

## Evaluation of chilli (*Capsicum* spp.) germplasm for fruit yield and component characters

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### Abstract

Fifty-two genotypes of chilli comprising local collections, established varieties and advanced breeding lines were evaluated for their fruit yield and its component characters. The results indicated significant variation among the genotypes for all the characters studied. The genotype Bahjuri ranked first in overall performance with highest yield and other desirable characteristics. Other promising genotypes were Kala Jalakia Long, Nadharia and Khoti Jalakia. Performance of local chilli genotypes was better than the introduced genotypes.

**Key words:** Chilli, *Capsicum* spp., *C. annuum*, *C. frutescens*, germplasm

### Introduction

Collection of diverse germplasm and their systematic evaluation assume considerable importance in any crop improvement programme. In chilli, a wide diversity of plant and fruit characters is quite evident, which holds a lot of potential for developing high yielding varieties with desirable fruit characters, through appropriate breeding methods. Some needful variation created in nature may not only be important to support the present day crop improvement programmes, but they will also be needed to face some unprecedented challenges of biotic and abiotic stresses in future. There is every chance of losing some useful genetic resources if efforts are not made from time to time for collection, evaluation and maintenance of locally adapted germplasm. The North-Eastern states of India, particularly Assam has a diverse genetic resources of chilli and wide range of variability exists in plant and fruit characters. Two principal species of chilli grown in this region are *C. annuum* L. and *C. frutescens* L. In the present experiment, an attempt has been made to evaluate the available genotypes of chilli maintained at the Department of Horticulture, Assam Agricultural University, Jorhat for possible utilization in future breeding programmes.

### Materials and methods

Fifty-two genotypes of chilli (*Capsicum* spp.) comprising local collections, established varieties and advanced breeding lines were evaluated for their fruit yield and component characters at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during the period from February 1999 to October 1999. The experiment was laid out in single plant randomization technique with two blocks within environment. Five seedlings of each genotype were transplanted in each of the experimental block (12 x 10.35 m) with a spacing of 60 x 45 cm. Recommended agronomic measures were adopted to raise the crop. Observations on plant height, number of primary branches, leaves per plant, specific leaf weight (SLW), days to first flowering, flowers per plant, fruits per plant, fruiting

percentage, fruit drop percentage, fruit length, fruit diameter, fruit weight, 1000-seed weight, fruit yield per plant and dry fruit yield per plant were recorded from three individual plants of each genotype in each of the experimental blocks and the mean performance of the genotypes for different characters was compared from pooled analysis of variance.

### Results and discussion

The analysis of variance revealed significant differences among the genotypes for all the characters under study and the results are presented in Table 1&2.

In the present investigation, plant height ranged from the highest of 71.21 cm in Asamia Jalakia to the lowest of 36.20 cm in RHRC Erect. Higher number of primary branches is a desirable growth character in chilli, which results in production of more number of secondary branches thereby increasing the scope for bearing more number of fruits. Among the genotypes under study, the highest number of primary branches (7.83) was observed in Nadharia and Kala Jalakia Long followed by Balijuri (7.77). Number of leaves is an important vegetative character related to the photosynthetic activity of the plant. Better plant growth in terms of number of leaves was obtained in Nadharia, Kala Jalakia Long, Jati Jalakia and Balijuri. The differences in vegetative characters might be due to difference in genetic make up of the genotypes (Khurana *et al.*, 1987).

SLW is an important index of plant growth as it determines the rate of photosynthetic activity. SLW among the genotypes ranged from the highest of 6.62 mg cm<sup>-2</sup> in Balijuri to the lowest of 3.20 mg cm<sup>-2</sup> in Chakma. Higher SLW indicates the better accumulation of photosynthates in the leaves.

The number of days required for opening of the first flower is an important factor in determining the earliness of a variety. Among the genotypes, the number of days for opening of the first flower ranged from 51.83 in Soalkuchi to 105.84 days in Dhan Marish.

