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EVALUATION OF CHILLI GERMPLASM IN THE KHARIF SEASON

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Abstract

Thirty-six genotypes of chilli (*Capsicum* sp.) were evaluated at the Regional Spices Research Centre, BARI and Gazipur during February 2017 to November 2018 to identify the promising genotype(s) for variety development process. Distinct variation among the genotypes was observed in all the qualitative parameters except seed color and fruiting behavior. The genotype CO 525 and CO 631 took relatively short times for the 1st flower bud opening showing 44 and 42 days respectively, while the genotype CO 633 & CO 648 took 125 & 110 days for the 1st flowering and 130 and 141 days for the first fruit set Plant height ranged from 47.02 cm (CO 002) to 111.35cm (CO 525). The maximum number of primary branches was recorded in CO 648 (11.33/plant) and the lowest in CO 630 (4.00/plant). Single fruit weight ranged from 1.46 g (CO 626) to 11.70 g (CO 631) while fruit length varied from 2.90 cm (CO 645) to 10.63 cm (CO 002 & CO 631). Pedicel length was longest in CO 643 (5.06 cm) and shortest in CO 639 (1.53 cm). The highest pericarp thickness was recorded from CO 640 (4.72 mm) and the lowest in CO 635 (0.63 mm). The larger weight of pericarp was obtained from CO 640 (6.00 g) and the smaller from CO 645 (0.24 g). The genotype CO 631 had the maximum number of fruits/plant (308.00) and the genotype CO640 had the minimum number of fruits/plant (38.00). The genotype CO 631 produced the maximum weight of fruits/plant (606.43 g) which was identical to CO 525 (465.50 g/plant). The highest number of fresh seeds was obtained from CO 631 (89.66/fruit) and it was the lowest in C0 646 (20.33). The highest weight of fresh seeds/fruit was obtained from CO 631 (0.63 g) and the lowest from CO 645 (0.11 g). The genotypes CO 631 had the maximum 1000-fresh seed weight (5.20 g) which was statistically similar to BARI Chilli-2 and the minimum in CO 647 (1.50g). The maximum fruit yield was recorded with CO 631 (23.04 t/ha) followed by CO 525-1 (18.25 t/ha), CO 5251 (17.69 t/ha), CO 003 (17.13 t/ha), respectively while it was minimum in CO 002 (4.65 t/ha). The results revealed that the genotypes significantly differed in most of the parameters which offers a good scope for selection of better genotypes as parents for the desired traits.

Keywords: Chilli, Germplasm, Kharif season, Pericarp, Yield

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Introduction

Chilli (*Capsicum* sp.) is a vital commercial crop, cultivated for vegetable, spice, and value-added processed products (Kumar and Rai, 2005) and is an important constituent of many foods, adding flavour, and colour, vitamins A and C and pungency and is, therefore, indispensable to world food industries. It can be used medically for the treatment of fevers, colds, indigestion, constipation and pain killing (Dagnoko *et al*., 2013) and also used by the security agencies in the preparation of tear gas. Chilli production in Bangladesh is mainly under rain-fed conditions resulting in a drop-in production and availability of fresh chilli during the monsoon. The consequence of this shortage in the supply of chilli is an increase in the market price of both fresh and dried fruit. The low production may be attributed to low soil fertility, pests and diseases, unavailability and/or high cost of irrigation, inadequate knowledge of improved technologies coupled with the use of unimproved varieties (MiDA, 2010). Most of the chilli varieties farmers cultivate unimproved chilli varieties that are low yielding. Chilli in Bangladesh cultivated both in Rabi and Kharif season. Total production of chilli in Bangladesh was about 1.30 lac metric tons cultivated in 1.02 lac ha of land (BBS, 2016).

