Effect of some propagation methods and growth regulators on propagating banaty (seedless) guava.

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ABSTRACT

This investigation was carried out during 2002 and 2003 seasons to study different methods for the propagation of Banaty (seedless) guava trees. The methods used included leafy softwood cuttings, grafting, budding and layering. For softwood leafy cuttings method, mother trees were sprayed with ethephon at 0, 50, 100 ppm. After a week we prepared cuttings in mid-June and their bases were dipped in IBA at 2500, 3500 and 4500 ppm for 30 seconds. The highest rooting percentages were obtained using 50 ppm ethephon with 2500, 3500 ppm IBA in both seasons of study and with using 100 ppm ethephon with 4500 ppm IBA.

As for grafting, the highest percentages of success were 92.3%, 83.7% in both seasons of study, respectively, while the best dates were mid June and August.

The patch budding method showed the highest percentage of success was 42.0% and 40.0% in 2002 and 2003, respectively when operated on 20th of July.

Concerning layering method, the best rooting percentage was 21.66% and 23.31% in first and second seasons, respectively in ground layer, while it was 30% and 48% in air layers in 2002, 2003, respectively with black polyethylene cover. The white polyethylene cover gave the lowest results 15.66% and 21.67% in first and second seasons, respectively.

The date of August was considered the best time for layering either ground or air.

It was also found that spraying mother trees with ethephon increased root formation but using mist can help much rooting. The dates of propagation also can help for rooting success. Air layering was better than ground layering with either black or white polyethylene cover and with 4500 ppm IBA in lanolin paste.

It could be concluded that the grafting methods were to cheapest and gave high percentage of success but they need experience.

The cuttings method gave the highest number of plants but the percentage of success was intermediate when it was carried under tunnal.

INTRODUCTION

Guava (*Pisidium guajava* L.) is probably the most important fruit of the family (Myrtaceae). Guava acreage in Egypt occupies about 33371 feddens, with total fruit production 244575 tons (2002).

The difficulty of propagating guava trees vegetatively by cuttings, grafting, or even layering is considered an important factor that limits the extension of guava plantation.

The major important factors that affect rooting ability of stem cuttings are genetic characteristics of individual clones, time of collection and handling methods (Youssef *et al* , 1991). Seedless guava (Banaty) stem cuttings are hard to root while using growth regulators can help rooting and there were some inhibitors present in both Balady and seedless (Banaty) guava, Minessy *et al* (1967), Ahmed (1963), Girgis (1967).

Soft wood guava cuttings of different cultivars were killed if they growth without mist or growth regulators [El-Agamy *et al* (1983) and Reddy and Singh (1988)].

The propagation of guava by grafting has a limited success so far and it is the cheapest method of vegetative propagation. Grafting carried out in June was more successful than when it was carried out in July, Hartman (1969). Bahagate *et al* (1999).

The designating modified ring budding (M.R.B.), recorded the best success was 71.9%-75.9% compared with 63.4-64.2% with patch budding, Kanndal and Deal (1990). The buds sprouted the quickest on plants budded in June and July, Gorakh and Pandey (1998).

Air layering gave the better results using black wrappers than white wrappers with using 10000 ppm (IBA + NAA) and the black polyethylene resulted in 100% rooting and maximum number of roots (Mahabir *et al*, (1995) and Patel *et al*, (1989)).

Using poly bag method of ground layering in guava increased root growth and survival percentage when layers were prepared on 16th July in hot or dry climate (Dod *et al* (1998)).

The major objective of the present study was to evaluate some different methods of propagating Banaty guava and the best date for each method.

MATERIAL AND METHODS

The present study was carried out during 2002 and 2003 growing seasons on Banaty (seedless) guava (*Psidiun guajava* . L.). The trees were 35-years old growing in a sandy soil at El-Maamoura Botanical Garden, Alexandria, Horticulture Research Institute. Selected trees were similar in growth vigour and were subjected to the same agricultural practices. Certain trees were used for each propagation method (leafy soft wood cuttings, grafting, budding and layering).

