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Morpho-Physiological Evaluation of Sweet Potato (*Ipomoea batatas* L.) Genotypes in Acidic Soil

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ABSTRACT

An experiment was conducted at the experimental field of the Department of Crop Botany and Tea Production Technology, Sylhet Agricultural University, Sylhet, Bangladesh during July-December, 2013 to evaluate the morphological attributes and yield performances of nine genotypes of sweet potato in acidic soil. Among the genotypes, seven were Japanese viz. JSP-1, JSP-2, JSP-3, JSP-4, JSP-5, JSP-6, JSP-7 and two were Bangladeshi like BARI SP-7 and BARI SP-9. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The results revealed that the genotypes varied considerably in the morphological characters at all growth stages and yield attributing characters. Among all the genotypes, the highest number (6.53), length (10.80 cm), diameter (3.35 cm) and yield (22.83 t ha^{-1}) of storage root was recorded in BARI SP-7 followed by JSP-3 which was 5.35, 9.67 cm, 3.28 cm and 20.96 t ha^{-1}, respectively. On the other hand, BARI SP-9 showed the longest vine length, highest vine number $plant^{1}$ which were 298.7 cm and 6.60, respectively but yield was third highest amounting 19.37 t ha^{-1}. All the Japanese varieties except JSP-3 were not suitable for the acidic soil condition of Sylhet, Bangladesh. Therefore, the genotypes BARI SP-7 and JSP-3 were found suitable for their better growth and yield performance in acidic soils.

Key words: Acid soil, genotypes, morpho-physiology, sweet potato

INTRODUCTION

The plant *Ipomoea batatas* L., popularly known as sweet potato, is a dicotyledonous plant that belongs to the Convolvulaceae family (Cuminging *et al*., 2009). The sweet potato tuberous roots contain simply fermentable sugars such as glucose, fructose and sucrose; minimal quantities of fibers and proteins and they are rich in starch which may be helpful to reduce the malnutrition problems of Bangladesh to some extent. The foliage has the potential for use as vegetable and animal feed (Otoo *et al*., 2001). It is the fourth important crop in Bangladesh after rice, wheat and potato (Delowar and Hakim, 2014). It is mainly cultivated by the marginal or subsistence farmers in a sporadic way in different river belts, charlands, deltas and seasonally inundated flood plains (Ahmed *et al*., 1998). The average storage root yield in Bangladesh is very low as compared to those of other tropical and subtropical countries (Verma *et al*., 1994) due to cultivation of local and poor quality indigenous sweet potato varieties.

Acidic soils are one of the most important limitations to agricultural production worldwide (Kochian *et al*., 2004). Acid-soil involves both nutrient deficiencies and toxicities, the tolerance of plants to soil acidity could take the form of efficient uptake and utilization of those nutrients that are deficient under acid soil conditions or outright tolerance to Al and Mn toxicities. Thus, it is important to select acid tolerant sweet potato genotypes with the intention of reducing the dependence of small farmers on lime and fertilizer inputs. Onunka *et al.* (2012) confirmed that yields of sweet potato is presently restricted by many factors among which are low soil fertility, varietal selection, planting date, weather condition, soil type, weed, insect and disease pressure and crop management practices among others. Soils may also become acidified rapidly as a consequence of intensive cultivation of cereals with application of ammonium based N fertilizer (Mahler and Macdole, 1985) and heavy rain in the monsoon. For example, most of the topsoils of the hills, terraces and other flood plains are acidified to variable extends (Sharfuddin and Ahmed, 2005; Sen *et al*., 1988). Foy *et al.* (1992) stated that selection of genotypes with high adaptability to the acid soils is a promising alternative.