The number of flowers per plant ranged from the highest of 662.67

**Table 1. Performance of chilli (*Capsicum* spp.) germplasm for leaf and flowering characters**

Genotypes	Plant height (cm)	No. of primary branches	Leaves per plant	SLW (mg cm <sup>-2</sup> )	Days to first flowering	Flowers per plant
Jab Jalakia	55.88	6.75	193.50	4.50	75.00	466.75
Rangalu	63.17	6.52	156.33	3.88	82.33	398.66
Rajgarh	61.28	7.50	156.00	4.53	75.58	323.50
NC-1	54.13	6.33	129.92	6.12	63.83	436.01
C-1	56.65	7.00	132.17	5.32	92.50	369.99
Longamiri	45.50	6.25	115.00	3.34	89.75	258.50
Latabih-I	43.68	6.00	105.50	3.67	90.00	127.34
Ou Jalakia-II	62.60	5.50	146.50	4.77	89.50	278.00
BC-24	53.05	6.75	138.00	4.65	65.67	333.75
Chakma	47.20	5.75	135.75	3.20	87.67	347.84
Garo Firingi	49.37	7.33	92.17	4.72	84.00	220.17
Latabih-II	38.42	5.33	91.67	3.70	93.17	118.50
Firingi Jalakia	65.92	5.92	109.75	3.87	75.83	234.34
Tupura Jalakia	55.18	7.00	133.33	3.67	82.83	304.34
C-2	48.35	5.75	96.00	4.63	99.00	356.26
Kala Jalakia	56.55	5.34	148.50	5.57	85.00	463.67
Rangia Jalakia	39.35	6.00	160.00	4.63	54.67	356.15
Thupuka Jalakia	64.83	6.00	152.50	5.92	84.00	217.34
Refugee	38.82	6.00	102.33	4.30	92.50	216.67
Soalkuchi	42.70	5.00	147.50	5.92	51.83	367.34
Yellow Jalakia	51.73	7.00	155.75	5.16	81.33	319.00
Balijuri	45.00	7.77	190.67	6.62	87.33	621.67
Nadharia	57.10	7.83	202.83	5.85	79.67	514.33
Mirza	43.43	6.50	175.25	5.60	56.25	382.25
Ou Jalakia-I	55.08	5.50	146.92	5.27	87.17	303.17
Kala J. Long	63.15	7.83	198.50	4.60	77.67	313.50
Bijoynagar	52.08	6.25	173.25	5.48	52.83	343.99
Hajo	48.40	5.50	157.75	5.76	54.08	367.84
Salaguri	42.18	5.25	174.75	5.05	52.50	315.34
C-5	47.13	6.50	164.25	6.03	52.17	405.75
LCA-301	62.75	7.25	187.00	5.80	77.50	419.00
LCA-312	53.30	7.50	153.50	4.35	65.92	410.09
Mihi Firing	44.70	5.00	105.00	3.72	80.50	217.34
4B-1	41.73	4.67	123.50	4.68	85.67	221.83
Thupa Jalakia	69.73	7.00	124.25	5.02	82.17	197.67
Asamia Jalakia	71.21	6.50	164.08	3.95	86.67	504.67
Kala J. Upar.	62.01	6.67	127.75	4.82	85.67	375.34
Uparmukhia	51.26	5.83	143.08	5.42	84.50	332.84
Ugda Jalakia	47.57	6.50	131.33	4.00	89.50	292.50
Khoti Jalakia	42.73	5.67	178.00	4.45	92.50	662.67
Pavaria	44.35	6.50	163.25	5.76	54.83	216.00
RHRC-16-5	42.70	7.00	127.00	4.23	78.42	307.17
LCA-334	51.07	5.67	141.67	4.95	72.17	456.34
LCA-324	48.13	7.50	167.75	4.81	67.50	426.48
Jayanti	44.60	7.00	150.50	5.32	68.67	344.25
LCA-206	65.00	6.75	180.75	5.20	73.17	383.17
Singhasan	47.84	4.67	178.00	5.72	88.34	437.33
Bogori Jalakia	52.47	5.84	179.17	4.87	90.17	224.42
RHRC Erect	36.20	6.00	132.00	5.27	82.34	238.75
Dhan Marish	42.14	6.67	94.17	4.29	105.84	255.92
BC-14-2	42.85	6.67	135.00	5.64	77.34	391.84
KDCS-810	36.55	6.00	141.25	3.73	78.50	369.00
General Mean	50.94	6.32	146.35	4.85	78.14	341.66
Sem ±	4.42	0.85	21.71	0.41	8.11	61.13
CD (p=0.05)	8.88	1.70	43.59	82.00	16.28	122.76

in Khoti Jalakia to the lowest of 118.50 in Latabih-II. Similarly, number of fruits per plant ranged from the highest of 278.17 in Khoti Jalakia to the lowest of 33.17 in Latabih-II. Genotype Balijuri also produced higher number of flowers (621.67) and fruits (252.33) following Khoti Jalakia. Khoti Jalakia and Balijuri may be recommended as donor parents to increase fruit number and subsequently the fruit yield as fruits per plant had positive correlation with fruit yield (Bhygyalakshmi *et al.*, 1990, Devi and Arumugam, 1999).

In the present investigation, all the genotypes registered a lower fruiting percentage, but the variation among them was highly significant. The fruiting percentage ranged from the highest of 42.00% in Khoti Jalakia to the lowest of 27.42% in Mirza. Lower extent of fruit set might be recorded due to heavy rainfall experienced during the flowering period resulted in dropping of more number of flowers. Nagarathnam and Rajamani (1963) and Alam (1990) also reported that heavy rainfall during flowering period reduces the fruit set percentage in chilli.

