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Assessment of Growth and Yield Attributes of Chilli and Capsicum Varieties in Baramulla District in Union Territory of J and K

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ABSTRACT

Chilli and capsicum being popular in district and is grown by all groups of people but due to insufficient knowledge regarding improved varieties and management practices, the productivity and quality is facing a barrier to reach to its maximum. Moreover, selection of a variety most suited for the locality is an immediate need of the hour. In the present study, various growth and yield characteristics of promising lines developed by ICAR-CITH, Srinagar were studied in comparison with the local varieties used by the farmers kept as check. Eleven locations in several different villages of district were selected. One trial was also laid out at KVK farm. Capsicum lines CITH-N-4-1-1, CITH-SP-4, CITH-SP-3-1, CITH-CW-4-1/15, CITH-NS-284-1/15, Nishat-1-Sel-5 and Gold Selection-1 and chilli line CITH HP-111-1 were planted in May, 2021 under scientific management. The data for several parameters in chilli showed that CITH-HP-111-1 exhibited higher fruit length, fruit width and fruit yield than the local variety. CITH-HP-111-1 was of red color darker than local chilli variety having light red color. In capsicum, CITH-NS-284-1/15, CITH-CW-4-1/51, CITH-SP-3-1 exhibited superior mean performance for all the characteristics compared with the check variety and was accepted by the farmers for future planting. Also, technology gap of 7.55 t ha^{-1}, extension gap of 2.60 t ha^{-1} and the percentage increase over farmers' practice was 17.5 % in case of chilli, hence indicating a positive response to yield attributes.

Keywords Chilli, Capsicum, Fruit weight, Fruit size, Fruit color, Technology gap.

INTRODUCTION

Chilli (*Capsicum annuum* L.) and capsicum (*Capsicum annuum* var. grossum) belong to Solanaceae family and are leading spice-cum-vegetable crops that are grown commercially throughout world especially in India, which contribute to the economic upliftment of the farmers because of its high value. Chilli's origin is believed to be in the Central America, most likely in Mexico (CABI 2019). In 16th century, it is believed that Portuguese and Spanish explorers introduced

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pepper from South America to Asia through trade routes. Today, India is the major producer, consumer, and exporter of chilli, participating in almost one fourth of the world production. As per latest statistics it is grown over an area of 366 thousand hectares with an average production of 3737 thousand metric tones in India (FOA 2019). In Kashmir it is grown on an area of 3,200 hectares with an annual production of 64,800 tonnes (NHB 2017). The major chilli growing states of India are Andhra Pradesh, Karnataka, Maharashtra, Orissa, Tamil Nadu, Madhya Pradesh, West Bengal and Rajasthan. Chilli contributes about 33% of the total spice export from India and holds for about a 16% share of the world spice trade. Chilli is highly valued for its green or red ripe fruits with characteristic pungency, color and flavor whereas capsicum is available in diverse colors, such as green, red, orange, yellow and purple. It is usually consumed as fresh, dried or in powder form. The fruits are an excellent source of health-related phytochemical compounds, such as ascorbic acid, carotenoids (provitamin A), tocopherols (vitamin E), flavonoids and capsaicinoids that are very important in preventing chronic diseases such as cancer, asthma, toothache and cardiovascular diseases. Chilli is also rich in mineral salts like calcium, phosphorus and iron. The coloring agent present in its fruits is Capsanthin and capsaicin/capsicutin present in placenta of the chilli fruit is responsible for pungency and has diverse prophylactic and therapeutic uses. Capsicum does not contain capsaicin ($C_{18}H_{27}NO_3$), causing lack of hot taste. Capsaicin causes strong burning sensation when contacted with mucus membranes (Roy *et al.* 2018). Chillies and capsicum also carry antioxidant, antimicrobial, antiviral, anti-inflammatory and anticancer properties (Khan *et al.* 2014). Even though pepper production fetches good price in market all through the year but the major reason behind negative trade deficit is lower productivity and lack of abundant varieties. Only few varieties have been commercialized till now in Kashmir. It has ample of potential from which many processing units and industries can make good amount of turnover every year. This scenario express the necessity and urgency of developing hot pepper and bell pepper varieties adaptable to different regions of district Baramulla with reasonably high productivity and higher yield returns in monetary terms.

