Evaluation of different hybrids of chilli in Prayagraj agro-climatic condition

ABSTRACT

The present investigation entitled "Evaluation of different hybrids of chilli in prayagraj agro-climatic condition" was conducted from July 2022- January 2023. The experiment was laid out in a Randomised Block Design with 3 replications and 10 hybrids viz., LHC-Diya, LHC-4010, Beauty, NS-1101, Deva, NS-1701 DG, VNR-305, Chushul, Pushkar, Sonali. Experiment was done to understand the plant growth, fruit yield, quality and economics of Chilli using different hybrids under Allahabad agro-climatic conditions at the experimental field of the Department of Horticulture, Naini Agricultural Institute (NAI), Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHUATS), Prayagraj, Uttar Pradesh. From the above experimental findings it is concluded that, all the characters viz., growth parameters, earliness parameters, yield parameters and qualitative parameters varied significantly. Further, while studying the plant height (F_1-Sonali) was found best, highest number of branches, maximum average fruit weight and maximum ascorbic acid was found in (F_1-NS-1701 DG), days to first flowering and days to 50% flowering was found minimum in (F_1- Pushkar), maximum number of fruits per plant, maximum fruit length and fruit girth was found in (F_1- VNR-305), highest yield per plant, highest yield per hectare and highest profit and maximum benefit cost ratio were found in (F_1-NS-1101), maximum TSS was found in (F_1- Beauty).

Keywords: *Chilli, Hybrid, Evaluation, Growth, Yield, Quality.*

INTRODUCTION

Chilies are members of the solanaceae family and are endemic to tropical South America. Although most Capsicum species have 2n = 2x = 24 chromosomes, wild species with 2n = 2x = 26 chromosomes have been observed. **(Pickersgill, 1991; Tong and Bosland, 2003).** There are a few species with genomes that are 2n = 2x = 32). *C. annuum* is said to have originated in semi-tropical Mexico. The origins of the four other domesticated species are thought to be in South America. **(Denevan, 2001).** It was brought to Europe by Christopher Columbus in 1493 as a spicy spice that symbolised his quest's success. Pepper fruit nutritional contents vary depending on genotype and fruit maturation stage. In general, 100 g of green fruits contain 85.7 g of moisture, 2.9 g of protein, 0.6 g of fat, 1.0 g of minerals, 6.8 g of fiber, 3.0 grams of carbs, 30 mg of calcium, 24 mg of magnesium, 0.39 mg of riboflavin, 67 mg of oxalic acid, 0.9 mg of nicotinic acid, 80 mg of phosphorus, Antioxidant vitamins including Vitamin A, C, and E are abundant in the green fruits of hot and sweet peppers. In fact, Hungarian scientist Albert Szent Gyorgyi isolated vitamin C from Capsicum fruits for the first time in 1928, which helped him win the Nobel Prize in physiology and medicine in 1937. Chilli fruits are used to add pungency to food in both the green and mature stages. The fruit ranges in size from 1 to 20 cm long, with a thin, long form to a conical, thick-fleshed blocky shape. 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 **(Parthasarathy *et al*., 2008).** Chili peppers come in a variety of shapes, sizes, colors, and heat levels, ranging from mild to extremely hot. They are commonly used in soups, stews, curries, sauces, marinades, and many other dishes. They can be consumed fresh, dried, or powdered and are often added to food to enhance its flavor and increase its heat level. **(Srinivasan, K. 2016).** Chili peppers have been an important part of human diets and traditional medicine for centuries. In many cultures, they are believed to have therapeutic properties and are used to treat various ailments such as indigestion, arthritis, and inflammation. They have also been used as a natural remedy for pain relief and fever. **(Topolska, K. 2015).** Chilli's pungency is caused by a crystalline acid, volatile alkaloid called capsaicin, which is found in the fruit's placenta. It's also high in oleoresin, the complete flavour extract found in dried and crushed chilies. Chilli extracts with natural colour are also gaining popularity as a substitute for artificial colours in cuisine. **(Katheek *et al*., 2018).**

MATERIAL AND METHODS

The present investigation entitled "Evaluation of different hybrids of chilli in prayagraj agro-climatic condition" was conducted from July 2022- January 2023. The experiment was laid out in a Randomised Block Design with 10 hybrids and 3 replications. Experiment was done to understand the plant growth, fruit yield, quality and economics of Chilli using different hybrids under Allahabad agro-climatic conditions at the experimental field of the Department of Horticulture, Naini Agricultural Institute (NAI), Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHUATS), Prayagraj, Uttar Pradesh.

