



Evaluation of some Mango Interstock on 'Kiet' Scion Growth

Omayma M. Ismail^{1*} and Sanaa Ebeed²

¹Horticultural Crop Technology Dep., National Research Center (NRC),12311, Egypt.

omaymaismail@yahoo.com

²Horticulture Research Institute, Agricultural Research Center, 12619,Egypt

ABSTRACT

This experiment was carried out during the years 2009-2011 to investigate the effect of the mango interstock on growth 'Kiet' scion also their effect on 'sukkary' rootstock. The rootstock plants were grafted with scion 'Hindi', 'Ewais', 'Seddik' and 'Kiet' as the first grafting, after one year the second graft were done by 'Kiet' scion on the different interstock. The vegetative growth parameters as length cm, thickness mm, leaves number, leaf area cm² and fresh dry weight of shoots (g) were recorded. The results cleared that the rootstock length of 'sukkary' had the highest value (43.95 and 43.80 cm) with 'Kiet' and 'Seddik' scion respectively. The scion length was insignificant differences among 'Hindi', 'Ewais' and 'Seddik' where the lowest scion length was 'Kiet' 57.25cm. The rootstock and scion thickness were insignificant among all of them. The means of leaves number were ranged from 31.10 to 47.80 of 'Hindi' and 'Kiet' respectively and the leaf area was the highest of 'Hindi' 113.4 cm² and the lowest one of 'Kiet' 45.04 cm². The data of second grafting, where the 'Kiet' scion length was the highest value 79.50 cm., also the 'Kiet' interstock and the 'Kiet' scion thickness were the highest values 1.20 and 1.12 cm respectively but the 'Hindi' interstock and the 'Kiet' scion were insignificant values 1.14 and 1.01 cm respectively. The means of 'Kiet' leaves number ranged from 23.8 to 44.30 of 'Ewais' and 'Kiet' interstock respectively. The 'Kiet' scion of 'Hindi' interstock had the highest significant values of shoots fresh and dry weight 214.4 and 102.1 g. respectively, while 'Kiet' interstock was the lowest significant values of shoots fresh and dry weight (67.90 and 30.27 g.) respectively. These results revealed that the 'Kiet' interstock had a dwarfing effect while the 'Hindi' had an activating effect followed by 'Seddik' then 'Ewais'.

Keywords

Mangifera indica L., interstocks, scions, growth parameters.

Academic Discipline And Sub-Disciplines

Agricultural science ; Horticulture, pomology

SUBJECT CLASSIFICATION

Plant propagation, pomology

TYPE (METHOD/APPROACH)

Quasi-Experimental

Council for Innovative Research

Peer Review Research Publishing System

Journal: JOURNAL OF ADVANCES IN BIOLOGY

Vol 3, No.1

editor@cirworld.com

www.cirworld.com, member.cirworld.com



INTRODUCTION

Grafting has been a common propagation method in many fruit trees to achieve fruiting precocity. Its success has depended on proper alignment of parenchymatous tissues of both scion and their respective rootstocks. Mng'omba, (2013) Although grafting has been practiced for a long time.

The supply of good quality and sufficient mango (*Mangifera indica* L.) planting materials in the tropics hinges on the development of good nursery management practices which include propagation methods. Generally, improvement in the supply of good quality planting materials would ensure good tree survival and establishment in the field. Grafting is a common and preferred vegetative propagation method for mango trees Bally (2006).

Double-working is used for various purposes, such as (a) overcoming graft incompatibility between a desired top cultivar and the rootstock, (b) providing a cold or disease-resistant trunk, (c) obtaining a dwarfing effect from the use of certain intermediate stocks, or obtaining the strong trunk or crotch system of certain cultivars Hartmann and Kester (1975).

Unquestionably, the scion, the interstock, the rootstock and the graft union itself all interact to influence each other and determine the overall behavior of the plant Simkhada (2007).

Rootstocks play an important role for tree survival and establishment in the field, tree productivity and dwarfing of grafted fruit trees (Mng'omba et al., 2008). Seedling rootstocks with desirable attributes such as rapid growth (in height and diameter) could reduce the 'waiting period' to grafting time. Furthermore, proper alignment of scion and rootstock cambium tissues could determine the graft success (Pina and Errea, 2005, Mng'omba et al., 2010).

