Middle-East Journal of Scientific Research 5 (5): 388-391, 2010
ISSN 1990-9233

Growth of Different Soybean (*Glycine max* L. Merril) Varieties as Affected by Sowing Dates

[1]M.S. Ahmed, [1]M.M. Alam and [2] Mirza Hasanuzzaman

[1]Improved Livelihood for Sidr-Affected Rice Farmers (ILSAFARM) project,
International Fertilizer Development Center (IFDC), Bangladesh,
[2]Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh

Abstract: An experiment was carried out to find out the effect of sowing date and variety on the growth of soybean. Five sowing dates viz. 7 November, 27 November, 16 December 06, 7 January and 27 January, 07 and 3 soybean varieties viz. Bangladesh soybean-4 (G-2), Shohag (PB-1) and BARI soybean-5 (BS-5) were included in the experiment as treatment. The experiment was conducted in split-plot design with three replications. The result revealed that the plant height, number of nodes plant^{-1} and branches plant^{-1} were significantly affected by sowing date. The tallest plant(55. 12 cm), highest nodes plant^{-1} (13.98) and branches plant^{-1} (2.71) was found with 16 December sowing. The lowest plant height (44.67 cm) was found 27 November sowing. The lowest nodes plant^{-1} (9.13) and branches plant^{-1} (0.42) were found with 7 November sowing. Plant height, nodes plant^{-1} and branches plant^{-1} were also significantly affected by the variety. The tallest plant (67.70 cm), highest nodes plant^{-1} (14.25) and branches plant^{-1} (2.19) were found in the variety G-2. The lowest (40.04 cm) and branches (1.40) were found in variety BS-5 and lowest nodes plant^{-1} (10.85) was found in PB-1. In aspect of vegetative characters (plant height, nodes plant^{-1} and branches plant^{-1}) both PB-1 and BS-5 are statistically identical. In those aspects the interaction effect of sowing date and variety plant height was non-significant but nodes plant^{-1} and branches plant^{-1} were significant. The highest nodes plant^{-1} (15.46) was found in variety G-2 with 16 December sowing and highest branches plant^{-1} (2.96) was found in same variety on 27 January sowing. The lowest nodes plant^{-1} (7.16) and branches plant^{-1} (0.16) were found in BS-5 with 7 November sowing which were also statistically identical with PB-1 in same sowing date.

Key words: Plant height · Branching · Soybean · Vegetative growth · Sowing time

INTRODUCTION

Soybean (*Glycine max* L. Merril) is the most important oil seed crop. A lot of amount of element are present in soybean for physical development and nutrition. From various nutritious crops soybean is one of them. It has a tremendous value in agriculture as a good source of high quality plant protein and vegetable oils in one hand and nitrogen fixation ability on the other hand. It is quite wide spread in different region of the world and grows well from the tropics to the temperate zones. The crop is grown through out the world with the largest production in United States, China, Brazil, Indonesia, Japan, Korea and Argentina. Soybean has a great role in agriculture as food, feed, national income etc. soybean seed contains about 40-45% protein, 20-22% oil, 20-26% Carbohydrate and a high amount of Ca, P and vitamins [1]. Soybean oil is cholesterol free and easily acceptable in diet. Soybean can be used for making nutritious food items like- soymilk, soycake, kendies, biskuts etc. It is also used as raw materials in various industries viz. Burnish, paint, soap, medicine and poultry feed industries.

Soybean plants can fix atmospheric nitrogen by the formation of nodule in their roots so no need extra N application from out side and also required less amount of N for next crop. It grows well in unfertile land and used as green manure. In the aspect of cost of production, time of ripening and yield it is more beneficial than mustard, sesame or pulse crops [2].

Corresponding Author: Mirza Hasanuzzaman, Department of Agronomy, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh, E-mail: mhzsauag@yahoo.com

Soybean is new prospective crop in Bangladesh. It can be cultivated throughout the year. The world average yield of soybean is about 3 t ha^{-1} while that in Bangladesh 1.2 t ha^{-1} [3] compared to other soybean producing countries. This is mainly due to use of low yield potential varieties and poor agronomic management practices. Among the agronomic practice sowing date have remarkable influence on soybean yield. The yield is largely affected by yield contributing characters which are influenced by environment during the growth and development of the crop in different sowing date.