I. Leafy soft wood cuttings.

In the middle of June, at both seasons, three mother trees of Banaty guava were selected and sprayed with 0, 50, 100 ppm ethephon solution. After one week terminal leafy soft wood cuttings were collected in the early morning from non fruity shoots. Cuttings were prepared 15 cm length and

0.5 cm in diameter, which included four nodes. The basal leaves were removed and each cutting has (4) half leaves only.

The concentration (2500, 3500 and 4500 ppm of IBA were used to treat the cutting base for 30 seconds, while the control cuttings were dipped in distilled water. Every treatment was represented by 30 cuttings and every cutting was planted in a polyethylene black bag full of mixture of sand; peatmoss as 1:2 by volume.

The cuttings were then placed in plastic tunnel, its dimensions were (2.25 m length x 0.85 width x 1.30 m height) in a shaded place, and kept for 60 days under high R.H which was maintained by trapping the water vapor produced after irrigation done day after day. At the end of each season, the following data were recorded,

1- Rooting percentage.
2- Number of roots per cutting.
3- Average root length.

II. Grafting.

- Approach grafting.

Two years old seedy guava seedlings were used as rootstock and Banaty shoots which used as scion were grown near the ground and their diameters were similar to those of rootstocks about 1cm. The grafting was carried out in the middle of June and August of each season.

The rootstocks were put under the Banaty trees near the selected shoots. A small slice of stem bark was cut with a sharp knife 6 inches long, and 12 inches high from the pot in both stock and scion. Grafting was then done using the standared technique described by Adriance and Brison (1939). After 60 days, the shoots were separated from the mother trees and grafted seedlings were kept in the greenhouse until next March, while the succeeded seedlings were planted in Sabahia Horticultural Research Station orchard in a clay soil and the seedlings were observed 6 months later.

III. Budding :

- Patch budding

Seedlings guava c.v Balady, two years old, were used as rootstock. The seedlings were used as rootstock. The seedlings were similar in growth vigour and stem diameter. The patch buds were taken from 15 years-old Banaty guava trees grown at El-Sabahia farm, near Alexandria. The patch budding was carried out on 20th of July and August of each season. The budded seedlings were kept in the greenhouse. After 60 day percentage of success was recorded.

IV. The layering.

Air and ground layerings were used in Banaty guava trees grown in El-Maamoura Botanical garden and the trees were 35-years old.

A. Air layering.

In the middle of June in both seasons of study, when the shoot length reached approximately about 45-60 cm, 2.5 cm wide ring of bark was removed and 4500 ppm of IBA in lanolin paste was applied at the upper end of the ring, while ringing alone was used as a control. The rings were then covered with wetted peatmoss, and covered with either black or white polyethylene sheets. The number of layerings representing each polyethelene colour was 50, separated on ten (10) mother trees for two colours of polyethylene.

After 60 days, the air layerings were separated from the mother trees and the percentage of success was recorded. The seedlings were then planted in polyethylene bags containing peatmoss and sand 1:1 with volume and kept in a shaded place, the percentage of successful plants was recorded.

B. Ground layering

Shoots growing near the base of trees were prepared by cutting the bark between the nods (10 cm length). The shoots were 5 cm diameter and were used on Feb 22 and August 10.

The layering was made by bending and covering a part of the branch with soil after preparing. In general a shallow trench was made in soil and the branch was bent down in it prior to being covered with soil to the depth 3 or 5 inches and they were irrigated once a week. The roots formed were counted, and the length of roots was measured. The number of ground layerings were (15) layerings separated in (7) trees. Its length ranged between (75 cm) to (150 cm). The data were obtained after 60 days of initial treatments.

All data obtained through the course of this study were statistically analysed according to Snedecor and Cochran (1990) and L.S.D. test at 0.05 level was used for comparison between treatments.

RESULTS AND DISCUSSION

I. Leafy soft wood cuttings treated with IBA and ethephon.

In the first season, the data in Table (1), indicated that best effect was obtained when the cuttings were treated with IBA at (2500, 3500 or 4500 ppm) when the mother trees were sprayed with 50 or 100 ppm ethephon, with highest roots number.