Even though chilli is very popular in all the agro-ecological zones of Bangladesh, very little has been achieved in the improvement of the indigenous cultivars probably because of the limited information on the genetic diversity within the species. It has been observed that farmers select and disseminate seeds of elite genotypes to fellow farmers, and ultimately cultivated as various local names. These materials are named based on several criteria, such as the origin of the genotype, pungency, uses, size and shape of fruits. This ptactice has resulted in the treatment of some genotypes as different cultivars in different localities. For this reason, estimation of the genetic diversity among cultivated genotypes has become the fundamental requirement of the crop industry, purposely, for identification and crop improvement (Tam *et al*., 2005). Phenotypic characters such as fruit weight, fruit length, pericarp thickness, plant height etc., have been used to distinguish between chilli germplasm and classify them into groups (Fonseca *et al*., 2008; Weerakoon and Somaratne, 2010). The use of phenotypic characters in describing and classifying germplasm is the fundamental step in any characterization programme (Smith and Smith, 1989). However, studies have shown that morphological characterization in chilli, though a simple method of detecting differences in genotypes is highly influenced by environmental factors and may not be able to distinguish between individuals that are closely related (Gilbert *et al*., 1999; Geleta *et al*., 2005). In Bangladesh the study regarding collection, evaluation, characterization, selection and conservation of genetic resources of chilli is hardly been emphasized in the past. Since there are different types of chilli germplasm distributed throughout the country, it is necessary to collect and characterize them with a view to develop new variety.

Materials and Methods

The present investigation was carried out at Regional Spices Research Centre (RSRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during the month from February 2017 to November 2018. The location of the site was 24° North latitude to

90.43° East longitude with an elevation of 8.4 m from sea level and about 35 km north of Dhaka. The experimental field was medium high land. It was located in the center of Madhupur tract and the soils were developed later for research purpose. Thirty-six chilli germplasm, twenty indigenous and 15 exotics, were collected from different areas of the country including Spices Research Centre, BARI, and Gazipur. Background of the germplasm is presented in Table 1. The seeds were soaked in water for 24 hours in order to facilitate germination. They were dried and treated by Autostin @ 2 g/kg of seed to minimize the primary seed-borne diseases. The seeds were sown on beds in lines maintaining a depth of one centimetre for easy emergence. Each bed was then covered with one layer of newspaper to increase the soil temperature to facilitate germination and prevent evaporation. The seeds were nursed in seed boxes on 17th February, 2017 using potting mix sterilized by steam sterilization method. The potting mix consisted of two parts of top soil to one part of well decomposed cow dung. Nursery management practices, such as shading, forking, thinning, watering and hardening off, were carried out appropriately to ensure that healthy seedlings were produced. The field was ploughed, harrowed and ridged at a spacing of 75 cm between ridges. After this the trial was laid out and transplanted. Transplanting was done in the cooler period of the day (evening) after which watering was done to reduce transplanting shock. The experimental design used was the augmented design with single rows of each germplasm. The length of each row was 5 m long with inter and intra row spacing of 75 cm and 50 cm respectively. The germplasm were randomly assigned to plots by means of drawing lots to avoid bias. Seedling of 35 days old was transplanted on 23th March 2017 representing Kharif season (Mid-March to August). The experimental plots were manured and fertilized. Cow dung, Urea, TSP, MoP and Gypsum were used as 10 ton, 210, 330, 200 and 110 kg ha^{-1}, respectively. The total amount of Cow dung, TSP, Gypsum and one third of MoP were applied during land preparation. The rest MoP and Urea were applied at three equal splits after 20, 50 and 70 days of transplanting (FRG, 2012). The fertilizer application method was side placement which was done at about 5 cm away from the plants.

Table 1. Chilli germplasm codes with sources of collection

SL. No.	Germplasm	Source
1.	CO 001	SRC, BARI
2.	CO 002	SRC, BARI
3.	CO 003	SRC, BARI
4.	CO 446	SRC, BARI
5.	CO 446-1	SRC, BARI
6.	CO 525	SRC, BARI
7.	CO 525-1	SRC, BARI
8.	CO 525-2	SRC, BARI
9.	CO 525-3	SRC, BARI
10.	CO 610	SRC, BARI
11.	CO 610-1	SRC, BARI

Table 1. Contd.

SL. No.	Germplasm	Source
12.	CO 611-1	SRC, BARI
13.	CO 611-2	SRC, BARI
14.	CO 613	SRC, BARI
15.	CO 626	SRC, BARI
16.	CO 629	SRC, BARI
17.	CO 630	SRC, BARI
18.	CO 631	The World Vegetable Centre
19.	CO 632	The World Vegetable Centre
20.	CO 633	The World Vegetable Centre
21.	CO 634	The World Vegetable Centre
22.	CO 635	The World Vegetable Centre
23.	CO 636	The World Vegetable Centre
24.	CO 637	The World Vegetable Centre
25.	CO 638	The World Vegetable Centre
26.	CO 639	The World Vegetable Centre
27.	CO 640	The World Vegetable Centre
28.	CO 641	The World Vegetable Centre
29.	CO 642	The World Vegetable Centre
30.	CO 643	The World Vegetable Centre
31.	CO 644	The World Vegetable Centre
32.	CO 645	The World Vegetable Centre
33.	CO 646	SRC, BARI
34.	CO 647	SRC, BARI
35.	CO 648	SRC, BARI
36.	BARI Chilli-2	Released by SRC, BARI

