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EVALUATION ON GROWTH AND YIELD OF SWEETPOTATO GENOTYPES IN RAMGARH SOIL SERIES OF LOW HILLS IN SYLHET

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Abstract

Sweetpotato is a fast growing starchy root crop. It can be grown on a wide variety of soils. Soils of Sylhet region are classified into various soil series or soil groups. Several indigenous sweetpotato genotypes are distributed in Sylhet region. So far they are not being explored. From this point of view, the present study was conducted to evaluate the growth and yield performance of nine sweetpotato genotypes namely Local-1, Local-2, local-5, Local-8, Exotic-1, Exotic-2, Exotic-3, Exotic-4 and BARI SP-4. The evaluation was carried out on Ramgarh soil of North-Eastern Piedmont plains during November 2015 to March 2016 in a Randomized Complete Block Design with three replications. Morphology of leaves, vines, fibrous roots and storage roots as well as yield determinants were studied. Correlation study between morphological and yield attributes were also carried out. Correlation study revealed that primary vine number, total fresh weight, total dry matter, harvest index, storage root number plant^{-1}, diameter of storage roots, fresh weight of storage roots were positively correlated with yield. The highest harvest index (HI) was observed in Local-1 (69.46%). The maximum number of storage roots plant^{-1} was in Exotic-2 (7.20). The longest storage roots were in Local-5 (14.13 cm) and thickest storage roots were in Local-8 (5.22 cm). The highest storage roots fresh weight plant^{-1} was obtained from Local-1 (826.10 g). The highest storage roots yield was in Local-1 (48.96 t ha^{-1}) followed by Local-8 (42.60 t ha^{-1}). It can be concluded that Local-1 and Local-8 would be suitable for higher yield whereas potentials of Local-2 and Exotic-3 suggested for further investigation.

Keywords: Morphology, storage root, dry matter partitioning, harvest index, Ramgarh soil series.

Introduction

Sweetpotato is popularly known as `Misti Alu' in Bangladesh. It is a starchy fast growing root crop. It is perennial in nature and easily propagated by its vines. Sweetpotato produces more edible energy hectare^{-1} day^{-1} than wheat, rice or cassava (Kitaya *et al*., 2008). It is a very efficient food crop and produces more dry matter, protein and minerals per unit area in comparison to cereals (Woolfe, 1992). Sweetpotato has multiple uses. Its storage roots are consumed by human as boiling, burning or as processed foods. The tops (tender vines with leaves) are using as vegetables. The leaves and vines are good feed for livestock. Despites its various usefulness, it is a neglected crop in Bangladesh and still it is under-exploited.

Sweetpotato grows in marginal conditions. It can easily grow in charlands, fallow lands, river banks, valley areas, homestead areas and even less fertile soils. It requires low level fertilizer, irrigation and less management practices. Insect infestation is very low. Sweetpotato has capable of rapid soil coverage and good rooting characteristics which helps to reduce soil acidity (Essilfie, 2015) and soil erosion in hilly areas.

Sylhet is a specialized agriculture zone in Bangladesh which is covered 11% of hill areas. Among the cultivated lands 34.4% are high land and medium high land. Three major textural classes namely sandy loam, loam and clay loam seems to be preferable for sweetpotato cultivation in this region (SRDI. 2010). About 31768 tons of sweetpotato was produced on 1452 ha of land with an average yield of 21.88 t ha^{-1} in the region (DAE, 2017). Average yield in this region is comparatively higher than national average yield of 10.4 t ha^{-1} (MoA, 2017). There are several indigenous sweetpotato genotypes are distributed in the region. Some of them are being cultivated by farmers' sporadically and some of the genotypes are not being explored. So there is a great scope to expand and cultivate sweetpotato commercially in this region. Keeping this idea in mind, the experiment was conducted to evaluate the growth and yield

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performance of the genotypes, and to correlate the morphological and yield attributes with yield of the sweetpotato genotypes.

Materials and Methods

The experiment was conducted at Sylhet Agricultural University Farm, Tilagorh, Sylhet during November 2015 to March 2016. Four local genotypes viz. Local-1, Local-2, Local-5 and Local-8, four exotic genotypes viz. Exotic-1, Exotic-2, Exotic-3 and Exotic-4 and a check variety BARI SP-4 were used as planting materials. Local genotypes were collected from different places of Sylhet region. Exotic genotypes were collected from Japan via Sylhet Agricultural University and BARI SP-4 from Bangladesh Agricultural Research Insitute, Gazipur. Soil samples were collected from the field, analyzed (Table 1) and characterized as per procedures of SRDI (2013) (Tables 2 and 3). Fertilizer rate was calculated on soil test basis. After tillage, dolomite was applied @ 988 kg ha^{-1} to minimize soil acidity. Applied cowdung, Urea, TSP, MoP, Gypsum, Zinc sulfate (Hepta), Solubor and Magnesium sulfate were 5000, 212, 186, 187, 63, 9, 3 and 84 kg ha^{-1}, respectively. Urea and MoP were applied in two splits. Half of Urea and MoP, and other fertilizers and cowdung were applied as basal during final land preparation. Remaining Urea and MoP were applied as side dressing at 30 days after planting during earthing up operation. Experimental field was divided into three blocks for three replications and each block was further divided into nine plots resulting 27 plots. Apical vine cuttings were planted on the beds with maintaining 0.60 m row to row, 0.30 m plant to plant and 0.60 m plot to plot distances following Randomized complete block design with three replications. Weeding, irrigation and other intercultural operations were done as and when necessary. Data collection and observations were started after 45 days of planting. Leaf length and breadth, petiole length, individual leaf area was taken at 60, 90, 120 and 150 days after planting (DAP) following the guidelines of CIP (1991). Yield and yield attributes were taken at final harvest (150 DAP). Collected data were analyzed through ANOVA technique and mean separation was done by Duncan's Multiple Range Test (DMRT) using MSTATC computer software.

