J. Sylhet Agril. Univ. 2(1):59-63, 2015 **Research Article** **ISSN: 2308-1597**

VARIABILITY IN VEGETATIVE AND REPRODUCTIVE CHARACTERISTICS OF SOME RAPESEED VARIETIES AVAILABLE IN BANGLADESH

M D Hossain[1], M Rahman[2], M Saha[3] and I Miah[4]

[1]*Department of Agribusiness, Atish Dipankar University of Science and Technology (ADUST), Dhaka-1213*
[2]*Senior Officer, Investment Corporation of Bangladesh, Head Office, BDBL Bhaban-8, Rajuk Avenue, Dhaka-1000*
[3]*Department of Agricultural Chemistry, Sylhet Agricultural University, Sylhet 3100, Bangladesh*
[4]*Department of Agricultural Chemistry, Sylhet Agricultural University, Sylhet 3100, Bangladesh*

Abstract

The experiment was conducted in the research field of Society and Human Development Organization, Tangail (SAHDOT) during November 2013 to March 2014 to investigate the morphological characteristics of rapeseed varieties Tori-7, SAU Sharisha-1 and Sampad. The seeds were grown under field condition and the vegetative and reproductive characteristics of the cultivars were determined. Data on different characteristics were recorded to find out the differences for different cultivars of rapeseed (*Brassica campestris)*. The highest plant height (98.30 cm) was recorded for the SAU Sharisha-1, while the lowest (80.05 cm) was recorded for Sampad. The maximum number of primary branches plant^{-1} (9.90) was recorded for the SAU Sharisha-1 and while the minimum (7.80) was recorded for Sampad. The minimum number of secondary branches plant^{-1} (4.80) was recorded for cultivar SAU Sharisha-1. The maximum number of siliqua plant^{-1} (232.00) was recorded for the SAU Sharisha-1 and the minimum number of siliqua (142.00) was recorded for Sampad. The longest length of siliqua (4.60 cm) was recorded for the SAU Sharisha-1, while the shortest length of siliqua (3.65 cm) was recorded for Sampad. The maximum number of seeds siliqua^{-1} (17.63) was recorded for cultivar SAU Sharisha-1, while the minimum (12.25) was recorded for Tori-7. The highest thousand seed weight (0.883 g) was recorded for the SAU Sharisha-1, while the lowest (0.212 g) was recorded for Sampad. The highest yield (1.17 t ha^{-1}) was recorded for the SAU Sharisha-1, while the lowest yield (0.89 t ha^{-1}) was recorded for Sampad.

Keywords: Rapeseed, *Brassica campestris,* Primary branch, Secondary branch, Siliqua

Introduction

The *Oleiferous Brassica* symbolized by rapeseed and rapeseed is one of the leading oilseed crops in Bangladesh. It is mainly self-pollinating crop, although on an average 7.5 to 30% out-crossing does occur under natural field conditions (Abraham, 1994; Rakow and Woods, 1987). In Bangladesh, sources of edible oil are rapeseed, sesame, groundnut, soybean, niger, linseed, sunflower and safflower. But rapeseed is one of the important oilseed crops in the world after soybean and palm (FAO, 2004). Rapeseed oil is widely used as cooking oil and medicinal ingredient and supplies fat in our daily diet. Oilseed crops play a vital role in human nutrition. It is used as a condiment, salad, green manure and fodder crop, and as a leaf and stem vegetable in the various rapeseed growing countries of the world. It is not only rich source of energy (about 9 Kcal g^{-1}) but also rich in fat soluble vitamins A, D, E and K. The National Nutrition Council (NNC) of Bangladesh reported that Recommended Dietary Allowance (RDA) capita^{-1} day^{-1} should be 6 g of oil for a diet with 2700 Kcal. On Recommended Dietary Allowance (RDA) basis, the edible oil need for 150 million people are 0.39 million tons of oil equivalent to 0.82 million tons of oilseed (NNC, 1984). Rapeseed oil is also used in food industry as an illuminant and lubricant and for soap manufacture. Residual rapeseed cake, though low in food value, used as livestock feed. Rapeseed oil has potential market in detergent lubrication oils, emulsifying agents, polyamide fibres, and resins, and as a vegetable wax substitute. Rapeseed and mustard are rich source of oil and contains 44% to 46% good quality oil (Rashid, 2013). In 2012-2013, the edible oil production from major oilseed crops in the world is 497.0 M. tons where rapeseed contributes 64.3 M. tons. The annual oil seed production of 0.41 million tons of which the share of rapeseed was 0.21 million tons, which comes

