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EFFECT OF PLANTING DATES ON THE GROWTH AND YIELD OF SWEETPOTATO GENOTYPES AT SYLHET IN BANGLADESH

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Abstract

The study was conducted during September 2013 to March 2014 at the experimental field of Sylhet Agricultural University with a view to characterize and evaluate the growth and yield of three exotic sweetpotato genotypes *viz.* SP004, SP006 and SP007 planted at three dates *viz*., 1 September, 1 October and 1 November 2013 following randomized complete block design (Factorial) with three replications. Growth and yield of sweetpotato were largely influenced by genotypes. The highest number of storage roots plant^{-1} was recorded from the genotype SP006 (4.93) which were identical to SP004 (4.44). The corresponding highest storage root yield plant^{-1} (381.44 g) and hectare^{-1} (21.01 t) was also measured from the genotype SP006 while it was the lowest for SP007 (18.03 t ha^{-1}). Date of planting did not influence the growth and yield of sweetpotato significantly. Average storage root yield hectare^{-1} for 1 November planting was 20.5 t ha^{-1} followed by 1 October (20.13 t) and 1 September (18.36 t ha^{-1}) planting. However, among the genotypes, SP007 yielded the highest (22.5 t ha^{-1}) planted at 1 November followed by 1 October planting (21.9 t ha^{-1}). Similar yield was also exhibited by the genotype SP006 which produced 21.9 t and 21.6 t of storage root hectare^{-1} from 1 October and 1 November planting, respectively.

Keywords: Genotypes, planting dates, sweetpotato, yield.

Introduction

Sweetpotato *(Ipomoea batatas* L.), commonly known as "Misti Alu" in our country belongs to the family Convolvulaceae is an important starch rich root crop of Bangladesh. It covers about 58 thousand hectares of land in Bangladesh producing 7.20 lakh tones annually with an average yield of 12.41 t ha^{-1} (BBS, 2007) which is very low compared to the yield of 22.7 and 21.0 t hectare^{-1} in Japan and Korea, respectively (FAO, 1999). Rashid *et al.* (1982) stated that sub-optimal production methods are the major reasons for poor yield of this crop. Sweetpotato is a good source of Vitamin-B6, Vitamin-C, Vitamin-D and iron which are very important for our body fitness and good health. In Bangladesh, sweetpotato is generally harvested during March to May when cereal supply like rice is the minimum. Sweetpotato plays an important role to compensate the demand of cereals of the needy people of Bangladesh. The highest production and good quality are mostly depends on planting dates. Since climatic conditions are dissimilar at different locations therefore suitable planting time may also vary at different locations. Determination of suitable planting dates for sweetpotato cultivation in Sylhet region is not yet determined. Therefore, it would be worthy to identify suitable planting dates of sweetpotato for Sylhet region. Many sweetpotato genotypes have been introduced in Bangladesh by several organizations such as AVRDC, BARI, BAU, MCC etc. Bangladesh Agricultural Research Institute (BARI) released many improved varieties of sweetpotato production of which some are very popular (Razzaque *et al.,* 2000). Besides, many local varieties are also grown at the farmer's level. Further improvement of sweetpotato production can be made through various ways like introduction of new genotypes, optimization of growing season, management practices for specific location etc. (Islam *et al.,* 1995). Considering the above stated issues three Japanese sweetpotato genotypes were evaluated at the experimental field of Sylhet Agricultural University for assessing growth and yield of storage root under different planting dates.

Materials and Methods

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The experiment was conducted at the experimental field of Horticulture Department, Sylhet Agricultural University during September 2013 to March 2014 to evaluate the performance of sweetpotato genotypes under different planting dates. The experimental site belongs to the Agro-Ecological Zone 20 of the Eastern Surma Kusiyara Floodplain. The soil was gray, sandy loam with organic matter content of 1.79 %, P^H 4.98, total N 0.09 %, exchangeable K 0.13 meq 100^{-1} g soil, available P 14.98 µg g^{-1} soil and available S 27.01 µg g^{-1} soil. Three Japanese sweetpotato genotypes (SP004, SP006 and SP007) were evaluated at three planting dates 1 September, 1 October and 1 November 2013. The experimental land was first opened using a power tiller and subsequently spading and followed by laddering to obtain the desirable tilth. Hence the land was acidic in nature, lime (Dolomite) was applied in the field @ 4 kg $decimal^{-1}$. The recommended dose of cowdung @ 20 t ha^{-1}, TSP @ 60 kg ha^{-1}, $ZnSO_4$ @ 5 kg ha^{-1}, half dose of MoP @ 150 kg ha^{-1} and half dose of Urea @ 135 kg ha^{-1} were applied basally during land preparation one week before transplanting. The remaining MoP and urea were applied in three equal installments as top dressing at 30, 45 and 60 day after planting. The experiment was conducted in a Randomized Complete Block Design (Factorial) with three replications. The unit plot size of the experiment was 1.2 m × 3.0 m where spacing was maintained at 60 cm and 30 cm between row to row and plant to plant, respectively. As a result there were 2 rows per unit plot and ten plants row^{-1}. Fifteen centimeter long terminal vines having at least three nodes were burried in the soil of experimental field. Irrigation, drainage, gap filling, weeding, mulching and vine lifting were done whenever necessary. Sweetpotato from all planting dates was harvested at 135 day after planting with the help of spade to record yield and yield attributing parameters. Collected data on different parameters were subjected to MSTATC software for analysis of variance and mean separation was done as per Duncan's Multiple Range Test (DMRT).