Table 1. Fertility status of the soil of the experimental site

Elements	Critical limit	Initial soil		Post-harvest soil	
		STV	Status	STV	Status
pH	>5.50	4.80	Strongly acidic	5.95	Slightly acidic
Total N (%)	0.12	0.11	Low	0.10	Low
P (μg g^{-1})	7.00	8.00	Low	7.00	Low
K (meq100 g^{-1})	0.12	0.12	Low	0.15	Low
S (μg g^{-1})	10.00	13.00	Low	19.00	Medium
Zn (μg g^{-1})	0.60	0.46	Low	0.48	Low
B (μg g^{-1})	0.20	0.28	Low	1.09	Very high
Mg (meq100 g^{-1})	0.50	0.38	Low	0.51	Low
Ca (meq100 g^{-1})	2.00	1.60	Low	2.30	Low
OM (%)	C:N= 10:1	1.39	Low	1.34	Low

STV = Soil test value

Table 2. Land and soil characteristics of the experiments site

Physical parameter	:	Land and Soil characteristics
1. Geographic location	:	24°54′33.5″ to 24°54′34.7″ N and 91°54′ 04.6″ to 91°54′05.6″ E
2. Agro-ecological zone	:	Northern and Eastern Hill (Low Hill Ranges):29
3. Physiography	:	Dupitila-Dihing Hills (Low Hill)
4. Parent materials	:	Tertiary rock of Dupitila formation
6. Land type and soil series	:	High land
7. Soil series	:	Ramgarh
8. Texture with particle composition	:	Top soil: Loam (Sand 50%, Silt 37%, Clay 13%) Sub-soil: Clay loam (Sand 30%, Silt 36%, Clay 34%)

Table 3. Identifying characteristics of Ramgarh soil series (SRDI, 2013)

Soil layer (depth)	Soil colour	Soil texture	Soil consistency (at wet)	Soil reaction (p^H)	Drainage condition
Top layer (0-15 cm)	Deep yellow brown	Loam	Friable	Strongly acidic	
Middle layer (15-30 cm)	Deep brown	Clay loam	Friable	Strongly acidic	Well drained
Lower layer (>30 cm)	Fade brown	Clay loam	Hard	Strongly acidic	

Results and Discussion

A) Characteristics of morphophysiology and yield attributes

(a) Morphological parameters

Primary vine number increased up to 150 DAP (Fig. 1). The highest primary vine number at 150 DAP was in Local-1 (8.43) followed by Local-8. The lowest number of primary vine (3.90) was in BARI SP-4. Primary vine lengths of Local-2, Exotic-1, Exotic-2, Exotic-3 and BARI SP-4 increased gradually whereas Local-5, Local-8 and Exotic-4 increased rapidly up to 90 DAP and thereafter most of the genotypes grew up rapidly (Fig. 2). The highest primary vine length was in Local-8 (125.7 cm) followed by Local-5, and the shortest primary vine (96.27 cm) was in Exotic-2. The primary vine length of the exotic genotypes ranged from 96.27 to 109.70 cm, whereas the local genotypes ranged from 99.50 to 125.7 cm.

Yildirim *et al*. (2011) recorded vine number plant^{-1} and vine length 2.8-8.9 and 179.9-368.9 cm, respectively at Aegean region of Turkey in 2004. Kareem (2013) reported that medium sized vine length ranged from 140-180 cm gave the best yield of sweetpotato and high yielding cultivars were likely to produce low vine yield as well as low vine growth rate.

Jahan *et al.* (2009) stated that the vine length differed due to their genetic make-up and different vine parts used as planting materials of sweetpotato. Anshebo *et al.* (2004) reported that high heritability estimates were noticed for vine traits (length of vine, number of vines plant^{-1} and weight of foliage) of sweetpotatoes in Madras, India.

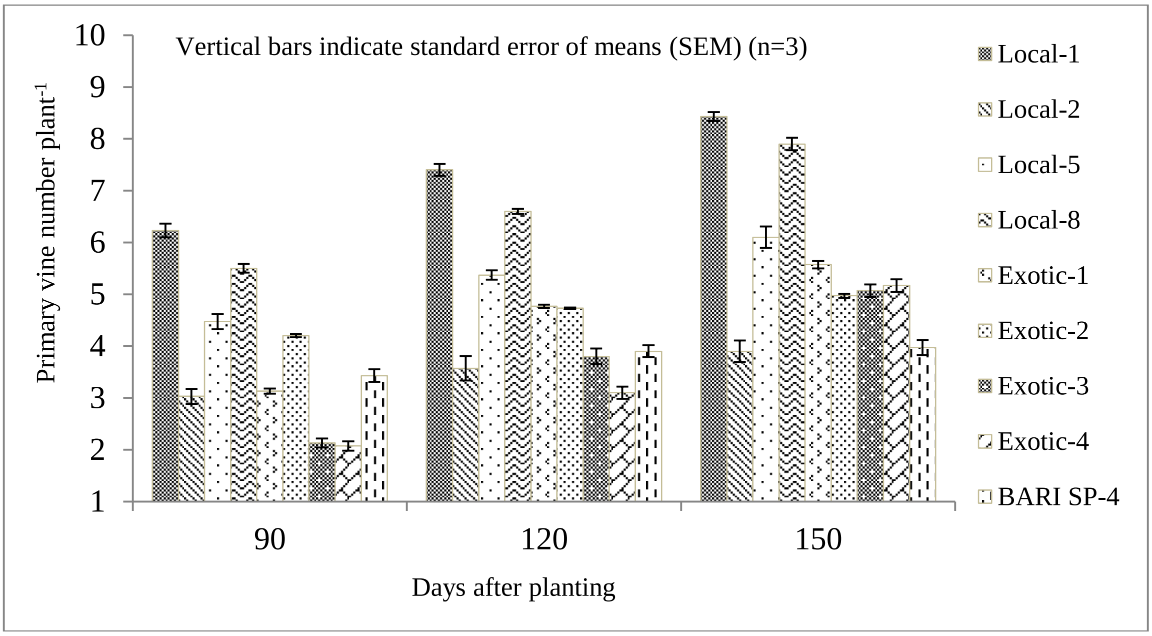

Fig. 1. Primary vine number plant^{-1} of sweetpotato genotypes at different DAP at Ramgarh soil series