One of the important methods the crop improvement is introduction of new varieties for different areas and putting them under trial in the local condition and selecting the variety which is suitable for the location and give the best performance. Many countries of the world including Japan have developed good quality high yielding varieties of sweet potato using this method. Thus it was felt that through introduction of high yielding exotic varieties may be adopted in Bangladesh environmental condition for commercial purpose. Keeping this idea in mind seven genotypes of sweet potato were imported from Japan and put under trials with two local selected genotypes. High and medium lands of the region contain acid soils with pH ranging from 4.8-5.7 with high content of iron. So far there is no research report available regarding the cultivation of the developed varieties and cultivars in acidic soils in the Sylhet region. To expand the cultivation of sweet potato in acidic soils, selection of suitable cultivars is essential. In the present study an attempt was undertaken to study some exotic genotypes with local genotypes to assess their performances in acid soil of Sylhet region of Bangladesh.

MATERIALS AND METHODS

Soil and climate: The experiment was carried out at the experimental field of the Department of Crop Botany and Tea Production Technology, Sylhet Agricultural University, Sylhet, Bangladesh during July-December, 2013 to evaluate the morphological attributes and yield performance of nine genotypes of sweet potato in acidic soil. The climate and soil of the selected plot was under subtropical climate having heavy rainfall during April to September (Kharif Season) and scanty rainfall during October-March (Rabi Season), high land type, well drained and non-calcareous grey floodplain fertile soils of acidic nature. The soil pH, nutrient status of the soil, monthly air temperature, relative humidity, rainfall and sunshine hours are presented in the Table 1 and 2.

Experimental materials and design: Nine genotypes of sweet potato were used as experimental materials. Among these BARI SP-7 and BARI SP-9 were collected from Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh and seven Japanese Sweet Potato (JSP) genotypes viz. JSP-1, JSP-2, JSP-3, JSP-4, JSP-5, JSP-6 and JSP-7 from Japan. The experiment was laid out in a Randomized Complete Bock Design (RCBD) with three replications. The size of each unit plot was 2.5×1 m. Distances between two plots were 0.50 m and the blocks were 0.70 m apart. Planting distance between the rows were 60 cm and plants 30 cm and planting of vine cutting on 16 July,

Table 1: Nutrient status of the soil of experimental field

Elements	Amount
Soil pH	4.83
Organic matter (%)	1.39
Potassium (milli equivalent/100 g of soil)	0.38
Nitrogen (N%)	0.07
Phosphorus (μg g^{-1} of soil)	9.15
Sulphur (μg g^{-1} of soil)	37.98

Source: Regional Office of SRDI (Soil Resources Development Institute), Sylhet-3100, Bangladesh

Table 2: Monthly air temperature (°C), relative humidity, rainfall and sunshine hours/day of the experimental site during the period from July to December, 2014

	Monthly average air temperature (°C)		Average		
Month	Maximum average	Minimum average	Rainfall (mm)	Relative humidity (%)	Daily sunshine (h)
July	33.3	25.8	18.9	78	4.4
August	32.6	26.6	17.8	80	4.8
September	32.8	25.3	14	78	4.6
October	31.5	23.1	29.6	74	4.2
November	28.7	16.5	13	69	3.8
December	25.9	14.3	0.0	76	4.3

Source: Sylhet Meteorological Station, Sylhet-3100, Bangladesh

2014. The length of the vine cuttings ranges from 20-30 cm long with six to seven nodes. The plot were fertilized with a general dose of urea, Triple Super Phosphate (TSP), Muriate of Potash (MOP) as sources of nitrogen, phosphorus, potassium and were applied at 90, 100, 130 kg ha^{-1}, respectively.