***Corresponding author: M D Hossain,** Department of Agribusiness, Atish Dipankar University of Science and Technology, Banani, Dhaka., E-mail: deluaradust@yahoo.com.*

about 52 % of the total edible oil seed production (BBS, 2005). Bangladesh is running with acute shortage of about 70% edible oil. Annually producing about 0.16 million tons of edible oil as against the requirement of 0.5 million tons and to meet up the demand, the country has to import oil and oilseeds to the tune of about 160 million US $ every year (Wahhab *et al*. 2002). At present, the oil seed production is about 0.26 million tons, which covers only 30% of the domestic need (BBS, 2011). In Bangladesh the seed yield of mustard is about 740 kg ha^{-1}, which is very low in comparison to other developed countries (2400 kg ha^{-1}) (FAO, 2011). Per capita consumption of edible oil is one of the lowest in the world (11 g $head^{-1}$ day^{-1}) which is one fifth of the recommended requirement for a balanced diet (FAO, 2011). The area for rapeseed and mustard is reduced from 0.784 million acres to 0.57 million acres in 2001 to 2009. The area reduces to 26.32% for the crop (Bhuiyan, 2012). Total area of mustard and rapeseed in the world is 34.33 million hectares (FAO, 2013). Among the oilseed crops, mustard and rapeseed is in the second position after soybean (FAO, 2014). The utilization of oil seed in Bangladesh is 1.8 million tons where 1.6 million tons is imported (FAO, 2013). The shortage of edible oil has become a chronic problem for the nation. Bangladesh requires 0.29 million tons of oil equivalent to 0.8 million tons of oilseeds for nourishing her people. But the oilseed production is about 0.254 million tons, which covers only 40% of the domestic need (FAO, 2001). As a result, more than 60% of the requirement of oil and oilseed has been imported every year by spending huge amount of foreign currency involving over 371 cores taka (BBS, 2012). The population of Bangladesh is increasing and economic prosperity has been growing fast, it is now a challenge for accelerating the production of edible oils. It is essential to reduce the import dependence of it to insulate the domestic market from the volatility of the world market (Hossain, 2013). There are only a few varieties of rapeseed in our country. So, to have self sufficiency in oil production we should develop high yielding rapeseed varieties. In this experiment three varieties of *Brassica* seed *viz.*, SAU Sharisha-1 (Released by Prof. S. R. Bhuiyan of Sher-e-Bangla Agricultural University), Tori-7 (BARI released) and Sampad (S-S 75, BARI released) were investigated. The present research work has been undertaken in order to analyze the different vegetative and reproductive characters of Tori-7, SAU Sharisha-1 and Sampad.

Materials and Methods

The experiment was conducted in the research field of Society and Human Development Organization, Tangail (SAHDOT) during November 2013 to March 2014 to investigate the variation in vegetative and reproductive characteristics of rapeseed varieties Tori-7, SAU Sharisha-1 and Sampad. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The experimental plot was opened in the first week of November 2013 with a power tiller, and was exposed to the sun for a week, after one week the land was harrowed, ploughed and cross ploughed several times followed by laddering to obtain a good tilth. Weeds and stubbles were removed, and finally obtained a desirable tilth of soil for sowing of *Brassica* seeds. The experimental plot was fertilized with at the rate of 10 tons of Cowdung, 250 kg Urea, 175 kg Triple Super Phosphate (TSP), 85 kg Muriate of Potash (MoP), 250 kg Gypsum, 3 kg Zinc Oxide and Boron 1 kg $hectare^{-1}$. The entire amount of TSP, MP, Gypsum, Zinc Oxide and Boron was applied during the final preparation of land. Urea was applied in two equal installments at before sowing and flowering. The half amount of urea was applied during final land preparation and the rest half amount of urea was applied as top dressing after 25 days of sowing. Field layout was done after final land preparation. The layout of the experiment was prepared for distributing the variety into the every plot of each block. The total area of the experiment was 784 m^2 (56 m×14 m). Each replication size was 56 m×3.5 m and the distance between replication to replication was 1 m. The *Brassica* seeds were sown in lines each having a line to line distance of 40 cm under direct sowing in the well prepared plot on 17 November 2013. The seeds were placed at about 1.5 cm depth in the soil. After sowing the seeds were covered with soil carefully so that no clods were on the seeds. When the seedlings started to emerge in the beds it was always kept under careful observation. After emergence of seedlings, various intercultural operations were accomplished for better growth and development of the *Brassica* seedlings. The crop was harvested depending upon the maturity of each variety. Harvesting was done manually. Enough care was taken for harvesting, threshing and also cleaning of *Brassica* seed.

