than 400 different varieties of chillies found all over the world. It is also called as hot pepper, cayenne pepper, sweet pepper, bell pepper etc. The agro-climatic condition prevailing in the southern district of Karnataka have been found to be highly favourable for chilli cultivation. Country wise production. India is not only the largest producer but also the largest consumer of chilli in the world. Chillies are the most common spice cultivated in India. Chilli is a universal spice of India. It is cultivated in all the States and Union Territories of the country. India contributes about 36% to the total world production. In India, Chillies are grown in almost all the state throughout the country. Andhra Pradesh is the largest producer of Chilli in India and contributes about 26% to the total area under Chilli, followed by Maharashtra (15%), Karnataka (11%), Orissa (11%), Madhya Pradesh (7%) and other states contributing nearly 22% to the total area under Chilli. The production of Chilli in India is dominated by Andhra Pradesh which contributes nearly 57% to the total production. Karnataka is the second largest producer contributing 12% to the total production followed by Orissa (5%), West Bengal (5%), Maharashtra (4%), Madhya Pradesh (3%) and others about 14% (NHB 2016-17). Red chilli fruit yield is directly proportional to the management agronomic Practices variety drying methods, climatic zone and varietal relationship. Chilli, imparts colour and characteristic pungent flavour apart from being used as a seasoning factor. Yield attributes have a positive influence on the yield significant results Considering this moisture, ash, water insoluble ash, acid insoluble ash, capsaicin content, colour value, total carbohydrate, protein, fat, fibre, total phenols. Sun drying, followed at temperature range between at this Research Institute 30 to 40 °C final moisture content reduced from 3.3: 1 ratio its considered as red chilli excellent quality.

Materials and Methods

The experiment was carried during the year Kharif 2021 to study the performance of eight chilli cultivars (*Capsicum Annum* L.) the experiment conducted at Agricultural and Horticultural Research Station, Kathalagere. Davangere district of Kathalagere is the middle part of the state tropical climatic region. The experimental geographical area is located at 14°16' N latitude, and 75°49' E longitude at an elevation 628 m from mean sea level with annual rainfall of 598 mm. The soil are deep and clay loamy in structure with brown colours moderately acidic to neutral in reaction the available N₂ P₂O₅ and K₂O ranged from 280-235, 24-35.5 and 161-318 kgs /ha respectively. The organic carbon available nitrogen phosphorus and potash, during the period of experimentation, the maximum and minimum temperature ranged from 33.0° to 39.20 °C & 25° to 28.0 °C and 28.0° to 22.0 °C & 25.6 to 21.8° in spring summer and kharif season respectively. Raise the seedlings under nylon net cover portrays filled with properly fermented and microbial enriched coco pit at the time of germination drenched the trays with fungicides Caftaf @ 2 g/liter of H₂O Prior to transplanting the seedlings to be sprayed with confider @ 0.5 ml /liter of H₂O mean while at the time of land preparation work was done thoroughly. Deep plough the land and bring the soil to fine tilth spacing to be followed 75x45 cm Applied basal organic and in-organic fertilizer mixture biofertilizer, farm yard manure and 30 percent of NPK on the row planting applied farm yard manure 10 tons /acre and Recommended fertilizer dose N: P: K-150 250 and 60 Kg. Border crop for row of maize after transplanting of chili seedlings.35 days age seedlings collected from nursery, transplanting work were taken at popper moisture condition. Seeds eight chilli cultivars were collected from Indian Institute of Horticultural Research Bangalore viz Arka Yashasvi, Ark Saanvi, Arka Gagan, Arka tejasvi Arka H-23, H-25 and Check variety(Arka Harith). The transplanting work taken at main field, three replications in randomized complete block design with eight treatments followed by high density planting each plot area is 4.0 x 4.0m and maintained 0.75 x 0.45m spacing, 24 plants were accumulated in each plot, Regular cultural and agronomic practices were followed weeding, earthing up and fertilizer application were taken in timely nitrogen given in three split dose plant protection measures were adopted as per the recommended package of practices. The data were collected randomly from 5 plants each viz plant height (cm), plant canopy North & South and East & West direction, Fruit length (cm), fruit diameter(cm), average Green and Red fruit weight/plant (kg), fruit yield kg/plot. Respectively the experimental data were statistically analysed (Panse and Sukhatme, 1978) ^[17] and

compared using critical difference at five per cent probability level.