Prayagraj falls in central plain sub-zone of Agro-climatic zone V (Source: Perspective and Strategic Plan (PSP) for IWMP of Uttar Pradesh, Department of Land Development and Water Resources, Government of U.P.). The area is situated on the South of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. It is situated between the parallels of 20° 33' 40'' to 21° 50' North latitude and 73° 27' 58'' to 73° 56' 36'' East longitude and at an altitude of 98 meters above mean sea level (MSL).

The area of Prayagraj district comes under sub-tropical climate prevailing in the South-East part of U.P with both the extremes in temperature, i.e the winter and the summer. In cold winters, the temperature sometimes is as low as 4°C -5°C in the months of December- January and very hot summer with temperature reaching up to 46°C-48°C in the month of May and June. The relative humidity ranges between 20 to 94 per cent. During winter, frost and during summer, hot scorching winds are also not uncommon. The average rainfall is around 1014.4 mm. Most of the precipitation is received through south -west advancing monsoon with maximum concentration during July to September months with occasional showers in winter.

Observations were recorded at different stages of growth periods and studied for growth parameters like plant height, number of branches per plant, earliness parameters like days to first flowering, days to 50% flowering, yield parameters like number of fruits per plant, fruit length, fruit girth, fruit weight, fruit yield per plant, fruit yield per hectare and quality parameters total soluble solid and ascorbic acid content. The data were statistically analysed by the method suggested by **Fisher and Yates, 1963.** The details of hybrids used is given in table 1. The height of five randomly selected plants from each plot was measured in cm with of a 100 cm meter scale from ground level to tip of the shoot at 30, 60 and 90 DAT stage. The numbers of branches per plant (plant) of five randomly selected plants arising from main shoot were counted and were averaged to represent numbers of primary branches per plant. Number of branches per plant basis was counted at 30, 60 and 90 DAT. The

numbers of days taken from the date of sowing to the date at which first flower appeared in plants or date at which plants start flowering in whole plot were recorded as days to first flowering, similarly, was taken for days to first flowering and days to 50% flowering**.** The percentage of total soluble solids of the fruit was determined with the help of Portable Hand Refractometer. The sample of juice for this purpose was taken from the strained juice. The observed value of T.S.S. was recorded from the scale of the instrument (0-32 range). Vitamin C content or Ascorbic acid content in the pulp was estimated by using 2, 6 dichlorophenol indophenol dye as reported by **Ranganna (1986)**.

Table 1. Details of hybrids used

S. No.	Notation	Name of Hybrids
1	V_1	F_1 -LHC- DIYA
2	V_2	F_1 -LHC-4010
3	V_3	F_1 -BEAUTY
4	V_4	F_1 -NS-1101
5	V_5	F_1 -DEVA
6	V_6	F_1 -NS-1701 DG
7	V_7	F_1 -VNR-305
8	V_8	F_1 -CHUSHUL
9	V_9	F_1 -PUSHKAR
10	V_{10}	F_1 -SONALI

RESULTS AND DISCUSSION

Growth Parameters

Plant height (cm)

The maximum plant height at 30 DAT (63.27 cm) was recorded in the hybrid NS-1701 DG followed by CHUSHUL (54.53 cm). Plant height was found to be minimum (43.13cm) in the hybrid LHC-4010. The maximum plant height at 60 DAT (94.93 cm) was recorded in the hybrid SONALI followed by DEVA (93.93 cm). Plant height was found to be minimum (65.93cm) in the hybrid VNR-305. The maximum plant height at 90 DAT (120.33 cm) was recorded in the hybrid SONALI followed by DEVA (119.4 cm). Plant height was found to be minimum (94.13cm) in the hybrid LHC-DIYA. The hybrid SONALI gives maximum height due to favourable Prayagraj Agro-climatic conditions, better adaptability of the hybrids and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Sreelathakumary and Rajamony (2004), Smitha and Basavaraja (2006), Ukkud et al. (2007), Sandeep et al. (2008), Tembhurne et al. (2008), Pramila et al. (2009), Cheema et al. (2010), Saravaiya et al. (2011), Phulari (2012) and Dhaliwal et al. (2014)** in chilli.

