International Journal of Natural and Social Sciences, 2016, 3(4): 35-42 ISSN: 2313-4461

International Journal of Natural and Social Sciences
ISSN: 2313-4461
IJNSS

Morpho-physiological attributes and yield of four groundnut genotypes as influenced by different plant spacing

K. M. Monir Hossain, Md. Nesar Uddin, Md. Masudul Karim, Md. Ashrafuzzaman*

Department of Crop Botany, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

ARTICLE INFO

Article history

Accepted 21 Oct 2016
Online release 3 Nov 2016

Keyword

Groundnut
Spacing
Morpho-physiology
Yield

***Corresponding Author**

Md. Ashrafuzzaman
drashraf2007@yahoo.com

ABSTRACT

An experiment was conducted at the Crop Botany Field Laboratory of Bangladesh Agricultural University, Mymensingh, during the period from November 2014 to April 2015 to study the morpho-physiological attributes and yield of four groundnut genotypes as influenced by different plant spacing. The experiment was laid out in two factors randomized complete block design (RCBD) with three replications. Four plant spacing viz. 30 cm × 15 cm, 30 cm × 20 cm, 40 cm × 15 cm and 40 cm × 20 cm were tested on four groundnut genotypes viz. BINA cheenabadam-1, BINA cheenabadam-2, BINA cheenabadam-3 and BINA cheenabadam-4. Results showed that plant spacing had significant influence on growth and yield contributing characters. The highest pod yield (2.93 t ha^{-1}) and harvest index (36.79%) were recorded in 40 cm × 15 cm spacing due to accommodation of higher number of plants per unit area. The minimum number of pod plant^{-1} (25.25) and pod yield (2.59 t ha^{-1}) were recorded in 30 cm × 15 cm spacing. The pod yield decreased gradually with the increasing of row spacing. The genotypes BINA cheenabadam-1, BINA cheenabadam-2 and BINA cheenabadam-3 performed superiority in morphological, physiological and yield contributing characters than the BINA cheenabadam-4 genotype. The interaction of genotype and spacing had significant effect on morpho-physiological and yield contributing characters. BINA cheenabadam-1 and BINA cheenabadam-2 produced the highest pod yield of 2.98 and 3.28 t ha^{-1}, respectively with 40 cm × 15 cm spacing whereas BINA cheenabadam-3 produced the highest pod yield (3.13 t ha^{-1}) with 30 cm × 20 cm spacing although per plant yield was inferior to the closer spacing in all the genotypes. So, 40 cm × 15 cm spacing is the best spacing in terms of pod and seed yield in groundnut genotypes.

INTRODUCTION

Groundnut *(Arachis hypogaea* L.*)* is one of the principal economic crops of the world. It is also known as monkey-nut, peanut and earthnut. Groundnut seed contains mainly non-dry oil and protein, about 38‒50% oil, 11.5% carbohydrate, 2.3% ash and 6% water. Groundnut cake is a rich food for cattle. It is also rich in vitamin B and E (Rachie and Roberts, 1974). Its seeds contain 48‒52% oil, and 24‒26% protein (Mondal and Wahhab, 2001) and it can also help providing carbohydrate, glycerides and other chemical compounds which are essential for growth and health of the human being.

There are many oil crops grown in Bangladesh. Of them, groundnut stands third in terms of acreage but ranks second in terms of production, with mustard being the first and sesame the third. Nevertheless, the scope of extending total acreage is becoming more apparent with ever increasing shoals for continued short fall of annual precipitation and water tables (Sarker, 2007).

Groundnut cultivation is concentrated in 'char' areas of Kishorganj, Noakhali, Sherpur and Kurigram district during the Rabi season and its Kharif cultivation is limited for seed purposes in high land areas of Dhaka, Comilla, Rajshahi and Kushtia districts. The yield of groundnut is lower (1850–2200 kg ha^{-1}), in our country (BBS, 2005) as compared to high yields obtained in Israil (2857 kg ha^{-1}), Mozambique (2,600 kg ha^{-1}) and USA (2,603 kg ha^{-1}) (FAO, 2005). At present its acreage is 74,227 with the production of 53,654 MT (BBS, 2012).