Data collection and analysis: Final harvesting of the crop was done on 26 December, 2013 when drying of latex to white colour in cut storage roots and yellowing of leaves to some extent. The data collection on morphological growth parameters was started at 45 Days after Planting (DAP) and continued with an interval of 20 days until final harvest. Data on main vine length (cm), vine diameter (cm) and number of vine $plant^{-1}$ were recorded with sampling of 6 plants/plot starting from 45 DAS till 125 DAS with an interval of 20 days. After sampling the plant, the plant parts were separated into leaves, vines, storage roots and the corresponding fresh weight and dry weight were recorded after oven drying at 80±2°C for 72 h and calculated the morphological growth parameters like fresh weight of leaves (g), dry weight of leaves (g), fresh weight of vine (g), dry weight of vine (g), fresh weight of storage roots (g), dry weight of storage roots (g), fresh weight of non-storage roots (g), dry weight of non-storage roots (g). At harvest, yield and plant characters like number of storage roots, diameter of storage roots (cm), length of storage roots (cm), yield of storage root ha^{-1} were measured. The collected data were analyzed statistically and the mean differences were separated with Duncan's Multiple Range Test (DMRT) at 5% level of significance using the statistical computer package program, MSTATC (Russel, 1986).

RESULTS AND DISCUSSION

Morphological characteristics

Main vine length (cm): Main Vine length varied significantly among the sweet potato genotypes (Table 3). The result revealed that the vine length increased rapidly until 85 DAP after that increased slowly till at 125 DAP. The genotype BARI SP-9 produced the longest vine (298.7 cm) and JSP-4 produced the shortest vine (151.7 cm) at 125 DAP. Vine length differs due to the genetic make up present in the genotypes as well as tolerance to the acidic soil. Kareem (2013) reported

Table 3: Main vine length (cm) of different sweet potato genotypes at different DAP

Genotypes	Main vine length (cm) 45 DAP	65 DAP	85 DAP	105 DAP	125 DAP
JSP-1	178.0^{ab}	212.3^{ab}	230.3^{ab}	249.3^{ab}	254.0^{ab}
JSP-2	154.0^{abc}	179.0^{bc}	185.3^{bc}	190.0^{abc}	194.7^{b}
JSP-3	135.3^{bc}	180.0^{bcd}	188.7^{bc}	192.7^{bc}	197.7^{ab}
JSP-4	83.73^{c}	116.7^{d}	130.7^{c}	139.3^{c}	151.7^{b}
JSP-5	112.0^{bc}	150.9^{bcd}	161.0^{bc}	183.0^{bc}	186.0^{b}
JSP-6	136.3^{bc}	155.3^{bcd}	164.0^{bc}	171.3^{bc}	175.3^{b}
JSP-7	105.2^{bc}	122.0^{cd}	129.3^{c}	137.3^{c}	152.3^{b}
BARI SP-7	144.0^{abc}	170.1^{bcd}	176.0^{bc}	197.3^{abc}	206.7^{ab}
BARI SP-9	217.3^{a}	275.7^{a}	287.3^{a}	293.0^{a}	298.7^{b}
CV%	31.21	22.66	27.08	28.55	32.19

Values having same letter(s) in a column do not differ significantly at 5% level of significance, DAP: Days after planting

Table 4: Diameter of main vine (cm) of different sweet potato genotypes at different DAP

Genotypes	Diameter of vine (cm) 45 DAP	65 DAP	85 DAP	105 DAP	125 DAP
JSP-1	0.62^{cd}	0.64^{cd}	0.83^{bc}	0.93^{cd}	1.11^{cd}
JSP-2	0.91^{a}	1.04^{a}	1.29^{a}	1.87^{a}	2.39^{a}
JSP-3	0.71^{bc}	0.77^{bc}	0.93^{ab}	0.99^{bc}	1.17^{c}
JSP-4	0.77^{b}	0.94^{ab}	1.06^{ab}	1.32^{ab}	1.87^{b}
JSP-5	0.53^{de}	0.68^{cd}	0.84^{bc}	0.88^{d}	0.99^{d}
JSP-6	0.69^{bc}	0.77^{bc}	0.84^{bc}	1.02^{bc}	1.15^{c}
JSP-7	0.56^{de}	0.73^{bcd}	0.98^{ab}	1.12^{b}	1.38^{bc}
BARI SP-7	0.52^{de}	0.65^{cd}	0.89^{b}	1.10^{b}	1.47^{bc}
BARI SP-9	0.49^{e}	0.60^{d}	0.73^{d}	0.94^{c}	1.11^{cd}
CV%	10.34	10.67	17.70	15.22	18.25

Values having same letter(s) in a column do not differ significantly at 5% level of significance, DAP: Days after planting

that medium sized vine length ranges from 140-180 cm gave the best yield of sweet potato. Similar results were found in literature stated that the vine length differ from 220.17-264.43 cm due to their genetic make-up of sweet potato.