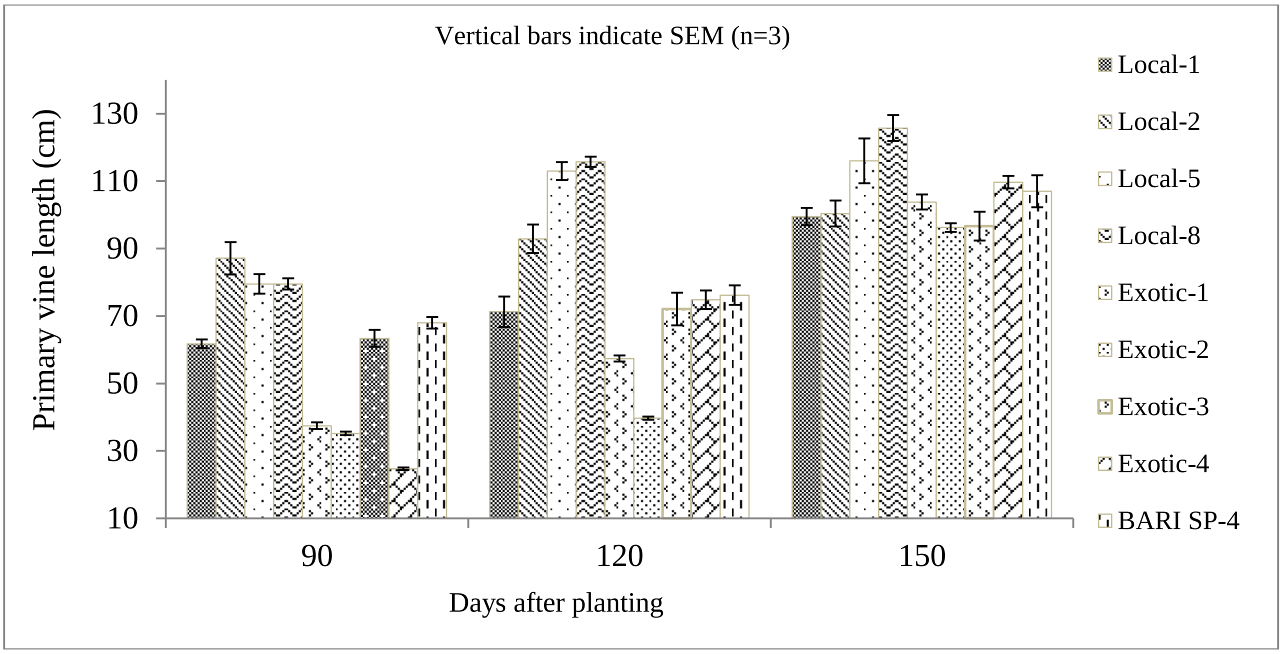

Fig. 2. Primary vine length (cm) of sweetpotato genotypes at different DAP at Ramgarh soil series

The petiole length varied significantly and increased up to 150 DAP except Local-8, where petioles of Local-2, Exotic-1, Exotic-2 and Exotic-4 increased rapidly and rest of genotypes increased gradually (Fig. 3). The maximum leaf petiole length was in Exotic-1 (20.63 cm) followed by Exotic-2 (19.07 cm) and the smallest petiole length (12.33 cm) was in Local-5 at 150 DAP. Huaman (1992) reported that petiole length varies widely with genotypes and may range from approximately 10-40 cm. It increased with descending vine hierarchy (secondary vine < primary vine < main vine).

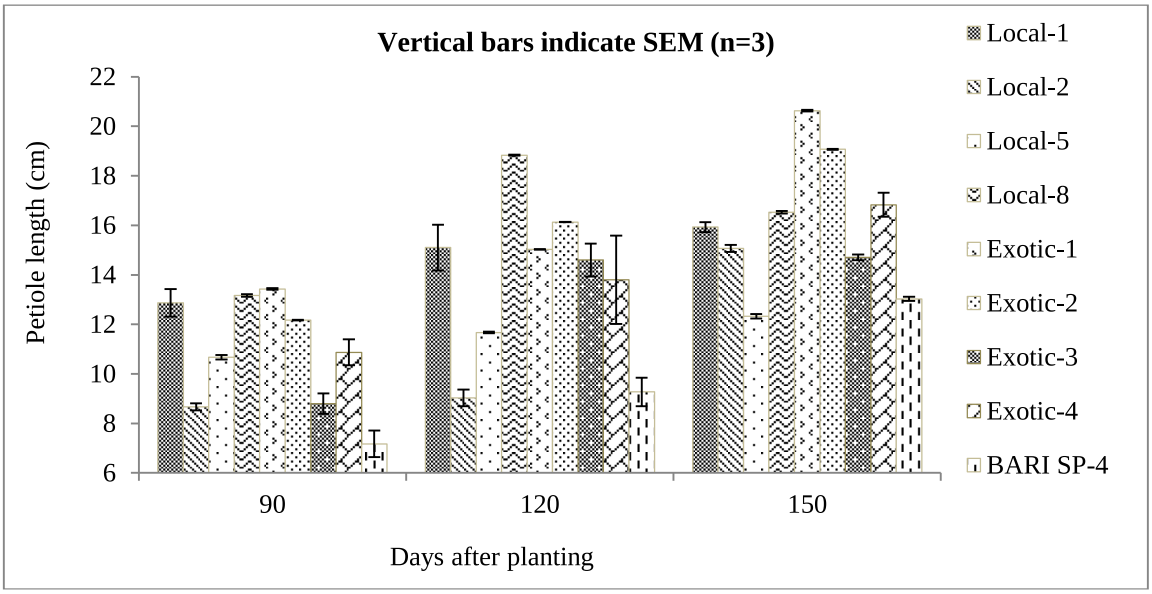

Fig. 3. Petiole length of leaf of sweetpotato genotypes at different DAP.

Leaf length of all genotypes increased marginally up to 120 DAP and thereafter decreased (Fig. 4). The maximum leaf length was in Exotic-3 and the minimum in Local-5 followed by local genotypes at 120 DAP. The leaf length of the present study was varied from 8.47 to 11.13 cm which was less than the finding of Prabawardine *et al.* (2007), where the leaf length ranged from 12 to 16.5 cm.

The leaf breadth of all the genotypes increased slightly up to 120 DAP (Fig. 5). The maximum leaf breadth (8.23 cm) was in Local-8 followed by Local-5 and Exotic-1, and the minimum leaf breadth (5.23 cm) was in Local-1 and BARI SP-4 at 120 DAP. The present result of leaf breadth was higher than the results obtained by Farooque *et al*. (1973) where they recorded the leaf breadth ranged from 3.80 to 6.60 cm. It might be due to genetical and/or environmental factors.

Leaf area leaf^{-1} of all genotypes increased gradually up to 120 DAP and thereafter decreased (Fig. 6). The highest leaf area (76.43 cm^2 leaf^{-1}) was found in Exotic-1 followed by Local-8 and Exotic-4. The lowest leaf areas were observed both in Local-1 (49.19 cm^2 leaf^{-1}) and BARI SP-4 at 120 DAP. After 150 DAP, the highest leaf area (73.89 cm^2 leaf^{-1}) was in Exotic-1 followed by Exotic-4 and the lowest (51.06 cm^2 leaf^{-1}) was in Local-1.

