American-Eurasian Journal of Scientific Research 5 (3): 183-186, 2010
ISSN 1818-6785

Pod Development in Different Soybean (*Glycine max* L. Merril) Varieties as Affected by Sowing Dates

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Abstract: The effect of different sowing dates and variety on the pod development of soybean crop was observed in an experiment with. 5 sowing dates viz. 7 November, 27 November, 16 December, 7 January and 27 January; and 3 soybean varieties viz. Bangladesh soybean-4 (G-2), Shohag (PB-1) and BARI soybean-5 (BS-5). The experiment was conducted in split-plot design with three replications. Highest number of pod plant^{-1} (39.85) and fertile pods plant^{-1} were observed with 16 December sowing while 7 November sowing showed the lowest no. of pods. However, non-fertile pods plant^{-1} (7.17) was found with 27 January sowing and highest seeds pod^{-1} with 27 November sowing. The highest pods plant^{-1} (35.94), fertile pods plant^{-1} (32.87), seeds pod^{-1} (2.09) were found in the variety G-2 and the highest no. of non-fertile pods plant^{-1} (4.47) was produced by BS-5. The interaction effect of sowing dates and varieties were also significant and hence 16 December sowing coupled with G-2 variety gave the best performances regarding pod development and seed production.

Key word: Missing

INTRODUCTION

Soybean occupied the top position as oil source in the world. Soybean oil is very popular as cooking oil but our country is fully depends on import. The production of soybean is very negligible (around only 3000 MT. per year) compared to its lodge demand. Bangladesh has to import soybean cooking oil with US $ 180 million and soybean meal about US$ 25.51 million per year [1].

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 [2]. Soybean oil is cholesterol free and easily acceptable in diet. Soybean plants 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, til or pulse crops [3].

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} [4] 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 study the effect of sowing and variety on the pod development of soybean.

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%.

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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

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 of 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 and 35 days 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. Randomly selected ten pods were taken from each sample plants and average number of seeds pod^{-1} was determined. The pods contains at least one seed were counted as fertile pods. The number of pods having no seeds or with seeds <4 mm diameter were counted as non-fertile pods.

Data were analyzed using analysis of variance (ANOVA) technique and the mean differences were adjudged by Duncan's Multiple Range Test [5] 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

Number of Pods $Plant^{-1}$: Due to the effect of sowing date the number of pods $plant^{-1}$ was significantly affected (Table 2). The highest number of pods $plant^{-1}$ (39.85) was found 16 December sowing which was statistically identical with 27 January. The lowest number of pods $Plant^{-1}$ (9.68) with 7 November sowing (Table 3). The result shows that the number of pods $plant^{-1}$ 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 pods $plant^{-1}$ again started to decreased. Ehsanullah *et al.* [6] observed that number of pods $plant^{-1}$ was significantly affected by sowing date and was highest of the 19 May sowing.

Due to the effect of variety the number of pods $plant^{-1}$ was affected significantly (Table 2). The highest number of pods $plant^{-1}$ (35.94) was found in variety G-2 and the lowest number of $plant^{-1}$ (23.95) was found in variety PB-1 which was statistically identical with BS-5 (Table 3). The result shows that G-2 produce 33 and 32% higher pods $plant^{-1}$ than PB-1 and BS-5. respectively.

Table 2: Summary of analysis of variance (mean square value) on yield and yield attributes of soybean

Source of variance	Degree of freedom	Pods Plant^{-1}	No. of fertile pods plant^{-1}	No. of non fertile pods plant^{-1}	No. of seeds pod^{-1}
Replication	2	8.762	19.397	0.267	0.020
Sowing date	3	1675.864**	1182.247**	69.593	0.275*
Error	6	2.275	3.947	0.124	0.042
Variety	2	553.272**	627.297**	6.829**	0.813**
Sowing date × Variety	6	67.116**	45.532**	9.622**	0.071*
Error	16	12.053	10.618	0.213	0.020

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

Table 3: Effect of sowing date and variety on the yield attributes and yields of soybean

Treatment	Total Pods plant^{-1}	No. of fertile pods plant^{-1}	No. of non fertile pods plant^{-1}	No. of seeds pod^{-1}
Sowing date				
7 Nov	9.68c	9.26d	0.45d	1.61c
27 Nov	26.0b	23.11c	2.93c	2.03a
16 Dec	39.85a	36.00a	3.85b	1.77b
27 Jan	36.87a	29.77b	7.17a	1.75b
S$\bar{x}$	0.5028	0.6623	0.1175	0.0684
Level of significance	**	**	**	*
CV (%)	5.366	8.096	9.765	11.423
Variety				
G-2	35.94a	32.87a	3.12b	2.09a
PB-1	23.95b	20.76b	3.21b	1.68b
BS-5	24.41b	19.97b	4.47a	1.60b
S$\bar{x}$	1.0022	0.9406	0.1333	0.0408
Level of significant	**	**	**	**
CV (%)	12.35	13.28	12.81	7.87

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

NS= Not significant, *= Significant at 5% level of probability, **= Significant at 1% level of probability

Table 4: Interaction effect of sowing date and variety on the yield attributes and yield of soybean