Diameter of main vine (cm): Diameter of main vine varied significantly in all the stages of growth and presented in Table 4. The results showed that the diameter of the main vine increased with the increase of days after planting. The highest diameter (2.39 cm) was found in the genotype JSP-2 followed by JSP-4 (1.87) whereas the lowest (0.99 cm) was found in the genotype JSP-5 at 125 DAP. Results revealed that diameter increased gradually from 45 DAP to till to the maturity in all growth stages of sweet potato genotypes. The difference might be due to their different genetic make up and response to soil and climatic conditions. Rashid *et al.* (2002), Onunka *et al.* (2012) and Yooyongwech *et al.* (2014) stated that vine diameter is a genetic character and may differ from genotype to genotype under similar soil and environmental conditions. The growth behaviour of sweet potato may vary in particular climate other than it originated although most of the genotypes used in this research were exotic varieties.

Number of vine plant^{-1}: All the branches developed from the main vine were considered the primary branches. The number of vines plant^{-1} at all growth stages differed significantly due to variety, different vine parts and their interactions (Table 5). Result revealed that the number of vines increased gradually from 45 DAP to till maturity in all growth stages of sweet potato genotypes. The highest number of vines was recorded in BARI SP-9 (6.60) followed by JSP-3 (6.33), BARI SP-7 (6.20) and the least number of vines was produced in JSP-1 (3.07) in 125 DAP. Results

Table 5: Number of vine plant^{-1} of different sweet potato genotypes at different DAP

	No. of vine plant^{-1}				
Genotypes	45 DAP	65 DAP	85 DAP	105 DAP	125 DAP
JSP-1	2.00^{e}	2.07^{c}	2.47^{d}	2.87^{c}	3.07^{d}
JSP-2	3.27^{c}	3.87^{bc}	4.40^{bc}	4.60^{bc}	4.93^{bc}
JSP-3	3.67^{bc}	3.93^{b}	4.53^{bc}	5.00^{ab}	6.33^{a}
JSP-4	2.53^{de}	3.47^{bc}	3.80^{cd}	4.27^{bc}	4.93^{bc}
JSP-5	2.93^{de}	4.27^{b}	4.80^{bc}	5.13^{ab}	5.13^{b}
JSP-6	3.23^{c}	3.63^{bc}	3.63^{cd}	4.13^{bc}	4.87^{bc}
JSP-7	2.33^{de}	3.20^{bc}	3.73^{cd}	4.60^{bc}	4.73^{c}
BARI SP-7	4.33^{ab}	5.07^{a}	6.00^{a}	6.00^{a}	6.20^{a}
BARI SP-9	4.73^{a}	4.97^{a}	5.40^{ab}	5.93^{a}	6.60^{a}
CV%	16.92	25.70	22.72	21.41	16.11

Values having same letter(s) in a column do not differ significantly at 5% level of significance, DAP: Days after planting

Table 6: Comparisons of fresh and dry weight and yield of different sweet potato genotypes