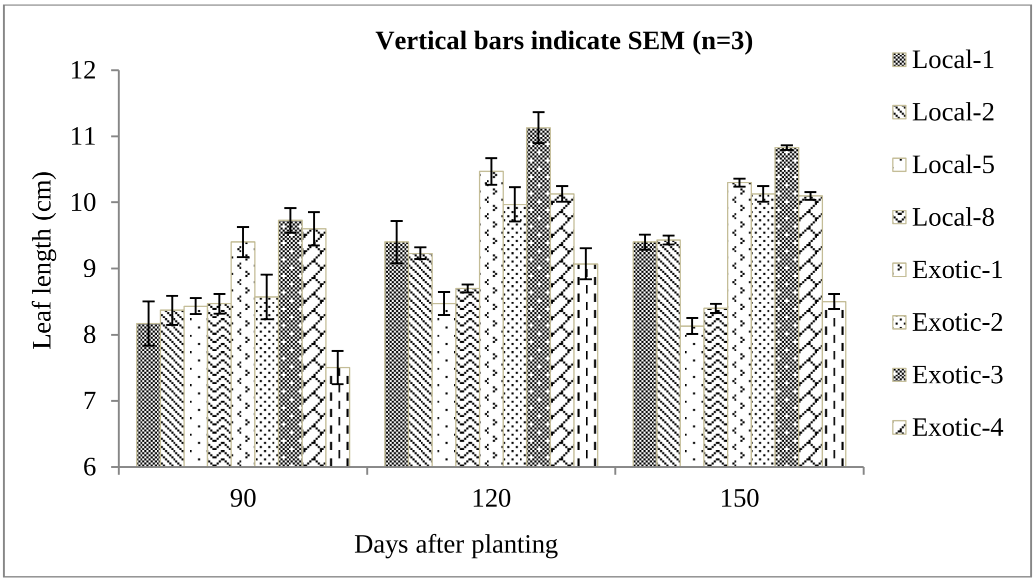

Fig. 4. Leaf length (cm) of sweetpotato genotypes at different DAP at Ramgarh soil series

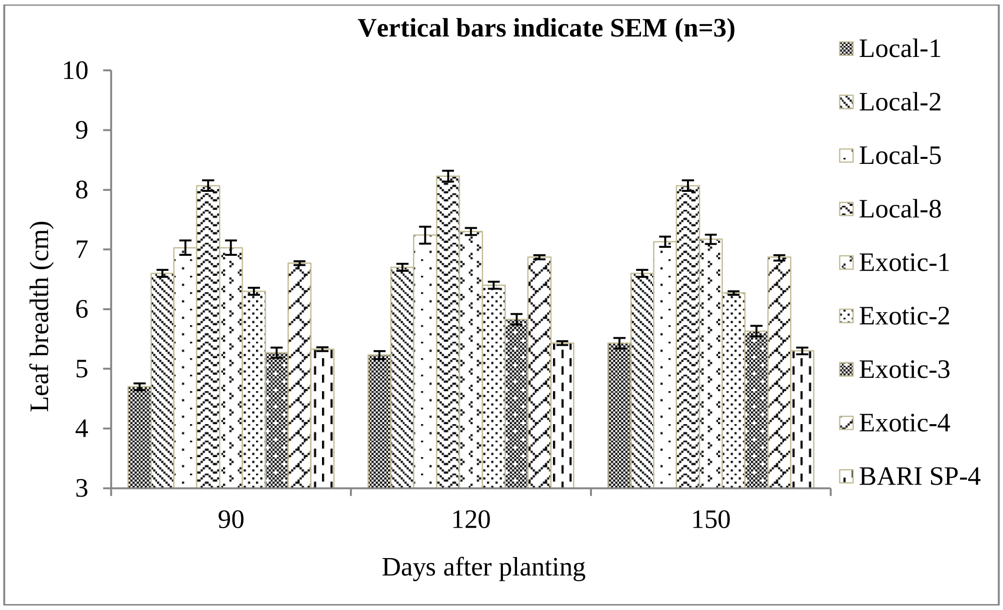

Fig. 5. Leaf breadth (cm) of sweetpotato genotypes at different DAP at Ramgarh soil series

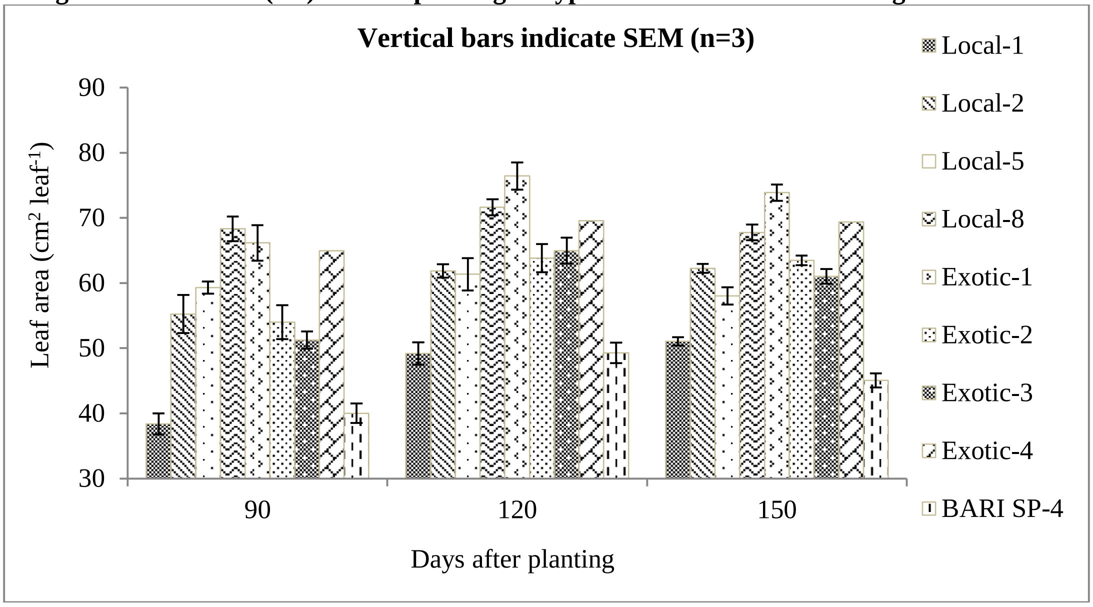

Fig. 6. Leaf area cm^2 leaf^{-1} of sweetpotato genotypes at different DAP at Ramgarh soil series

Table 4. Leaf number, LAI, moisture content in leaf and storage root and dry matter in storage root of different sweetpotato genotypes at 150 DAP

Genotypes	Leaf number plant^{-1}	Leaf area index (LAI)	Moisture in leaves (%)	Moisture in storage roots (%)	Dry matter content (%) in storage roots
Local-1	195.3±2.96 a	8.308±0.03 a	82.69±0.10 bc	71.13±0.17 d	28.87±0.58 bc
Local-2	116.7±2.60 d	6.051±0.09 c	81.77±0.17 d	73.13±0.23 c	26.87±0.44 cd
Local-5	122.3±1.86 d	5.919±0.22 c	81.68±0.69 d	64.57±0.29 f	35.42±0.58 a
Local-8	143.0±1.73 c	8.074±0.12 a	82.98±0.09 bc	69.55±0.26 e	30.10±0.58 b
Exotic-1	119.0±2.65 d	7.324±0.11 b	82.77±0.17 bc	64.36±0.17 f	35.64±0.35 a
Exotic-2	74.7±2.60 f	3.949±0.11 e	83.18±0.12 bc	63.31±0.40 g	36.71±0.31 a
Exotic-3	158.3±2.96 b	8.048±0.07 a	84.21±0.17 a	74.31±0.40 b	25.69±0.58 d
Exotic-4	93.0±2.08 e	5.376±0.16 d	82.39± 0.15 cd	62.50±0.58 h	37.47±0.58 a
BARI SP-4	76.2±1.26 f	2.862±0.08 f	83.48±0.07 ab	74.85±0.29 a	25.18±0.58 d
CV %	3.36	3.53	0.40	0.33	2.94

Figures (Mean ± SEM) in a column having similar letters do not differ significantly at 0.01 by Duncan's Multiple Range Test. SEM = Standard error of means, n= 3

The number of unfolded leaves plant^{-1} was recorded from 74.7 to 195.3 (Table 4) where the highest number of leaves was observed in Local-1 followed by Exotic-3 and Local-8, and the lowest was in Exotic-2 and BARI SP-4. The present result agrees partially with the findings of Haque (2002) where it was varied from 137.30 to 585.28 at different harvesting dates.