The research in this line is highly scarce in Bangladesh. Therefore, the present study was undertaken to find out the effect of sowing date, variety and their interaction on the vegetative growth of soybean plant.

MATERIALS AND METHODS

The experiment was conducted during the period from November 2006 to May 2007 to find out the effect of sowing date and variety on the soybean seed yield and quality. During this period the maximum temperature ranged from 17.0°C to 37.0°C and the minimum temperature ranged from 6.0 °C to 26.4 °C and the average temperature ranged from 14.3 °C to 31.6°C. The maximum and minimum air humidity was from 64 to 97%.

Five sowing dates viz. 7 November (S_1), 27 November (S_2), 16 December 06 (S_3), 7 January (S_4) 27 January (S_5). Three soybean varieties viz. Bangladesh soybean-4 (G-2) (V_1), Shohag (PB-1) (V_2) and BARI soybean-5 (BS-5) (V_3) were included in the experiment as treatment. The experiment was laid out in a split-plot design with three replications. The sowing dates were allocated in the main plot and varieties in the sub-plots. The unit plot size was 4.0 m×2.5 m. The spaces between tow main plots and that between tow sub-plots were 1 m and 0.50 m, respectively.

The experimental land was opened with a power tiller and then ploughed twice with a country plough followed by laddering to achieve a medium tilth. The land was fertilized with N, P_2O_5, K_2O and S @ 50, 150, 100 and 100 kg ha^{-1} respectively were applied in the form of Urea, Triple Super Phosphate, Muriate o f Potash and Gypsum during final land preparation at each sowing date. The seeds of soybean varieties were sown at 25 cm apart rows using of 50 kg seeds for G-2, 60 kg for PB-1 and 60 kg for BS-5, ha^{-1}. High seed rate was used to ensure adequate plant population in each plot. Intercultural operations such as weeding, thinning, spraying of insecticide and fungicide were done uniformly, in all plots. Weeding were done tow times at 15 & 35days after sowing (DAS) and thinning at final weeding . Finally plant to plant distance in each row was kept 5 cm. No irrigation was required in the field. Soybean plants were infested by hairy caterpillar and cutworm at the early growth stage which were controlled by spraying Dimethion 50 EC @ 35 ml a.i. with 10 li. water for 5 decimal land.Powdery mildew, root rot of soybean and rust disease were found which were controlled by the spraying tilt @ of 5 ml in 10 litter water for one acre of land.

The crop was harvested from the central 4.5 m^2 area with sickle at full maturity (i.e. when 95% pods become brown). PB-1 and BS-5 were shown early maturity than G-2. within 110-120 DAS all plants became mature. The height of sample plant s were measured from the ground level to the tip of main shoot and mean plant height was recorded (cm). The number of visible nodes on main stem were counted. All the branches present on ten sample plants were counted and were averaged.

Table 1: Records of meteorological observation (monthly) for the period of experiment (November 2006-May 2007)

	Air temperature (°C)					
Month	Max.	Min.	Avr.	Average relative humidity (%)	Total Rainfall (mm)	Sunshine hours
November 2006	28.88	18.30	23.59	86.07	0.2	153.84
December 2006	26.22	13.48	19.85	85.19	0.00	129.43
January 2007	23.66	10.80	17.22	82.90	0.00	114.96
February 2007	25.41	15.73	20.57	81.11	55.20	148.40
March 2007	29.13	17.77	23.45	75.42	18.5	218.23
April 2007	30.44	22.16	26.30	28.40	207.9	186.09
May 2007	33.35	24.77	29.05	79.74	96.8	220.46

Data were analyzed using analysis of variance (ANOVA) technique and the mean differences were adjudged by Duncan's Multiple Range Test [4] with the help of a computer based statistical package programme M-STAT-C. In case of Abnormal Seedlings %, the data were transformed by squire root transformation technique.