Genotypes	Fresh wt. of vine (g)	Dry wt. of vine (g)	Fresh wt. of leaves (g)	Dry wt. of leaves (g)	Total fresh wt. (g)	Total dry matter (g)
JSP-1	173.4^{b}	30.27^{c}	55.83$_{bc}$	10.54^{a}	2080.80^{bc}	458.37^{bc}
JSP-2	170.2^{b}	36.47$_{b}$	61.23^{ab}	7.63b^{c}	1525.90^{c}	306.81^{c}
JSP-3	199.1^{ab}	43.31^{a}	57.23$_{b}$	6.50^{cd}	2571.57^{b}	514.18^{b}
JSP-4	138.7^{cd}	25.93$_{d}$	42.43^{cd}	6.87^{c}	1199.43^{cd}	218.35^{d}
JSP-5	206.4^{a}	39.25^{ab}	66.13$_{ab}$	10.07^{a}	2421.40^{b}	636.06^{a}
JSP-6	135.3^{cd}	31.53$_{bc}$	40.40^{d}	6.13^{d}	1349.13^{c}	419.33^{bc}
JSP-7	170.0^{b}	29.99^{c}	46.86$_{cd}$	8.84^{b}	1081.07^{d}	240.68^{cd}
BARI SP-7	152.9^{cd}	31.77^{bc}	70.00^{a}	8.07^{bc}	2966.60^{a}	526.05^{ab}
BARI SP-9	163.3^{cd}	26.18^{cd}	72.13$_{a}$	10.57^{a}	2795.67^{ab}	449.34^{bc}
CV%	37.89	36.17	49.66	43.31		

Values having same letter(s) in a column do not differ significantly at 5% level of significance, DAP: Days after planting

indicated that the tendency of producing primary branches in the terminal or apical part of the cuttings was more than those of the basal parts and the tip vine produced the maximum branches. The findings of the present experiment are in agreement with the findings of Choudhury *et al.* (1986). Shen *et al.* (2015) reported that number of vine plant^{-1} ranges from 10.4-13.3 due to available nutrient present in soil. In the present study, vine number was not satisfactory because of the tip portion of vine dry in all the genotypes upto the maturity for the reason of acidic soil as a result new vine could not grow.

Fresh and dry weight of vine plant^{-1} (g): Fresh weight of vine varied significantly in all the genotypes of sweet potato (Table 6). The highest fresh weight of vine was obtained in JSP-5 (206.4 g plant^{-1}) followed by JSP-3 (199 g plant^{-1}) while the lowest fresh weight of vine was found in the genotype JSP-6 (135 g plant^{-1}). These findings were also corroborated with the findings of Choudhury *et al.* (1986) and Delowar and Hakim (2014). Uddin (2006) stated that the fresh weight of vine were 306-806 g plant^{-1} due to the prevailing favorable soil or weather conditions during the experimentation. Similarly, the highest dry weight (43.31 g) of vine was found in the genotype JSP-3 followed by JSP-5 (39.25 g) whereas the lowest vine dry weight (25.93 g) was found in the genotype JSP-4. The present findings are closely related to the results of Dayal *et al.* (2006).

Fresh and dry weight of leaves plant^{-1} (g): Variations observed among the genotypes in respect of the fresh weight of leaves are shown in the Table 6. The genotype BARI SP-9 had the highest fresh weight of leaves (72.13 g) which was closely followed by BARI SP-7 (70 g) while the lowest weight of leaves was found in the genotype JSP-6 (40.40 g). Delowar and Hakim (2014) stated that the fresh weight of leaves varied for soil characteristics and minimum growth of the plant occurred perhaps due to a variation in soil acidity. On the other hand, variations observed among the genotypes in respect of dry weight of leaves are presented in the same table. The genotypes BARI SP-9 produced the maximum dry weight of leaves (10.57 g) which was statistically similar to those of JSP-1 (10.54 g) and JSP-5 (10.07 g) but the minimum dry weight was produced in the genotype JSP-6 (6.13 g) which was similar to those of JSP-3 (6.50 g) and JSP-4 (6.87 g). The findings are closely related to Hoque (2002) who found that the genotypes Doulatpuri produced the maximum (32.67%) dry matter in leaves whereas; the genotype J9 produced the minimum (20.77%).