(b) Physiological characteristics

The highest LAI was in Local-1 (8.308) followed by Local-8 and Exotic-3 and then Exotic-1 at 150 DAP (Table 4). The lowest LAI was found in BARI SP-4 (2.862). Hossain (2002) found LAI of 9.883 in BARI SP-4 at 140 DAP. The highest moisture was in the leaf of Exotic-3 (84.21%) followed by check variety BARI SP-4, and the lowest was in the leaf of Local-5 (81.68%) (Table 4). Moisture in leaves of Local-1, Local-8, Exotic-1 and Exotic-2 was statistically similar. The highest moisture was in the storage roots of BARI SP-4 (74.85%) followed by Exotic-3 and the lowest (62.50%) was in the leaf of Exotic-4 (Table 4).

The highest dry matter content was in storage roots of Exotic-4 (37.47%) which was statistically similar to Exotic-2 (36.71%), Exotic-1 (35.64%) and Local-5 (35.42%) followed by Local-8 (30.10%) (Table 4). The lowest dry matter content was both in Exotic-3 (25.69%) and BARI SP-4 (25.18%). Lewthwaite and Triggs (2011) explained that dry matter content is mainly influenced by variety and by environmental factors, e.g. location, climate, day length, soil type and cultivation practices.

The highest fresh weight plant^{-1} of leaves (179.8 g), vines (216.7 g), fibrous roots (4.3 g) and storage roots (826.1 g) were in Local-2, Local-8, Local-5 and Local-1, respectively (Table 5). Local genotypes were performed better than check variety in respect to fresh weight of storage roots whereas maximum dry weights of leaves, vines, fibrous roots and storage roots were recorded in Local-2 (32.77 g), Exotic-1 (46.21 g), Local-5 (1.42 g) and Local-1 (238.5 g), respectively (Table 6). The maximum total fresh weight plant^{-1} was in Local-1 (1189.33 g) which was similar to Local-8 (1126.40 g) and the minimum was in Exotic-1 (561.57 g) (Table 5). The highest total dry matter was in Local-1 (313.54 g) followed by Local-8 and the lowest was in Exotic-3 (131.34 g) and BARI SP-4 (142.44 g) (Table 6).

Delowar and Hakim (2014) stated that the leaf fresh weight and vine fresh weight varied for soil characteristics and minimum growth of the plant achieved perhaps due to a variation in soil type. Rahman (2015) showed a wide variation in case of vines fresh weight among the sweetpotato genotypes. Vine fresh weight was highest at 120 DAP in all the genotypes due to increased growth rate, maturation of vines and fiber formation in vines and was lowest at 150 DAP due to weathering of vines for over maturation of plant. Shen *et al.* (2015) stated the fibrous roots fresh weight varied from 1 to 2 g.

Table 5. Fresh weights (g) of leaves, vines, fibrous roots and storage roots of sweetpotato genotypes at Ramgarh soil

Genotypes	Leaf fresh weight (g plant^{-1})	Vine fresh weight (g plant^{-1})	Fibrous root fresh weight (g plant^{-1})	Storage root fresh weight (g plant^{-1})	Total fresh weight (g plant^{-1})
Local-1	173.80±2.47a	187.70±1.40bc	1.73±0.030d	826.10±5.91a	1189.33±9.24a
Local-2	179.80±2.96a	207.70±4.27ab	1.53±0.030e	617.00±7.89c	1006.03±14.80b
Local-5	144.30±4.37b	178.50±11.97c	4.30±0.001a	608.60±11.63c	935.70±26.97c
Local-8	167.90±1.06a	216.70±4.15a	1.80±0.001d	740.0±11.55b	1126.40±16.40a
Exotic-1	133.00±3.50b	175.30±3.06c	2.27±0.030b	251.0±5.44g	561.57±5.18e
Exotic-2	112.10±7.80c	145.30±2.53d	1.20±0.060g	367.70±9.55e	626.30±9.02de
Exotic-3	73.60±4.23e	114.10±2.91e	2.10±0.060c	380.70±5.81e	570.50±9.06e
Exotic-4	179.60±2.83a	171.70±7.26c	1.37±0.030f	298.10±11.84f	650.77±21.88d
BARI SP-4	91.4±0.93d	99.73±5.56e	1.20±0.001g	424.30±9.62d	616.63±14.17de
CV (%)	6.23	6.23	2.50	3.26	7.29

Figures (Mean ± SEM) in a column having similar letters do not differ significantly at 0.01 by Duncan's Multiple Range Test. SEM = Standard error of means, n= 3

Siddique *et al.* (2008) recorded the storage roots fresh weight plant^{-1} of different genotypes from 260 to 1120 g. Delowar and Hakim (2014) noticed that storage roots fresh weight depends on the varietal performance to the particular soil. Hossain and Islam (2010) recorded the highest dry matter in storage roots. They estimated the dry matter content of storage roots of exotic genotypes from 24.91 to 37.46%, and in local varieties from 18.46 to 30.54 %.

The highest leaf dry matter partitioning was in Exotic-4 (17.23%) followed by Exotic-1 (14.37%) and Local-2 (13.55%) (Table 7). The lowest dry matter was partitioned into leaves of Exotic-3 (8.83%) along with rest of the genotypes. The highest dry matter partitioning into vines appeared in Exotic-1 (29.02%) followed by Exotic-4 and lowest into vines of Local-5 (13.53%). The highest dry matter partitioning into fibrous roots was both in Local-5 (0.51%), Exotic-1 and Exotic-4. The maximum dry matter partitioning into storage roots was in Local-5 (76.58%)

followed by Local-1, Local-8, Exotic-3 and BARI SP-4 (Table 7). The lowest dry matter partitioning into storage roots appeared in Exotic-1 (56.15%). Lewthwaite and Triggs (2011) reported partitioning of Beniazuma and Beauregard was 66.2% and 65.8%, respectively. The partitioning of DM into vines was higher than leaves.