Number of branches per plant

The maximum number of branches at 30 DAT (8.73) was observed in the hybrid NS-1701-DG and was followed by (7.13) in LHC-DIYA while the minimum number of branches (4.8) was recorded in the hybrid SONALI. The maximum number of branches at 60 DAT (12.47) was observed in the hybrid NS-1701-DG and was followed by (10.4) in DEVA while the minimum number of branches (7.33) was recorded in the hybrid SONALI. The maximum number of branches at 90 DAT (11.07) was observed in the hybrid NS-1701-DG and was followed by (12.4) in DEVA while the minimum number of branches (8.4) was recorded in the hybrid SONALI. The hybrid NS-1701-DG gives maximum number of branches due to favourable Prayagraj Agro-climatic conditions, better adaptability of the hybrids and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Smitha and Basavaraja (2006), Ukkud et al. (2007), Sandeep et al. (2008), Pramila et al. (2009), Amit et al. (2014) and Vijaya et al. (2014)** in Chilli.

Earliness parameter

Days to first flowering

Days to first flowering ranged from PUSHKAR (46.33) to LHC-DIYA (60.67) with a mean of 52.53. The minimum number of days to first flowering observed in hybrid PUSHKAR (46.33 days) followed by VNR-305 (56.33 days). The maximum days to first flowering was observed in V1 LHC-DIYA (60.67 days). The hybrid PUSHKAR was found significantly superior in all the hybrids. The hybrid PUSHKAR gives minimum days to first flowering due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the

hybrid to have wide adaptability. Similar findings were reported by **Singh *et al*. (2019), Islam *et al.* (2020), Dhal *et al*. (2021), Awasthi *et al.* (2021), Molonaro *et al.* (2022)** in Chilli.

Days to 50% flowering

Days to 50% flowering ranged from PUSHKAR (61.33) to LHC-DIYA (75.67) with a mean of 67.53. The minimum number of days to 50% flowering observed in hybrid PUSHKAR (61.33 days) followed by VNR-305 (71.33 days). The maximum days to first flowering was observed in LHC-DIYA (75.67 days). The hybrid PUSHKAR was found significantly superior in all the hybrids. The hybrid PUSHKAR gives minimum days to 50% flowering due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Farhad *et al*. (2008), Tembhurne *et al*. (2008), Singh *et al*. (2019), Islam *et al.* (2020), Awasthi *et al*. (2021), Lohani *et al*. (2022)** in chilli.

Yield Parameter

Number of fruits per plant

Number of fruits per plant ranged from SONALI (128.52) to VNR-305 (360.54) with a mean of 245.90. Maximum number of fruits per plant was observed in hybrid VNR-305 with 360.54 fruits per plant and was superior over rest of the hybrids, followed by BEAUTY with 343.74 fruits per plant, while the minimum number of fruits per plant was observed in hybrid SONALI with 128.52 fruits per plant. The hybrid VNR-305 gives maximum number of fruits per plant due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Sreelathakumary and Rajamony (2004), Smitha and Basavaraja (2006), Sandeep et al. (2008), Tembhurne et al. (2008), Ajjapplavana and ChannaGoudra (2009), Pramila et al** in Chilli.

Average fruit length (cm)

Average fruit length ranged from VNR-305 (6.63 cm) to NS-1701-DG (9.68 cm) with a mean of 7.64 cm. Maximum average fruit length was observed in hybrid NS-1701-DG with 9.68 cm fruits and was superior over rest of the hybrids, followed by NS-1101 with 9.63 cm fruits, while the minimum average fruit length was observed in hybrid VNR-305 with 6.63 cm fruits. The hybrid NS-1701-DG gives maximum average fruit length due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Sreelathakumary and Rajamony (2004), Smitha (2006), Dahal et al. (2008), Tembhurne et al. (2008), Pramila et al. (2009), Cheema et al. Chattopadhyay et al. (2011), Saravaiya et al. (2011), Shiva et al. (2013), Dhaliwal et al. (2014), Lakshmanan (2014), Vijaya et al. (2014)** in Chilli.

