



Variability of Chilli (*Capsicum annuum* L.) Genotypes for Yield and Yield Attributes

M. S. Islam¹, N. Akter^{2*} and S. Jui³

¹BRAC Agricultural Research and Development Center, Gazipur, Bangladesh.

²Department of Horticulture, Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, 5200, Bangladesh.

³Department of Genetics and Plant Breeding, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh.

Authors' contributions

This work was carried out in collaboration among all authors. Author MSI designed the study, performed the statistical analysis, wrote the protocol. Author NA wrote the first draft of the manuscript. Author SJ managed the literature searches. All authors read and approved the final manuscript.

Article Information

Editor(s):

(1) Dr. Ogbonna, Abigail Ifemelunma, University of Jos, Nigeria.

Reviewers:

(1) K. Ashok Kumar, Kerala Agricultural University, India.

(2) Amit Kumar, Horticulture College, Jharkhand, India.

(3) Manasi Dash, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/56776>

Received 27 February 2020

Accepted 04 May 2020

Published 13 May 2020

Original Research Article

ABSTRACT

The experiment was conducted during October 2018 to May 2019 at BRAC Agricultural Research and Development Centre, Gazipur, Bangladesh to evaluate the variability of chilligenotypes. The experimental field belongs to medium high land with sandy loam soil in texture. The experiment was laid out in RCBD design with three replications. Twenty-five genotypes were evaluated for their performances. Thirty days old seedlings were transplanted maintaining of 60 cm × 50 cm spacing in each case. The crop (Green chilli) was started to harvest from February and completed on May, 2019. The results of the experiment revealed that PP-13 (68.67) needs more time to flower whereas Premium (21.67) takes short time for flowering. Crop duration was recorded highest in PP-15 (188.67) and lowest in PP-8(171.00). Among the genotypes PP-4 was recorded the highest fruit weight(18.61), fruit length(17.25), fruit diameter(1.90) but emerged the lowest number of fruits,(46.21) while PP-9 emerged as superior in terms of maximum number of fruits/plant (300.65) and highest green fruit yield (22.42 ton/acre). So, PP-09 is the best under this agro climatic condition with respect to yield and its associate characters.

*Corresponding author: E-mail: nazminhstu143@gmail.com;

Keywords: Variability; chilli; yield and yield traits.

1. INTRODUCTION

Chilli (*Capsicum annuum* L.) is a member of the Solanaceae family. It is the second most important solanaceous vegetable after tomato, grown worldwide both as a spice or vegetable crop [1]. It is one of the most popular vegetables, originated from South and Central America [2]. It is a vegetable as well as spice and one of the most important crops in Bangladesh. It is a fruit of the plant '*Capsicum annuum* and *Capsicum frutescens*' that come from the genus capsicum. It is a diploid (2n=24) species and genetically self-pollinated and chasmogamous crop whose flowers open only after pollination [3]. Capsaicin (C₁₈ H₃₇ NO₃) substance is responsible for pungency in chilli. The fruits are an excellent source of health-related phytochemical compounds, such as ascorbic acid (vitamin C), carotenoids (provitamin A), tocopherols (vitamin E), flavonoids, and capsaicinoids that are very important in preventing chronic diseases such as cancer, asthma, coughs, sore throats, toothache, diabetes and cardiovascular diseases [4,5]. The total area, production and national average yield of chilli in Bangladesh are 183490 acres, 92813 metric tons and 506 kg/acre, respectively during 2014-15 [6]. It has more than 25 species of which only five (*C. annuum* L., *C. chinense* Jacq., *C. frutescens* L., *C. baccatum* L. and *C. pubescens* Keep.) are domesticated and cultivated [7]. Throughout the world, chilli is consumed fresh, dried or in powder [5]. Though chilli production is possible throughout the year in Bangladesh, but production is low as majority of our farmers are still growing local cultivars. Besides soil and climatic factors the cultivar itself is very important

in respect of its performance regarding earliness, disease resistance and yield. Many cultivars have been developed and recommended by various research institutes, but the adoptability and yielding capacity of the cultivars is not the same in all regions. So, there is a pressing demand for selecting a suitable with stable high yielding disease resistant variety. Hence, the present study was conducted to evaluate the variability of chilli genotypes for yield and yield contributing characters.