Total fresh weight and total dry matter plant^{-1} (g): Total fresh weight plant^{-1} recorded at harvest exhibited a wide variation (Table 6). The total fresh weight plant^{-1} in 9 sweet potato genotypes ranged from 1081.07-2966.60 g. The highest total fresh weight plant^{-1} was found in the genotype BARI SP-7 (2966.60 g) followed by BARI SP-9 (2795.67 g) and the lowest was found in the genotype JSP-7 (1081.07 g). Onunka *et al.* (2012) reported that the highest fresh weight plant^{-1} was found in the genotype Kamala sinduri (1301 g) and the lowest was found in the genotype Doulatpuri (420 g). Likewise, there was noticeable variation among the nine genotypes in dry matter content of storage roots which is shown in Table 6. The total dry matter content of nine sweet potato genotypes varied from 636.06 g (JSP-5) to 218.35 g (JSP-4). The other genotypes were produced between 240-526 g. Uddin (2006) who was reported that the total dry matter between 114.15-231.68 g. Dayal *et al.* (2006) stated that dry matter content of the sweet potato influenced the growth performance of the plant.

Fresh and dry weight of non-storage roots (g): Fresh weight of on-storage root varied significantly among the sweet potato genotypes (Fig. 1). The highest fresh weight of non-storage root was found in genotype JSP-1 (14.27 g) which closely followed by JSP-6 (12.40 g) while the lowest was found in JSP-2 (3.47 g). Variability of the non-storage root weight depends on the growth and development of the sweet potato genotypes. The findings of the present study agrees with the agreement of Naskar and Chowdhury (1994) and Shen *et al.* (2015) who stated that the adventitious root weight ranges from 1-2 g. Similarly, dry weight of on-storage root differs significantly among the sweet potato genotypes. The maximum dry matter of fibrous roots was recorded in the genotypes JSP-1 (3.73 g) which is statistically similar to JSP-6 (3.62 g) and the minimum dry weight found in JSP-2 (1.63 g) (Fig. 1). This result was corroborated with

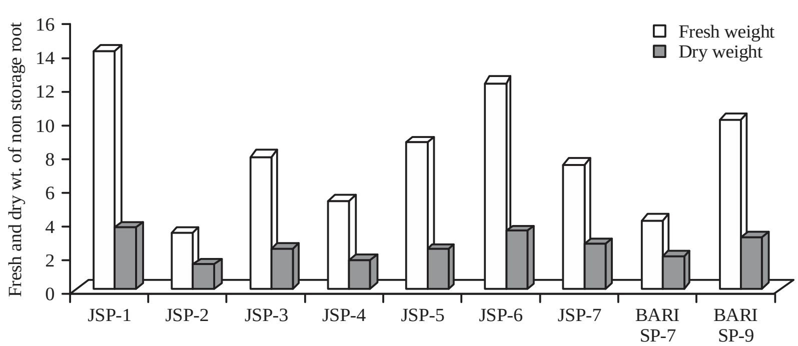

Fig. 1: Fresh and dry weight of non-storage roots of sweet potato genotypes

Table 7: Number, length and diameter of storage root of sweet potato genotypes

Genotypes	Number of storage roots plant^{-1}	Length of storage roots plant^{-1} (cm)	Diameter of storage roots (cm)
JSP-1	4.00^{c}	9.53^{b}	3.17^{a}
JSP-2	3.32^{d}	9.40$_{b}$	2.04^{c}
JSP-3	5.33^{b}	9.67^{ab}	3.28^{a}
JSP-4	2.82^{d}	7.60^{d}	1.26^{d}
JSP-5	4.91^{bc}	8.80^{bc}	3.09^{ab}
JSP-6	3.10^{cd}	9.13^{b}	2.30^{c}
JSP-7	3.62^{cd}	3.81^{e}	1.45^{cd}
BARI SP-7	6.53^{a}	10.80^{a}	3.35^{a}
BARI SP-9	5.10^{bc}	8.73^{bc}	3.20^{a}
CV%	12.65	14.17	9.54

Values having same letter(s) in a column do not differ significantly at 5% level of significance

Dayal *et al*. (2006) who reported that the dry matter of fibrous root was 2.23-0.97%. Dry matter of non storage root was higher in those genotypes whose poor plant growth but higher accumulation rate in non storage roots.