SRC, BARI: Spices Research Centre, Bangladesh Agricultural Research Institute

Weeds were manually controlled using hand hoe at the second and sixth weeks after transplanting was done. Reshaping of ridges was carried out at the fourth and eighth weeks after transplanting with hand hoe. Insect pests and diseases were managed by spraying of Vertimec (Abamectin) 1.8EC @ I ml/L of water, Dithane M-45 (Mencozeb) @ 2g/L of water, Imetaf (Imedacloprid) 20 SL @ 0.5ml/L of water and Sex pheromone trap. The data pertaining to the days to first emergence, days to first flower bud open, days to first flowering, days to first fruit set, plant height (cm), number of branches per plant canopy (cm^2), single fruit weight (g), fruit length (cm), pedicel length (cm), pericarp thickness (cm), weight of pericarp (g), number of fruits per plant, weight of fruit per plant

(g), number of seeds per fruit, weight of seed per fruit (g), 1000 seed weight (g) and yield per hectare (ton)characters were recorded from randomly selected five plants from each plot. The data collected was analysed using Genstat statistical package (9th edition). Frequency distribution was used to classify the germplasm into groups based on the qualitative traits. For the quantitative traits mean, standard deviation, standard error, range and coefficient of variation were calculated using Microsoft Excel.

Results and Discussion

Observed characteristics of thirty-six chilli germplasm are presented in Tables 2, 3 and 4. In the morphological characters, non-significant variation was found on the 1st emergence days under studied germplasm where the thirty germplasm showed in similar value (Table 3). Significant variation was observed on the days to flowering bud open in thirty germplasm (Table 3). Among them, CO 525 and CO 631 took minimum days to flowering bud open (44 and 42, respectively), followed by BARI Chilli-2. However, CO 633 and CO 648 took maximum days for flowering bud open (Table 3). No significant variation was found on the 1st flowering days among the germplasm (Table 3). The germplasm CO 525 and CO 631 required minimum time (59 and 22 days, respectively) for first fruit setting and which was statistically similar to CO 002, CO 525-3, CO 629, CO 632 and CO 633 (Table 3).

The germplasm CO 631 also required minimum time (50 days) for first flowering, while the maximum time for this trait (125 days) was recorded by CO 633 (Table 3). The plant height showed significant variation among the germplasm (Table 3). The highest plant height (111.35 cm) was recorded in while the lowest (47.02 cm) in CO 602. Significant variation was observed on the number of branch per plant in the studied germplasm (Table 3), which varies in the range of 4.00 (CO 630) to 9.66 (CO 610 & CO 634) (Table 3. The single fruit weight varied from 0.1.46 to 11.70 g. The highest single fruit (11.70 g) was collected from CO 631 which was statistically similar to CO 525 (11.33 g). The lowest (1.46 g) was collected from CO 626 (Table 4). Germplasms exhibited significant variation exhibited on the fruit length (Table 4). The longest fruit length (10.63 cm) was recorded from CO 002 and CO 631 which was statistically similar to CO 525 (10.10 cm) and CO 641 (10.00 cm) whereas the shortest was recorded from CO 645 (2.90 cm) (Table 4). The pedicel length showed significant difference with in the germplasm (Table 4).