Results and Discussion

Effect of genotypes on growth and yield: Main effects of sweetpotato genotypes on different yield and yield parameters are presented in Table 1. The longest vine was recorded from the genotype SP007 (233.77 cm) which was statistically identical with that of genotype SP006 (222.77 cm). On the other hand, the shortest vine length was recorded from the genotype SP004 (95.11 cm). Siddique (1985) recorded the vine length of sweetpotato genotypes varied from 93.33 cm to 488.73 cm. Maximum foliage weight was recorded from the genotype SP004 (690.77 g) and minimum from the genotype SP007 (646.88 g). In case of number of vines $hill^{-1}$, the highest number was recorded from SP004 (6.09). On the contrary, the lowest number vines $hill^{-1}$ was recorded from genotypes SP007 (5.06). The highest number of storage roots $hill^{-1}$ was recorded from the genotype SP006 (4.93) which were statistically identical with the genotype SP004 (4.44) while the lowest number was recorded from the genotype SP007 (3.74). Siddique (1985) examined 24 sweetpotato genotypes during 1982-1983 seasons at Horticulture Farm, BAU, Mymensingh and found significant variation in number of storage roots $hill^{-1}$. The highest storage root length was recorded from the genotype of SP006 (10.34 cm) followed by SP007 (10.31 cm) and the lowest was recorded from SP004 (9.29 cm). Siddique (1985) also made an experiment with 24 genotypes of sweetpotato where he observed differences in storage root length and width among the genotypes. Weight of storage root was significantly different among the genotypes. The highest weight of storage roots $plant^{-1}$ was measured from genotype SP006 (381.44 g) and lowest was recorded from genotype SP004 (324.67 g).

Remarkable yield variation was recorded among the genotypes (Table 1). The genotype SP006 produced the highest storage root yield (21.01 t ha^{-1}) followed by the genotype SP007 (19.9 t ha^{-1}). However the genotype SP004 produced 18.03 t ha^{-1}. Similar storage root yield variation among the different planting dates of sweetpotato was also reported by several researchers (Ahmed, 1998; Ahmed, 1999; Bhuiyan *et al.*, 1997; Hossain, 1995).

Table 1. Effect of genotype on growth and yield of sweetpotato.

Genotypes	Longest vine length (cm)	Foliage weight (g $plant^{-1}$)	Number of vines $hill^{-1}$	Number of storage roots $plant^{-1}$	Storage root length (cm)	Storage root width (cm)	Weight of storage roots (g $plant^{-1}$)	Storage root yield (t ha^{-1})
SP004	95.11 b	690.77 a	6.0 9 a	4.44 a	9.29 b	4.49	324.67 c	18.3 c
SP006	222.77 a	685.88 a	5.42 ab	4.93 a	10.34 a	4.42	381.44 a	21.01a
SP007	233.77 a	646.88 b	5.06 b	3.74 b	10.31 a	4.64	359.67 b	19.9 b
CV%	12.61	3.16	10.76	9.01	7.77	5.27	11.43	12.52
F-test	**	**	**	**	*	NS	*	*

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

Effect of planting dates on growth and yield: There was no significant effect of planting dates on growth and yield parameter except foliage weight and number of vines hill^{-1} (Table 2). Length of the longest vine varied from 174.66 cm to 193.44 cm. The longest length was recorded from 1 November planting and the shortest was found in 1 September planting. In case of foliage weight, the highest foliage weight 838.67 g was found in 1 November planting and the lowest weight 407.22 g was recorded from 1 September planting. September 1 planting showed the maximum number of vines hill^{-1} (6.90) while 1 October planting recorded the lowest number (4.48). Effect of planting dates on number of storage roots plant^{-1} was non-significant and it varied from 4.27 to 4.45. Similarly there was no significant effect of planting date on storage root length and root width. There was no significant effect of planting dates on weight of storage root plant^{-1} and the range varied from 330.66 g to 370.66 g. Planting time did not show appreciable response on weight of storage root plant^{-1}. However, the highest weight (370.66 g) was recorded from 1 November planting while the lowest (330.66 g) from 1 September planting. Although non significant variation in storage root yield ha^{-1} (Table 2) but it was maximum 20.5 t ha^{-1} when planted at 1 November followed by 1 October planting (20.13 t ha^{-1}) and the lowest yield was 18.36 t ha^{-1} was recorded from 1 September planting.