Yield and yield attributing characteristics

Number of storage roots plant^{-1}: The numbers of storage root plant^{-1} were varied significantly and shown in Table 7. The highest number of storage root was found in BARI SP-7 (6.53) followed by JSP-3 (5.33) and BARI SP-9 (5.10) and the lowest were found in JSP-4 (2.82). Higher number of storage roots per plant enhances the total yield of the sweet potato and it's indicated that these genotypes are tolerable to the acidic soil than the lower yielding one. This might be due to the variation of genetic makeup of the different sweet potato genotypes. The results obtained from the present study are consistent with the results of Rashid *et al*. (2002) and Uwah *et al*. (2013) who stated that the numbers of storage root plant^{-1} were found considerable variation. Farooque and Husain (1973) also showed that the storage roots number plant^{-1} varied from 4.70-11 and it depends on the genotypes of sweet potato.

Length of storage roots plant^{-1} (cm): The length of storage roots plant^{-1} of sweet potato genotypes showed the significant variation and presented in the Table 7. It was found that the genotype BARI SP-7 produced highest length of storage roots (10.80 cm) which was closely followed by JSP-3 (9.67 cm), JSP-1 (9.53 cm) and the lowest was found in JSP-7 (3.81 cm). The variation was found among the genotypes both in the genetical and growth characteristics. The agreement of the present study closely related to the findings of Uwah *et al*. (2013) who reported that the length of storage root plant^{-1} in two years ranges from 14.4-16.3 cm. Rashid *et al*. (2002) and Farooque and Husain (1973) showed that the length of the storage roots differed among the varieties. It is clearly indicated that the highest storage roots length producing genotypes of sweet potato in acidic soil influences the higher production of yield.

Diameter of storage roots (cm): The mean values of diameter of storage roots are shown in Table 7. Analysis of variance revealed that there was a significant difference in diameter of storage roots of sweet potato genotypes. It was found that the genotype BARI SP-7 (3.35 cm) produced the highest diameter of storage roots closely followed by JSP-3 (3.28 cm), BARI SP-9 (3.20 cm) and the lowest was found in JSP-4 (1.26 cm). The diameter of the storage roots varied due to the growth pattern of the plant which was influenced by the genotypic characteristics as well as adaptation capacity to the acidic soil. Rashid *et al*. (2002) and Sen *et al*. (1988) who reported that diameter of storage root varied from variety to variety. The differences of storage roots characters are controlled by genetic makeup of the genotypes and it is obviously varied from one genotype to another.

Fresh and dry weight of storage roots plant^{-1} (g): Fresh weight of storage roots plant^{-1} differs significantly from genotype to genotype. It clearly showed that the highest fresh weight was found in the genotype BARI SP-7 (2140 g) which was closely similar to the genotype BARI SP-9 (1950 g), JSP-3 (1867 g) and the lowest was found in the genotype JSP-7 (857 g) (Fig. 2). The present results are in agreement with the findings of Siddique *et al*. (1988) who stated that the fresh weight of storage roots plant^{-1} varied widely the different genotypes. In the present study, it is clearly indicated that the fresh weight of storage root increased with the increases of length and diameter of storage roots. Similarly, the highest dry weight was obtained in JSP-5 (585.36 g) while the lowest dry weight was found in JSP-7 (205.11 g). Delowar and Hakim (2014) reported that dry weight of storage roots depends on the varietal performance to the particular soil. The result showed that the some genotypes failed to show the relationship of fresh weight to the dry weight of the storage roots.