Simkhada (2007) reported that the effects of an intermediate rootstock on scion and rootstock are Produce a dwarfed trees, Early-bearing of fruits and Compatibility. The rootstocks and the interstocks effect on translocation of carbohydrates from shoots to different parts of the plants.

In Egypt, mostly mango seedlings of whatever type are available and used as rootstocks. However, the two local mango cultivars 'sukkary' and 'Zebda' become wide spread as trust polyembryonic rootstocks Abd El-Zaher (2004). Moreover, Wahdan (2004) and Melouk (2005) recommended using 'sukkary' mango as a salt tolerant rootstock in saline soils. Also, Hamed, (2009) recommended using 'sukkary' rootstocks for the scions of 'Kiet' and 'Seddik' mango cultivars.

In this investigation, we aimed to study the effect of different interstocks on the growth of 'Kiet' mango scion, and which interstock more compatible between the rootstock and the scion, also effect of different scion /interstocks on 'Sukkary' rootstock growth.

MATERIALS AND METHODS

Plant material and cultivation

The experiment carried out in the nursery under the seran green house at the Horticulture Research Institute, Agricultural Research Center, Giza, Egypt, during 2009, 2010 and 2011 seasons.

The 150 'Sukkary' seedlings were planted in plastic bags (25 × 15 cm), the soil was sand and peat moss (2:1). The rootstock plants divided to 4 treatments, each treatment represented by 7 replicates/ 5 plants for each replicate.

For grafting operation, the Mango scions selected in similar thickness of the rootstocks

First grafting:

The similar seedlings were grafted with scion 'Hindi', 'Ewais', 'Seddik' and 'Kiet' by using top cleft method in April 2009/2010. Cleft-grafting is preferred on commercial level of nurseries which it was given the highest success rate. In India, cleft grafting on stem has been 88.9% successful; Simkhada (2007)

Second grafting:

After one year from the first grafting the vegetative growth were removed to the vegetative measured and left 5 cm from the stem of the first scions as interstock then grafted with 'Kiet' by using top cleft method in April 2010 /2011.

Vegetative growth and dry matter measurements:

The earliest methods used to detect graft incompatibility relied on the external symptoms such as graft union malformations, yellowing of foliage, decline in vegetative growth and vigor, marked differences in growth rate of scion and rootstock (Hartmann et al., 1997). Some vegetative growth parameters as length (cm) and thickness (mm) above 5 cm from the crown portion of rootstocks, the middle of inter rootstocks and above 3 cm. from grafting union of scion were measured of 10 plants by meter and precision vernier caliper, Steco, Germany, respectively, also Leaves number was recorded per seedling and leaf area cm² of average of 20 mature leaves /plant was measured according to the equation (1) described by Ahmed and Morsy (1999) , at the end of experiment vegetative growth of each grafting treatments were carefully taken out vegetative growth , six Plants were divided into "leaves and stem", each organ was washed separately with distilled water, air dried and weighted as fresh weight then dried at 70 °C till constant weight and weighted as dry weight (g.), weights measured by weighting device (RADWAG , Model: WTB200) with an accuracy of 0.001g.



Where leaf area (cm²) = 0.70(length × width) – 1.06 (1).

Statistical analysis

The experiment was randomized complete block design with four replications. There were 35 rootstocks plants per treatment for 7 replicates. The data were subjected to ANOVA and were evaluated by MSTATC program. The differences between means were compared using LSD test at 5% level.

RESULTS & DISCUSSION

The average data of the two seasons for first grafting showed in the table(1) the effect of 'Hindi' and 'Ewais' scion on the 'Sukkary' rootstock length was less than 'Kiet' and 'Seddik', where the rootstock length of 'sukkury' had the highest value (43.95 and 43.80 cm) with 'Kiet' and 'Seddik' scions respectively. The scion length was insignificant differences among 'Hindi', 'Ewais' and 'Seddik' where the lowest scion length was 'Kiet' 57.25cm. The rootstock and scion thickness were insignificant among all of them. The means of leaves number were ranged from 31.10 to 47.80 of 'Hindi' and 'Kiet' respectively and the leaf area was the highest of 'Hindi' 113.4 cm² and the lowest one of 'Kiet' 45.04 cm² the data of leaf area in agreement and related to the characteristics of the cultivars. 'Kiet' mango cv. recorded the minimum average values 46.59 and 46.56 cm. (Abourayya et al., 2012), respectively. The fresh and dry weight of shoots were the highest of 'Hindi' (143.6 and 57.33 g.), while 'Ewais' was the lowest (100.3 and 37.66 g.) respectively.