Results and Discussion

1. Plant height (cm)

The height of capsicum plants varies greatly, which has an impact on their eventual performance as inferred by climatological factor the plant height was measured at 190 days after transplanting. Among the eight hybrid cultivars Arka Sanvi hybrid recorded the maximum plant height of (66.83 cm) followed by T-7.H-25 hybrid cultivar (65.33 cm) and the minimum plant height was recorded in the Local cultivar check variety Arka Harith (61.25 cm) Similar results were obtained by Jyothi *et al.*, (2011) ^[10] and Ruplai Sharma (2017) ^[23] Growth, flowering and yield of Chilli as influenced by spacing and Growing Conditions.

2. Plant canopy North and south

Split application of nitrogen (N) is one of the most important nutrients for plant canopy is achieving desirable productivity of crops the maximum canopy, showed the treatment es were significantly influenced treatment T-5 shows Arka Sanvi hybrid cultivar (41.75 cm) on par with T-7. H25 hybrid cultivar (41.67. cm) were minimum canopy was recorded in T-8 check variety Arka Harith (41.05 cm) results are in agreement with the findings Ruplai Sharma (2017) ^[23] Growth, flowering and yield of Chilli as influenced by spacing and Growing Conditions.

3. East and West canopy

The maximum East and West direction canopy, showed the treatment were significantly influenced treatment T5 Arka Sanvi hybrid cultivar (41.44 Cm) on par with T-7 H25 hybrid cultivar (40.28 51. cm) were minimum East and West canopy was recorded in T-8. Check variety Arka Harith (38.65 cm results are in agreement with the findings Ruplai Sharma (2017) ^[23] Growth, flowering and yield of Chilli as influenced by spacing and Growing Conditions.

4. No of primary branches

The highest number of branches per plant (6.79) was recorded Arka Sanvi hybrid cultivar Hybrid cultivar followed by the accession T7-H25 hybrid cultivar (6.47) and the least (5.92) number of branches per plant was observed in the hybrid cultivar Local check variety Arka Harith (5.92 Nos) Similar results were obtained by Jeevitha *et al.*, (2021) ^[8] Performance assessment of various chilli species grown under shade net for growth, yield and quality characters in Coimbatore region, India. Performance of Chilli Hybrid cultivars growth parameters under zone 7 of Karnataka.

Table 1: Performance of Chilli Hybrid cultivars growth parameters under zone 7 of Karnataka

Sl No	Treatments	Plant height (Cm)	Main Branches /plant	Canopy NS (Cm) EW (Cm)		Fruit length (Cm)	Fruit width (mm)	20 fruit weight	No of fruits /pl
1	Arka Yashasvi	64.31	6.287	41.100	39.760	10.133	1.055	159.260	51.170
2	Arka Saanvi	63.20	6.450	41.167	39.283	10.207	1.066	159.693	52.150
3	Arka Gagan	65.75	6.383	41.027	39.390	10.240	1.053	158.610	52.127
4	Arka tejasvi	64.39	6.307	41.220	38.667	10.175	1.051	158.833	50.343
5	Arka Tanvi	66.83	6.790	41.450	41.443	10.450	1.107	162.333	53.633
6	H 25	65.33	6.210	41.213	40.287	10.175	1.048	158.333	52.137
7	H-43	64.93	6.470	41.283	41.383	10.333	1.088	161.783	53.560
8	Arka harith	61.25	5.927	40.433	38.650	9.967	0.985	157.867	49.440
	Sem +	1.860	0.187	1.19	1.19	0.331	0.034	4.74	1.630

	Cd5%	5.660	0.56	3.62	3.61	1.005	0.105	14.37	4.945
	Cv@5%	5.010	5.100	5.16	5.18	5.612	5.695	5.14	5.449

2. Fruit Characters

1. Fruit length

Growth, yield and quality parameters of chilli as influenced by application of different organic manures and decomposers the highest fruit length were recorded at last harvest 8th picking treatment Hybrid cultivar T-5 Arka Sanvi hybrid cultivar (47.03) were recorded in maximum fruit length and followed by Hybrid cultivar T-7 H 25 hybrid cultivar on par with the results (46.17 cm) and minimum fruit length was recorded in the treatments in check T1 (33.69 cm) Similar results were obtained by Gagadhar and Dev kumar (2020) [6] Growth, yield and quality parameters of chilli as influenced by application of different organic

manures and decomposers.