Table 6. Dry weights (g) of leaves, vines, fibrous roots and storage roots of sweetpotato genotypes at 150 DAP

Genotypes	Leaf dry weight (g plant^{-1})	Vine dry weight (g plant^{-1})	Fibrous root dry weight (g plant^{-1})	Storage root dry weight (g plant^{-1})	Total dry matter (g plant^{-1})
Local-1	30.08±0.62ab	44.42±0.34ab	0.53±0.01c	238.50±6.46a	313.54±6.00a
Local-2	32.77±0.78a	43.1±2.09ab	0.52±0.01c	165.80±3.54c	242.21±5.15c
Local-5	26.43±1.50bc	38.18±2.48b	1.42±0.03a	215.60±6.32b	281.63±9.35b
Local-8	28.57±1.24ab	45.63±2.29a	0.67±0.01d	225.30±8.11b	300.17±11.61ab
Exotic-1	22.91±1.36cd	46.21±0.94a	0.72±0.02b	89.45±2.27e	159.29±1.90de
Exotic-2	18.86±0.72de	30.30±1.36c	0.38±0.02d	134.90±2.85d	184.44±1.31d
Exotic-3	11.62±0.74f	21.28±0.25d	0.65±0.02b	97.79±2.53e	131.34±3.26e
Exotic-4	31.57±1.25a	39.42±1.58ab	0.51±0.01c	111.80±5.32e	183.30±7.43d
BARI SP-4	15.10±0.41ef	20.27±1.07d	0.37±0.01d	106.70±0.34e	142.44±0.81e
CV (%)	7.29	7.77	4.16	5.73	5.36

Figures (Mean ± SEM) in a column having similar letters do not differ significantly at 0.01 by Duncan's Multiple Range Test. SEM = Standard error of means, n= 3

Table 7. Dry matter partitioning into plant parts of sweetpotato genotypes at 150 DAP

Genotypes	Dry matter partitioning (%)			
	Leaves	Vines	Fibrous roots	Storage roots
Local-1	9.61±0.29 c	14.18±0.38 de	0.17±0.003 c	76.05±0.63 ab
Local-2	13.55±0.47 b	17.79±0.50 c	0.21±0.01 bc	68.45±0.52 c
Local-5	9.39±0.45 c	13.53±0.44 e	0.51±0.02 a	76.58±0.63 a
Local-8	9.51±0.05 c	15.19±0.20 c-e	0.22±0.01 bc	75.08±0.25 ab
Exotic-1	14.37±0.75 b	29.02±0.76 a	0.45±0.01 a	56.15±1.18 e
Exotic-2	10.23±0.44 c	16.43±0.79 cd	0.21±0.01 bc	73.14±1.21 b
Exotic-3	8.83±0.35 c	16.22±0.41 cd	0.50±0.02 a	74.45±0.30 ab
Exotic-4	17.23±0.37 a	21.54±0.70 b	0.28±0.02 b	60.9±0.51 d
BARI SP-4	10.60±0.34 c	14.22±0.68 de	0.26±0.01 b	74.92±0.35 ab
CV (%)	6.48	5.79	7.80	1.82

Figures (Mean ± SEM) in a column having similar letters do not differ significantly at 0.01 by Duncan's Multiple Range Test. SEM = Standard error of means, n=3.

(c) Yield contributing characters and yield

The highest number of storage roots plant^{-1} was in Exotic-2 (7.20) followed by Local-8 (6.15), and the lowest numbers were in Exotic-1 (3.17) (Table 8). Local-1, Local-8, Exotic-2 and Exotic-3 achieved higher number of storage roots than check variety BARI SP-4. Yildirim *et al*. (2011) reported that number of storage roots plant^{-1} range was 4.9-7.7. Rahman *et al.* (2015) found number of storage roots plant^{-1} from 2.82 to 6.53. They argued that higher number of storage roots plant^{-1} enhanced the total yield of the sweetpotato. Haque (2002) stated that storage roots number plant^{-1} depends on the variety while reported that the storage roots number plant^{-1} from 2 to 7.33 and this variation confirmed the result of present study.

The longest storage root was in Local-5 (14.13 cm) followed by Local-1 and Local-2 (Table 8). The shortest storage roots were in Exotic-2 (8.70 cm), BARI SP-4, and Exotic-3. Length of storage roots of local genotypes and Exotic-1 was greater than check variety.

The result of the present study was lower than the findings of Uwah *et al.* (2013) who reported that the storage roots length in two years ranged from 14.4 to 16.3 cm. The result of the present study differed with the result of Rana *et al.* (1993) who reported that the sweetpotato genotype harvested at 150 DAP produced bigger storage roots compared to other harvesting dates.

Table 8. Yield contributing characters of different sweetpotato genotypes at 150 DAP

Genotypes	Number of storage roots plant^{-1}	Length of storage roots (cm)	Diameter of storage roots (cm)	Harvest Index (%)
Local-1	4.67±0.17 cd	12.03±0.18 b	4.79±0.13 ab	69.46±0.13 a
Local-2	4.33±0.17 de	12.07±0.89 b	3.66±0.18 c	61.33±0.19 c
Local-5	3.83±0.09 ef	14.13±0.19 a	3.21±0.09 cd	65.04±0.69 b
Local-8	6.15±0.11 b	11.38±0.29 bc	5.22±0.09 a	65.70±0.11 b
Exotic-1	3.17±0.20 f	10.13±0.41 b-d	3.48±0.12 cd	44.70±0.95 e
Exotic-2	7.60±0.15 a	8.70±0.55 d	2.98±0.09 d	58.71±1.21 d
Exotic-3	5.07±0.30 c	9.13±0.15 d	3.55±0.22 cd	66.73±0.22 ab
Exotic-4	3.37±0.58 f	9.50±0.09 cd	4.54±0.44 b	45.81±0.28 e
BARI SP-4	4.23±0.58 de	8.93±0.12 d	4.40±0.0.26 b	68.81±0.17 a
CV (%)	6.15	7.40	5.85	1.73

Figures (Mean ± SEM) in a column having similar letters do not differ significantly at 0.01 by Duncan's Multiple Range Test. SEM = Standard error of means, n=3.

The highest diameter of storage roots was in Local-8 (5.22 cm) followed by Local-1 (4.79 cm) (Table 8). The thinnest storage roots were in Exotic-2 (2.98 cm). Local-1 and Local-8 were performed better than check variety in respect to diameter of storage roots.

Hossain (2002) reported the number, length and diameter of the storage roots of BARI SP-4 were 5 plant^{-1}, 15.39 cm and 6.63 cm, respectively. Rahman *et al.* (2015) reported that the diameter of the storage roots vary with growth pattern of the plant which is influenced by the genetic characteristics. Sen *et al.* (2009) reported that storage roots diameter varied from genotype to genotype. Rahman (2015) stated the diameters from 1.26 to 3.26 cm at 150 DAP.