Rootstock	scion	Rootstock length (cm.)	Scion length (cm.)	Rootstock thickness (cm.)	Scion thickness (cm.)	Leaves No.	Leaf area (cm ²)	Shoot fresh weight (g.)	Shoot dry weight (g.)
'Sukkary'	'Hindi'	38.45 B	71.65 AB	1.60 A	1.37 A	31.10 B	113.4 A	143.6 A	57.33 A
	'Ewais'	38.70 B	75.30 A	1.41 A	1.21 A	41.00 AB	64.81 B	100.3 D	37.66 D
	'Seddik'	43.80 A	70.80 AB	1.53 A	1.32 A	43.70 A	57.07 C	108.3 C	43.75 B
	'kiet'	43.95 A	57.25 B	1.60 A	1.22 A	47.80 A	45.04 D	113.5 B	40.25 C
LSD value 0.05		1.482	16.98	0.4495	0.3409	11.72	4.953	0.0123	1.231

*Means with the same letter are not significantly different

Table (1) The average data of the two seasons for frist grafting.

The data of second grafting where the scion was 'kiet' and the interstock were 'Hindi', 'Ewais', 'Seddik' and 'Kiet' shown in the table (2) the rootstock length (rootstock + interstock) was insignificant values among the all interstock except the 'Seddik' 81.40 cm. The 'Kiet' scion length was the highest value 79.50 cm., also the 'Kiet' interstock and the 'Kiet' scion thickness were the highest values 1.20 and 1.12 cm respectively but the 'Hindi' interstock and the 'Kiet' scion were insignificant values 1.14 and 1.01 cm respectively. The means of 'Kiet' leaves number ranged from 23.8 to 44.30 of 'Ewais' and 'Kiet' interstock respectively, also it can be noticed that increased the leaves number with increased the rootstock thickness, this results in agreement with (Mng'omba et al 2010), that showed a general trend with grafts with thicker rootstocks retained more leaves that those with thinner rootstocks.

Table (2) The average data of the two seasons for second grafting.

Inter stock	Scion	Rootstock length (cm.)	Scion length (cm.)	Inter stock thickness (cm.)	Scion thickness (cm.)	Leaves No.	Leaf area (cm ²)	Shoot fresh weight (g.)	Shoot dry weight (g.)
'Hindi'	'kiet'	100.7 A	67.75 B	1.14 AB	1.01 AB	38.50 AB	60.85 B	214.4 A	102.1 A
'Ewais'		101.2 A	64.60 B	0.94 B	0.86 B	23.80 C	47.67 C	111.5 C	50.25 C
'Seddik'		81.40 B	70.20 B	0.93 B	0.82 B	32.70 B	48.80 C	181.6 B	79.61 B
'kiet'		98.60 A	79.50 A	1.20 A	1.12 A	44.30 A	76.58 A	67.90 D	30.27 D
LSD value 0.05		11.36	8.00	0.2357	0.2132	6.753	2.442	1.538	1.375

*Means with the same letter are not significantly different

the highest 'Kiet' leaf area was 76.58 cm² of 'Kiet' interstock followed by 'Hindi' interstock 60.85 cm², these data related to the highest growth compatible was with the same cultivars where these were the highest cambium connection between rootstock and scion so the 'Kiet' scion had the best growth on the 'Kiet' interstock, where the presence of the graft union itself may stimulate earlier and perhaps heavier bearing Simkhada (2007).



The 'Kiet' scion of 'Hindi' interstock had the highest significant values of shoots fresh and dry weight 214.4 and 102.1 g. respectively, while 'Kiet' interstock was the lowest significant values of shoots fresh and dry weight (67.90 and 30.27 g.) respectively. These results revealed that the 'Kiet' interstock had a dwarfing effect while the 'Hindi' had an activating effect followed by 'Seddik' then 'Ewais'. The ability of certain dwarfing clones, inserted as an interstock between a vigorous top and vigorous root, to produce a dwarfed and early-bearing fruit trees has been known for centuries. Dwarfing of apple trees by the use of a dwarfing interstock, such as 'Malling7', 8 or 9, has been widely used commercially for many years Simkhada (2007).

