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EVALUATION OF DIFFERENT MORPHOTYPES OF MANGO (*MANGIFERA INDICA* L.) FOR USE AS ROOTSTOCK IN SEEDLINGS PRODUCTION

***[1]Baita, H. U., [2]Manga, A.A., and [3]Mustapha, Y.**
[1]School of Arabic and Islamic Studies, Hadejia, P. O. Box 037, Jigawa State, Nigeria
[2]Department of Agronomy, Faculty of Agriculture, Bayero University, PMB 3011, Kano, Nigeria
[3]Department of Biological Sciences, Faculty of Science, Bayero University, PMB 3011, Kano, Nigeria
*Correspondence author

ABSTRACT
The experiment was designed to assess the growth performance of improved cultivars of Mango grafted on adapted local morphological types. Two trials were conducted in 2005/2006 and 2006/2007 wet season at the teaching and research farm of Faculty of Agriculture, Bayero University, Kano (11^0 58'N and 8^0 25'E) situated in Sudan Savanna ecological zone of Nigeria. The experiment consisted of four morphotypes (Binta Siga, Gwaiwar Rago, Dankamaru and Fafaranda) factorially combined with three scions (Alphonso, Peach and Taymour) and laid out in a completely randomized design with three repetitions. The results showed that Binta Siga was identified as the best rootstock in terms of plant establishment probably due to production of higher number of roots, stem diameter, number of leaves, percentage take and general crop vigor. Taymour was observed to be the best scion in terms of compatibility with most of the rootstocks as expressed by its superior performance with regard to the characters mentioned earlier. Binta Siga is therefore recommended for use as rootstock by nursery men in Mango seedlings production for higher profit margin in Kano environment

Keywords: Nigeria, Rootstocks, Scions,Mango

INTRODUCTION

Mango was introduced into Nigeria towards the end of the 19th century. The government of Southern Nigeria received some mango cultivars from the Botanical Gardens of Jamaica in 1898 (Adejoh, 1980). These were planted at the Botanical Gardens of old Calabar. These cultivars spread to other parts of Nigeria and became highly adapted to Nigerian condition. However, some varieties of recent introduction that are better in yield and quality are not well adapted to Nigerian condition. Moreover, since most of them are monoembryonic they produce fruits that are not true to the mother plant when grown from seedlings. They must, thus, be maintained vegetatively on a suitable rootstock, which have been found over the years to be adapted to local conditions. Experimental evidence on the effect of rootstock on growth, development and yield of mango in Nigeria is lacking or very limited. However, rootstock – scion interaction effects on mango and other tree crops have been reported from other parts of the world.

Rajan and Pandey (1991) reported that rootstock strongly affected tree vigor of mango when the performance of Dashehari was evaluated on 24 rootstocks. ST – 9 and Latra stimulated the most vigorous growth and Mylepelian and Rumani caused dwarfing Rumani and Amvalbi caused less scion girth. Fruit yield of mango in G1 – Ost and G3 - Kt trees proved significantly higher than that on the other rootstocks. The fruit weight and length with the G3 – Kt combination were greater than those with G1 – Kt. However, both cultivars grafted on Gomera 3 rootstock had the highest height and canopy volume (Durian Zuazo, *et al.,* 2006). In a trial conducted with Pomegranate, Vazifeshenas *et al*. (2009) observed that the use of Torsh Ma Molyzabol as rootstock led to the lowest tree size and height, and the lowest rate of sun burn scald disorder. However the highest yield and the highest sucker production were obtained in plants grafted on Golna Farsi. Rahemi and Tavallali (2007) also reported the effect of rootstock on Iranian Pistachio. The result showed that total cross sectional area was significantly lower on Sarakhs rootstock than on the other two rootstocks. Sarakhs was also the least vigorous among the tested rootstocks and gave the lowest leaf area of scion cultivars. It also consistently influences the formation of the highest suckers. However, the highest yield, yield efficiency and the lowest percentage splitting of Pistachio nuts was obtained with Badami. Karikari and Olarewaju (1981) reported a trial involving 8 locally selected rootstocks in Nigeria named Rs1, Rs2, Rs3, Rs4, Rs5, Rs6, Rs7 and Rs9 combined with Julie, Peach, Alphonso, Mabrouka, Peter and Taymour as scions. The results indicated that the rootstock had no effect on growth flushing, flowering period and plant vigor. Based on a 13 year yield record Rs4 was observed to be the best followed by Rs5 and Rs9. Taymour was also observed to be a heavy yielder and bore fruits more consistently. In addition to the effect of rootstock one could admit the fact that the scion, the interstock, the rootstock and the graft union all interact to influence each other to determine the overall behavior of the plant.

