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Growth Performance of Nigerian Sweet Orange Cultivars (*Citrus Sinensis* (L.) *Osbeck)* on Two Commonly used Rootstocks in the Nursery.

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ABSTRACT: Five Nigerian Citrus Sweet orange local land races namely: Agege 1, Umudike, Bende, Etinan and Meran were screened on two commonly used citrus rootstocks in Nigeria. The rootstocks are Cleopatra mandarin (*Citrus reshni* Hort. Ex Tan) and Rough Lemon (*Citrus jambhiri L.* Lush) with the aim of rapid production of good quality Sweet orange budlings for orchard establishment. The five sweet orange local land races served as the subplots and the two commonly used rootstocks were used as the main plots. The experimental design was a split plot in randomized complete block. Percentage budtake was almost one hundred percent for all the scions and rootstocks used. There were also no significant differences in the percentage budsuccess/break 28days after budding. On the later growth for the scion length, Agege 1, Umudike and Meran varieties performed better in growth vigour, while 'Bende' recorded the lowest growth attributes. However, only Agege 1 and Meran cultivars had the 45.0cm scion length recommended for orchard establishment twenty-four weeks after budding. Rough lemon rootstock was found to impart more vigour on its scion than Cleopatra mandarin. Agege 1 and Meran Sweet orange cultivars produced the best scion growth attributes and rough lemon rootstock imparted the best vigour on scions.

Keywords: Sweet orange, Land races, rootstock and scion growth.

INTRODUCTION

Sweet orange *(Citrus sinensis (L.) Osbeck)* is the most widely cultivated among the citrus species (Davies and Albrigo, 1994). In Nigeria more than 90% of the citrus production is of Sweet orange (Kolade and Olaniyan, 1998). Its importance is due to the high Vitamin C content in the fruit, high industrial potential for manufacturing concentrates, fruit juice squash, marmalade and essential oils and flavorings. Olapade (1999) noted that the high medicinal value of citrus is not restricted to the fruit alone but to virtually to all its parts. The banning of fruit juices by the Federal Government of Nigeria to save foreign exchange on importation will lead to the development of fruit juice industry in the country. While 33% of all citrus worldwide is processed Internationally, 83% of the processed citrus fruits is of Sweet oranges (Davies and Albrigo, 1994). In Nigeria 45% of citrus fruit is reported to be consumed fresh, 30% to post harvest losses and only 25% to processing (Anonymous, 2002). Working on 12 Sweet orange varieties in the orchard that will be suitable for Nigeria ecology, Kolade and Olaniyan (1998) identified three Local land races (Nigerian Green Orange) in terms of yield and fruit quality, they are 'Agege 1' Umudike and Etinan out of the five local land races among the 12 sweet orange varieties screened for the trial. Looking for raw materials for juice processing the three local land races that have been identified to be good in term of plant survival, high yield and good quality fruits will be of high demand for orchard establishment. There is therefore the need to plan for the availability of the Sweet Orange planting materials for farmers and entrepreneurs who would likely want to go into the production of citrus fruits for juice processing industry. In an attempt to solve the problem of citrus planting materials, five Nigeria Sweet Orange land races namely:

(1) 'Agege 1' (2) Bende (3) Meran (4) Umudike (5) Etinan were screened on two popular rootstocks in use in Nigeria Cleopatra mandarin and Rough lemon for rapid citrus budlings multiplication.

MATERIALS AND METHODS

Cleopatra mandarin (*Citrus reshni* Hort. Ex tan) and Rough lemon (*Citrus jambhiri* Lush) rootstock seedlings earlier raised in the pre-nursery were transplanted to the main nursery at six-months old. They were maintained for another six months until 80% of the Cleopatra mandarin rootstock seedlings have attained 0.60 stem diameter 15cm above the soil surface at this time all the rough lemon rootstock seedlings had attained 0.70cm stem diameter because of its vigorous growth. The five Nigerian land races Sweet orange scion (*Citrus sinensis* (L.) Osbeck) budded on the two rootstocks were (1) 'Agege 1' (2) Bende

(3) Meran (4) Umudike (5) Etinan all served as sub-plot treatments. Cleopatra mandarin and Rough lemon rootstock seedlings were the main plot treatments. The experimental design was randomized complete block in split plot layout. Each treatment plot size for the sub-plot was 2m x 2m separated by 0.5m; each main plot was 2m x 4m separated by 0.5m distance. The treatments were replicated four times. Growth data of budtake and budbreak/Success 14 and 28 days respectively were recorded. Subsequent growth such as number of leaves, scion stem diameter 2cm from bud union, scion length and number of branches every two weeks were recorded until 24 weeks after budding. The data were subjected to analysis of variance and the means were compared by least significant difference (LSD).