How to cite this article: Hossain KMM, Uddin MN, Karim MM and Ashrafuzzaman M (2016**).** Morpho-physiological attributes and yield of four groundnut genotypes as influenced by different plant spacing. International Journal of Natural and Social Sciences, 3(4): 35-42.

According to DAE (Department of Agricultural Extension) information of groundnut acreage and production during 2009–2010 was 0.89 million hectare and 1.25 million ton, respectively (Begum, 2011). The yield of groundnut is lower in our country. This lower yield is mostly attributed to genetic and environmental factors and management practices. Of the management practices, spacing is the most important one for determining yield. It is important to accommodate the most appropriate number of plants per unit area of land to obtain better yield. It is expected that groundnut may occupy the top position in the list of oil yielding crops of the country in producing oil if it is grown with proper care and management. But the evidences in this respect are still away to fulfill the desired target.

Yield of any crop is a complex phenomenon, a function of genetic factor as influenced by climate and management. The crop must be given proper agronomic culture so that better growth can take place. Optimum spacing ensures proper growth of the aerial and underground parts of the plant through efficient utilization of solar radiation, nutrients, water, land as well air spaces (Miah et al., 1990). A large number of research works were conducted throughout the world in order to augment the production of groundnut. It was found that there was a proper spacing for planting of groundnut seeds beyond which the crop can't produce high yield (Tavora et al., 2002; Akter, 2011). Proper attention should be given on underlying concept as groundnut has wider scopes for its cultivation in Bangladesh. Therefore, the present investigation was undertaken to study some morpho–physiological attributes of four groundnut genotypes under different plant spacing and to find out the optimum plant spacing for better yield in groundnut.

MATERIALS AND METHODS

Four Groundnut genotypes were used as planting materials. The tested materials were collected from Plant Breeding Division, Bangladesh Institute of Nuclear Agriculture, Mymensingh. The experimental field was medium high land belonging to the Sonatala soil series of grey flood plain soil type under the Agro-ecological Zone-9 (AEZ-9) named old Brahmaputra Flood Plain. The soil was silty loam with imperfectly to poorly drained permeability. The experiment was laid out as two factor experiment in Randomized Completely Block Design (RCBD) with 3 replicates. The experiment consisted of 48 unit plots; each plot was 1 m × 1 m in size. Plot to plot distance was 0.5 m. The land of the experimental site was first opened in 1st week of November 2014 with power tiller. Later on, the land was ploughed and cross-ploughed three times followed by laddering to obtain the desirable tilth. The corners of the land were spaded and larger clods were broken into smaller pieces after ploughing and laddering all the stubbles and uprooted weeds were removed and the land was made ready. The fertilizers and manures were used following a recommended dose (BINA, 2012) in the experimental plots as urea @ 50 kg ha^{-1}, TSP @ 150 kg ha^{-1}, MP @ 150 kg ha^{-1}, gypsum @ 100 kg ha^{-1} and cowdung 1000 kg ha^{-1}. Half of the amount of urea and full dose of all other fertilizers and manure were applied at the time of final land preparation. The remaining amount of urea was top dressed on 30 DAS. Agronomic practices like irrigation, weeding, thinning etc. were done accordingly. The plants were uprooted carefully for data collection. To study ontogenetic growth characteristics, a total of three harvests were made and at final harvest, data were collected on some morpho-physiological parameters, yield attributes and yield. The first crop sampling was done at 50 DAS and continued at an interval of 25 days up to 100 DAS i.e. till attaining physiological maturity. From each sampling, three plants were randomly selected from each plot and uprooted for collecting necessary parameters. The plants were separated into leaves, stems and roots and the corresponding dry weight were recorded after oven drying at 80 ± 2 °C for 72 hours. The plants of the given genotype under these three replications were harvested at a time, when most of the pods become mature (about 90% pods were mature). The mature pods were collected by hand and then allowed them for drying well under bright sunlight. Finally, grain weights were taken on individual plot basis at moisture content of about 12% and converted into ton ha^{-1}. The data on the following yield components and yield were recorded. The collected data were analyzed statistically following the analysis of variance (ANOVA) technique and the mean differences were adjudged by Duncan's