MATERIALS AND METHODS

The following study was conducted by Krishi Vigyan Kendra, Baramulla, ICAR in district Baramulla viz., Higam, Mulgam, Hardbani villages and Chanapora villages by laying multi location trials to evaluate the performance of a Chilli selection named CITH HP-111-1 and capsicum selections developed and maintained by ICAR-CITH, Srinagar in a single year following all the scientific standards during 2021-22. The technological interventions taken up in the study for chilli and capsicum are as follows: Seed rate @ 280-320g acre^{-1}, spacing 45cm x 30 cm, Transplanting time-May, FYM @ 10 tonnes acre-1 and NPK @ 40:20:10 kg acre-1. All the organic manures, 1/3 N along with other fertilizers as basal application were applied before transplanting of seedlings and the remaining N top dressed in two split doses at 21 and 42 days after transplanting as per SKUAST-K package of practices. In addition, awareness programmes were conducted for the farmers on scientific cultivation practices and disease management of chilli and capsicum. The farmer's variety, which is a non-descript local variety cultivated through traditional practice was considered as local check. The observations for growth and yield parameters were made by using standard procedures and the recorded data of the trials at multiple locations were converted as an average for the promising lines under evaluation and local check. The extension tools used in the study viz., technology gap, extension gap and technology index were worked out using the formulae (Samui *et al*. 2000) as below:

Technology gap = Potential yield – Demonstration yield
Extension gap = Demonstration yield – Farmers' yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

The increase (%) over farmer's practice is calculated with the formula given below:

$$\text{Increase (\%) over farmer's practice} = \frac{\text{Demonstration yield} - \text{Farmers' yield}}{\text{Farmers' yield}} \times 100$$

RESULTS AND DISCUSSION

Regarding the growth parameters in capsicum, the

Table 1. Mean performance of capsicum selections and local check in district Baramulla.

Average of three locations	Average plant height (cm)	Average plant spread (cm)	Average fruit weight (g)	Average number of fruits/ plant	Average fruit length (mm)	Average fruit width (mm)	Average yield per plant (kgs)
Gold Selection-1	51	42.33	50	21.66	47.18	48.62	1.08
Nishat-1-Sel-5 (Check)	49	45	50.66	27.66	64.66	56.02	1.40
CITH-NS-284-1/15	60.66	47.33	78.66	19.66	74.33	60	1.54
CITH-CW-4-1/15	57	47	68.13	23	67.19	60.66	1.56
CITH-SP-3-1	52.66	44.66	60.66	26	61.02	59.66	1.58
CITH-SP-4	63.33	53.33	36.20	41.66	39	41.90	1.51
CITH-N-4-1-1	52.33	46.66	41.33	37.33	64	56.33	1.54

results in Table 1 reveal that average plant height and spread was highest in CITH SP-4 with 63.33 cm and 53.33 cm respectively followed by NS-284-1/15 with 60.66 cm and 47.33 cm respectively while as least plant height of 49 cm was recorded with check variety and least plant spread of 42.33 cm was recorded with Gold Selection 1 and this variation could be due to variation in photosynthetic ability of the each genotype. The data in Table 1 also reveal that maximum average number of fruits was recorded with CITH-SP-4 (41.66) followed by CITH-N-4-1-1 Selection (37.33) and least with CITH-NS-284-1/15 (19.66) however, maximum average fruit weight was recorded as 78.66 g in CITH-NS-284-1/15 followed by CITH-CW-4-1/15 (68.13 g) and CITH-SP-3-1 (60.66 g) and highest yield was recorded with CITH-SP-3-1 (1.58 kg/plant) followed by CITH-CW-4-1/51 (1.56 kg/plant) while as lowest yield was recorded with Gold Selection -1 (1.08 kg/ plant) followed by Nishat-1 -Sel-5 which is local check variety (1.40 kg/ plant). Highest average fruit width and fruit length was recorded with CITH-NS-284-1/15 (74.33 cm and 60 cm respectively) followed by CITH-CW- 4-1/51 and CITH-SP-3-1 (67.19 cm and 60.66 cm respectively) while as least fruit length and breadth was recorded with CITH-SP-4 (39 cm and 41.90 cm respectively).