In view of the dearth of information on effect of rootstock – scion interaction on the growth, establishment and yield of mango in Nigeria, the experiment was designed to assess the growth performance of improved cultivars grafted on adapted local morphological types.

MATERIALS AND METHODS

Two trials were conducted in 2005/2006 and 2006/2007 wet season at the teaching and research farm of Faculty of Agriculture, Bayero University, Kano (11^0 58'N and 8^0 25'E) situated in Sudan Savanna ecological zone of Nigeria. The area is characterized by a unimodal rainfall, a short growing season (May/June – October) and a wide temperature range (Aiyelaagbe, *et al.,* 1993). The treatments consisted of four morphotypes rootstocks (Binta Siga, Gwaiwar Rago, Dankamaru and Fafaranda) factorially combined with three scions (Alphonso, Peach and Taymour) and laid out in a completely randomized design with three repetitions. Mango seedlings of near uniform size were collected from the base of protected mother trees of each cultivar to be used as rootstock. Morphological comparison was done to ensure that the seedlings were true to the mother plant. Nursery soil mixture was prepared by mixing river sand, top soil and manure in the ratio of 5:1:1 respectively. A medium size polyethylene bags measuring 13 x25 cm were filled with the mixture, leaving sufficient space for irrigation. The polyethylene bags were irrigated and left to settle for 2 hours. The seedlings were transplanted later and watered again. Three seedlings were allocated to each treatment giving a total of 108 seedlings for the whole experiment. The scions were obtained from National Horticultural Research Institute, Bagauda Sub - station, Kano. They were prepared by cutting the leaves of the potential scion branches and left for two weeks to mobilize auxins to the scions and activate the dormant axillary buds. Apical grafting was done in July when the rainfall and humidity was high. Seedlings were watered as often as necessary and weeds were controlled by hand pulling. Data on stem girth, crop vigor, leaf area, percentage take, number of days to bud break, number of leaves per plant, number of primary roots and number of secondary roots were taken. The data were analyzed using Analysis of Variance according to Steel and Torrie (1985) using the General Linear Model in SAS (1989) and the means were separated using Duncans Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of rootstocks on growth of mango seedlings

Stem diameter was not significantly affected by rootstock; however, Gwaiwar Rago had a higher mean stem diameter when compared to Binta Siga, Dankamaru and Fafaranda. This could be because Gwaiwar Rago had quicker establishment due to larger number of secondary roots (Table 1). Differences in stem diameter between rootstocks of Mango cultivars was reported by (Rajan and Pandey, 1991). Binta Siga and Dankamaru were statistically similar in terms of number of leaves per plant but the earlier had significantly higher number of leaves per plant when compared to Gwaiwar Rago and Fafaranda which were at par with one another. Duria Zuazo *et al.* (2006) also reported increase in canopy volume of mango due to influence of Gomera 3 rootstock. There was no significant effect among the rootstocks with regard to number of days to bud break. However, it took longer time for the buds on the scions of Dankamaru to break than on the scions of the other rootstocks. Rootstocks also had no significant effect on leaf area. On the contrary rootstocks have been shown by Rahemi and Tavallali (2007) to influence the leaf area of Pistachio. As such the lack of significant difference in case of mango could be because the duration might not be sufficient for the expression of full effect of the rootstock on the scion. Even though, rootstocks had no effect on percentage take, Binta Siga had the highest mean for percentage take followed by Gwaiwar Rago, Dankamaru and Fafaranda in decreasing order. The higher percentage take of Binta Siga could be due to higher number of primary roots for better establishment and higher number of leaves for assimilates production. Significantly higher number of primary roots was observed on Dankamaru but was at par with Binta Siga and all of them were significantly higher than Gwaiwar Rago and Fafaranda. However, in terms of secondary roots, Gwaiwar Rago was significantly higher than Dankamaru which was significantly higher than Faranda which was in turn higher than Binta Siga. This might have given Gwaiwar Rago the chance to establish better and produce larger stem girth and became second only to Binta Siga in percentage take.