Multiple Range Test (DMRT) using the statistical computer package program, MSTAT-C (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Total dry matter (TDM) plant^{-1}

The effect of plant spacing on total dry matter plant^{-1} was significant at all sampling dates (50, 75 and 100 DAS) (Table 1). At 100 DAS spacing 30 cm × 20 cm produced the highest total dry matter plant^{-1} (11.67 g) while spacing 40 cm × 20 cm produced lowest total dry matter plant^{-1} (7.66 g) (Table 1). The result is consistent with the findings of Aktar (2011) and El-Habbasha et al. (1996) who reported that increasing plant density decreased dry mass production. Patra et al. (1999) found that 25 cm × 12 cm spacing possibly accumulated more dry matter as compared to crop sown at 50 cm × 6 cm in groundnut. Similar result was also found in groundnut Tavora et al. (2002). Genotypes had a significant effect on total dry matter plant^{-1} (table 1). At 100 DAS BINA cheenabadam-1 produced the highest total dry matter plant^{-1} (12.59 g) while BINA cheenabadam-3 produced the lowest total dry matter plant^{-1} (8.30 g). Genotypic variations in TDM were also observed by Patel et al. (2005) and Karanjikar et al. (2005) in groundnut which supported the present experimental result.

Interaction between genotypes and spacing showed the highest total dry matter plant^{-1} (table 1); 1.75 g at 50 DAS from BINA cheenabadam-1 at a spacing of 30 cm × 15 cm; 4.56 g at 75 DAS from BINA cheenabadam-4 at a spacing of 40 cm × 20 cm and 18.85 g at 100 DAS from BINA cheenabadam-4 at a spacing of 40 cm × 20 cm, respectively. The lowest total dry matter plant^{-1} (0.69 g) was obtained from BINA cheenabadam-4 at a spacing of (40 cm × 15 cm) at 50 DAS; (2.05, 2.19, 2.31, 2.56, 2.18 and 1.99 g) was obtained from BINA cheenabadam-1 at a spacing of 40 cm × 20 cm, BINA cheenabadam-2 at a spacing of 40 cm × 15 cm, BINA cheenabadam-2 at 40 cm × 20 cm, BINA cheenabadam-3 at a spacing of 40 cm × 15 cm, BINA cheenabadam-3 at a spacing of 40 cm × 20 cm and BINA cheenabadam-4 at a spacing of 40 cm × 15 cm at 75 DAS and (5.90 g) found in BINA cheenabadam-3 at a spacing of 40 cm × 20 cm at 100 DAS, respectively.

Number of pods plant^{-1} and Pod length as influenced by spacing and genotype

Significant variations in number of pod plant^{-1} were observed in different plant spacing (Table 2). The maximum number of pod plant^{-1} (33.83) was found from 40 cm × 20 cm than any other spacing. Variation in pod number due to plant density was observed by Aktar (2011) in groundnut which supports the present experimental result. Reduction in the number of pods plant^{-1} under high plant density might be due to increased number of plants per unit area. It is revealed that genotype BINA cheenabadam-4 produced the maximum number of pod plant^{-1} (38.08) while BINA cheenabadam-4 produced small size pod length than any other varieties. The results are also supported by the result of Rahman (2001) and BINA (2002) in groundnut. Interaction between genotypes and spacing showed that highest number of pod plant^{-1} (46.33) was produced from BINA cheenabadam-4 at a spacing of (30 cm × 15 cm), which was identical to that produced by BINA cheenabadam-3 at a spacing of 40 cm × 20 cm. The lowest number of pod plant^{-1} (15.33) was produced from BINA cheenabadam-1 at a spacing of 30 cm × 20 cm, which was identically followed by BINA cheenabadam-2 at a spacing of 30 cm × 15 cm, BINA cheenabadam-3 at a spacing of 30 cm × 15 cm and BINA cheenabadam-3 at a spacing of 30 cm × 20 cm (Table 2).

