EFFECT OF GRAFTING METHOD ON SUBSEQUENT GROWTH OF MANGO

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Abstract

Nine - month-old mango seedings (0.9 - 1.1 cm. in diameter) were grafted with grafts of Himdi-Be-Sinnara mango CV. using 4 methods i.e. , approach grafting, side grafring with T-shape, modified top seasons. Modified topنصغgrafting and side veneer at first May for grafting gave the highest success percentage. However, side veneer method resulted in the best sizeable grafted seedlings after one year and modified top grafting gave the lowest values length, diameter, leaf number and total leaf area. The other two methods were intermediate in this respect. The histological study revealed that side veneer and side grafting with T shape completed its wound healing 1-2months earlier than the other two methods.

INTRODUCTION

Grafted mango trees were commonly propagated by approch (inarch) grafting methos (Luthra and Sharma, 1946). However , many defectes are encountered in such method, one of them is that grafting zone can easily be separated (Buhgat and Mohsen, 1951). Other methods of grafting as side-grafting with T. shape (Singhn 1960 and Bukhar and Rozvi , 1974) . Side veneer (Lynch and Nilson, 1957 and Marry , 1987) and modified top grafting by covering the grafts with plastic bags (Azzouz, et al., 1984) have been described. The success of take off are mainly depending upon grafting method (Bohan, et al ., 1969; Stion, et al., 1984; Marry,

Side-grafting was more successful than side inarching in mango (Bukhar and Rozvi, 1974).

Also, side veneer and cleft graftin (Top grafting) gave higher percentage of success after one year than chip budding, and side grafting with -T- shape in mango CV. Pairi and Langra (Marry, 1987). Growth takes of after grafting was greatly affected with grafting methoed (Stino, *et al .*, 1984). Moreover, side veneer grafting method gave the highest number of leaves, union diameter and dry matter thangrafting (Marry , 1987).

Four main stages were observed in the formation of the mango grafts as follows: precallus, callus, cambial bridge and healed union (Soule, 1971; Stino *et al.*, 1984 ; Marry , 1987) .

The sequence of these stages differed in the time neccessary to each stage according to the method of grafting which in turn reflected on the subsequent growth of the developed takes . (Soule, 1971, Stino *et al.* 1984 and Marry, 1987).

The aim of this study was to explore the effect of some grafting methods on the success of takes and subsequent growth of the developed takes.

MATERIALS AND METHODS

The present studey was carried out through two successsive seasons (1987/ 1988 and 1988/1989) at El-kanater Horticultural Research Station Orchard. Nine-month-old mango seedlings (09 - 1.1cm . in diameter) grown in plastic bags were used as root stocks . Bud sections were taken from flowerless of about eight months old vegetative growth taken from Hindi-Be-Sinnara mango trees. Four grafting mehtods were evalutated in this study as follows:

a. **Inarch grafting** Similar wood was used for inarch grafting on the mango seedlings which were put-arround the mother trees as described by singh (1960)
b. **Side grafting with T. shape** (Singh , 1960 and Bukhar and Rozvi 1974).
c. **Modified top grafting** as described by Azzouz et al. (1984).
d. **Side veneer grafting** as recommended by Lynch and Nelson , 1957 and adopted by Marry . 1987.

Each treatment was represnted by 40 grafted seedlings in four replicates. These

grafts were carried out at May 1st in both seasons (1987 and 1988).

Percentage of succeded grafts were recorded after one year. Also, number of growth cycles, length, diameter, leaves number and total leaf area were recorded after one year after grafting .

Histological study

Samples of stem containing the union zone and approximatly 1 cm . of stock on either side weere collected at weekly intervals for 8 weeks and after 6,7 and 8 months of grafting split into pieces of which about 1 cm ., killed and fixed in 70 % F.A.A. and stored in 70 % alcohol . Tissues of selected samples were softended a minimum of 2 weeks in glycerol-alcohol solution(C.P. glycerol 50 % ethyl alcohol 1:1). Transverse and radial sections were cut at 25 u on a hand -fed sliding mocromtome, double stained with safranin- fast green, and mounted in canada balsam as described by Soule 1971.

Data were statistically analysed as complete randomized design according to Snedecor and Cochran 1972. L.S.D. (0.05) was used for mean separation.

RESULTS AND DISCUSSION

Percentage of takes :

Data jjpresented in Table 1. show the percentage of success produced from different methods of grafting used in this studey. It is evident that modified top grafting used in this study . It is evident that modified top grafting method induced the highest tate of seccess. Percentages of success were 85.5 and 82.2 in both sea-

Table 1. Effect of different methods of grafting on the percentage of success after one year (Hindi Be-sinnara mango cultivar).

Method of grafting	1987/1988		1987/1989	
	%	Angle *	%	Angle *
Side grafting with T. shape	78.4 c	62.31	77.6 b	61.75
Modtop grafting	85.5 a	67.62	82.8 a	65.50
Approach grafting	77.3 c	61.55	75.7 b	60.47
Side veneer grafting	80.7 b	63.94	81.4 a	64.45

* Angle = Arcsin percentage

sons successively . This result was in agreement with the results obtained by Azzouz, *et al* . 1984.