The germplasm CO 643 gained maximum (5.06 cm) pedicel length which was statistically narrowly similar to CO 646 (4.16 cm). Whereas, the minimum pedicel length (1.53 cm) was recorded from CO 639 (Table 4). Statistically significant difference was found on the pericarp thickness with in the germplasm (Table 4). Generally, pericarp addressed to quality of chilli and minimum thickness encourages to high quality of chilli. For instance, the lower level of pericarp thickness (0.63 mm) was obtained from CO 635

Table 2. Chilli germplasm used for the study with salient morphological characteristics

Germplasm code	Flower colour	Fruit fresh colour	Ripe Fruit colour	Seed colour	Position of fruit	Fruiting behavior
CO 001	White	Deep Green	Red	Straw	Pendant	Single
CO 002	White	Light Green	Dark Red	Straw	Pendant	Single
CO 003	White	Green	Red	Straw	Pendant	Single
CO 446	White	Green	Red	Straw	Pendant	Single
CO 446-1	Purple	Green	Dark Red	Straw	Pendant	Single
CO 525	White	Light Green	Dark Red	Straw	Pendant	Single
CO 525-1	White	Deep Green	Dark Red	Straw	Pendant	Single
CO 525-2	White	Green	Dark Red	Straw	Pendant	Single
CO 525-3	white	Green	Red	Straw	Pendant	Single
CO 610	White	Green	Red	Straw	Pendant	Single
CO 610-1	White	Green	Red	Straw	Pendant	Single
CO 611-1	White	Green	Red	Straw	Pendant	Single
CO 611-2	White	Green	Dark Red	Straw	Pendant	Single
CO 613	White	Green	Red	Straw	Pendant	Single
CO 626	White	Deep Green	Dark Red	Straw	Pendant	Single
CO 629	White	Green	Red	Straw	Pendant	Single
CO 630	White	Green	Red	Straw	Pendant	Single
CO 631	White	Green	Red	Straw	Pendant	Single
CO 632	Purple	Black	Dark Red	Straw	Erect	Single
CO 633	White	Green	Light Red	Straw	Cluster	Cluster
CO 634	White	Green	Red	Straw	Pendant	Single
CO 635	White	Green	Dark Red	Straw	Pendant	Single
CO 636	White	Green	Red	Straw	Pendant	Single
CO 637	White	Deep Green	Red	Straw	Pendant	Single
CO 638	White	Deep Green	Red	Straw	Pendant	Single
CO 639	White	Green	Red	Straw	Pendant	Single
CO 640	White	Creamy White	Red	Straw	Pendant	Single
CO 641	White	Green	Red	Straw	Pendant	Single
CO 642	White	Green	Red	Straw	Pendant	Single
CO 643	White	Green	Red	Straw	Pendant	Single
CO 644	White	Green	Red	Straw	Pendant	Single
CO 645	White	Green	Red	Straw	Pendant	Single
CO 646	White	Green	Red	Straw	Pendent	Single
CO 647	Purple	Black	Red	Straw	Pendant	Single
CO 648	White	Green	Red	Straw	Pendant	Single
BARI Chilli-2	White	Green	Red	Straw	Pendant	Single

Table 3. Performance of growth parameters of chilli germplasm in Kharif season

Chilli germplasm	1st emergence (days)	1st flowering bud open (days)	1st Flowering (days)	1st fruit set (days)	Plant height (cm)	No. of branch/plant
CO 001	7.00	51.00	60.00	70.00	100.74	7.33
CO 002	7.00	59.00	69.00	87.00	47.02	6.33
CO 003	7.00	51.00	59.00	75.00	73.49	5.33
CO 446	11.00	46.00	56.00	47.30	83.42	7.33
CO 446-1	11.00	46.00	58.00	59.54	92.00	7.00
CO 525	11.00	44.00	51.00	59.10	111.35	7.66
CO 525-1	11.00	51.00	58.00	70.00	90.46	7.00
CO 525-2	11.00	49.00	59.00	70.00	104.00	7.00
CO 525-3	11.00	51.00	60.00	82.00	92.31	8.00
CO 610	11.00	46.00	57.00	70.00	107.43	9.66
CO 610-1	11.00	49.00	60.00	74.00	97.47	6.33
CO 611-1	11.00	46.00	57.00	59.40	89.44	8.66
CO 611-2	11.00	46.00	56.00	47.80	98.00	8.33
CO 613	11.00	59.00	69.00	77.00	72.56	7.33
CO 626	11.00	51.00	63.00	81.00	83.66	6.66
CO 629	11.00	42.00	53.00	36.30	83.00	6.33
CO 630	11.00	59.00	69.00	77.00	53.22	4.00
CO 631	11.00	42..00	50.00	22.20	78.72	8.66
CO 632	11.00	77.00	89.00	103.00	100.27	8.00
CO 633	11.00	110.00	125.00	141.00	57.35	9.33
CO 634	11.00	45.00	54.00	19.10	81.59	9.66
CO 635	11.00	50.00	59.00	70.00	67.43	8.66
CO 636	11.00	59.00	69.00	77.00	73.66	8.00
CO 637	11.00	49.00	59.00	71.00	86.11	7.33
CO 638	11.00	59.00	67.00	76.00	57.35	6.66
CO 639	11.00	49.00	59.00	67.40	63.32	6.66
CO 640	11.00	51.00	60.00	69.00	65.42	6.33
CO 641	11.00	45.00	59.00	69.00	82.33	5.33
CO 642	11.00	48.00	58.00	70.00	58.66	6.66
CO 643	11.00	45.00	58.00	69.00	53.30	6.66
CO 644	11.00	51.00	60.00	70.00	84.77	7.00
CO 645	11.00	51.00	60.00	71.00	68.45	6.33
CO 646	11.00	59.00	67.00	76.00	57.71	6.00
CO 647	11.00	45.00	56.00	70.00	80.31	7.00
CO 648	11.00	100.00	110.00	130.00	78.23	11.33
BARI Chilli-2	11.00	41.00	52.00	68.00	87.53	7.33
LSD (5%)	-	1.713	-	3.196	17.52	2.460
LSD (1%)	-	2.298	-	4.288	23.51	3.301
Level of significant	NS	**	NS	**	**	**
CV (%)	0.00	6.91	4.00	7.54	12.73	20.26