In chilli, as shown in Table 2 CITH-HP-111-1 gave highest number of fruits (87.33) than local check (75), and has higher average yield per plant (0.291 kgs/ plant) than local check (0.247 kg/plant). Fruits of CITH-HP-111-1 also exhibited dark red color and larger fruit than check variety having light red color of fruits.

Data in Table 3 also reveals that the potential yield of capsicum in Baramulla district is 55 t ha^{-1} with a technology gap of 2.43 t ha^{-1} , 1.73 t ha^{-1}, 1.38 t ha^{-1}, 3.73 t ha^{-1} and 1.55 t ha^{-1} for capsicum selections CITH-NS-284-1/15, California Wonder-4-1/51, CITH SP3-1, CITH-SP-4 and CITH-N-4-1-1 respectively , while as extension gap of 4.97 t ha^{-1} , 5.67 t ha^{-1}, 6.02 t ha^{-1}, 3.67 t ha^{-1} and 4.85 t ha^{-1} was observed in capsicum selections CITH-NS-284-1/15, CITH-CW-4-1/15, CITH-SP-3-1, CITH-SP-4 and CITH-N-4-1-1 respectively. Data in Table 3 also indicates that the percentage increase over farmers' practice was highest for CITH-SP-3-1 (12.64 %) followed by CITH- CW-4-1/15 (11.91%) indicating a positive response to yield attributes. In chilli, potential yield in Baramulla district is 10 t ha^{-1} and the data presented in Table 4 depicted that there were technology gap of 7.55 t ha^{-1} and extension gap of

Table 2. Mean performance of chilli section and local check in district Baramulla.

Average of three locations	Average plant height (cm)	Average plant spread (cm)	Average fruit weight (g)	Average number of fruits/ plant	Average fruit length (mm)	Average fruit width (mm)	Average yield per plant (kgs)	Fruit color when ripe
CITH-HP-111-1	71.33	36.66	3.33	87.33	68	9.06	0.291	Red
Local	62	45	3.30	75.00	60	8.00	0.247	Light red

Table 3. Yield gap and yield index analysis of various capsicum selections.

Selection	Average yield (t ha^{-1})	Potential yield (t ha^{-1})	Increase (%) over farmer's practice	Technology gap (t/ha)	Extension gap (t/ha)	Technology index (%)
Gold Selection-1	36.82	55	-	-	-	-
CITH-NS-284-1/15	52.57	55	10.44	2.43	4.97	4.42
CITH-CW-4-1/15	53.27	55	11.91	1.73	5.67	3.14
CITH-SP-3-1	53.62	55	12.64	1.38	6.02	2.51
CITH-SP-4	51.27	55	7.71	3.73	3.67	6.78
CITH-N-4-1-1	52.45	55	10.18	2.55	4.85	4.64
Nishat-1-Sel-5 (Check)	47.6	-	-	-	-	-

Table 4. Yield gap and yield index analysis of chilli selection.

Selection	Average yield (t ha^{-1})	Potential yield (t ha^{-1})	Increase (%) over farmer's practice	Technology gap (t/ha)	Extension gap (t/ha)	Technology index (%)
CITH-HP-111-1	17.45	25	17.50	7.55	2.60	30.20
Local	14.85	-	-	-	-	-

2.60 t ha^{-1}. These result are in conformity with Gogoi *et al.* (2021). The percentage increase over farmers' practice was 17.5 %, hence indicating a positive response to yield attributes. These might be due to varietal differences (Devi *et al*. 2020) and adoption of scientific cultivation practices. The technology gap may be attributed by high yielding variety, balanced fertilizer application, timely irrigation, timely weeding and proper plant protection measures. This result is in conformity with Singha *et al.* (2020).

CONCLUSION

From the above observations, it can be thus concluded that selections CITH SP3-1 and California Wonder-4-1-51 of capsicum and CITH-HP-111-1 in chilli are highly suitable for Baramulla district of UT of J and K for its high quality yield and return than the local variety which can uplift the economic status of the rural farmers. Since no selection could be identified to have superior performance for all the characters, the genotype with maximum good characteristics could be used in a well planned hybridization program to select superior performing lines in the successive segregating lines. Thus, these important and well performed genotypes could be utilized for further specific variety improvement and capsicum and chilli breeding in UT of J and K.

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