Results and Discussion

Data were collected on the morphological characteristics of *Brassica* varieties Tori-7, SAU Sharisha-1 and Sampad, under the field condition. Data on different characteristics were recorded to find out the differences among different varieties of *Brassica campestris*. Statistically significant variation was recorded in the different characteristics of selected varieties. Rameeh (2013) evaluated twenty four rapeseed genotypes including two varieties and 22 advanced lines were based on Randomized Complete Block Design with three replications. Significant varietal

differences were exhibited for phonotypical traits, plant height, yield components and seed yield, indicating significant genetic differences among the genotypes.

Plant height

The height of plant was recorded in centimeter (cm) at harvest in the experimental plots. Data were recorded as the average of 10 plants selected at random from the inner rows of each plot after harvest. The height was measured from the ground level to the tip of the growing point of the main branch. Plant height of different *Brassica campestris* varieties are presented in Table 1 and found significant difference. The highest (98.30 cm) plant height was recorded for the SAU Sharisha-1, while the lowest (80.05 cm) was recorded for Sampad which was statistically similar (81.58 cm) with Tori-7. Plant height governed genetically. Usually different cultivar or variety showed different plant height. Management practices influences plant height but in control condition plant height may be more or less similar or identical for same variety in different replicated trial. It is an important yield contributing characters. Chowdhury *et al.* (2004) found dwarfness in Din-2 in *Brassica rapa* L.

Number of primary branches plant^{-1}

The total number of branches arisen from the main stem of a plant was counted as the number of primary branches plant^{-1}. Number of primary branches plant^{-1} of different *Brassica campestries* variety showed statistically significant differences. The maximum (9.90) number of primary branches plant^{-1} was recorded for the SAU Sharisha-1 and while the minimum (7.80) was recorded for Sampad which was statistically identical (8.70) with Tori-7 (Table 1). Number of primary branches directly influences number of siliqua plant^{-1} which is the ultimate results of maximum seeds plant^{-1} as well as maximum yield plant^{-1} and hectare^{-1}. Chowdhury *et al.* (2004) obtained more primary branches on sampad in *Brassica rapa* L.

Number of secondary branches plant^{-1}

The total number of branches arisen from the primary branches of a plant was counted as the number of secondary branches plant^{-1}. A statistically significant variation was recorded for number of secondary branches plant^{-1}. The minimum (4.80) number of secondary branches plant^{-1} was recorded for cultivar SAU Sharisha-1, while the maximum (8.20) was recorded for Tori-7 which was statistically identical (7.90) with Sampad (Table1). Maximum number of secondary branches ensured maximum siliqua and highest yield.

Number of siliqua plant^{-1}

The total numbers of siliqua of the randomly selected 10 plants of a plot were recorded and then average numbers of siliquae were estimated. Number of siliqua plant^{-1} of different *Brassica campestries* variety are presented in Table 2 and found that different variety showed a significant statistically differences. The maximum (232.00) number of siliqua plant^{-1} was recorded for the SAU Sharisha-1. On the other hand, the lowest (142.00) number of siliqua was recorded for Sampad which was statistically similar (147.00) with Tori-7. Number of siliqua is a varietal characters and different variety produced different number of siliqua. Chowdhury *et al.* (2004) found highest number of siliqua in Din-2 in *Brassica rapa* L. Acharya and Swain (2004) observed more siliqua in Pusa Bahar in *Brassica juncea* L.