RESULTS AND DISCUSSION

Plant Height: Plant height varied significantly due to sowing dates (Table 2). The tallest plant (55.12 cm) was recorded from 16 December sowing and the shortest plant (44.67 cm) from 27 November sowing (Table 3). Ponnuswamy *et al.* [5] showed that plant height was influenced by sowing date. Halvanker *et al.* [6] observed that the plant height varied for different sowing dates and the highest plant height (52.3 cm) was obtained with the 5 February sowing.

The plant height varied significantly among the varieties (Table 2). The tallest plant (67.70 cm) was observed in G-2. The lowest height was found in variety BS-5 (40.04 cm) which was statistically identical with PB-1 (42. 32 cm) (Table 3). Similar reports are presented by Ponnuswamy *et al.* [5] who observed that plant height differed between varieties having taller plant s in variety Co-1 (50.3 cm) compared with variety PK-472 (38.8 cm). The plant height variation among the varieties might be related to their genetic make up.

However, there was no significant effect of interaction between sowing date and variety on plant height (Table 4).

Number of Nodes Plant^{-1} : There was significant variation in number of nodes plant^{-1} among the sowing dates (Table 2). The highest number of nodes plant^{-1} (13.9) was found in the sowing date with 16 December which was statistically identical with 27 January sowing and the lowest nodes plant^{-1} (9.13) was found with 7 November sowing (Table 3). The result shows that the number of nodes plant^{-1} was increased with each successive delay in sowing after 7 November up to 16 December and further delay in sowing after 16 December the number of nodes plant^{-1} again started to decreased.

The number of nodes plant^{-1} differed significantly among the varieties (Table 2). It was found that G-2 had highest number of nodes plant^{-1}(14.25) than those of two varieties (PB-1&BS-5) (Table 3).On an average G-2 produced 24 and 22% more nodes plant^{-1} compared with PB-1 and BS-5 respectively.

Table 2: Summary of analysis of variance (mean square value) on vegetative characters of soybean

Source of variance	Degree of freedom	Plant height (cm)	No. of nodes plant^{-1}	No. of branches plant^{-1}
Replication	2	690.592	6.801	0.164
Sowing Dates	3	187.912*	40.989**	8.052**
Error	6	32.366	0.402	0.104
Varieties	2	2829.390**	42.614**	2.455**
Sowing Date× Variety	6	28.577NS	5.017**	0.520**
Error	16	19.272	0.645	0.085

NS =Non significant *= Significant at 5% level of probability **= Significant at 1% level of probability

Table 3: Effect of sowing date and variety on vegetative characters of soybean

Treatment	Plantheight (cm)	Number of nodes plant $^{-1}$	Number of branches plant $^{-1}$
Sowing date			
7 November 06	48.15bc	9.13c	0.42c
27 November 06	44.67c	12.00b	1.66b
16 December 06	55.12a	13.98a	2.71a
27 January 07	52.14ab	13.23a	1.87b
S$\bar{x}$	1.8964	0.2114	0.1077
Level of significance	*	**	**
CV(%)	11.376	5.244	19.322
Variety			
G-2	67.70a	14.25a	2.19a
PB-1	42.32b	10.85b	1.41b
BS-5	40.04b	11.15b	1.40b
S$\bar{x}$	1.2673	0.2319	0.0840
Level of significance	**	**	**
CV(%)	8.78	6.64	17.42

In a column, figures with similar letter or without letter (s) do not differ significantly as per DMRT

*= Significant at 5% level of probability

**= Significant at 1% level of probability

Table 4: Interaction effect of sowing date and variety on vegetative characters of soybean