** Significant at 1% level of probability

followed by rest of the germplasm. Whereas, the higher level of pericarp thickness (4.72 mm) was observed from CO 640 which was statistically similar to CO 002 (3.58 mm). The weight of pericarp varied from 0.24 to 6.00 g (Table 4). Among the studied germplasm, the maximum weight (6.00 g) was recorded from CO 640 while the lowest from CO 645 (0.24 g). Number of fruits per plant varied significantly, ranged from 38.06 to 308. The germplasm CO 631 produced maximum fruits per plant (308) that was statistically similar to CO 526 while the lowest (38.00) was in found from CO 640 (Table 4). The second highest fruit (290.3) per plant was recorded from CO 446. Highly significant variation was found on the weight of fruit per plant in all germplasm (Table 4). The highest weight of fruit (606.43 g) was recorded from CO 631. The data showed significant variation in respect of all chilli genotypes (Table 4). The maximum seeds per fruit (89.66) were collected from CO 631 which was nearly similar to CO 525. While, the minimum (20.33) was collected from CO 646 (Table 4). Weight of seeds per fruit varied from 0.11 to 0.63 g. However, the maximum quantity of seeds was collected from CO 631 that was statistically similar to CO 525 while the minimum was collected from CO 645 (Table 4).Over all similar trend was occurred in thousand seed weight under all chilli germplasm (Table 4). Nevertheless, the highest thousand seed weight (5.20 g) was recorded from CO 631 that was statistically similar to CO 525 while the lowest (1.50 g) was found from CO 647. The highest yield of green chilli was obtained from the germplasm CO 631 (23.04 t ha^{-1}) followed by CO 525-1 (18.25 t ha^{-1}), CO 525 (17.69 t ha^{-1}), CO 003 (17.13 t ha^{-1}) respectively whereas the lowest yield was recorded from the germplasm CO 002 and (4.65 t ha^{-1}) (Table 4).

From the results it is revealed that most of the growth parameters showed significant variation among the germplasm except for 1^{st} emergence days and 1^{st} flowering days. Among the thirty-six germplasm, CO 525 and CO 631 was advantegious with respect to 1^{st} flowering bud open days, 1^{st} fruit set days, number of branch/plants, canopy (cm^2). The rest of germplasm resulted in late appearance through 1^{st} flowering bud open days which lead to late fruit setting. Such variation might be due to inherent characters coupled with environmental effects. The critical observation of the data of this experiment showed a wide variation in physical characteristics such as plant height was the highest in CO 525 and CO 631. It might be due to environmental effects. Similar result was made by El-Tohamy *et al.*, (2006). Therefore, germplasm with wider canopy diameter might produced more fruits or pods than varieties with narrow canopy due to increasing number of secondary and tertiary branches which were the locations for fruit bud formation. The number of days to fifty percent flowering showed very highly significant ($p<0.001$) difference and as investigation comprised of 36 genotypes of chilli.