Yields of storage roots (t ha^{-1}): The yield of storage roots ha^{-1} varied markedly among nine sweet potato genotypes. The genotype BARI SP-7 gave the highest yield (22.83 t ha^{-1}) closely followed by JSP-3 (20.96 t ha^{-1}), BARI SP-9 (19.37 t ha^{-1}) whereas the lowest yield of storage roots (7.13 t ha^{-1}) was obtained from the genotype JSP-7 (Fig. 3). These results are corroborated with the findings of Naskar and Chowdhury (1994), Siddique *et al*. (1988) and Yooyongwech *et al*. (2014)

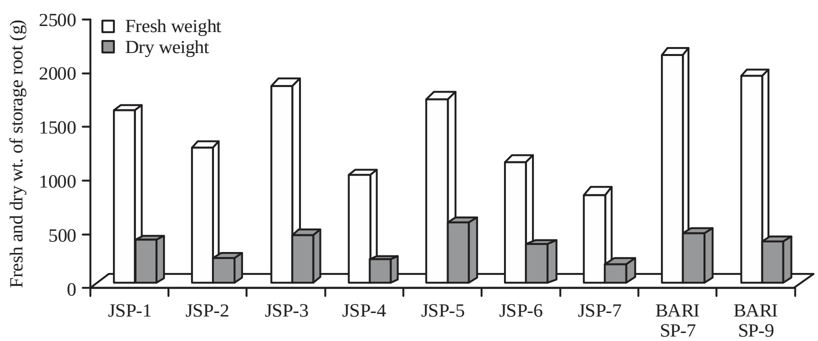

Fig. 2: Fresh and dry weight of storage roots of sweet potato genotypes

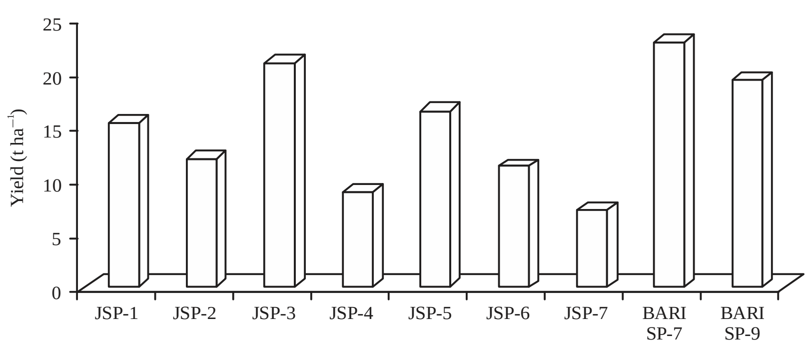

Fig. 3: Yield (t ha^{-1}) of storage roots of sweet potato genotypes

found that yield potentiality of sweet potato depends on the genetic make-up plant. Sen *et al*. (1988) stated that significant variations among the genotypes were happened may be due to the adoption of proper cultural management techniques. It is clearly indicated that yields of storage roots increased with the increases of number, length, diameter and total dry matter content of storage roots of sweet potato. On the other hand, local varieties of Bangladesh showed comparatively better performance than the Japanese varieties of sweet potato in the acidic soil condition.

CONCLUSION

The present study revealed that there were significant differences among the cultivars in respect of morphological and yield contributing characters. Assessing all the characteristics of yield and yield contributing characteristics like number, length, diameter and total dry matter content of storage roots of sweet potato, BARI SP-7, JSP-3 and BARI SP-9 showed better performance in acidic soil conditions in the Sylhet region of Bangladesh. Interesting point is that among the Japanese varieties JSP-3 appears attractive for its colour, shape, softness and dry matter content. Therefore, two local varieties BARI SP-7 and BARI SP-9 and one exotic variety JSP-3 are suggested to cultivate in acidic soil condition of Sylhet region of Bangladesh. After all, more trials at both research field and farmers' fields with wider agro-ecological regions would give more precise information to select the best genotype to develop new variety under the acidic soil condition of Bangladesh.

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