Treatment	Plantheight (cm)	Number of nodes plant $^{-1}$	Number of branches plant^{-1}
Sowing date × variety			
7 November 06 ×G-2	70.15	12.90cd	0.80de
7 November 06 ×PB-1	37.28	7.33g	0.30ef
7 November 06 ×BS-5	37.03	7.16g	0.16f
27 November 06 ×G-2	60.12	14.83ab	2.33b
27 November 06 ×PB-1	36.34	10.26f	1.30cd
27 November 06 ×BS-5	37.55	10.90ef	1.367c
16 December 06× G-2	72.42	15.46a	2.66ab
16 December 06× PB-1	49.59	13.56bcd	2.70ab
16 December 06× BS-5	43.35	12.93cd	2.76ab
27 January 07×G-2	68.13	13.83dc	2.96a
27 January 07×PB-1	46.08	12.26de	1.36c
27 January 07×BS-5	42.23	13.60bcd	1.30cd
S $\bar{x}$	2.5346	0.4638	0.1679
Level of significance	NS	**	**
CV(%)	8.78	6.64	17.42

In a column, figures with similar letter (s) or without letter do not differ significantly as per DMRT.
NS =Non significant
** Significant at 1% level of probability

There was significant difference due to interaction of sowing date and variety on number of nodes plant^{-1} (Table 2). The highest number of nodes plant^{-1} (15.46) was found in G-2 with 16 December sowing which was statistically identical with 27 November sowing in same variety. The lowest number (7.16) was found in BS-5 with 7 November sowing. Also BS-5 was statistically identical with PB-1 at same sowing date (Table 4).

Number of Branches Plant^{-1}: The number of branches Plant^{-1} was affected significantly by sowing date (Table 2). The highest number of branches plant^{-1} (2.71) was produced when sown 16 December and the lowest number of branches plant^{-1} (0.42) was found with the crop sown 7 November (Table 3). Shafshak *et al.,* [7] observed that number of branches plant^{-1} was influenced by sowing date.

There was significant difference due to the effect of variety on branches plant $^{-1}$ (Table 2). The highest branches plant^{-1} (2.19) was found in the variety G-2 and the lowest branches plant^{-1} (1.40) was found in the variety BS-5 which is also statistically identical with PB-1 (Table 3). Saad [8] observed that the variety Clark produced the highest number of branches plant^{-1} compared with varieties Evans, William-82, Crawford and Colombus.

The significant variation was observed in number of branches plant^{-1} due to interaction effect of sowing date and variety (Table 2). The highest number of branches plant^{-1} (2.96) was found in variety G-2 in 27 January sowing. It was statistically identical with all varieties of in 16 December sowing. The lowest number of branches Plant^{-1} (0.16) was found in BS-5 with 7 November sowing which was also statistically identical with PB-1 at same sowing date (Table 4).

REFERENCES

1. Rahman, L., 2001. Soybean: Production and Food Use Technology (in Bangla) BAU-USDA Soyabean Project. Department of Genetics and Plant Breeding, Mymensingh, pp: 1-24.
2. Ali, M., 1978. Soybean. Bangladesh Agricultural Research Council. Dhaka. pp: 2-3.
3. Woodruff, M.J., 1998. Reports on the soybean: Its Status and Potential for Bangladesh. Agrobased industries and Technology Development project (ATDP). May 1998. Ministry of Agriculture and International Fertilizer Development. Centre. (IFDC).
4. Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedures in Agricultural Research.2nd edition. Wiley, New York. pp: 680
5. Ponnuswamy, K., P. Santhi, R. Durai and M. Subramanian, 2001. Response of soybean varieties to various dates of sowing. J. Ecobiol., 13(1): 17-21.
6. Halvankar, G.B., S.P. Taware and V.M. Raut, 2001. Respone of soybean varieties to sowing dates during summer. J. Maharashtra. Agril. Univ., 26(2): 223-224.
7. Shafshak, K.S.E., G.M.S. EI-Din, M.S. Hasaan and M.S.A. Mohamed, 1997. Evaluation of six soybean genotypes under deferent population densities and two sowing dates. Ann. Agril. Sci. Moshtohor, 35(1): 115-130.
8. Saad, A.M.M., 1995. Statistical studies of some economic characters in keratin soybean varieties Ann. Agril. Sci., 32(2): 551-557.