Average fruit girth (mm)

Average fruit girth ranged from DEVA (2.46 mm) to VNR-305 (3.40 mm) with a mean of 2.88 mm. Maximum average fruit girth was observed in hybrid VNR-305 with 3.40 mm fruits and was superior over rest of the hybrids, followed by LHC-4010 with 3.36 mm fruits, while the minimum average fruit girth was observed in hybrid DEVA with 2.46 mm fruits. The hybrid VNR-305 gives maximum average fruit girth due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Kumari *et al.* (2017)** in chilli.

Average fruit weight (gm)

Average fruit weight ranged from LHC-DIYA (1.66 gm) to NS-1101 (3.82 gm) with a mean of 2.49 gm. Maximum average fruit weight was observed in hybrid NS-1101 with 3.82 gm fruits and was superior over rest of the hybrids, followed by NS-1701-DG with 2.84 gm fruits, while the minimum average fruit weight was observed in hybrid LHC-DIYA with 1.66 gm fruits. The hybrid NS-1101 gives maximum average fruit weight due to favourable Prayagraj Agro-climatic conditions. Similar findings were reported by **Sreelathakumary and Rajamony (2004), Tembhurne et al. (2008), Sarkar et al. (2009), Cheema et al. (2010), Chattopadhyay et al. (2011), Amit et al. (2014), Rohini and Lakshmanan (2014) and Vijaya et al. (2014)** in chilli.

Average fruit yield per plant (Kg)

Average fruit yield per plant ranged from SONALI (0.27 Kg) to NS-1101 (1.12 Kg) with a mean of 0.624Kg. Maximum average fruit yield per plant was observed in hybrid NS-1101 with 1.12 Kg fruits and was superior over rest of the hybrids, followed by VNR-305 with 0.94 Kg fruits, while the minimum average fruit yield per plant was observed in hybrid SONALI with 0.27 Kg fruits. The hybrid NS-1101 gives maximum average fruit yield per plant due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Purad *et al*. (2019), Srinivas *et al.* (2017), Dhal *et al*. (2021), Awasthi *et al*. (2021), Molonaro *et al*. (2022)** in chilli.

Average fruit yield per hectare (t/ha)

Average fruit yield per hectare ranged from SONALI (7.41 t/ha) to NS-1101 (31.11 t/ha) with a mean of 17.36 t/ha. Maximum average fruit yield per hectare was observed in hybrid NS-1101 with 31.11 t/ha fruits and was superior over rest of the hybrids, followed by VNR-305 with 26.11 t/ha fruits, while the minimum average fruit yield per hectare was observed in hybrid SONALI with 7.41 t/ha fruits. The hybrid NS-1101 gives maximum average fruit yield per hectare due to favourable Prayagraj Agro-climatic conditions. Similar findings were reported by **Smitha and Basavaraja (2006), Tembhurne *et al.* (2008), Thul *et al*. (2009), Saravaiya *et al.* (2011), Vijaya *et al*. (2014), Amit *et al.* (2014)** in chilli.

Quality parameter

Total Soluble Solid (°Brix)

Fruit content total soluble solid ranged from NS-1101 (4.13) to BEAUTY (7.27) with a mean of 6.08. The maximum Total Soluble Solid content in fruit was recorded in hybrid BEAUTY with 7.27 and was superior over rest of the hybrids, followed by VNR-305 with 6.87, while minimum Total Soluble Solid content in fruit was recorded in hybrid NS-1101 with 4.13. The hybrid BEAUTY gives maximum Total Soluble Solid content in fruit due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Awasthi *et al.* (2021), Molonaro *et al.* (2022), Kumar *et al.* (2022)** in chilli.

Ascorbic acid content (mg/100g)

Fruit content ascorbic acid (mg/100g) ranged from VNR-305 (61.33) to NS-1701-DG (90.67) with a mean of 74.27. The maximum Total Soluble Solid content was recorded in hybrid NS-1701-DG with 90.67and was superior over rest of the hybrids, followed by DEVA with 86.67, while minimum Total Soluble Solid content was recorded in hybrid VNR-305 with 61.33. The hybrid NS-1701-DG gives maximum ascorbic acid content in fruit due to favourable Prayagraj Agro-climatic conditions, and genetic makeup of the hybrid to have wide adaptability. Similar findings were reported by **Srinivas *et al.* (2017), Awasthi *et al.* (2021), Molonaro *et al.* (2022), Kumar *et al.* (2022)** in chilli.

