Studies on the Relationship between some Morphological Characteristics and Tuber Yield of Sweet Potato (*Ipomoea batata* L,)

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SUMMARY

Both local sweet potato cultivars and Nigerian introductions showed high variability in their petiole lenth, vine length, tuber number and tuber yield.

Petiole length was not significantly correlated with either tuber yield or tuber number per plant and indicates that such correlations cannot be used as a selection index to evaluate the yield potential of sweet potato cultivars. Although not significant, vine length was negatively correlated with the yield due to unfavourable distribution of assimilates in favour of vine growth.

INTRODUCTION

Although there are several local clones of sweet potato, little research has been undertaken to produce improved varieties with a high yield potential. Thus a programme of breeding and selection of sweet potato based on relationships between quantitative and qualitative characters, degrees of heritability influence or interference of gene action and factors pertaining to adaptability may be useful. The petiole and vine length in sweet potato have been cited as important yield parameters (Kamalam *et al* 1976; Degras, 1967). As sweet potato is propagated by cuttings the selection of hybrid material could be possibly terminate in the f_1 progeny and consequently further segregation of petiole and vine length in subsequent progenies will not arise. Therefore studies were initiated to ascertain the correlations that may exist between petiole and vine length and tuber yield in some local and Nigerian introductions of sweet potato.

MATERIALS AND METHODS

Two field experiments were carried out at the Central Agricultural Research Institute, Gannoruwa, during April-August, 1978. The soil was a clay-loam.

In experiment 1, 20 introductions from Nigeria were raised by seeds (Table 1) and in experiment 2, 15 local selections were established by cuttings

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(Table 2). The maturity period of the varieties varied from 3-4 months. Both cuttings and seedlings were exposed to similar conditions by planting them on ridges at a spacing of 0.26 x 0.26 m. All varieties received 29 kg N/ha as Urea (46% N), 35 kg P_2O_5 / ha as super phosphate (20% P_2O_5) and 76 K_2O/ ha as muriate of potash (60% K_2O) at planting. A top dressing of 29 kg N/ha was applied 35 days after planting (DAP) to all plots. All cultural practices recommended for sweet potato were adapted as per local recommendations. A randomized block design with three replicates was used.

Measurements of length of petiole and vine were recorded at crop maturity. Petiole and vine length, tuber number and tuber yield per plant were recorded from 8 randomly selected plants per variety. Petiole length was measured for 5 fully expanded leaves per plant, discarding 5 apical leaves.

RESULTS AND DISCUSSIONS

In both experiments there were highly significant differences in petiole and vine length, tuber yield and tuber number per plant. These differences may be attributed to the genetic differences among the cultivars.

There were no significant correlations between petiole length and tuber yield per plant and petiole length and tuber numbers per plant in both experiments (Table 3). Limited information is available on the correlation studies on yield components of sweet potato. Kakalam *et al.*, (1976) in a study of 10 selections of sweet potato reported that tuber yield was significantly and positively correlated with tuber numbers. They did not report any significant correlation between tuber yield and petiole length. Hrishi and Nair (1973) obtained a positive correlation between lengths of petiole and tuber yield and they suggested that this character may be effectively utilized as a selection index for yield in sweet potato. But data obtained in this study did not show any correlation between petiole length and tuber yield and agrees with the findings of Kamalam *et al.*, (1976) who reported similarly.

There was a negative correlation between vine length and tuber yield in all varieties in both experiments (Table 4). This finding confirms the report of Kamalam *et al* (1976) who also showed that the vine length and its weight are negatively correlated with tuber yield, although contrary to the findings of Li (1965) and Thamburaj and Muthukrishnan (1976). The negative relationship may be attributed to the differential distribution of assimilates in the form of vine growth at the expense of tuber growth. When vine growth increases respiratory surface also increases and a part of assimilates will also be utilized for respiration. This could further reduce the availability of carbohydrates for root growth (Burt, 1964). On the other hand, excessive vegetative growth may reduce light transmission through the crop canopy due to mutual shading of the leaves, This could reduce assimilation, although res-

piration may be normal. Consequently the amount of assimilates available for tuber growth will be less and tuber yield will decrease (Chapman & Cowling, 1965). Therefore it could be interpreted that vines of medium length with adequate leaf area would be more efficient in photosynthesis and assimilate production for root development.