Yield parameters had also showed significant variation under thirty-six germplasm. CO 525 and CO 631 germplasm responded with better yield parameter (single fruit weight, number of fruit/plant, weight of fruit/plant, number of seeds /fruits, weight of seed/fruit, thousand seed weight and yield). However, the fewer fruit numbers

Table 4. Performance of yield and yield contributing characters of different chilli germplasm in *Kharif* season.

Chilli germplasm	Single fruit weight (g)	Fruit length (cm)	Pedicel length (cm)	Pericarp thickness (cm)	Wt. of pericarp (g)	No. of fruit/ plant	Wt. of fruit /plant (g)	No. of seed/fruit	Weight of seed/fruit (g)	Thousand seed weight (g)	Yield (t/ha)
CO 001	5.42	5.73	2.90	2.02	0.91	191.33	212.46	38.33	0.25	3.20	8.07
CO 002	8.76	10.63	3.53	3.58	5.51	43.33	122.32	48.33	0.40	3.60	4.65
CO 003	4.90	4.93	2.60	1.42	1.05	251.66	450.84	40.33	0.26	4.40	17.13
CO 446	2.08	5.60	3.13	1.23	0.58	290.33	311.26	40.33	0.18	4.86	11.83
CO 446-1	2.96	6.03	3.43	1.79	0.90	130.66	377.71	40.33	0.24	4.80	14.35
CO 525	11.33	10.10	3.10	0.84	1.04	273.00	465.50	70.33	0.56	5.10	17.69
CO 525-1	2.50	6.03	2.53	1.30	0.48	306.33	480.33	55.00	0.18	5.00	18.25
CO 525-2	2.33	8.96	3.96	1.49	1.03	154.66	321.35	27.33	0.24	5.00	12.21
CO 525-3	3.13	5.20	2.40	1.64	0.78	136.33	223.63	49.66	0.17	2.80	8.50
CO 610	2.53	5.96	3.30	1.08	0.44	206.33	304.50	21.33	0.20	5.00	11.57
CO 610-1	3.20	6.36	2.86	0.90	0.50	194.33	331.32	36.66	0.24	4.80	12.59
CO 611-1	2.46	7.16	3.86	1.23	0.89	238.66	340.16	61.66	0.19	4.40	12.93
CO 611-2	2.70	5.96	4.00	1.41	0.69	252.00	253.92	34.66	0.28	4.36	9.65
CO 613	2.02	3.20	1.70	0.69	0.60	191.66	266.43	69.66	0.23	3.10	10.12
CO 626	1.46	5.13	3.76	1.26	0.28	246.66	340.86	39.33	0.27	4.80	12.95
CO 629	1.73	3.96	3.00	1.15	0.48	207.33	221.45	54.33	0.22	2.80	8.42
CO 630	2.00	4.00	2.23	0.65	0.92	135.00	224.25	35.00	0.42	3.20	8.53
CO 631	11.70	10.63	3.53	1.58	0.82	308.00	606.43	89.66	0.63	5.20	23.04
CO 632	3.76	5.63	3.40	1.23	0.69	221.66	331.52	64.00	0.36	3.80	12.60
CO 633	2.63	4.80	2.86	1.00	0.61	121.66	211.03	67.00	0.21	4.20	8.02
CO 634	4.00	6.73	3.20	2.21	2.11	157.00	205.07	60.00	0.33	5.00	7.79
CO 635	4.56	5.93	2.56	0.63	1.91	127.33	401.50	42.00	0.43	4.66	15.26
CO 636	4.53	8.13	2.53	3.11	3.52	151.00	249.22	58.33	0.28	3.46	9.47

Table 4. Contd.