In crop vigor score, Binta Siga was observed to be statistically similar to Dankamaru but were all significantly higher, than Gwaiwar Rago and Fafaranda. This may be due to higher number of leaves and primary roots observed in Binta Siga and Fafaranda. The influence of rootstock on the vigor of mango was similarly reported by Rajan and Pandey (1991) who reported that ST – 9 and Latra rootstocks stimulated the most vigorous growth . The rootstocks of Pistachio were also reported to affect the vigor of Pistachio by increasing the growth characters (Rahemi and Tavallali, 2007).

Effect of scions on growth of mango seedlings

The stem diameter was not significantly affected by the scion; however, Peach had the highest mean diameter compared to the other scions. Significantly higher number of leaves was observed on Taymour when compared to Alphonso and Peach which were at par with one another (Table 1). This confirms the observation of Karikari and Olarewaju (1981) who reported that Taymour which put out 4 flushes in a year when compared to Alphonso and Peach with 2 – 3 flushes had a better capacity of differentiating more buds into leaves. Number of days to bud break was not significantly different among the three scions, but Taymour took a longer time for the buds to break, probably because it had more buds to differentiate to leaves. The leaf area was not significantly affected by scions.

The percentage take of Taymour was significantly higher than that of Alphonso and Peach. This could be due to better compatibility of Taymour with the rootstocks as expressed by its significantly higher number of primary and secondary roots. Although, Taymour had the highest mean vigor, this character was not significantly affected by scion.

The compatibility of Taymour with most of the rootstocks is in line with the observation of Karikari and Olarewaju (1981) who reported that Taymour gave the highest flush per year, highest yield and bore fruits more regularly than Alphonso, Peach, Peter Julie and Mabrouka that were used in their experiment.

Rootstock – Scion Interaction

The interaction between rootstock and the scion was observed to be significant on number of primary roots per plant. Taymour and Binta Siga, Peach and Binta Siga and Alphonso and Dankamaru had the highest number of primary roots while the least was obtained with Alphonso and Fafaranda(Table 2).

Conclusion

The experiment clearly demonstrated that rootstock and scion could influence the seedling growth of mango. Based on the result of the main effect and interaction it has been shown that Binta Siga was a better rootstock since it had higher percentage take, number of primary roots, number of leaves, crop vigor and was more compatible with most of the scions. On the other hand Taymour was observed to be more compatible with most of the rootstocks because it gave higher means in most of the characters mentioned earlier. Binta Siga is therefore recommended for use as rootstock by nursery men in Mango seedlings production for higher profit margin in Kano environment.

REFERENCES

Adejoh, J. E. (1980). An evaluation of mango propagation techniques in Nigeria with particular reference to bench grafting. Ahmadu Bello University, Zaria, Nigeria Higher Diploma Project.

Aiyelaagbe, I. O. O., Manga, A. A., Lasisi, S. O. (1993). Fruit trees in the Sorghum – Cowpea system of Nigeria; their management use and agro forestry potential. Paper presented at International Symposium of Farmed Parklands of Semi – Arid Zone of West Africa, 25th – 27th October, 1993., Burkina Faso. PP. 12

Duncan, D. B. 1955. Multiple range and multiple – F test. *Biometrics* 2: 1 – 42.