Using IBA at 4500 ppm was the best when mother trees sprayed with 100 ppm ethephon and gave high roots number.

In the second season (2003) the data showed that the cuttings treated with IBA (2500, 3500 ppm) gave better results. However, cuttings taken from trees sprayed with 50 or 100 ppm ethephon and treated with IBA 3500 or 4500 ppm gave the best results, and produced the highest roots number.

In both seasons of the study using IBA with different concentration produced the highest average of root length compared with control.

These results were practically in line with those obtained by Reddy and Singh (1988) who found that non wounded cuttings of guava cv Allahabad Safeda treated with IBA at 2500 ppm gave the best rooting when the cuttings were rooted without mist under plastic house with RH by trapping the water vapour produced after irrigation.

Ali (1990) reported that the terminal cuttings of seedy guava trees 42 years-old treated with 1000, 2000 and 3000 ppm IBA under mist condition, gave the highest percentage of rooting with 3000 ppm IBA 38.5% and 38.2% in first and second seasons, respectively. Also, Youssef *et al* (1991) sprayed guava trees cv. Banaty with ethephon at 0, 50, 100 and 150 ppm a week prior to cuttings preparation in mid-June or mid-August and then dipped in 2500 or 5000 ppm IBA. They found that the maximum rooting percentage was in cuttings taken in mid-June and treated with 2500 ppm IBA after being sprayed with 100 ppm ethephon.

On the other hand, El-Iraqy (1994) reported that guava cuttings taken from trees sprayed with 100 ppm ethephon and treated with 4000 ppm IBA + 500 ppm NAA gave higher rooting percentage than those of control. The cuttings planted in early May produced statistically the longest roots as compared with July or September. Marco *et al* (1998) sprayed guava trees with 0, 50, 100 ppm ethephon and seven days later, stem cuttings were treated with 0, 1000, 2000, 3000 and 4000 ppm IBA. They found that 50 ppm ethephon gave the highest rooting and number of roots percentage. As for IBA treatments the parameters were increased with increasing concentration of IBA.

The results obtained by Al-Obeed (2000) also revealed that semi-hard wood cuttings of guava cv Balady treated with IBA at 3000 ppm gave better rooting percentage in both seasons of study.

Table (1): Effect of ethephon and IBA on rooting percentage, number of roots and average length (cm) of roots of Banaty guava cuttings.

Treatments		Rooting %		Number of roots/ cutting		Average of root length/cutting (cm)	
Ethephon ppm	IBA	2002	2003	2002	2003	2002	2003
0.0	0.0	-	-	-	-	-	-
50	0.0	0	1.67	0.0	5.0	5.93	4.63
50	2500	24.33	22.00	38.33	35.33	12.20	11.03
50	3500	31.0	31.00	18.67	17.33	8.27	7.69
50	4500	17.33	18.33	42.67	39.33	8.23	8.23
100	0.0	1.0	1.67	4.00	3.00	5.45	4.40
100	2500	19.667	21.00	19.67	21.33	13.27	12.86
100	3500	24.33	22.67	31.00	32.33	9.43	8.96
100	4500	37.667	37.67	45.00	38.667	12.27	10.96
L.S.D.$_{0.05}$		6.89	5.74	5.90	6.66	6.97	6.66

II. Grafting

II. 1. Approach grafting :

The results of approach grafting presented in Table (2) showed that in the first season the highest percentage of success was 92.33% when done on 10th August while it was 82.67% on 16th June. In the second season (2003) the highest success percentage 83.67 was on 5th June compared with 68% on 10th August.

It could be concluded that the best time of approach grafting was mid of June to mid August. These results were partially in line with those obtained by Bhagate *et al* (1998) who found that intergeneric grafts in guava carried out in June were more successful than when they were carried out in July .

Table (2) : Effect of grafting (approach grafting) of Banaty guava.