Results suggests that neither petiole length nor tuber number per plant could be used to evaluate the yield potential of sweet potato varieties. However the differences in the length of petiole may be of some use in characterizing and identifying sweet potato varieties. Vine length may be a suitable criterion to evaluate the yield potential, although vine growth may vary under different environmental conditions.

Table 1—**Petiole length, vine length, tuber yield and tuber number per plant of Nigerian introductions**

Name of variety			*Mean petiole length cm*	*Mean vine length cm*	*Mean No. of tubers/ plant*	*Mean tuber yield/ plant*
T_{15} 3055 D_{38}	3 months	...	20.71	193.00	5	0.355
T_{15} 2328 A_2	...	...	12.87	283.00	4	0.283
T_{15} 3055 D_{33}	3 1/2 months	...	18.62	276.00	4	0.425
T_{15} 2328 A_3	...	...	17.79	199.00	5	0.292
T_{15} 2330 B_3	...	...	21.66	287.00	3	0.294
T_{15} 2328 A_1	...	...	17.17	251.00	4	0.354
T_{15} 2332 C_6	4 months	...	14.47	296.33	4	0.564
T_{16} 8 E_2	...	...	14.03	146.00	2	0.156
T_{15} 2332 C_4	...	...	17.55	329.00	1	0.121
T_{16} 8 E_5	...	...	15.37	334.00	2	0.171
T_{15} 2328 A_{12}	...	...	18.42	569.00	1	0.036
T_{15} 2332 C_3	...	...	14.88	242.00	2	0.333
T_{16} 8 E_1	...	...	18.04	362.00	1	0.055
T_{15} 3055 D_{28}	...	...	19.57	512.00	2	0.259
T_{15} 2330 B_1	...	...	15.88	322.00	4	0.554
T_{15} 2332 C_1	...	...	15.50	247.00	4	0.422
T_{15} 2332 C_{15}	...	...	15.75	5.13	1	0.029
T_{15} 2332 C_5	...	...	16.13	374.00	1	0.129
T_{15} 2330 B_2	...	...	15.50	439.00	1	0.187
T_{15} 2332 C_2	...	...	23.42	335.00	2	0.134
LSD (5%)	...	...	8.53	2.74	3.36	0.156
CV%	...	...	15.03	21.4	26.4	36.60

Table 2—Petiole length, vine length, tuber yield and tuber number per plant of local sweet potato varieties

Varieties	*Mean petiole length cm*	*Mean vine length cm*	*Mean No. of tubers*	*Mean tuber yield*
Selection II (3 months)	13.41	208.00	3	0.266
Cinchi	19.71	209.00	3	0.349
Borgia Red (3 months) ...	10.88	291.00	3	0.286
Norin	18.41	170.00	4	0.411
Wariapola	14.62	181.00	2	0.128
F.A.–	17.06	185.00	3	0.330
Selection 14 (4 months) ...	16.87	279.00	1	0.050
Selection 1	12.28	292.00	1	0.240
Selection 5	12.08	237.00	4	0.185
B'nas	26.00	75.00	3	0.164
N.S.F. White	17.87	264.00	2	0.120
Bentota–B	19.21	271.00	1	0.360
Selection 12	11.58	258.00	4	0.187
Selection 13	12.62	246.00	2	0.067
Selection 6	17.38	237.00	3	0.156
L S D (5%) cm/plant	7.71	111.20	2.298	0.109
CV %	14.46	14.69	28.47	35.67

Table 3—Correlation coefficients of growth attributes of sweet potato varieties

Varieties used	*Correlation Coefficients*		
	Petiole length Tuber yield per plant	*Petiole length/ Tuber number per plant*	*Vine length/ Tuber yield per plant*
3 1/2 months Local selections	0.49	0.31	–0.08
3 1/2 months Nigerian introductions	0.25	0.43	–0.09
4 months Local selections ...	0.16	0.14	–0.44
4 months Nigerian introductions	0.33	0.42	–0.06

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