Table 2. Effect of planting date on growth and yield of sweetpotato.

Planting time	Longest vine length (cm)	Foliage weight (g plant^{-1})	Number of vines hill^{-1}	Number of storage roots plant^{-1}	storage root length (cm)	storage root width (cm)	Weight of storage roots (g plant^{-1})	storage root yield (t ha^{-1})
1 September	174.66	407.22 c	6.90 a	4.45	10.31	4.60	330.66	18.36
1 October	183.55	777.66 b	4.48 b	4.39	9.63	4.64	364.44	20.13
1 November	193.44	838.66 a	5.17 b	4.27	10.00	4.32	370.66	20.50
CV%	12.61	3.16	10.76	9.01	7.77	5.27	11.43	12.52
F-test	NS	**	**	NS	NS	NS	NS	NS

*** Significant at 1% level of probability, NS= non-significant*

Interaction effect of genotypes and planting dates: Among the growth and yield parameters only foliage weight and weight of storage root plant^{-1} were significantly affected by interaction of genotypes and planting dates (Table 3). In the present study the highest foliage weight was recorded from the genotype SP006 (871.66 g) in 1 November planting which was statistically identical with the genotype SP004 (842.33 g) for their foliage weight. The lowest foliage weight was recorded for the genotype SP007 (388.33 g) in 1 September planting. The number of vines hill^{-1} was not affected by the interaction of genotype and planting dates ranging from 3.86 - 7.45. The maximum storage root weight was recorded from the genotype SP007 (405.33 g) in 1 November planting which was statistically identical with genotype SP007 (399.33 g) in 1 October planting. The second highest storage root yield plant^{-1} was observed for the genotype SP007 (399.33 g) in 1 October planting. This result revealed that all the genotypes showed better storage root yield performances at later planting dates. The lowest storage root weight was recorded from genotype SP007 (274.33 g) in 1 September planting.

A remarkable yield variation was found in the interaction effect between genotypes and planting dates (Table 3). Interaction effect between genotypes and planting dates indicated that the genotype SP007 along with 1 November planting gave the highest yield (22.5 t ha^{-1}). After that the second highest yield (21.9 t ha^{-1}) was noticed from two genotypes SP006 and SP007 at 1 October planting. Finally the lowest yield (15.3 t ha^{-1}) was recorded from the genotype SP007 when planting was done at 1 September.

Considering above results and discussion the genotypes SP006 and SP007 along with BARI released high yielding sweetpotato variety(s) may be undertaken for further evaluation at Sylhet region for final and more useful recommendation.

Table 3. Interaction effect of planting dates and genotypes on growth and yield of sweetpotatoes.

Genotypes	Longest vine length vine (cm)	Foliage weight (g plant^{-1})	Number of vines hill^{-1}	Number of storage roots plant^{-1}	Storage root length (cm)	Storage root width (cm)	Weight of storage roots (g plant^{-1})	Storage root yield (t ha^{-1})
V_1T_1	86.00	444.0 d	7.45	4.43	9.27	4.66	360.00 c	20.0c
V_1T_2	95.00	786.0b c	5.10	4.78	9.26	4.63	299.00 e	16.6e
V_1T_3	104.33	842.33 a	5.73	4.11	9.33	4.19	315.00 d	17.5d
V_2T_1	210.00	389.33 e	6.56	5.03	11.00	4.53	357.00 c	19.8c
V_2T_2	222.33	796.66 b	4.50	4.80	9.86	4.56	395.00 a	21.9a
V_2T_3	236.00	871.66 a	5.20	4.97	10.16	4.18	391.66 ab	21.6ab
V_3T_1	228.00	388.33 e	6.70	3.90	10.66	4.60	274.33 f	15.3f
V_3T_2	233.33	750.33 c	3.86	3.60	9.76	4.73	399.33 a	21.9a
V_3T_3	240.00	802.00 b	4.60	3.72	10.50	4.59	405.33 a	22.5a
CV%	12.61	3.16	10.76	9.01	7.77	5.27	11.43	12.52
F-test	NS	*	NS	NS	NS	NS	**	**

** Significant at 5% level of probability, **Significant at 1% level of probability, NS= non-significant*
V_1 = SP004, V_2 = SP006, V_3 = SP007, T_1 = 1 September, T_2 = 1 October and T_3 = 1 November

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