Length of siliqua

Distance between the ends of the peduncle to the starting point of the beak was recorded as siliqua length and was presented in centemeter (cm). A statistically significant difference was recorded for length of siliqua of different *Brassica campestries* variety. The longest (4.60 cm) length of siliqua was recorded for the SAU Sharisha-1, while the shortest (3.65 cm) length of siliqua was recorded for Sampad which was statistically similar (3.80 cm) with Tori-7 (Table 2). Length of siliqua influences the number of seeds siliqua^{-1}. The longest length of siliqua produced maximum number of seeds siliqua^{-1} and the ultimate results is the highest yield. Chowdhury *et al.* (2004) found maximum seeds siliqua^{-1} in Dhali in *Brassica rapa* L. Acharya and Swain (2004) observed highest seeds siliqua^{-1} in Varuna in *Brassica juncea* L.

Number of seed siliqua^{-1}

Ten siliqua from each plant were selected randomly and number of seeds was counted and the average number of seed siliqua^{-1} was determined. A statistically significant variation was recorded for number of seed siliqua^{-1}. The maximum (17.63) number of seed siliqua^{-1} was recorded for cultivar SAU Sharisha-1, while the minimum (12.25) was recorded for Tori-7 (Table 2). Optimum vegetative growth ensured longest length of siliqua with maximum number of seed siliqua^{-1}. Proper management practices also influences the number of seed siliqua^{-1}. Helal *et al.* (2014) conducted an experiment to study genetic variability, correlation of yield and yield contributing characters and coefficient of variance in rapeseed. The results relevant that varieties produced the highest seed yields and 15% variation at genotypic and phenotypic level.

1000 seed weight

One thousand seeds were counted randomly from the total seeds of cleaned harvested seeds and then weighted in grams. Thousand seeds weight of rapeseed seed was determined at the condition of 13% moisture level. Thousand seed weight of different *Brassica campestries* variety are presented in Table 2. Different variety showed statistically significant variation under the experiment for 1000 seed weight. The highest (0.883 g) thousand seed weight was recorded for the SAU Sharisha-1, while the lowest (0.212 g) was recorded for Sampad which was statistically identical (0.232 g) with Tori-7.

Yield hectare $^{-1}$

Seed weight hectare^{-1} was measured by converted plot yield. Yield hectare^{-1} of different *Brassica campestries* varieties are presented in Table 2 and the presented data showed statistically significant differences for different cultivars that were used in this experiment. The highest yield (1.17 t ha^{-1}) was recorded for the SAU Sharisha-1, while the lowest yield (0.89 t ha^{-1}) was recorded for Sampad which was statistically similar (0.94 t ha^{-1}) with Tori-7. Among the varieties the entire yield contributing characters is higher in cultivar SAU Sharisha-1 which also ensured the highest yield comparing the other variety.

Table 1. Vegetative characteristics of Tori-7, SAU Sharisha-1 and Sampad of *Brassica campestris*

Name of the variety	Plant height (cm)	No. of Primary branches plant^{-1}	No. of Secondary branches plant^{-1}
Tori-7	81.58 b	8.70 b	8.20 a
SAU Sharisha-1	98.30 a	9.90 a	4.80 b
Sampad	80.05 b	7.80 b	7.90 a
$LSD_{(0.05)}$	6.589	1.112	0.399
CV (%)	3.76	6.19	2.87

In a column, means having similar letter(s) are statistically similar and those having dissimilar letter(s) differed significantly as per 0.05 level of probability.