Durian Zuazo, V. H., Pleguezuelo, C. R.R., Tarifa, D. F. (2006). Fruit yield, growth and leaf nutrient status of mangoes grafted on two rootstocks in marginal growing area (South – East Spain). *Fruits* 61 (3): 163 – 171.

Karikari, S. K., Olarewaju, J. D. (1981). The effect of the rootstocks on the yield of mangoes (*Mangifera indica L.*) at Samaru, Nigeria. Unpublished Final Report Submitted to the Institute for Agricultural Resaerch, Ahmadu Bello University, Zaria, Nigeria, 15 Pp.

Rahemi, M., Tavallali, V. (2007). Effects of rootstocks on Iranian Pistachio scions cultivars. *Fruits* 62 (5) : 317 – 325.

Rajan, S., Pandey, D. (1991). Studies in propagational techniques in mango. Central Institute of Horticulture for Northern Plains Annual Report 1989 – 90. Pp.17 – 29.

SAS (1989). Statistical application for the sciences. SA/TAT, User Guide, Version 64th, Vol. 2. SAS Inst. Inc. Cary, NC. USA.

Steel, R. D., Torrie, J. H. (1985). *Principles and procedures in statistics: Biometrical application.* 2nd edition, MacGraw Hills Publishers, New York, USA, 1985.180 Pp.

Vazifeshenas, M., Khayyat, M., Julian, S., Somydzadeh, A. (2009). Effect of different scion – rootstock combinations on vigor, tree size, yield and fruit quality of three Iranian cultivars of Pomegranate. *Fruits* 64 (6) 2009.: 343 -359.

Table 1. Effect of rootstock and scion on stem diameter, number of leaves per plant, number of days to bud break, leaf area, percentage take, number of primary roots per plant, number of secondary roots per plant and vigor score of mango at Bayero University, Kano in 2005/06 and 2006/2007 wet seasons.

Treatments	Stem Diam. (cm)	No. of leaves/plant	No. of days to bud break	Leaf area (cm^2)	% take	No. of 1^o roots	No. of 2^o roots	Vigor	Crop
Rootstocks									
Binta Siga	1.53a	25.00a	13.55a	12.08a	71.66a	9.33a	24.33d		6.44a
G/Rago	3.17a	18.55b	9.77a	6.48a	67.22a	5.44b	70.00a		4.22b
Dankamaru	1.21a	21.00ab	15.33a	11.51a	55.00a	10.11a	61.00b		5.44a
Fafaranda	1.45a	17.66b	9.66a	12.97a	51.66a	4.00b	34.44		3.33b
SE±	1.050	3.120	2.980	4.290	9.000	1.430	4.280		0.427
Scions									
Taymour	1.51a	17.89a	13.33a	8.26a	78.75a	17.83a	60.08a		6.00a
Alphonso	1.46a	8.08b	12.83a	8.32a	50.83b	6.66b	43.50b		4.25a
Peach	2.55a	6.67b	10.08a	8.20a	54.58b	8.08b	38.75b		4.33a
SE ±	0.910	3.120	2.583	3.710	7.790	1.230	3.700		0.490
RXS Intr.	NS	*	NS	NS	NS	NS	NS		NS

Means followed with the same letter(s) within a treatment group are not significantly different at 5% level of significance using Duncan's Multiple Range Test.

Table 2. Effect of rootstock – scion interaction on number of primary roots per plant of mango at Bayero University, Kano in 2005/06 and 2006/07 wet seasons

Scions	Rootstocks			
	Binta Siga	**Dankamaru**	**Fafaranda**	**G/Rago**
Alphonso	6.00ab	11.00a	2.33ab	6.33ab
Peach	11.00a	9.67a	8.00a	2.33ab
Taymour	11.00a	9.67a	1.67b	7.67a
SE±		2.470		

Means followed with the same letter(s) within a row and column is not significantly different at 5% level of significance using Duncan's Multiple Range Test.