Also , side veneer method gave some what higher rates of success compared with both side grafting with T. shape and approach grafting . These results were in harmony with the previous findings of Marry 1987 who mentioned that side veneer and top grafting gave higher percentage of success after one year than ship budding and side grafting with T. Shape in mango cv. pairi and Langra. Also, in harmony this Bukhar and Rozvip (1974), they found that side grafting was more successful than side inarching in mango. Morever, this result was in paralled with the previous observation , that the success of takes are mainly dependant upon grafting method (Bhan, *et al* ., 1969; Stino *et al* ., 1984 and Marry, 1987).

Growth of the developed takes

Data presented in Table 2. show the morphological characters of developed takes after one year (April , 1988 and 1989). Generally it is evident that side - veneer method greatly activated vegetative growth . Thus it produced 2.8 and 3.1 growth cycles on the average in 1988 and 1989, respectively. However, top grafting produced the lowest values of growth cyceles. It was 1.22 and 1.34 growth cycles in both seasons, successively. However, side grafting and approach grafting gave intermediate values in this respect. The remarkeable increase in growth cyceles of side veneer takes was accompanied with similar increase in shoot length, diameter, leaf number and total leaf area which showed the statistically highest values when compared with the other three methods. However, top grafting takes gave the lowest values in these previous charcters. This result was in harmony with the previous findings of Marry 1987. who found that side veneer method gave the higher number of leaves, union diameter and dry matter than top grafting, Generally, it is clear that different methods of grafting greatly affected the growth of developed takes as suggested by (Stino *et al* ., 1984 and Marry. 1987).

Table 2. Effect of different methods of grafting on vegetative growth after one year (Hindi Be-sinnara mango cultivar).

Method of grafting	Growth cycles	Shoot length (cm)	Shoot diameter (cm)	Leaf number	Total leaf area (cm^2)
Side grafting with T. shape	2.11	33.4	0.73	14.7	567.4
Modified top grafting	1.27	16.8	0.65	8.9	371.3
Approach grafting	1.60	22.9	0.70	11.2	523.7
Side veneer grafting	2.82	45.3	0.82	19.6	867.9
	1988/1989				
Sid grafting with T. shape	2.37	32.3	0.72	16.16	794.2
Modified top grafting	1.34	19.2	0.46	9.3	452.3
Approach grafting	1.37	23.8	0.70	12.7	518.7
Side veneer grafting	3.15	34.5	0.81	20.7	988.3

The histological studies .

The histological study aimed to clear the subsequence of different steps of healing which occurred between the tissues of both stock and scion. Figures 1-4 show the main 4 stages for complete headling of the gap between stock and scion.

These four stages occurred in all grafting methods as follows :

1) precallus stage (Figs. 1&2) Callus formation (Fig. 2&3) cambial bridge (Fig. 3) and 4) complete healing (Fig. 4) These four stages were previously described by Soule 1971 . Stino, *et al.* 1984 and Marry 1987. Perfect sections could not be prepared for samples taken up to 15 days, but thereafter sections could be improved. Data showed that the occurrance of each stage of development was markedly different. It is obvious that side grafting with T-shape had the shortest period required for callus formation (2-3 weeks after grafting) followed by apporach grafting and side veneer (3-4 weeks), however , top grafting required 4 weeks, Moreover, the cambial bridge stage started earlier one week (after 3-4 weeks of grafting) than side veneer and approach grafting which required (4-5 weeks after grafting). However, top grafting delayed 2 weeks than side grafting , in other words it required 5-6 weeks after grafting to complete this stage. After cambial bridge formation all grafts began to produce new xylum and new phloem directly from the surface of new cambium at the plants of graft zone.

Examination of union zone after 6, 7 and 8 months of grafting revealed that side grafting and side veneer grafting completed its healing after 6 months (Fig.4) . However , inarch grafting and top grafting completed this stage after 7 and 8 months, successively . Moreover, the upper surface of the root-stocks was exterilolry curved which weakened the union zone. These results are in agreement with the previous findings of Stino *et al.* 1984 and Marry 1987. Also it may also explain the slow growth of developed takes in these two methods as shown in Table. and the previous observation of Bahgat and Mohsen 1951 who mentioned that many defects are encountered in inarch grafting, one of them is that grafting zone can easily be separated. Generally, it can ve concluded that side-veneer method was preferable to produce best sizeable grafted seedlings of mango cv. Hindi Be -Sinnara.