Thus, it is important to find a most appropriate interstock of graft that improves the alignment and adhesion between scion and rootstock, also select the interstock according to the purpose for dwarfing or activating growth. (Yano et al. 2003, Simkhada 2007) reported that, the use of compatible peach interstock to overcome the graft-incompatibility and enhances the nitrogen allocation to scions and there by extends the productive lives of dwarf peach.

CONCLUSION

These combinations were compared in order to observed compatibility between them through visual observation of the development growth. The results cleared that all the combinations had compatible with each other, the 'Hindi' as a scion or an interstock had an activating effect on growth, while interstock 'Kiet' had a dwarfing effect so it was more probability for intensive planting, also the dwarfing effect of 'Kiet' as a scion was effective than the activating effect of 'sukkary' as rootstock, so we can use 'sukkary' as an Egyptian local rootstock instead of '13/1' for 'kiet' espically in saline soils.

ACKNOWLEDGEMENTS

The authors thank Mr. Moustafa Zohair for collecting samples and his technical assistance. also we thanks Dr.Mahmoud Abd El Megeed.

REFERENCES

- [1] Abd El-Zaher, M.H., 2004 Acompartive study on polyembryonic rootstocks grafting three mango cultivars. J. Agric. Mansoura Univ., 29:3464-3479.
- [2] Abourayya, M.S., Kassim N.E., M.H. El-Sheikh and A.M. Rakha 2012 Evaluation of vegetative growth of 'Tomy Atkins', 'Kent' and 'Keitt' mango cultivars grown under Nubariya conditions J. Appl. Sci. Res., 8(2): 887-895,
- [3] Ahmed, F.F. and M.H. Morsy, 1999 A new methods for measuring leaf area in different fruit species. Minia J. Argic. Res. & Dev. 19:97 – 105.
- [4] Bally I.S.E. 2006. *Mangifera indica* (mango) Anacardiaceae (cashew family). Species Profiles for Pacific Island Agroforestry www.traditionaltree.org. Accessed on 20 April, 2009.
- [5] Hamed, H.H., 2009 Morphological, Histological and molecular identification of nucellar embryos and their compatibility with some mango cultivars. M.Sc. Thesis, Fac. Agric., Cairo Univ., pp:125.
- [6] Hartmann, H. T. ,D. E. Kester 1975. Plant propagation : principles and practices, 3d Ed. New Delhi Englewood Cliffs, N.J. Prentice-Hall. pp. 413
- [7] Hartmann, H. T. ,D. E. Kester, F. T. Davies and R. L. Geneva. 1997. Plant propagation Principles and Practices, Sixth Ed. Prentice Hall.
- [8] Melouk, A. M., 2005 Response of some mango nursery trees to salt stress (NaCl). The 6th Arabic Conference for horticulture, Ismailia Univ., Egypt, pp: 383-398.
- [9] Mng'omba S.A. 2013 Effect of Diagonal Cut Surface Length on Graft Success and Growth of *Mangifera indica*, *Persia americana*, and *Prunus persica* HortScience vol. 48 no. 4, 481-484.
- [10] Mng'omba S.A., F.K. Akinnifesi, G. Sileshi, and O.C. Ajayi 2010. Rootstock growth and development for increased graft success of mango (*Mangifera indica*) in the nursery. Africa. J. of Biotechnol. Vol. 9 (9), pp. 1317-1324.
- [11] Mng'omba S.A., F.K. Akinnifesi, G. Sileshi, O.C. Ajayi, S. Chakeredza, F.W. Mwase 2008. A decision support tool for propagating Miombo indigenous fruit trees of southern Africa. Afr. J. Biotechnol. 7 (25): 4677-4686.
- [12] Pina A, P. Errea 2005. A review of new advances in mechanism of graft compatible – incompatible in *Prunus* spp. Sci. Hort. 106: 1-11.
- [13] Simkhada, E. P. 2007. Study on graft incompatibility in 'Fuyu' Persimmon (*Diospyros kaki*) grafted on to different rootstocks in relation to physiological and morphological behaviors. Ph.D. Thesis, University of Tsukuba, pp161
- [14] Wahdan, M.T., 2004. Effect of salinity if irrigation water on growth and nutritional status of mango nurslings. J. Agric. Sci. Mansoura Univ., 29 (12): 7347-7362.