Fruit drop percentage among the genotypes was lowest (0.90%) in Singhasan closely followed by Balijuri (0.95%) and it was as high as 36.33% in 4B-1. The higher extent of fruit drop percentage might be due to higher susceptibility of the genotype to the anthracnose disease.

The genotype Jayanti which exhibited a fruit length of 9.71 cm may be recommended to improve fruit length as fruit length had positive correlation with fruit yield (Chang, 1977, Meshram, 1987). The genotypes Tupura Jalakia, Thupuka Jalakia and Bogori Jalakia which recorded a fruit diameter of 1.83, 1.81 and 1.64 cm, respectively may be recommended to improve the fruit diameter consequently the fruit yield as fruit diameter was positively correlated with fruit yield (Chang, 1977).

The genotypes Jati Jalakia, Kala Jalakia Long, Ou Jalakia-II, Ou Jalakia-I and LCA-206 may be used to improve fruit weight and subsequently the fruit yield as fruit weight had positive correlation with fruit yield (Warade *et al.*, 1996). 1000-seed weight among the genotypes ranged from highest of 5.55 g in LCA-206 to the lowest of 2.40 g in Refugee.

Fresh fruit yield per plant ranged from the highest of 679.23 g in Balijuri to the lowest of 52.01 g in Latabih-II, while dry fruit yield per plant ranged from the highest of 167.14 g in Asamia Jalakia to the lowest of 14.82 g in Latabih-I. The highest yield in Balijuri was contributed by higher total number of fruits (252.33) and moderate fruit weight (2.73 g). Although the genotype Jati Jalakia had moderate number of fruits (167.50), higher yield was due to its highest fruit weight (4.60 g). On the other hand, the genotype Khoti Jalakia had the highest number of fruits per plant (278.17) but it did not exhibit higher yield because of its lower fruit weight (1.52 g).

Looking back to the other characters of the high yielding genotype Balijuri, it was observed that it exhibited moderate plant height, higher number of primary branches and leaves per plant, highest SLW, moderate number of days taken for first flowering, higher number of flowers and fruits per plant,

Table 2. Performance of chilli (*Capsicum* spp.) germplasm for fruit yield and its component characters