Year	Date of grafting	% of Success
2002	16/6	82.67
	10/8	92.33
2003	5/6	83.67
	10/8	68.00
L.S.D. 0.05	-	14.17

III. Budding.

III. 1. Patch budding :

The data presented in Table (3) showed that the highest percentage of success was 42% and 40% when patch budding was done on 20th July in first and second seasons of study, respectively. The data also revealed that budding on 30th June gave 30.0% and on 20th August gave 34.33% success in first and second seasons, respectively.

These results are in line with the results of Gorakh and Pandy (1998) who reported that patch method was more successful than modified Farkert method and the best time for budding was July followed by August.

Table (3) : Percentage of success using patch budding in Banaty guava.

Date of budding (Patch budding)	% of success
2002	
30/6	30.0
20/7	42.0
2003	
20/7	40.0
20/8	34.33
L.S.D. $_{0.05}$	**6.20**

IV. Layering.

IV. 1. Ground layering.

The results of this study presented in Table (4) showed that the percentages of success of ground layering were 21.66% and 23.667% in first and second seasons, respectively. While the values were11.66% and 13.00% when applied on 22nd February in 2002, 2003 respectively.

These results disagree with those of Bhagate *et al.* (1998) who reported that the highest percentage rooting was 91.6%. this difference can be due to using different varieties than that used in the study.

Also, Dod *et al.* (1998) reported that the poly bag method of layering in guava significantly increased root growth and survival percentage when layers were prepared on 16th July in hot weather or dry climate.

The results of number of roots formed per ground layer in Table (4) indicated that the highest numbers *were* 29.167 and 36.667 roots/ layer in first and second seasons, respectively, when they were prepared on 10th August, and this was associated with the highest average of root length 9.319 cm and 11.5 cm in 2002 and 2003, respectively.

The results of this study were partially in line with those of Bhagate *et al* (1998) who found that the most roots number per layer was (14.8) and the greatest length of the longest root 13.4 cm were obtained in layers treated with 4500 ppm IBA.

Table (4) : The percentage of success of ground layering in Banaty guava, the average number of roots per layer and the average root length (cm).

year	Date of layering	Percent of success	No. of roots per layering	Average root length per layer (cm)
2002	22/2	11.66	8.73	4.87
	10/8	21.66	29.17	9.32
$L.S.D._{0.05}$		14.62	13.21	4.70
2003	22/2	13.00	10.33	7.07
	10/8	23.31	36.67	11.50
$L.S.D._{0.05}$		14.33	13.21	4.70

IV. 2. Air layering.

The data presented in Table (5) iindicated that air layering gave 30.33% and 48.0% in 2002, 2003, respectively, with black polyethylene and gave 15.667% and 21.667% in first and second seasons with white polyethylene, respectively using 4500 ppm IBA in lanoline paste.

The results of the study indicated that black polyethylene gave higher average percentage rooting (39.165%) than white polyethylene (18.667%).

The results of this study were partially in line with those of Patel *et al* (1989) who found that using IBA at 3000 ppm in lanoline paste and wrapping with black polyethylene resulted 100% rooting and the maximum number of roots.

The results are also in line with the results obtained by Sharma and Sharma (1991) who found that the highest percentage success of air layering guava cv Allahabad safeda (75.55%) was obtained using IBA at 10000 ppm. Mahabir *et al* (1995) also reported that the best plant growth regulator treatment for air layering was IBA + NAA in 2500, 5000 or 10000 ppm while black wrappers were better than white wrappers.

Concerning the results of chandrappa (1998) reported that the rooting was best in air layering taken in June and treated with 10000 ppm IBA + 1000 ppm 1, 2, 4 acid [a phenolic acid compound].

Table (5): percentage of air layering success in Banaty (seedless) guava.

	Year	Kind of polyethylene	% of success
2002	22/8	Black polyethylene	30.33
		White polyethylene	15.67
2003	22/8	Black polyethylene	48.0
		White polyethylene	21.67
$L.S.D._{0.05}$			14.31

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الملخص العربى

تأثير بعض طرق التكاثر الخضرى ومنظمات النمو فى إكثار الجوافة البناتى

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معهد بحوث البساتين – مركز البحوث الزراعية – جيزة.