Significant variations in pod length were observed in different plant spacing (Table 2). The highest pod length plant^{-1} (21.92 mm) was found from 40 cm × 20 cm spacing. The spacing 30 cm × 15 cm produced the lowest pod length plant^{-1} (20.22 mm), Production of shorter pods in the closer spacing was probably due to severe competition for space, nutrient, air, water and light by the plants. This result is in agreement with the findings of Mayande et al. (2002). The pod length plant^{-1} was significantly differed among the genotypes (Table 2). Higher pod length (23.39 mm) was obtained from BINA cheenabadam-1 and lower (17.73 mm) was obtained from BINA cheenabadam-4. The probable reason of these results might be due to genetic makeup of these genotypes which is influenced by heredity. The results of variability in pod length are in full agreement with many workers. Patil and Bhapkar (1987) and Rahman (2001) observed quite high degree of variability in pod length in their studies with groundnut. Interaction between genotypes and spacing showed the highest pod length plant^{-1} (25.80 mm) from BINA cheenabadam-1 with the spacing of 30 cm × 20 cm and the lowest pod length plant^{-1} (16.40 and 16.77 mm) was produced from BINA cheenabadam-4 at 30 cm × 15 cm and BINA cheenabadam-3 at 30 cm × 15 cm, respectively (Table 2).

Shelling percentage and weight of 1000 seeds

Significant variations in shelling percentage of pod plant^{-1} were observed in different plant spacing (Table 2). The maximum shelling percentage of pod plant^{-1} (67.06%) was found from 30 cm × 15 cm spacing while the spacing 40 cm × 15 cm produced the minimum shelling percentage of pod (63.13%). The results showed that the closest spacing recorded the highest shelling percentage in the experiment. This could be attributed to reduced weed growth and lower competition for resources leading to improved dry matter partitioning. This result disagrees with result of Howlader et al. (2009), Patel and Patel (1995) and Nandania et al. (1992) where they found that shelling percentage was unaffected by different spacing. From table 2, it is revealed that genotype BINA cheenabadam-1 produced the maximum shelling percentage of pod plant^{-1} (67.00%) due to the larger size of pod and seed which was identically followed by BINA cheenabadam-2 and BINA cheenabadam-4 (66.59%) genotype. The genotype BINA cheenabadam-3 produced the minimum shelling percentage of pod plant^{-1} (63.86%). Similar findings were reported by Agasimani et al. (1984) and Knauft et al. (1991).

Significant variations of weight of 1000 seeds plant^{-1} were observed in different plant spacing (Table 2). The maximum weight of 1000 seeds plant^{-1} (483.7 g) was found from 40 cm × 20 cm spacing. The spacing 40 cm × 15 cm produced the minimum weight of 1000 seeds plant^{-1} (298.8 g). The greater 1000 seed weight plant^{-1} in wider spacing (40 cm × 20 cm) compared to closer spacing (30 cm × 15 cm, 30 cm × 20 cm and 40 cm × 15 cm) might be due to get sufficient space, nutrient, air, water and light. Similar result was reported by Aktar (2011). Nenadic and Slovic (1994) showed that 1000 seed weight was highest at the closest row spacing (30 cm) and in the lowest planting i.e. 0.4 million plants ha^{-1}. From table 2, it is revealed that genotype BINA cheenabadam-2 produced the maximum weight of 1000 seeds (423.8 g) due to the bolder pod, which was identically followed by BINA cheenabadam-1. The genotype BINA cheenabadam-4 produced the minimum weight of 1000 seeds (288.5 g). This result is consistent with Islam (2007). Interaction between genotypes and spacing showed that the highest weight of 1000 seeds (592.1 g) was produced from BINA cheenabadam-3 at 40 cm × 20 cm while the lowest weight of 1000 seeds (235.4 g) was produced from BINA cheenabadam-4 at 40 cm × 15 cm (Table 2).