The highest harvest index (HI) was in both Local-1 (69.46%) and BARI SP-4 (68.81%) followed by Exotic-3, Local-5 and Local-8 (Table 8). The lowest harvest index was in both Exotic-1 (44.70%) and Exotic-4 (45.81%). A wide variation in HI of root and tuber crops has been reported by Enyi (1977) where the HI ranged from 38 to 88%.

Fodder yield (t ha^{-1}) was influenced by the genotypes significantly (Fig. 7). The highest fodder yield was observed in Local-2 (32.30) followed by Local-8 (32.05), Local-1 (30.13) and Exotic-4 (29.28). The lowest fodder yield was both in BARI SP-4 (15.93) and Exotic-3 (15.54).

The highest yield of storage roots (t ha^{-1}) was in Local-1 (48.96) followed by Local-8 (42.60), and the lowest yields were both in Exotic-4 (9.84) and Exotic-1 (10.25) (Fig. 7). Shimu *et al.* (2016) recorded storage root yield from 18.03 to 21.01 t ha^{-1} during November to March 2016. Rahman *et al.* (2015) reported storage roots yield of nine sweetpotato genotypes ranged from 7.13 (JSP-7) - 22.83 t ha^{-1} (BARI SP-4) at SAU farm, Sylhet in July to December. Siddique (2005) reported that the yields of 24 sweetpotato genotypes at Horticulture farm, BAU, Mymensingh ranged from l4.3 to 55.6 t ha^{-1}. Hossain (2002) estimated the yield (t ha^{-1}) of exotic genotypes from 28.36 to 47.59 and the yield of local genotypes from 17.65 to 51.66.

B) Simple correlation coefficients between growth and yield attributes of sweetpotato

Correlation study revealed that primary vine number, total fresh weight, total dry matter, harvest index, number of storage roots, diameter of storage roots, storage roots fresh weight were positively correlated with yield, whereas primary vine length, leaf number, leaf area index, length of storage roots were not correlated with yield (Table 9).

Table 9. Simple correlation coefficients between growth and yield attributes, and storage root yield of sweetpotato as affected by genotypes at Ramgarh soil series in 2015-2016

Attributes	VN	VL	LL	LB	LN	TLA	LAI	FSR	TFW	TDM	NSR	LSR	DSR	HI	YLD
VN	1.00														
VL	0.317	1.00													
LL	-0.159	-0.408*	1.00												
LB	0.232	0.523**	-0.199	1.00											
LN	0.496**	-0.178	0.260	0.006	1.00										
TLA	0.332	-0.102	0.442*	0.300	0.889**	1.00									
LAI	0.332	-0.102	0.442*	0.300	0.889**	1.000	1.00								
FSR	0.648**	0.258	-0.623**	0.026	0.204	-0.134	-0.134	1.00							
TFW	0.662**	0.309	-0.545**	0.190	0.222	-0.042	-0.042	0.966**	1.00						
TDM	0.719**	0.370	-0.531**	0.339	0.203	-0.004	-0.004	0.898**	0.958**	1.00					
NSR	0.159	-0.067	-0.149	-0.129	-0.349	-0.435*	-0.435*	0.199	0.115	0.118	1.00				
LSR	0.399	0.321	-0.497**	0.418*	0.279	0.144	0.144	0.662**	0.716**	0.773**	-0.241	1.00			
DSR	0.541**	0.381*	-0.150	-0.002	0.029	-0.075	-0.075	0.462*	0.476*	0.376	-0.082	0.078	1.00		
HI	0.237	0.036	-0.626**	-0.419*	-0.046	-0.441*	-0.441*	0.685**	0.479*	0.357	0.369	0.264	0.203	1.00	
YLD	0.671**	0.127	-0.502**	-0.211	0.135	-0.204	-0.204	0.859**	0.779**	0.684**	0.452*	0.267	0.584**	0.686**	1.00

Legends: VN = Primary vine numbers plant^{-1}, VL = Primary vine length, LL = Leaf length, LB = Leaf breadth, LN = Leaf number, TLA = Total leaf area (cm2 plant^{-1}), LAI = Leaf area index, FSR = Fresh weight of storage roots (g plant^{-1}), Total fresh weight (g plant^{-1}), TDM = Total dry matter (g plant^{-1}), Number of storage roots plant^{-1}, Length of storage roots (cm), Diameter of storage roots (cm), HI = Harvest index, YLD = Yield (t ha^{-1})

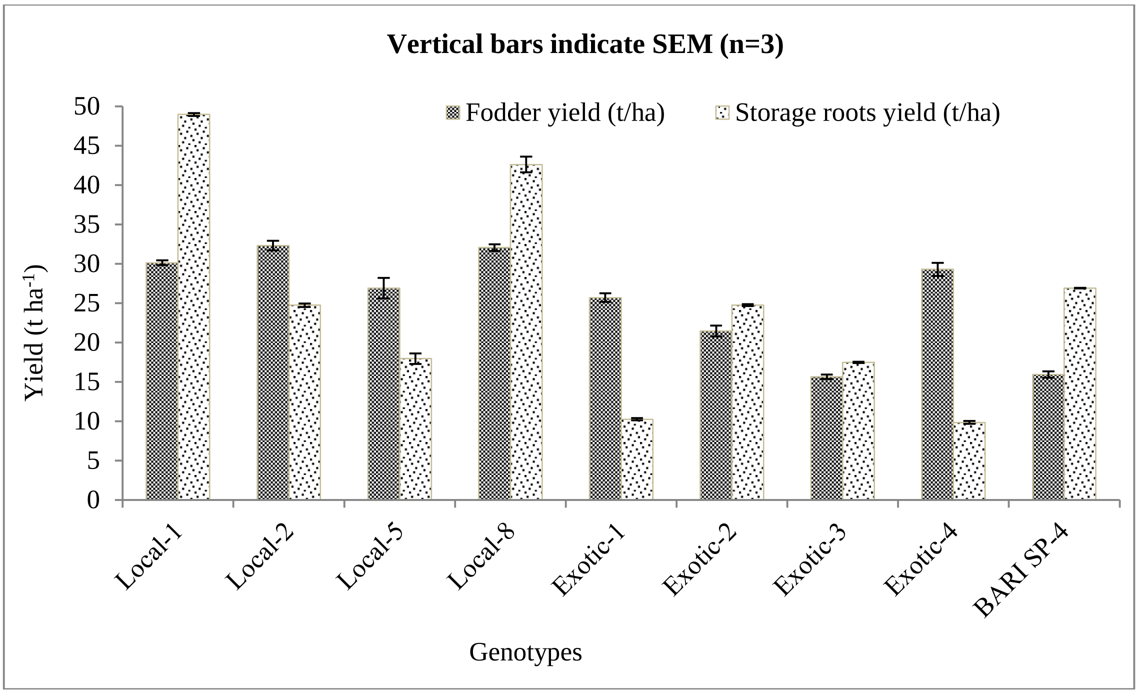

Fig. 7. Storage root yield and fodder yield (t ha^{-1}) of sweetpotato genotypes at Ramgarh soil series

Conclusion

Genotypes Local-1 and Local-8 were performed better at Ramgarh soil **series**. Primary vine number, total fresh weight, total dry matter, harvest index, number of storage roots, diameter of storage roots, storage roots fresh weight were positively correlated with yield. It can be concluded that Local-1 and Local-8 to be suitable for low hill ranges of Sylhet region.