Treatment	Total Pods Plant^{-1}	No. of fertile pods plant^{-1}	No. of non fertile pods plant^{-1}	No. of seeds pod^{-1}
7 Nov. × G-2	19.46d	18.53de	0.93i	1.76bc
7 Nov. × PB-1	5.30e	5.23f	0.16i	1.59cd
7 Nov. × BS-5	4.30e	4.03f	0.26i	1.48d
27 Nov. × G-2	40.03ab	35.66ab	4.36cd	2.30a
27 Nov. × PB-1	16.26d	14.20e	2.06h	1.88b
27 Nov. × BS-5	21.70d	19.46de	2.36gh	1.91b
16 Dec. × G-2	42.83a	39.80a	3.03fg	2.31a
16 Dec. × PB-1	38.16abc	34.76abc	3.40ef	1.53cd
16 Dec. × BS-5	38.56abc	33.43bc	5.13c	1.47d
27 Jan. × G-2	41.43ab	37.50ab	4.16de	1.99b
27 Jan. × PB-1	36.10bc	28.86c	7.23b	1.73bcd
27 Jan. × BS-5	33.10c	22.96d	10.13a	1.55cd
S$\bar{x}$	2.0044	1.8813	0.2667	0.0816
Level of significance	**	**	**	*
CV (%)	12.35	13.28	12.81	7.87

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

NS= Not significant, *= Significant at 5% level of probability, **= Significant at 1% level of probability

Due to the interaction effect of sowing date and variety the number of pods plant^{-1} was significantly affected (Table 2). The highest number of pods plant^{-1} (42.83) was found in variety G-2 sown 16 December and the lowest number (4.30) was found in BS-5 on 7 November sowing. Which was statistically identical with PB-1 at same sowing date (Table 4).

Number of Fertile Pods Plant^{-1} : The significant variation was found due to the effect of sowing date in fertile pods plant^{-1} (Table 2). The highest number of fertile pods plant^{-1} (36.00) was found with 16 December sowing and the lowest number (9.26) was found with 7 November sowing (Table 3). The result shows that the number of fertile pods 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 fertile pods plant^{-1} again started to decreased.

The effect of variety on number of fertile pods plant^{-1} was significant (Table 2). The highest fertile pods plant^{-1} (32.87) was found in variety G-2 and the lowest number (19.97) was found in BS-5. PB-1 was statistically identical with BS-5 (Table 3). The result shows that G-2 produce 37 and 39% higher fertile pods plant^{-1} than PB-1 and BS-5 respectively.

Due to the interaction effect of sowing date and variety the fertile pods plant^{-1} was significantly affected (Table 2). The highest fertile pods plant^{-1} (39.80) was found in variety G-2 with 16 December sowing and the lowest number (4.03) was found in BS-5 with 7 November sowing which was statistically identical with PB-1 in same sowing date (Table 4).

Non Fertile Pods Plant^{-1}: The significant result was fond in non fertile pods plant^{-1} by the sowing date (Table 2). The highest number of non fertile pods plant^{-1} (7.17) was found in 27 January sowing and the lowest number (0.45) in 7 November sowing (Table 3). The result shows that the number of fertile pods plant^{-1} was increased with each successive delay.

Variety had significant influence on number of non-fertile pods plant^{-1} (Table 2). The highest number of non fertile pods plant^{-1} (4.47) was found in BS-5 and the lowest number (3.12) in G-2, also it is statistically identical with PB-1(Table 3). The result revealed that the production of non fertile pods plant^{-1} was more in BS-5 compared with G-2 and PB-1.

The significant variation was found due to the interaction effect of sowing date and variety on non fertile pods plant^{-1} (Table 2). The highest number of non fertile pods plant^{-1} (10.13) was found in variety BS-5 with 27 January sowing on the lowest number (0.16) in PB-1 with 7 November, which is also statistically identical with G-2 and BS-5 on same sowing (Table 4).

Number of Seeds Pod^{-1}: There was significant influence on seeds pod^{-1} by sowing date (Table 2). The highest seeds pod^{-1} (2.03) was found in 27 November sowing and the lowest number (1.61) in 7 November sowing (Table 3).

The significant result was found on seeds pod^{-1} due to the effect of variety (Table 2). The highest seeds pod^{-1} (2.09) was found in G-2 and the lowest number (1.60) in PB-1, which was statistically identical with BS-5 (Table 3).

The interaction effect of sowing date and variety on seeds pod^{-1} was found significant (Table 2). The highest seeds pod^{-1} (2.31) was found in the variety G-2 with 16 December sowing. Also the 27 November sowing of same variety was statistically identical. The lowest seeds pod^{-1} (1.47) was found in the variety BS-5 with 16 December sowing which was also statistically identical with 7 November sowing (Table 4).

REFERENCES

1. Khan, M.R., 2003. Role of agrobased industry for national economic development. Key note paper presented in workshop organized by Agriculturists' Forum of Bangladesh. 24 July, 2003, Dhaka.
2. 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.
3. Ali, M., 1978. Soybean. Bangladesh Agricultural Research Council. Dhaka. pp: 2-3.
4. 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).
5. Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedures in Agricultural Research. 2nd edition. Wiley, New York. pp: 680
6. Ehsanullah, J.B., H. Mir, S.K. Khalie and S. Zahir, 1989. Effect of different sowing dates on yield and yield components of 20 soybean cultivars. Sarhad J. Agric., 5(1): 15-19.