أجرى هذا البحث خلال عامى ٢٠٠٢ ، ٢٠٠٣ بالحديقة النباتية بالمعمورة التابعة لمعهد بحوث البساتين لمحاولة الوصول إلى أحسن الطرق للتكاثر الخضرى للجوافة البناتى حيث أن عقلها الساقية صعبة التجذير وقد اشتملت الدراسة على أربعة طرق للتكاثر الخضرى.

أولا: العقل الساقية الغضة المعاملة بالهرمون :-

استخدمت العقل الغضة الطرفية من أشجار أمهات تم رشها بالأثيفون بتركيز صفر ، ٥٠ ، ١٠٠ جزء فى المليون قبل أخذ العقل الغضة بأسبوع ، وأظهرت النتائج أن تركيز ٥٠ جزء فى المليون من الاثيفون مع غمس العقل فى هرمون IBA بتركيز ٢٥٠٠ ، ٣٥٠٠ جزء فى المليون أعطى أحسن نتائج فى الموسم الأول بينما بتركيز ١٠٠ جزء فى المليون من الاثيفون مع غمس العقل فى محلول IBA بتركيز ٤٥٠٠ جزء فى المليون أعطى افضل النتائج فى موسمى الدراسة.

ثانيا : التطعيم :

واستخدم التطعيم باللصق وقد أعطت هذه الطريقة نسبة نجاح مرتفعة حيث كانت (٨٣,٦%) فى كلا الموسمين وذلك عند إجرائها فى شهر يونيو بينما كانت نسبة نجاحها ٩٢% و ٦٨% فى الموسم الأول والثانى على التوالى عند إجرائها فى شهر أغسطس ويعتبر شهرى يونيو وأغسطس افضل ميعاد لإجراء التطعيم باللصق.

ثالثا : البرعمة :

واستخدمت البرعمة بالرقعة وأعطت نسبة نجاح ٤٢,٠ ، ٤٠% فى كلا الموسمين على التوالى عند إجرائها فى شهر يوليو وأعطت نسبة نجاح ٣٠,٥% و ٣٤,٣٣% عند إجرائها فى شهر يونيو فى الموسم الأول و أغسطس فى الموسم الثانى ويفضل إجراء البرعمة بالرقعة فى شهر يوليو.

رابعا : الترقيدات :

ويشمل الترقيد الأرضى والترقيد الهوائى وقد أعطى الترقيد الأرضى نسبة تجذير ٢١,٦٦% ، ٢٣,٣١% فى الموسم الأول والثانى على التوالى عند اجرائه فى شهر اغسطس.

بينما الترقيد الهوائى المعامل بعجينة اللانولين المحتوية على ٤٥٠٠ جزء فى المليون من IBA أعطى أعلى نسبة تجذير باستخدام الغطاء الأسود من البولى ايثيلين ٣٠,٣٣% ، ٤٨,٠% فى الموسم الأول والثانى على التوالى. وكانت نسبة نجاح الترقيد الهوائى باستخدام غطاء ابيض (شفاف) من البولى ايثيلين نتائج منخفضة نوعا ما ١٥,٦٧% ، ٢١,٦٧% خلال موسمى الدراسة على التوالى. ويعتبر شهر أغسطس افضل ميعاد للترقيد الهوائى والارضى. مع ملاحظة أن تطوير وتحسين طرق الإكثار يمكن أن يزيد نسب النجاح.

يمكن اعتبار أن طريقة التطعيم افضل حيث انها غير مكلفة وتعطى نسبة نجاح عالية ولكن النقص فى العمالة المدربة يقف دون اتمامها ، بينما طريقة العقل تعطى اعداد كبيرة من النباتات ولا تحتاج عمالة ولكن نسبة نجاحها متوسطة تحت ظروف الانفاق.