RESULTS AND DISUSSION

There were no significant differences in the percent budtake and budbreak (Success) caused either by the different scions or the two rootstocks. There was also no interaction effect between the scion and the rootstock on the bud success. The value for budtake ranges between 92.7 – 100% for the different cultivars 14days after budding and 76.9 – 80.5% for budbreak 28 days after budding. The non significant differences in the percent budtake and break by the Sweet range cultivars might be because all the cultivars belong to the same species (*Citrus sinensis*) which does not allow for much genetic variation among the scions. There were also no significant differences between rough lemon and Cleopatra mandarin rootstocks on percent budtake and budbreak 14 and 28days after budding respectively.

Table 1 Influence of Sweet Orange varieties on scion diameter (cm) performance in the Nursery.

	Weeks after budding				
Varieties	8	12	16	20	24
Etinan	0.41	0.43	0.45	0.49	0.52
Bende	0.41	0.43	0.45	0.48	0.51
Meran	0.56	0.58	0.62	0.64	0.68
Umudike	0.44	0.435	0.47	0.49	0.54
Agege	0.58	0.62	0.63	0.71	0.74
LSD(P=0.05)	NS	0.18	NS	0.16	0.22

Table 2 Influence of Sweet Orange varieties on scion Number of leaves in the Nursery.

	Weeks after budding				
Varieties	8	12	16	20	24
Etinan	12.41	19.94	20.78	23.89	32.34
Bende	9.96	21.00	21.94	24.25	27.98
Meran	11.47	20.59	22.20	26.13	33.16
Umudike	11.95	17.66	20.53	22.04	36.18
Agege	10.65	19.21	25.21	25.57	38.03
LSD(P=0.05)	NS	NS	NS	NS	6.28

Table 3 Influence of Sweet Orange varieties on scion length (cm) performance in the Nursery.

	Weeks after budding				
Varieties	8	12	16	20	24
Etinan	20.63	29.28	32.28	34.97	39.18
Bende	19.75	25.6	26.56	29.22	34.37
Meran	17.75	23.75	30.87	38.66	45.20
Umudike	15.32	28.06	30.66	33.53	40.44
Agege	17.72	26.63	32.76	34.96	50.82
LSD(P=0.05)	NS	NS	NS	NS	6.80

Table 4 Effect of Rootstocks and Sweet Orange varieties on scion Performance at 24 weeks after budding.

	Scion Length (cm)		
Scion	Cleopatra Mandarin	Rough lemon	Scion Means
Etinan	36.06	42.29	39.18
Bende	29.63	39.11	34.37
Meran	43.58	46.81	45.20
Umudike	36.75	44.13	40.44
Agege 1	42.19	59.44	50.82
Rootstock means	37.64	46.36	

LSD (P=0.05), Variety = 6.8; Rootstocks = 8.3, Variety x Rootstock = 5.8

	Scion Diameter (cm)		
Scion	Cleopatra Mandarin	Rough lemon	Scion Means
Etinan	0.49	0.54	0.52
Bende	0.38	0.63	0.51
Meran	0.41	0.94	0.68
Umudike	0.31	0.77	0.54
Agege 1	0.47	1.00	0.74
Rootstock means	0.41	0.78	

LSD (P=0.05), Variety=0.22; Rootstocks=0.36, Variety x Rootstock = 0.41

Environmental factors have been reported to have more influence at this stage of the crop growth when all other factors are present (Olaniyan and Amih, 1992). On the later growth, there was increase in all the growth variables at each sampling period until the last sampling period (twenty-four weeks after budding WAB). On scion Stem diameter, Agege 1 Sweet orange cultivar showed superiority over Etinan and Bende from 12WAB, but was not significantly better than Meran and Umudike (Table 1). The scion number of leaves for all the cultivars showed no significant differences for the first 20 WAB, however at 24WAB Agege 1 with 38.0 number of leaves was significantly superior to Bende cultivar (Table 2). Agege 1 cultivars with 50.82 cm scion length was not superior to Meran with 45.20cm scion length but was significantly different from other varieties 24 WAB (Table 3). However, only Agege 1 and Meran had attained the recommended 45cm scion length recommended for field transplanting 24WAB.

Rough lemon rootstock imparted more vigour on the scions of the local sweet orange cultivars than Cleopatra mandarin (Table 4). The interaction observed on the scion was mostly caused by rough lemon rootstock.

The continuous increase in growth for all the scions cultivars until the last sampling period (Twenty-four WAB) showed that the plants were at the juvenile stage. The differences recorded in the performance of scion growth of the sweet orange cultivars were due in part to the degree of scion rootstock compatibility. Castle *et. al.*, (1993) reported that not all citrus species are compatible with each other or with species of other genera. Furthermore, Olaniyan *et.al.*, (2003) found out that Agege 1 Sweet Orange was more compatible in scion development than Valencia late sweet orange both of them on Cleopatra mandarin rootstock. Genetic variation could not be ruled out for the differences in the growth pattern observed for the Sweet orange local land races.

CONCLUSION

The sweet orange local land races and the two commonly citrus rootstocks did not affect the scion budtake and brake. However Agege 1 and Meran cultivars produced the best scion growth, over other Nigerian Sweet Orange cultivars. Rough lemon rootstock which imparted the best vigour on the scions of the sweet orange cultivars should be the choice for farmers to produce vigorous budlings at the shortest time.

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