Genotypes	Fruits per plant	Fruiting percentage	Fruit drop (%)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight		1000 seed weight (g)	Fruit yield per plant (g)	Dry yield per plant (g)
						Fresh	Dry			
Jab Jalakia	167.50	35.96	16.35	5.74	1.30	4.60	1.10	3.92	668.33	159.95
Rangalu	148.67	37.34	5.12	4.17	1.24	2.80	0.55	3.18	395.01	77.04
Rajgarh	105.50	32.61	16.57	4.69	1.05	3.32	0.52	3.14	292.17	45.32
NC-1	145.33	33.38	16.04	5.48	1.04	3.14	0.71	3.39	382.83	86.41
C-1	126.67	34.18	14.06	4.62	0.95	2.12	0.82	3.69	232.25	90.71
Longamiri	71.75	27.89	2.56	2.68	0.74	1.81	0.43	3.44	126.40	29.74
Latabih-I	35.50	28.15	3.70	2.42	0.85	1.73	0.44	3.72	59.16	14.82
Ou Jalakia-II	91.00	32.87	2.46	4.38	1.44	4.43	1.03	4.76	394.12	90.93
BC-24	111.75	34.04	15.17	5.40	0.83	2.52	0.94	3.31	238.65	88.48
Chakma	114.67	33.15	2.78	2.79	0.87	1.59	0.31	3.17	175.44	34.51
Garó Firingi	74.33	33.75	1.84	2.39	0.84	1.80	0.65	3.04	134.27	46.37
Latabih-II	33.17	28.09	3.60	2.97	0.91	1.62	0.63	3.23	52.01	19.96
Firingi Jalakia	73.67	31.51	1.85	3.88	0.72	1.47	0.28	2.99	105.82	20.56
Tupura Jalakia	110.33	36.26	1.34	2.02	1.83	2.39	0.67	3.89	262.73	73.14
C-2	126.67	35.71	1.29	2.53	0.89	1.60	0.63	3.71	202.27	79.07
Kala Jalakia	174.33	37.61	2.67	4.61	1.04	2.43	0.90	4.56	411.55	152.93
Rangia Jalakia	108.33	30.44	22.88	6.07	0.83	3.03	0.81	3.33	252.74	67.45
Thupuka Jalakia	82.33	37.88	2.01	2.14	1.81	1.75	0.53	5.03	141.17	42.77
Refugee	75.00	34.92	1.97	2.52	0.53	0.95	0.28	2.40	69.12	20.39
Soalkuchi	132.17	36.00	18.20	6.58	0.87	2.02	0.55	3.86	218.72	58.98
Yellow Jalakia	106.58	33.40	15.25	3.66	0.77	1.92	0.50	3.32	174.13	45.90
Balijuri	252.33	40.69	0.95	4.74	0.85	2.73	0.66	4.28	679.23	165.02
Nadharia	198.50	38.61	2.42	5.06	0.72	2.48	0.62	4.00	480.68	118.67
Mirza	104.75	27.42	11.01	4.79	0.87	2.08	0.30	3.82	194.26	28.14
Ou Jalakia-I	102.67	34.03	5.18	3.32	1.45	3.96	0.81	3.95	384.01	78.77
Kala J. Long	121.17	38.63	5.53	5.89	1.15	4.48	0.94	4.58	504.01	106.78
Bijoynagar	108.00	31.40	8.77	5.33	0.77	2.18	0.63	4.27	214.72	61.97
Hajo	117.83	32.07	28.36	5.57	0.76	2.23	0.66	4.01	187.69	56.28
Salaguri	97.17	30.82	10.46	6.03	0.78	2.33	0.66	3.72	202.75	56.98
C-5	126.00	31.10	18.12	5.80	0.77	2.20	0.63	3.98	225.95	65.35
LCA-301	140.50	33.57	28.83	5.33	1.04	2.45	0.88	5.04	244.81	87.92
LCA-312	130.67	31.86	15.50	5.68	1.02	2.43	0.99	5.01	275.39	112.66
Mihi Firing	73.00	33.59	5.71	3.71	0.69	2.60	0.75	2.90	179.96	51.54
4B-1	68.00	30.71	36.33	5.44	0.87	2.63	0.83	4.37	116.28	36.52
Thupa Jalakia	71.00	35.92	8.02	5.52	1.00	2.55	0.81	3.95	165.37	52.80
Asamia Jalakia	185.33	36.78	4.97	4.37	1.02	2.06	0.95	4.49	363.39	167.14
Kala J. Upar.	137.67	36.81	2.16	4.77	1.14	1.99	0.55	4.51	267.80	73.73
Uparmukhia	116.00	34.90	7.01	5.06	0.97	2.33	0.55	3.97	251.24	58.83
Ugda Jalakia	95.67	32.71	1.51	4.87	0.64	1.82	0.35	3.32	173.41	32.79
Khoti Jalakia	278.17	42.00	1.59	4.00	0.59	1.52	0.32	3.09	416.86	87.20
Pavaria	68.92	31.84	7.38	5.24	0.76	2.50	0.56	3.88	159.42	35.82
RHRC-16-5	108.83	35.68	27.82	7.45	0.76	2.43	0.82	4.28	191.19	64.73
LCA-334	126.33	27.70	22.94	6.11	0.81	3.08	0.71	5.47	299.63	68.93
LCA-324	125.92	29.81	20.62	7.82	0.77	3.36	0.99	5.48	338.35	99.16
Jayanti	108.33	31.59	22.82	9.71	0.70	2.69	0.44	3.81	225.89	36.68
LCA-206	139.17	36.32	8.97	8.16	0.71	3.92	0.94	5.55	497.01	119.31
Singhasan	167.00	38.31	0.90	4.06	1.08	2.28	0.61	3.86	377.93	100.77
Bogori Jalakia	84.17	37.52	2.21	1.96	1.64	2.01	0.50	4.09	167.04	40.60
RHRC Erect	81.17	34.09	4.87	5.41	0.75	2.20	0.88	4.16	169.99	66.82
Dhan Marish	79.34	31.00	1.66	2.22	0.50	0.79	0.26	3.14	61.46	19.99
BC-14-2	130.67	33.34	14.02	4.59	0.95	2.65	0.54	4.93	298.48	60.12
KDCS-810	108.17	29.33	19.88	5.77	0.72	2.07	0.48	3.71	179.41	41.28
General Mean	116.69	33.76	10.08	4.72	0.93	2.43	0.65	3.93	259.28	69.24
SEm ±	17.02	2.76	4.89	0.44	0.15	0.43	0.13	0.54	56.22	19.49
CD (p=0.05)	34.18	5.55	9.82	0.88	0.30	0.86	0.26	1.08	112.89	39.13

higher fruiting percentage, lower fruit drop percentage, moderate fruit size and weight and moderate 1000-seed weight besides lower incidence of anthracnose disease. Thus, the genotype Balijuri can be ranked first in overall performance. Other promising genotypes were Kala Jalakia Long, Nadharia and Khoti Jalakia. It was also observed that performance of local chilli genotypes was better than introduced genotypes. Baruah (1994) also reported better performance of local chilli genotypes than introduced genotypes under Jorhat condition.

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