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Performance of two soybean varieties in Noakhali region

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ABSTRACT

The crop Soybean has a lot of impending possibility in Bangladesh but in present the production is not sufficient due to use of low yield potential varieties, poor agronomic management practices, climatic conditions, pest concerns and low fertility requirements. The study was aimed to find out the best yielding varieties suited for Noakhali region among the available varieties. A field experiment was conducted at Halim bazar, Suborno Char, Noakhali, a coastal district of southern Bangladesh, during Rabi season 2017-2018 to evaluate the growth and yield performance of BARI Soybean-5 and another BARI released archaic variety named Shohag. Ten replication combinations were tested. The experiment was laid out in randomized complete block design (RCBD) with ten replications. There were significant differences among the different treatment combination in terms of growth and yield contributing characters. The highest seed yield was obtained from BARI Soybean-5 (1.75t/ha) and lowest seed yield was obtained from the local variety named Shohag (1.41t/ha). The overall results indicated that selection of modern variety BARI Soybean-5 produced the maximum seed yield of soybean in the char areas under Young Meghna Estuarine Floodplain soil (AEZ-16) of Bangladesh.

INTRODUCTION

Soybean (*Glycine max*) is an herbaceous annual legume with short growth duration due to its sensitivity to short day length. It's also known as an important grain legume of the world and a new prospective crop for Bangladesh (Rahman et al., 2011). Soybean has been classifying more as an oil seed crop rather than as a pulse (Devi et al., 2012). Soybean seed contain 40-42% good quality protein and 18-22% oil, depending upon genetic and environmental factors (Krishnann, 2000). It also has diabetic, medical, industrial and agricultural importance (Hossain et al., 1992). The expansion of cultivation about the high nutrient status of soybean as a human food is increasing in Bangladesh (Mannan et al., 2012).

Bangladesh has to import 1.8 million tons of soybean cooking oil in each year at the cost of more than 1.5 billion USD and soybean meal with about 25.51 million USD per year (Quaiyum et al., 2015). Out of total oil copped area in our country, soybean occupies 15,5351 acres and production of soybean is 96,921 metric tons (BBS, 2017). This crop can accomplish a great part of oil gap in our country.

Char lands of Bangladesh are not suitable for all crops and the nutrient status of char land is poor due to coarse textured soils, low water holding capacity, low nutrient capacity, river bank erosion and frequent flooding (Chowdhury et al., 2014). Soybean has the ability to fix atmospheric nitrogen through root nodule bacteria (*Bradyrhizobium japonicum)* and thus it enriches the soil fertility (Mahabal, 1986). It is reported that Bangladesh could meet 40 percent of its soybean oil demand by producing soybean locally (Anon, 2009). The newly recommended improved varieties of soybean have a wide range of maturity and different morphological disparities (Olufajo, 1992; Adeniyan et al., 2007). Ahmed et al. (2010) reported that rapid germination and even crop stands are crucial for attaining greater yield. Jin et al. (2010) observed that the yield increase is

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correlated with increasing pod number, while seed size and seeds per pod does not change greatly over time.

The crop Soybean has a lot of impending possibility in Bangladesh but in present the production is not sufficient. This is mainly due to use of low yield potential varieties, poor agronomic management practices, climatic conditions, pest concerns and low fertility requirements. By analyzing the soybean varieties and its yield contributing agronomic traits can give us a way to bond up this gap. Therefore, the present experiment has been undertaken to evaluate the growth and yield performance of soybean varieties in Noakhali region (char lands).

MATERIAL AND METHODS

Site description

This experiment was conducted during the period of 2017-2018 at Halim bazar, Suborno Char, Noakhali Sadar, Bangladesh. Geographically the experimental field was located in between 22°28' and 22°44' north latitudes and in between 90°59' and 91°20' east longitudes and the field belongs to the agro-ecological zone of the Young Meghna Estuarine Floodplain (AEZ-16). The experimental area remains under tropical climate and soil texture was sandy loam, maximum temperature was 34.3º C and minimum was 14.4º C annually. (According to the weekly meteorological data collected by Suborno Char Upazila Agriculture Extension Office)

Soybean varieties and experimental design

The experiment consisted of two varieties namely BARI Soybean-5 and another archaic BARI released variety named Shohag (released in 1991). The experiment was laid out in a randomized complete block design (RCBD) with ten replications for each variety. The size of the unit plot was 8m x 5m and net plot size was 800 m^2.

Growing condition

The crop was sown during mid December, 2017. The seeds were sown @ 60 kg ha^{-1} in line with the row to row and plant to plant spacing of 30 x 10 cm, respectively. The crop was fertilized with 20-50-45-3-1.5-1 $kgha^{-1}$of N-P-K-S-Zn-B, respectively. Half of the urea (in the form of N) and other fertilizers were applied at the final land preparation as basal dose. Rest of the urea fertilizer was applied after 25 DAS when first weeding was done.

Plant measurements and sampling

Parameters observed were plants per square meter, plant height, numbers of branch per plant, numbers of pod per plant, numbers of seed per pod, 100 seed weight and yield per ton per hectare.

Data analysis

The recorded data on the different parameters of the study were analyzed statistically using excel data sheet and SPSS software to find out the significance of the difference among the varieties.