Pod yield and biological yield

The influence of plant spacing on pod yield was statistically significant (Table 2). Spacing 40 cm × 15 cm produced the higher pod yield (2.93 t ha^{-1}) and the spacing 40 cm × 20 cm produced the minimum pod yield (2.43 t ha^{-1}). This might be due to the number and weight of pod plant^{-1} increased with the decreasing of plant spacing. However, such increments were lower under the narrow-row spacing. Munda and Patel (1989) reported in a field trial of groundnut that optimum spacing was 40 cm × 15 cm. This result is in agreement with the results of many researchers (Howlader et al., 2009; Tavora et al., 2002; Jordan et al., 2005; Gopal et al., 2007) who reported that the pod yield of groundnut were significantly greater with closer spacing. Genotype BINA cheenabadam-2 produced the higher pod yield (2.75 t ha^{-1}) and genotype BINA cheenabadam-4 produced the minimum pod yield (2.23 t ha^{-1}) (Table 2). Islam (2007) reported that BINA cheenabadam-2 produced higher pod yield (360 kg ha^{-1}) because of the production of higher number of pods plant^{-1} and robust pod which supported the present experimental result. Interaction between genotypes × spacing showed that the highest seed yield (3.28t ha^{-1}) was produced from BINA cheenabadam-2 at 40 cm × 15 cm and the lowest seed yield plant^{-1} (1.82 t ha^{-1}) was produced from BINA cheenabadam-4 at 40 cm × 20 cm (Table 2).

The effect of plant spacing on biological yield was statistically significant (Table 2). Spacing 40 cm × 20 cm produced the highest biological yield (9.28 t ha^{-1}) while spacing 40 cm × 15 cm produced the lowest biological yield (8.14 t ha^{-1}). It might be attributed due to greater number of plants in closely spaced area. Similar results were demonstrated by Aktar (2011) who reported that the biological yield increased when spacing was decreased. Genotype BINA cheenabadam-4 produced the highest biological yield (9.62 t ha^{-1}) due to the production of large number of pod. Genotype BINA cheenabadam-2 produced the lowest biological yield (8.64 t ha^{-1}), which was followed by BINA cheenabadam-1 and BINA cheenabadam-3. It is reported that pod yield was positively and significantly correlated with biological yield in groundnut (Azad and Hamid, 2000). Interaction between genotypes and spacing showed the highest biological yield (10.25 t ha^{-1}) was produced from BINA cheenabadam-3 at 30 cm × 20 cm. The lowest biological yield (6.92 t ha^{-1}) was produced from BINA cheenabadam-1 at 40 cm × 15 cm (Table 2).

Table 1
Effect of plant spacing on total dry matter (TDM) plant^{-1} in four groundnut genotypes