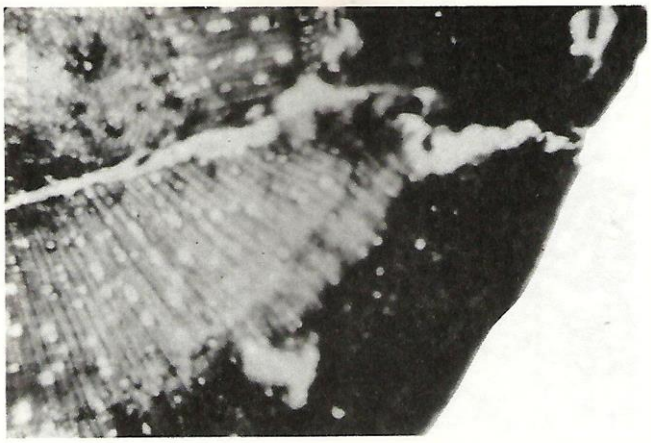

Fig. 1. Precallus stage

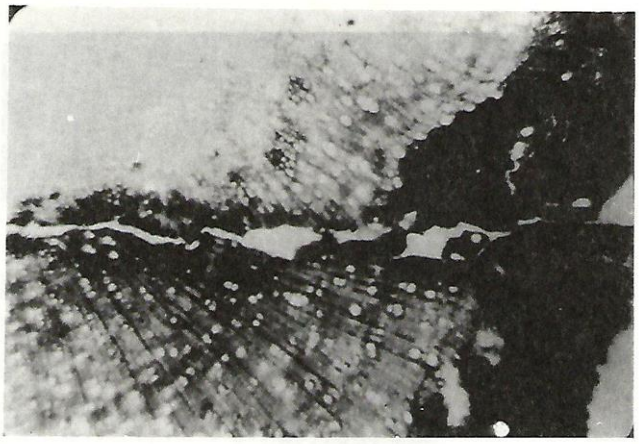

Fig. 2. Callus stage.

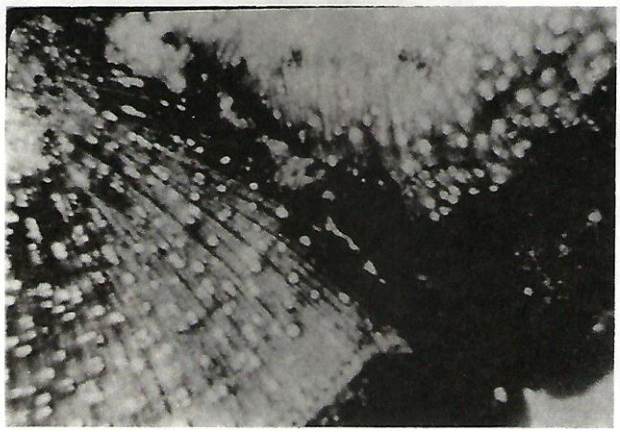

Fig. 3. Combial bridge

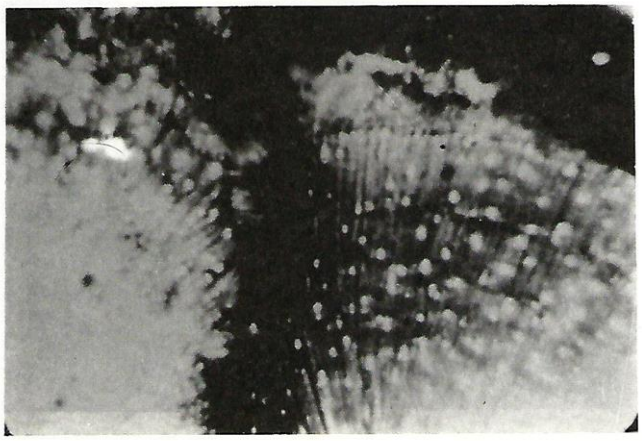

Fig. 2. Complete healing .

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تأثير طرق التطعيم علي نمو شتلات المانجو المطعومة

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تمت تجربة أربع طرق للتطعيم بالقلم من أشجار هندي بسناره مثمرة علي أصول بذرية عمرها ٩ شهور سمكها ٠,٩ – ١,١ سم.

وطرق التطعيم المستخدمه هي : –

التطعيم باللصق – القلم الجانبي علي شكل حرف T – القلم القمي المعدل– الفنير الجانبي .

وأوضحت النتائج ما يلي :

١ – التطعيم القمي تفوق علي الطرق الثلاث الاخري من حيث نسبه النجاح خلال موسمي التجربة.

٢– بمقارنة نمو الطعوم الناتجه علي الطرق المختلفه بعد عام من التطعيم تفوقت طريقتي الفنير الجانبي، والقلم الجانبي علي الطرق الأخري من حيث طول النموات، وقطرها ، وعدد الأوراق والمساحة الورقية ، أي أعطت شتلات اكثر قوة عن الطريقتين الأخريتين.

٣– تبين من الدراسة التشريحية أن الالتحام في الطرق المختلفه تم علي أربع مراحل ،هي : الكالوس الأولي ، الكالس ، القنطره الكمبيوميه ، الإلتحام الكامل، ولكن اختلفت طرق التطعيم المختلفه في الفتره اللازمة لإتمام كل مرحلة.

٤– مرحله الألتحام الكامل تمت مبكرا في كل من الفنير الجانبي والقلم الجانبي بحوالي ١–٢ شهر عن كل من اللصق والتطعيم القمي علي الترتيب.