Chilli germplasm	Single fruit weight (g)	Fruit length (cm)	Pedicel length (cm)	Pericarp thickness (cm)	Wt. of pericarp (g)	No. of fruit/ plant	Wt. of fruit /plant (g)	No. of seed/fruit	Weight of seed/fruit (g)	Thousand seed weight (g)	Yield (t/ha)
CO 637	3.20	5.86	2.86	1.72	1.68	110.66	339.63	51.00	0.28	4.80	12.91
CO 638	4.13	9.83	2.26	1.69	0.73	102.00	197.85	60.33	0.17	3.60	7.52
CO 639	7.23	9.36	1.53	2.65	2.60	84.66	310.34	57.00	0.16	4.33	11.79
CO 640	2.40	7.96	2.76	4.72	6.00	38.06	460.64	24.33	0.38	4.70	17.50
CO 641	9.10	10.00	3.10	3.03	4.34	53.66	333.23	41.33	0.34	4.40	12.66
CO 642	2.03	9.23	3.86	2.23	3.23	50.66	191.04	58.33	0.27	4.13	7.26
CO 643	5.50	5.73	5.06	2.34	2.22	50.66	213.69	47.66	0.18	5.00	8.12
CO 644	3.13	5.20	2.90	1.02	0.36	268.00	386.20	32.33	0.15	2.80	14.68
CO 645	1.86	2.90	2.53	0.88	0.24	146.00	246.57	38.33	0.11	3.40	9.37
CO 646	1.83	6.93	4.16	0.69	1.19	140.66	278.99	20.33	0.30	2.90	10.60
CO 647	2.39	3.96	3.23	1.19	0.48	231.33	244.12	50.66	0.22	1.50	9.28
CO 648	2.27	2.93	2.90	1.78	0.95	45.66	126.22	48.00	0.22	4.50	4.80
BARI Chilli-2	3.05	7.56	3.66	1.24	0.59	218.00	292.99	48.00	0.22	5.20	11.13
LSD (5%)	4.023	1.190	0.737	0.875	1.468	109.40	92.52	67.46	0.157	0.381	9.00
LSD (1%)	5.397	1.596	0.989	1.175	1.969	146.80	124.10	90.51	0.211	0.512	12.21
Level of significant	**	**	**	**	**	**	**	**	**	**	**
CV (%)	12.00	10.98	14.48	12.40	11.92	19.09	18.47	17.18	14.67	5.56	12.17

** Significant at 1% level of probability

obtained in summer and rainy season may have been due to loss of fruits to dampness and decay because of much rainfall received (Idowu-Agida *et al*., 2010). This is also attributed to abscission of flower buds, flowers and young fruits induced by higher temperatures and excessive moisture from much rains during flowering and fruiting stages. The variations of fruit yield depended might be due to the influence of the growing environmental factors like temperature, associated traits like canopy diameter that might limit the number of branches. As a number of primary, secondary and tertiary branches increased, there might be a possibility of increasing the number of fruit producing buds which are the locations for fruit production. On the other hand, fruit yield as well as higher yield per hectare was comparatively less in *Kharif* season due to unfavourably affecting photosynthesis. Similar result was reported by Jahangir (2009).

The study revealed existence of genetic variability among the germplasm at morphological levels. Substantial variation existed among the accessions especially in fruit traits (colour, weight, length, thousand seed weight and pericarp weight and width). The first four principal components accounted for 72.44% of the total genetic variance among the accessions. The larger part of variance was accounted for by plant height, single fruit weight, number of fruit per plant and fruit length. Morphological cluster analysis revealed genetic dissimilarity of 0.88-0.99. C0 003 and C0 525-1 showed the widest diversity while the highest degree of similarity existed between C0 610-1 and C0 632. The introduced chilli germplasm out-performed local germplasm in flowering and maturity periods, bigger fruits and total marketable fruit yields. Local germplasm is, however, better in number of fruits produced per plant and seeds per fruit, plant height and width. Germplasm are most stable for average fruit weight, fruit length, fruit width, seed weight and days to fruit 50% maturity, canopy and number of seeds. The germplasm CO 631, CO 635, CO 637, CO 525-1, C0 644 and C0 525 produced high in yield across the seasons performing better than all germplasm in all traits with the BARI chilli-2 as a check. The commercially three germplasm perform better than all the local germplasm and most of the germplasm in terms of fruit yield and maturity periods and perhaps this is why popular as a commercial variety among the farmers. The germplasm C0 634 though the medium yielder is the earliest-maturing variety among all germplasm. Its genes can be used for early yield improvement in chilli pepper. Thirty-six chilli germplasm were evaluated for characterization. The germplasm under investigation showed a wide range of variation for most of the characters. Based on yield and yield attributes of the germplasm C0 631, C0 635, C0 637, C0 525-1 and C0 644 were promising under the agro-ecological condition of Bangladesh as they produced higher yield. Germplasm C0 446, C0 001 and C0 613 may be considered as early crop. The present result provided some esstential information to the breeders for selecting parents' in future breeding programme.

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