	Total dry matter (TDM) (g plant^{-1}) at different days after sowing (DAS)		
	50	75	100
Genotype			
BINA Cheenabadam-1	1.15 a	3.63 a	12.59 a
BINA Cheenabadam-2	1.07 a	3.37 a	9.71 c
BINA Cheenabadam-3	0.96 b	2.74 b	8.30 d
BINA Cheenabadam-4	0.88 c	3.56 a	11.28 b
Spacing			
30 cm × 15 cm	1.14 a	4.01 a	11.22 b
30 cm × 20 cm	1.16 a	4.12 a	13.67 a
40 cm × 15 cm	0.91 b	2.61 b	9.33 c
40 cm × 20 cm	0.85 b	2.56 b	7.66 d
Genotypes × spacing			
BINA Cheenabadam-1 × (30 cm × 15 cm)	1.75 a	4.56 a	16.80 b
BINA Cheenabadam-1 × (30 cm × 20 cm)	1.01 cd	4.23 ab	16.00 b
BINA Cheenabadam-1 × (40 cm × 15 cm)	1.00cd	3.69 b	8.58 fg
BINA Cheenabadam-1 × (40 cm × 20 cm)	0.83 ef	2.05 c	8.97 efg
BINA Cheenabadam-2 × (30 cm × 15 cm)	0.79 ef	4.75 a	8.25 fg
BINA Cheenabadam-2 × (30 cm × 20 cm)	1.47 b	4.21 ab	12.37 c
BINA Cheenabadam-2 × (40 cm × 15 cm)	1.18 c	2.19 c	10.49 de
BINA Cheenabadam-2 × (40 cm × 20 cm)	0.85 def	2.31 c	7.74 fg
BINA Cheenabadam-3 × (30 cm × 15 cm)	1.02 cd	2.54 c	10.81 d
BINA Cheenabadam-3 × (30 cm × 20 cm)	1.16 c	3.66 b	7.47 g
BINA Cheenabadam-3 × (40 cm × 15 cm)	0.75 ef	2.56 c	9.03 fg
BINA Cheenabadam-3 × (40 cm × 20 cm)	0.92 de	2.18 c	5.90 h
BINA Cheenabadam-4 × (30 cm × 15 cm)	1.00 cd	4.18 ab	9.02 efg
BINA Cheenabadam-4 × (30 cm × 20 cm)	1.01 cd	4.36 a	18.85 a
BINA Cheenabadam-4 × (40 cm × 15 cm)	0.69 f	1.99 c	9.20 ef
BINA Cheenabadam-4 × (40 cm × 20 cm)	0.80 ef	3.69 b	8.05 fg

In a column in each group of means, figures with similar letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT.

Table 2
Interaction effects of plant spacing on yield and yield contributing characters of four groundnut genotypes