Table 2. Reproductive characteristics of Tori-7, SAU Sharisha-1 and Sampad of *Brassica campestris*

Name of the variety	Number of Siliqua plant^{-1}	Length of siliqua (cm)	Number of Seed siliqua^{-1}	1000 seed weight (g)	Yield hectare^{-1} (ton)
Tori-7	147.00 b	3.80 b	13.37 b	0.232 b	0.94 b
SAU Sharisha-1	232.00 a	4.60 a	17.63 a	0.883 a	1.17 a
Sampad	142.00 b	3.65 b	12.25 b	0.212 c	0.89 b
$LSD_{(0.05)}$	23.47	0.433	2.280	0.19	0.126
CV (%)	6.76	5.38	4.92	3.52	6.35

In a column, means having similar letter(s) are statistically similar and those having dissimilar letter(s) differed significantly as per 0.05 level of probability.

The findings of the experiment indicated that the highest (0.883 g) thousand seed weight was recorded for the SAU Sharisha-1, while the lowest (0.212 g) was recorded for Sampad. The highest yield (1.17 t ha^{-1}) was recorded for the

SAU Sharisha-1, while the lowest yield (0.89 t ha^{-1}) was recorded for Sampad. So it can be concluded from the above study that comparatively better yield can be obtained by cultivated SAU Sharisha-1 among the three varieties.

References

Abraham V. 1994. Rate of out-crossing in Indian mustard, *Brassica juncea*. Cruciferae Newsl. 16: 69-70.

Aaharya N N and Swain D. 2004. Combining ability analysis of seed yield and its components in Indian mustard (*Brassica juncea* L.). Indian J. Agril Res. 38(1):40-44.

BBS. 2005. Monthly Statistical Bulletin of the Bangladesh Bureau of Statistics (August). Administration and MIS Wing, Bangladesh Secretariat, Dhaka. p. 280.

BBS. 2011. Handbook of Agricultural Statistics, December 2010. Bangladesh Bureau of Statistics (BBS), Ministry of Planning Govt. People's Republic Bangladesh. 14p.

BBS. 2012. Statistical year book of Bangladesh, Bangladesh Bureau of statistics, Dhaka, Bangladesh.322p.

Bhuiyan M S R. 2012. Research and development of oilseed: past, present, and future. Proc. Nat. Work on research achievement of past ten years of pulses and oilseeds and future research strategy for sustainable crop production, Mar.20-21, BARC, Dhaka, Bangladesh. pp. 23-41.

Chowdhury M A Z, Miaa M A K, Akbar M A and Alam M Z . 2004. Combining ability for seed yield and yield contributing characters in turnip rape (*Brassica rapa* L.). Bangladesh J. Pl. Breed. Genet. 17 (1): 17-24.

FAO. 2001. Production year book for 1999. Food and Agricultural Organization of United Nations, Rome 00108, Italy. pp.118.

FAO. 2004. Production Year Book. Food and Agricultural of the United Nations Rome, Italy. 82: 190-193.

FAO. 2011. FAO Production Year Book. Basic data unit, Statistic Division, FAO Rome, Italy.

FAO. 2013. Food and Agriculture Organization of the United Nations, FAOSAT, FAO Statistics Division.

FAO. 2014. Food and Agriculture Organization of the United Nations, Trade and Market Division. Food outlook. 33-102.

Helal M M U, Islam M N, Kadir M and Miah M N H. 2014. Genetic variability, correlation and path analysis for selection of mustard (*Brassica spp.*). Eco-friendly Agril. J. 7(12):176-181.

Hossain M D. 2013. Food for the poor: achievement and challenges. The Daily Star, March 20.

NNC. 1984. Nutrition Policy for Bangladesh. National Nutrition Council, Bangladesh. pp. 28-29.

Rakow G and Woods D L. 1987. Outcrossing in rape and mustard under Saskatchewan prairies conditions. Can. J. Plant Sci. 67: 147-151.

Rameeh V. 2013. Multivariate analysis of some important quantitative traits in rapeseed (*Brassica napus* L.) advanced lines. J. oilseed Brassica, 4(2):75-82.

Rashid A. 2013. "Rapeseed", Pakistan Agricultural Research Council. [Online]. Available:http://www.parc.gov.pk/1subdivision/narccsi/csi/rapeseed.htm1.

Wahhab M A, Mondal M R I, Akbar M A, Alam M S, Ahmed M U and Begum F. 2002. Status of oil crops production in Bangladesh. Oil Research Centre BARI, Joydevpur, Gazipur. pp. 4-6.