2. MATERIALS AND METHODS

The present experiment was carried out in BRAC Agricultural Research and Development Center, Gazipur Bangladesh during October 2018 to May 2019. The experimental site was the 23.9763° N, 090.3539° E with an elevation of 8.4m from the sea level. The soil is sandy loam with pH 6.7. The planting materials for the present study comprised of the 25 genotypes (breeding lines and released varieties) which were collected from different sources (Table 1). The experiment was laid out in single factor RCBD with three replications. The spacing between row to row 60.0 cm and plant to plant 50.0 cm was maintained with accommodating 20 numbers of plants in each plot of 1.5 X 5 m. About 5t/ha of well decomposed cow-dung manure was mixed in the soil at field preparation. Fertilizer was applied @ 100 kg N, 66 kg P₂O₅ and 100 kg K₂O per hectare. The standard cultural operations were adopted whenever needed. The observations were recorded on ten randomly selected plants of each genotype. Data were collected on different yield and yield contributing characteristics i.e. Days to 1st Flowering, Days to

Table 1. List of genotypes and their source of collection

Genotypes	Source of collection	Genotypes	Source of collection
PP-01	Advance line, India	PP-14	Advance line, Thailand
PP-02	Advance line, India	PP-15	Advance line, Thailand
PP-03	Advance line, India	PP-16	Advance line, Thailand
PP-04	Advance line, India	PP-17	Advance line, Thailand
PP-05	Advance line, India	PP-18	local variety, Bangladesh
PP-06	Advance line, AVRDC, Taiwan	PP-19	local variety, Bangladesh
PP-07	Advance line, AVRDC, Taiwan	PP-20	local variety, Bangladesh
PP-08	Advance line, AVRDC, Taiwan	Bizli	AR Malik seed, Bd
PP-09	Advance line, AVRDC, Taiwan	Picnic	Metal Seed
PP-10	Advance line, AVRDC, Taiwan	Premium	Laltee Seed Ltd, Bd
PP-11	Advance line, Thailand	Shikha	BRAC Seed
PP-12	Advance line, Thailand	Summer Hot	AR Malik seed, Bd
PP-13	Advance line, Thailand		

Table 2. Yield and yield contributing characters of chilli lines

Genotypes	Days to 1 st Flowering	Days to 50% Flowering	Days to 1 st Harvest	Days to 50% Harvest	Crop duration	Fruit weight (gm)	Fruit Length (cm)	Fruit Diameter (cm)	No. of fruits per plant	Green fruit Yield (ton/acre)
PP-01	41.00cd	45.67d	76.00bcd	124.00fgh	174.00kl	3.92o	7.41n	1.30ghi	175.56i	9.85q
PP-02	40.00cde	45.00de	80.00b	128.33cd	181.00def	5.75h	12.68d	1.29hi	150.78j	11.53mn
PP-03	33.00hi	42.67efg	72.67de	123.00ghi	174.00kl	17.28b	14.00c	1.70cd	45.32o	11.61m
PP-04	37.67ef	43.67def	74.00cde	128.00cd	184.00bc	18.61a	17.25a	1.90a	46.21o	12.33k
PP-05	33.00hi	40.67gh	65.00gh	124.33fgh	185.00b	5.31j	8.03mn	1.61d	205.54e	15.54c
PP-06	36.00fg	45.67d	67.00fg	122.00hij	177.67hi	4.31n	12.51d	1.21ij	202.34ef	12.93h
PP-07	27.00lm	35.67ij	67.33fg	121.00ij	177.00hij	3.98o	11.51e	1.21ij	180.63h	9.78qr
PP-08	26.00lmn	32.00k	66.00gh	120.00jk	171.00m	3.00p	9.07kl	1.10kl	244.66b	10.74p
PP-09	34.00gh	42.00fg	67.00fg	108.67m	176.00ijk	5.16k	14.51c	1.37efgh	300.65a	22.42a
PP-10	36.00fg	43.67def	71.67def	123.67ghi	176.00ijk	4.51m	10.51ghi	1.45e	209.86d	12.44j
PP-11	39.67de	44.00def	72.67de	130.67bc	184.67b	6.40f	16.33b	1.13jk	115.02l	11.47n
PP-12	52.00b	58.00b	96.00a	136.00a	177.00hij	7.90d	10.79fgh	1.79bc	75.98n	9.72r
PP-13	68.67a	76.67a	96.00a	131.67b	172.67lm	8.97c	7.97mn	1.07kl	44.59o	6.20t
PP-14	42.67c	52.00c	76.00bcd	127.67de	179.00fgh	4.03o	9.48jk	1.07kl	194.98g	10.86o
PP-15	36.00fg	43.00efg	69.00efg	128.00cd	188.67a	2.81q	7.99mn	0.91m	297.74a	11.52mn
PP-16	25.00mn	34.33ijk	61.00hi	121.00ij	180.33efg	5.11kl	9.03kl	1.40efg	199.55f	15.20d
PP-17	32.00hij	40.67gh	67.00fg	125.00efg	182.00cde	7.11e	9.97ij	1.61d	136.45k	14.23f
PP-18	26.00lmn	34.00jk	65.33gh	124.00fgh	183.33bcd	8.00d	11.03efg	1.81ab	106.60m	14.05g
PP-19	40.33cde	45.00de	75.00bcd	116.00l	178.00ghi	5.51i	13.10d	1.62d	149.40j	12.52j
PP-20	40.00cde	45.67d	78.67bc	132.00b	183.00bc	6.22g	10.10hij	1.31fghi	104.93m	9.32s
Bizli	28.67 kl	36.00 ij	66.67fg	125.00efg	185.00b	5.21jk	10.10hij	1.81ab	211.39d	15.13d
Picnic	30.33ijk	41.00gh	64.67gh	118.00kl	175.00jkl	5.31j	11.21ef	1.07kl	107.88m	12.78i
Premium	21.67o	39.33h	65.00gh	126.67def	188.67a	5.03l	9.71jk	1.21ij	230.52c	16.62b
Shikha	30.00jk	36.67i	59.00i	116.00l	174.00kl	5.10kl	8.55lm	1.00lm	117.32l	14.52e
Summer Hot	24.00no	32.67k	61.00hi	123.00ghi	185.00b	5.81h	8.21m	1.41ef	138.53k	11.75l
CV(%)	2.50	1.80	2.29	0.7124	0.4540	0.5782	2.02	2.42	0.8532	0.2603
LSD	**	**	**	**	**	**	**	**	**	**