Table 2: Growth and earliness parameters of chilli genotypes under Prayagraj agro-climatic conditions

Hybrids	Plant height (cm)			Number of branches (cm)			Days to first flowering	Days to 50% flowering
	30DAT	60DAT	90DAT	30DAT	60DAT	90 DAT		
LHC DIYA	53.53	72.8	94.13	7.13	9.07	10.13	60.67	75.67
LHC-4010	43.13	72.8	97.2	6.07	9.07	9.73	55.67	70.67
BEAUTY	48.2	71.13	96.2	5.93	9.27	10.2	52.67	67.67
NS-1101	54.27	70.4	96.33	6.4	9.47	10.33	55	70
DEVA	54.47	93.93	119.4	6.73	10.4	12.4	51.33	66.33
NS-1701 DG	63.27	88.93	115	8.73	12.47	11.07	47.33	62.33
VNR-305	44.4	65.93	98.53	5.87	8	8.93	56.33	71.33

CHUSHUL	54.53	76	99.47	6.6	9	9.8	52.33	67.33
PUSHKAR	43.6	82.27	102.8	5.67	8.53	9.53	46.33	61.33
SONALI	44.47	94.93	120.33	4.8	7.33	8.4	47.67	62.67
F-Test	S	S	S	S	S	S	S	S
S.E (d)	0.87	2.088	2.16	0.28	0.29	0.45	1.03	1.03
C.D (@5%)	1.83	4.42	4.58	0.59	0.62	0.94	2.18	2.18
C.V.	2.10	3.24	2.55	5.31	3.88	5.43	2.41	1.87

Table 3: Yield and quality parameters of chilli genotypes under Prayagraj agro-climatic conditions

Hybrids	No. of fruit per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Fruit yield per plant (Kg)	Fruit yield per hectare (t/ha)	Total soluble solid (^{0}BRIX)	Ascorbic acid (mg/100gm)
LHC DIYA	270.66	6.64	2.53	1.66	0.45	12.5	6.2	66.67
LHC-4010	257.58	6.73	3.36	2.62	0.67	18.70	6.67	71.33
BEAUTY	343.74	6.67	3.02	2.67	0.92	25.56	7.27	76.67
NS-1101	292.82	9.63	2.93	3.82	1.12	31.11	4.13	82.67
DEVA	240.66	6.64	2.46	1.72	0.41	11.39	6.07	86.67
NS-1701 DG	231.6	9.68	2.93	2.84	0.66	18.24	6.47	90.67
VNR-305	360.54	6.63	3.40	2.61	0.94	26.11	6.87	61.33
CHUSHUL	147.88	9.57	2.78	2.71	0.40	11.20	5.27	65.33
PUSHKAR	185.08	7.44	2.90	2.2	0.41	11.30	5.67	68
SONALI	128.52	6.75	2.54	2.05	0.27	7.41	6.2	73.33
F-Test	S	S	S	S	S	S	S	S
S.E (d)	28.091	0.22	0.07	0.10	0.08	2.27	0.11	0.76
C.D (@5%)	13.268	0.10	0.03	0.05	0.04	1.07	0.24	1.62
C.V.	6.608	1.64	1.30	2.40	7.56	7.56	2.27	1.26

Conclusion

From the above experimental finding it is concluded that, all the characters viz., growth parameters, earliness parameters, yield parameters and qualitative parameters varied significantly. Further, while studying the plant height (F_1-Sonali) was found best, highest number of branches, maximum average fruit weight and maximum ascorbic acid was found in (F_1-NS-1701 DG), days to first flowering and days to 50% flowering was found minimum in (F_1- Pushkar), maximum number of fruits per plant, maximum fruit length and fruit girth was found in (F_1- VNR-305), highest yield per plant, highest yield per hectare and highest profit and maximum benefit cost ratio were found in (F_1-NS-1101), maximum TSS was found in (F_1- Beauty).

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