2. Fruit Diameter (cm)

Physiological and developmental behaviour of chilli fruit colour size and shape, fruit diameter /width was observed at the 85% fruit maturity stage. Fruit diameter variability was found in T-5 Arka Sanvi hybrid cultivar (1.107 cm) followed by T-7.H25 hybrid cultivar (1.088 C cm) and minimum fruit diameter was observed in in the treatments in check T8 (0.985 cm). Similar results were obtained Janaki *et al.*, (2015) [7]. Performance of chilli genotypes for yield and yield attributing traits.

Table 2: Performance of Chilli Hybrid cultivars Green and Dry yield parameters under zone 7 of Karnataka

Sl. No	Treatments	Green Yield			Dry Yield			Biomass yield (Kg)		
		Plant (kg)	Plot (kg)	Plant	Plot	Acre	Acre (kg)	Plant	Plot	Acre
1	Arka Yashasvi	0.712	11.503	2875.83	0.213	3.486	871.465	1.55	24.87	6219.16
2	Arka Saanvi	0.711	11.537	2884.16	0.214	3.496	873.990	1.53	24.58	6146.66
3	Arka Gagan	0.712	10.999	2749.75	0.215	3.333	833.258	1.56	25.01	6253.33
4	Arka tejasvi	0.713	11.487	2871.66	0.215	3.481	870.202	1.58	25.28	6320.00
5	Arka Tanvi	0.715	11.964	2991.08	0.217	3.626	906.389	1.62	26.69	6672.50
6	H 23	0.712	11.506	2876.41	0.213	3.487	871.641	1.56	23.44	5861.66
7	H-25	0.714	11.593	2898.33	0.216	3.513	878.283	1.59	26.49	6624.16
8	Arka Harith	0.684	10.431	2607.75	0.208	3.161	790.227	1.53	24.53	6133.33
	Sem +	0.021	0.34	86.94	0.004	0.111	0.111	0.04	0.763	190.826
	Cd5%	0.065	1.055	263.71	0.01	0.337	0.337	0.14	2.315	578.81
	Cv@5%	5.125	5.29	5.29	5.18	5.19	5.180	5.12	5.264	5.2640

3. Number of fruits per plant

The variation in number of branches per plant might be due to differences in plant height, the number of branches per plant is considered as a desirable feature since it increases the yield per plant by directly contributing to the photosynthesis. The highest number of fruits per plant was recorded in Arka Sanvi hybrid cultivar (53.63 Nos) followed by the T-7.H25 hybrid cultivar with (53.56 Nos) In contrast, least number of fruits were recorded in Local check variety Arka Harith (49.41 Nos). Similar results were reported by Kumar *et al.* (2009) Mantano Mata *et al.*, (2002), Sandeep *et al.*, (2008) [26] and Chattopadhyay *et al.*, (2011).

4. Average (Green) Fruit Weight/plant (g)

This may be due to the increase in fruit length and girth fruit weight per plant were recorded at last harvest the treatment were recorded maximum fruit weight in T-5 Arka Sanvi hybrid cultivar (0.71kg/plant) similarly on par with T-7 H25 hybrid cultivar (0.71kgplant) and minimum fruit weight was recorded in Local check variety Arka Harith n check T8 (0.68kg/plant). Similar results were obtained by Similar results by Rohini and Lakshmanan, (2017) [22]. Evaluation studies of hot pepper hybrids for yield and quality characters.

5. Average (Green) Fruit Weight/plot

The fruit yield attributes have a positive influence on the results among the treatment Hybrid cultivar T5- Arka Sanvi hybrid cultivar was recorded highest plot fruit yield (11.964 kgplot), followed by T-7 H25 hybrid cultivar (11.593 kg/plot) and minimum fruits Local check variety Arka Harith was recorded T-8 (10.431 kg/plot). Similar results

were reported Jeevitha (*et al.*, 2021) [8] Performance assessment of various chilli species grown under shade net for growth, yield and quality characters in Coimbatore region, India.

6. Green Fruit yield kg / Ac

The highest fruit yield is directly proportional to the management variety, climatic zone and Hybrid cultivar T-5 Arka Sanvi hybrid cultivar was recorded heights fruit yield (2991.083 kg/ac) followed by T-7 H25 hybrid cultivar was recorded in T-6 (2898.33 kg/ac) and minimum fruit yield/acre were observed in T8- Local check variety Arka Harith (2607.07 kg/ac). Similar results were reported Kavitha *et al.*, (2022). Studies on marketing of Chili Seeds in Anantapur District of Andhra Pradesh.