In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMRT

50% Flowering, Days to 1st Harvest, Days to 50% Harvest, Crop duration, Fruit Weight, Fruit Length, Fruit Diameter, number of fruits per plant, green fruit yield (ton/acre). Traits that differed significantly were further utilized for estimation of the genetic parameters. Finally, the data were analyzed by using Statistical Tools for Agricultural Research (STAR).

3. RESULTS AND DISCUSSION

3.1 Yield and Yield Contributing Characters

Significant differences were obtained among the genotypes for all the characters it indicate existence of adequate variability among all the genotypes (Table 2). Sufficient genetic variability for many traits had also been reported by Smitha and Basavaraj [8]. The highest days to 1st Flowering was counted in genotype viz. PP-13 (68.67) and lowest days to 1st Flowering 21.67, 24.00 was recorded to be which were observed in genotypes Premium and Summer Hot respectively. Days to 50% flowering ranged from 76.67 (PP-13) to 32.00 (PP-08). The highest days to first harvest 96.00 was recorded to be which were observed in genotypes PP-12 and PP-13 respectively and lowest days to 1st harvest is counted in genotype viz Shikha (59.00). Days to 50% harvest ranged from 136.00 (PP-12) to 108.67 (PP-09). The highest crop duration is 188.67 (PP-15) and the lowest crop duration is 171.00 (PP-08). The highest Fruit weight (cm) was observed in PP-04 (18.64) and lowest fruit weight was counted in PP-01 (3.92). The maximum fruit length was measured in PP-4 (17.25) and minimum fruit length was measured in PP-1 (7.41). The Fruit diameter (cm) ranged from PP-04 (1.90) to PP-15 (0.91). The maximum number of fruits per plant was recorded in PP-09 (300.65) and PP-15 (297.74) respectively and the lowest number of fruits per plant was measured in PP-13 (44.59), PP-03 (45.32) PP-04 (46.21) respectively.

The highest green fruit yield (ton/acre) was recorded in genotype, PP-09 (22.42) and the lowest fruit yield (ton/acre) PP-13 (6.20) (Table 2). Mehraj et al. (2014) studied the performance of four chilli lines and found variation on yield among the lines [9]. Padda et al. (1970) observed 113.7 to 399.8 g fresh weight of fruits per plant of chilli varieties in Punjab [10]. The differential response by different varieties may be due to differences in genetic constituents of the varieties and variable environmental condition [11].

4. CONCLUSION

From the present study, genotype PP-4 gave the highest fruit weight, fruit length, fruit diameter but gave the lowest number of fruits, that's why yield is not so high. On the other hand, genotypes PP-09 gave the highest number of fruits per plants and highest fruit yield on the overall performance of various genotypes. So, PP-09 is the best under this agro-climatic condition with respect to yield and its associated characters.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/56776>