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References

Anshebo T, Veerraragavathatham D and Kannan M. 2004. Genetic variability and correlation studies in sweetpotato [*Ipomoea batatas* (L.) Lam.] Madras Agricultural Journal. 91(7-12):420-424.

CIP. 1991. Descriptors for sweetpotato. Huaman Z (Editor), International Potato Centre, Rome, Italy. pp.43-64.

DAE. 2017. Annual Report of Regional Office for 2016-17. Directorate of Agricultural Extension, Ministry of Agriculture, People's Republic of Bangladesh, Sylhet.

Delower HKM and Hakim MA. 2014. Effect of salinity levels on the morpho−physiological characteristics and yield attributes of sweetpotato genotypes. International Journal of Science and Research (IJSR) (ISSN: 2319−7064). 10(3):929-934.

Enyi BAC. 1977. Analysis of growth and storage root yield in sweetpotato (*Ipomoea batatas L.*) cultivars. The Journal of Agricultural Science. 88**:** 421- 430.

Essilfie EM, Blay ET and Norman JC. 2015. Yield and storability of sweetpotato (*Ipomoea batatas* (L.) Lam) as influenced by chicken manure and inorganic fertilizer. PhD Thesis. Department of Crop Science, University of Ghana. 292p.

Farooque AM and Husain A. 1973. Studies on the comparative morphological characters and the yield of the seven varieties of sweetpotato. Bangladesh Horticulture. **1:**37 - 44.

Haque AM. 2002. Study of important morphological features and yield of eight sweetpotato genotypes, MS Thesis, Department of Crop Botany, Bangladesh Agricultural University, Mymensingh.

Hossain MAS and Islam AFMS. 2010. Comparative study on dry matter partitioning in five exotic genotypes and five local varieties of sweetpotato. Journal Sher-e-Bangla Agricultural University. 4(1):24-30.

Hossain MAS. 2002. Growth and yield comparison of some exotic and local genotypes of sweetpotato. MS Thesis, Dept. of Crop Botany, Bangladesh Agricultural University, Mymensingh.

Huaman Z. 1992. Systematic Botany and Morphology of the Sweetpotato Plant. Technical Information Bulletin 25. International Potato Center, Lima, Peru. 22p.

Jahan MMA, Islam AKMA and Siddique MA. 2009. Studies on growth and yield of sweetpotato *(Ipomoea batatas)* as influenced by variety and time of harvest. Department of Genetics and Plant Breeding, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur-1706, Bangladesh.

Kareem I. 2013. Growth, yield and phosphorus uptake of sweetpotato (*Ipomoea batatas L.*) under the influence of phosphorus fertilizers. Research Journal of Chemistry and Environment. 1**:**50-55.

Kitaya Y, Hirai H, Wei X, Islam AFMS and Yamamoto M. 2008. Growth of sweetpotato cultured in the newly designed hydroponic system for space farming. Advances in Space Research. 41**:**730-735.

Lewthwaite SL and Triggs CM. 2000. Preliminary study on sweetpotato growth: I. Dry matter partitioning. Agronomy New Zealand. 30.

MoA. 2017. Ministry of Agriculture, Government of the People's Republic of Bangladesh. http://www.moa.gov.bd, file://F:/Sweetpotato/information/crop_situation_2010-14 moa.pdf

Prabawardani S. 2007. Physiological and growth responses of selected sweetpotato (*Ipomoea batatas* (L.) Lam.) cultivars to water stress. James Cook University.

Rahman H, Islam AFMS, Maleque MA and Tabassum R. 2015. Morpho-physiological evaluation of sweetpotato (*Ipomoea batatas* L.) genotypes in acidic Soil. Asian Journal of Crop Science. **7:**267-276.

Rana AR, Curayag LJ, Vallador DM and Franje NS. l993. Harvesting periods and their effects on the yield and yield components of two sweetpotato varieties. CMU Journal of Science. 6(1):179−180.

SRDI. 2013. Physiography of Bangladesh. Soil Resource Development Institute, 1st edn., Ministry of Agriculture, Govt. of the People's Republic of Bangladesh. Dhaka. pp.1-53.

SRDI. 2010. Land and Soil Statistical Appraisal Book of Bangladesh. Soil Resource Development Institute, 1st edn., Ministry of Agriculture, Dhaka. pp.11-103.

Siddique MA, Hasanuzzaman ATM and Husain A. 2008. Growth and yield of three high yielding sweetpotato genotypes, Bangladesh J. Agriculture 13(3):139−145.

Siddique MAR. 2005. Studies on the morphology, growth and yield of some sweetpotato genotypes. MSc (Agriculture) thesis, Dept. of Horticulture, Bangladesh Agricultural University, Mymensingh.

Sen H, Mukhopadhyay SK and Goswami SB. 2009. Relative performance of some sweetpotato entries at early harvest. Journal of Root Crops. 16(1):18−21.

Shimu AA, Islam MS, Das AC and Biswas A. 2016. Effect of planting dates on the growth and yield of sweetpotato genotypes at Sylhet in Bangladesh. J. Sylhet Agril. Univ. 3(1):41-44.

Shen S, Gaofeng X, Clements DR, Jin G, Chen A and Kato-Noguchi FZH. 2015. Suppression of the invasive plant mile-a-minute (Mikania micrantha) by local crop sweetpotato (*Ipomoea batatas* L) by means of higher growth rate and competition for soil nutrients. Journal BMC Ecology. 15:1.

Uwah DF, Undie UL, John NM and Ukoha GO. 2013. Growth and yield response of improved sweetpotato (*Ipomoea batatas* (L.) Lam) varieties to different rates of potassium fertilizer in Calabar, Nigeria. Journal of Agricultural Science. 5(7): 123, 916-976.

Woolfe JA. 1992. Sweetpotato: An Untapped Food Resource. Cambridge University Press, Cambridge, UK. pp. 118-187.

Yildirim Z, Tokusoglu O and Ozturk G. 2011. Determination of sweetpotato [*Ipomoea batatas* (L.) Lam.] genotypes suitable to the Aegean region of Turkey. Turkish Journal of Field Crops, 16(1):48-53.