	No. of pod plant^{-1}	Pod length (mm)	Shelling %	1000 seed weight (g)	Biological yield (t ha^{-1})	Pod yield (t ha^{-1})	Harvest index (%)
Genotype							
BINA Cheenabadam-1	24.25 b	23.39 a	67.00 a	416.5 a	8.15 b	2.70 a	33.84 a
BINA Cheenabadam-2	23.67 b	22.45 b	66.09 a	423.8 a	8.64 b	2.75 a	32.20 ab
BINA Cheenabadam-3	26.75 b	20.27 c	63.86 b	392.8 b	8.94 ab	2.73 a	31.06 b
BINA Cheenabadam-4	38.08 a	17.73 d	66.53 a	288.5 c	9.62 a	2.23 b	23.40 c
Spacing							
30 cm × 15 cm	25.25 b	20.22 b	67.06 a	402.1 b	8.83ab	2.59 b	29.95 b
30 cm × 20 cm	26.83 b	20.77 b	66.71 a	337.0 c	9.09 a	2.46 b	27.13 c
40 cm × 15 cm	26.83 b	20.93 b	63.13 b	298.8 d	8.14 b	2.93 a	36.79 a
40 cm × 20 cm	33.83 a	21.92 a	66.59 a	483.7 a	9.28 a	2.43 b	26.63 c
Genotypes × spacing							
BINA Cheenabadam-1 × (30 cm × 15 cm)	18.67 gh	20.83 cd	71.93 a	441.8 c	9.75 abc	2.88abcd	29.66 cdef
BINA Cheenabadam-1 × (30 cm × 20 cm)	15.33 h	25.80 a	66.22 bcd	343.6 ef	7.83 cde	2.40 def	30.89 cd
BINA Cheenabadam-1 × (40 cm × 15 cm)	31.33 de	23.03 b	61.10 e	351.6 ef	6.92 e	2.98abc	43.19 a
BINA Cheenabadam-1 × (40 cm × 20 cm)	31.67 de	23.90 b	68.77 ab	528.8 b	8.08 bcde	2.53 cdef	31.63 cd
BINA Cheenabadam-2 × (30 cm × 15 cm)	17.33 gh	26.87 a	70.74 a	522.0 b	7.83 cde	2.70bcde	34.73 bc
BINA Cheenabadam-2 × (30 cm × 20 cm)	33.67cde	20.17 de	68.95 ab	392.3 d	9.08 abcd	2.25efg	24.82 fg
BINA Cheenabadam-2 × (40 cm × 15 cm)	23.00 g	19.07 defg	63.58 de	269.7 h	8.38 abcde	3.28 a	39.14 ab
BINA Cheenabadam-2 × (40 cm × 20 cm)	20.67 gh	23.70 b	61.08 e	511.4 b	9.25 abcd	2.78bcd	30.10 cde
BINA Cheenabadam-3 × (30 cm × 15 cm)	18.67 gh	16.40 h	61.53 e	360.1 e	8.08 bcde	2.38 def	30.48 cd
BINA Cheenabadam-3 × (30 cm × 20 cm)	21.00 gh	19.60 def	63.11 de	280.6 gh	10.25 a	3.13ab	30.16 cde
BINA Cheenabadam-3 × (40 cm × 15 cm)	23.67 fg	23.00 b	62.11 de	338.4 ef	7.67 de	2.82abcd	36.94 b
BINA Cheenabadam-3 × (40 cm × 20 cm)	43.67 ab	22.10 bc	68.70 ab	592.1 a	9.75 abc	2.60 cde	26.68 defg
BINA Cheenabadam-4 × (30 cm × 15 cm)	46.33 a	16.77 h	64.03 cde	284.6 gh	9.67 abc	2.40 def	24.93 efg
BINA Cheenabadam-4 × (30 cm × 20 cm)	37.33 cd	17.53 gh	68.55 ab	331.6 f	9.20 abcd	2.05 fg	22.66 gh
BINA Cheenabadam-4 × (40 cm × 15 cm)	29.33 ef	18.63 efg	65.74 bcd	235.4 i	9.60 abcd	2.65 bcde	27.90 def
BINA Cheenabadam-4 × (40 cm × 20 cm)	39.33 bc	17.97 fgh	67.81 abc	302.5 g	10.02 ab	1.82 g	18.10 h

In a column in each group of means, figures with similar letter do not differ significantly whereas figures with dissimilar letters differ significantly as per DMRT.

Harvest index

Both spacing and genotypes had significant influence on harvest index on groundnut (Table 2). Spacing 40 cm × 15 cm produced the maximum harvest index (36.79%) while spacing 40 cm × 20 cm produced the minimum (26.63%). Genotype BINA cheenabadam-1 produced the maximum harvest index (33.84%) in contrast to the genotype BINA cheenabadam-4 that produced the minimum harvest index (23.40%). This result was supported by Islam (2007).

Interaction between genotypes and spacing showed that highest harvest index (43.19%) was produced from BINA cheenabadam-1 at a spacing of 40 cm × 15 cm. The lowest harvest index (18.10%) was produced from BINA cheenabadam-4 at a spacing of 40 cm × 20 cm (Table 2). HI is a measure of the efficiency of conversion of photosynthate into economic yield of a crop plant (Gautom and Sharma, 1987). Increased HI results in increased crop yield, probably because of improved partitioning of dry matter to reproductive parts (Poehlman, 1991). This opinion has been reflected in the present study that harvest index decreased with increasing plant spacing (Aktar, 2011; Howlader et al., 2009).

In a summary it can be said that spacing had a significant influence on morpho-physiological parameters as well as yield and yield contributing characters of groundnut genotypes. The highest pod yield (2.93 t ha^{-1}) and harvest index (36.79%) were recorded in 40 cm × 15 cm spacing. It can be concluded that 40 cm × 15 cm spacing was appeared as the best spacing in terms of pod yield as compared to the other spacing studied.

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