RESULT AND DISCUSSION

Form the Table 1 and Table 2 it was observed that the average number of plant per square meter is 24 and 24.2 for BARI soybean-5 and Shohag, respectively which means that number of plant per square meter is more than BARI Soybean-5 although the coefficient of variation does not shows a good figure for shohag compared to BARI Soybean-5. From these tables it is clear that the average plant height of BARI Soybean-5 greater than variety Shohag and coefficient of variation is also less in BARI Soybean-5. Except number of branch per plant in Shohag all other plant characteristic's level are high in BARI Soybean-5 rather than Shohag. The average yield of BARI Soybean-5 is 1.752 ton per hector whereas the soybean variety Shohag average yield is 1.412 ton per hector which is quite less than BARI Soybean-5. Hence we can say that BARI Soybean-5 produce more soybean than Shohag.

Table 1: Descriptive statistics table of different plant characteristics of BARI Soybean-5

	Plant/ Square m	Plant height (cm)	No. of Branch /Plant	No. of pod/Plant	Pod Length (cm)	No of seed/ Pod	100 seed Weight (g)	Yield ton/ha
Average	24	42.54	1.568	36.22	2.957	1.942	10.83	1.752
St. dev.*	1.414	5.091	0.184	2.860	0.102	0.129	0.677	0.189
C.V.**	5.89%	11.9%	11.73%	7.89%	3.47%	6.65%	6.26%	10.8%

*Standard Deviation ; **Coefficient of variation

Table 2: Descriptive statistics table of different plant characteristics of Shohag

	Plant/ Square m	Plant height (cm)	No. of branch /plant	No. of pod/plant	Pod Length (cm)	No of seed/Pod	100 seed weight (g)	Yield ton/ha
Average	24.2	41.05	1.611	36.345	2.82	1.9	10.585	1.412
St. Dev.*	1.833	5.119	0.357	4.993	0.100	0.118	0.703	0.222
C.V.**	7.57%	12.47%	22.2%	13.74%	3.57%	6.23$	6.65%	15.7%

*Standard Deviation ; **Coefficient of variation

Table 3: Correlation table and pair wise significant test of the plant characteristics

		Plant per square	Plant height in cm	No. of branch per plant	No. of pod per plant	Pod length	No. of seeds per pod	100 seed weight in gm	Yield (ton) per hectare
Plant per square m	Correlation	1	-.172	-.184	.408	-.262	.033	-.186	.718*
	Sig. (2-tailed)		.634	.610	.242	.465	.928	.607	.019
Plant height in cm	Correlation	-.172	1	.243	-.284	.444	.536	-.337	-.510
	Sig. (2-tailed)	.634		.499	.426	.198	.111	.341	.132
No. of branch per plant	Correlation	-.184	.243	1	-.305	-.035	.344	.228	-.087

	Sig. (2-tailed)	.610	.499		.391	.924	.330	.526	.811
No. of pod per plant	Correlation	.408	-.284	-.305	1	-.020	-.536	-.297	.200
	Sig. (2-tailed)	.242	.426	.391		.957	.111	.404	.580
Pod length	Correlation	-.262	.444	-.035	-.020	1	.118	.060	-.394
	Sig. (2-tailed)	.465	.198	.924	.957		.745	.869	.260
No. of seeds per pod	Correlation	.033	.536	.344	-.536	.118	1	.183	-.132
	Sig. (2-tailed)	.928	.111	.330	.111	.745		.612	.716
100 seed weight in gm	Correlation	-.186	-.337	.228	-.297	.060	.183	1	.429
	Sig. (2-tailed)	.607	.341	.526	.404	.869	.612		.216
Yield (ton) per hector	Correlation	.718*	-.510	-.087	.200	-.394	-.132	.429	1
	Sig. (2-tailed)	.019	.132	.811	.580	.260	.716	.216	

* Correlation is significant at the 0.05 level (2-tailed)

Table 4: Paired sample t-test table

Paired Differences								
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Degrees of freedom	Sig. (2-tailed)
				Lower	Upper			
Yield in Shohag - Yield in BARI Soybean-5	.3400000	.2156128	.0681828	.1857599	.4942401	4.987	9	.001

The Table- 3 showed that there is no significant correlations between the plant characteristics accept plant per square and yield of soybean in ton per hector for soybean variety Shohag. Table-3 also showed that the p-value of aforementioned variables is 0.015 which is less than the assumed level of significance 0.05. Hence we can say that plant per square and yield in ton per hector are significantly correlated.

In the final stage a paired sample t-test was performed (Table 4) for testing the significant difference between the two varieties of soybean. It showed that the p-value is less than 0.05 which

indicate that the yield in two varieties have a significant difference. Hence finally we can conclude that BARI Soybran-5 is better than the soybean variety Shohag. Shaheenuzzamn et al. (2014) evaluate three varieties of soybean named BARI Soybean- 5, BARI Soybean-6 and Shohag and recorded that BARI Soybean-5 showed the highest number of pod per plant, the highest number of seeds per pod was found in Shohag. Among these three varieties the highest yield was obtained in variety BARI Soybean-6.

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