Yield of Red Chilli

a) Red (Dry chilli) Fruit weight per plant

Among the treatment Hybrid cultivar T5- Arka Sanvi hybrid cultivar was recorded maximum yield (0.217 kg/plant), followed by T-7 H25 hybrid cultivar (0.216 kg/plant) and minimum fruit yield was observed in T8-Local check Arka Harith cultivar (0.208 kg/plant). Similar results were reported Barinadh babu *et al.*, (2009) [3] Effect of nutrient ratios on yield and economics of chilli northern transitional zone of karnataka.

Red Fruit weight per plot (kg)

The treatment T-5 Arka Sanvi hybrid cultivar were recorded highest plot yield (3.62 kg/plot), followed by T-7 H25 hybrid cultivar (3.51 kg/plot) and minimum fruit yield was recorded in the treatments in check T8 Local check variety

Arka Harith (3.16 kg/plot). Similar results were obtained by were obtained Jeevitha (*et al.*, 2021) ^[8] Performance assessment of various chilli species grown under shade net for growth, yield and quality characters in Coimbatore region, India

Red Fruit yield kg / Ac

Computed (Dry) chilli fruit yield / acre hybrid cultivar T-5 Arka Sanvi recorded highest fruit yield (906.38 kg/Ac) followed by T-7 H25 hybrid cultivar T-7 (878.28 kg) and minimum fruit yield were recorded in in T8- Local check variety Arka Harith (790.22 kg/Ac). Similar results were reported Venkatachalam Kritika and Rhadarisri (2014) ^[30] Physicochemical and Nutritional Characteristics of Chilli Cultivars.

Assessment and monitoring of biomass

High density planting intensity of eight hybrid cultivar are shows on the growth, yield and biomass increased the harvest index (fruit yield vs. biomass production). Light is one of the most important environmental factors that determine the growth and development of plants photosynthesis and different kinds of photoreceptors, light intensity and spectral composition affect biomass and yield weight of biomass product and fruit yield was observed in chilli 2.16 to 3.2 ratio. Fruit yield and biomass concentration were higher in F1 Hybrid cultivar Arka Saanvi. Plant parts of roots leaves and shoots are associated with fruit and bioaccumulation the potentials of chilli plant parts grown contaminated soil with various concentrations NPK biofertilizer vermicompost concentration. Chilli plant parts are safe to utilization in agriculture adding farm yard manure pit its easily decomposable improves the fertility and supplies nutrient to the next crop beneficially sources of fuel energy.

Biomass yield (kg)

The treatment T-5 Arka Sanvi hybrid cultivar were given highest plant biomass product (1.62 kg), followed by T-7 H25 hybrid cultivar (1.59 kg) and minimum biomass yield was recorded in the treatments in check T8 Local check variety Arka Harith (1.53 kg). Similar results were obtained by Kashibai *et al.*, (2012) Evaluation of chilli cultivars for qualitative parameters at different maturity stages. With respect plot yield treatment T-5 Arka Sanvi hybrid cultivar were recorded highest plant biomass product (26.69kg), followed by T-7 H25 hybrid cultivar (26.49 kg) and minimum biomass yield was recorded in the treatments in check T8 Local check variety Arka Harith (24.53 kg). Similar results were obtained by Ruplai sharma and Rajeshkumar (2017) ^[23] Growth, Flowering and of chilli as influenced by spacing and growing condition And highest biomass product computed in acre basis, treatment T-5 Arka Sanvi hybrid cultivar were shows highest plant biomass product (6672.50kg), followed by T-7H25 hybrid cultivar (6624.16 kg) and minimum biomass yield was recorded in the treatments in check T8 Local check variety Arka Harith (6133.33 kg). Similar results were obtained by Ruplai sharma and Rajeshkumar (2017) ^[23] Growth, Flowering and of chilli as influenced by spacing and growing condition Conclusion From the experiment, it can be concluded that the Arka Sanvi recorded the maximum fruit length of 11.61 cm. Whereas the number of leaves per plant (540.77), number of branches per plant (12.1), number of fruits per

plant (58.83), dry fruit yield per plant (38.44 g) and number of seeds per fruit (70.73).

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