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INFLUENCE OF BACTERIA STRAINS AND IBA ON ROOTING STEM CUTTING IN PEAR ROOTSTOCKS (*Pyrus betulaefolia*)

Hussein, A. M.*; E. A. Kandil*; G. S. El Banna* and N.A.Haggazy**
*** Horticulture Research Institute, Agriculture Research Center, Giza.**
****Faculty of agriculture,Cairo university,Giza.**

ABSTRACT

This work has been carried out in the Horticultural Research Institute. The stem cuttings were planted (soft and semi- hardwood) under mist in green house for two seasons 2003 and 2004. Cutting treated with 3000 ppm IBA gave the highest rooting percentage, while the lowest was untreated cutting in both seasons. All treatments significantly incrased root number and length per cuttings of pear rootstocks (*Pyrus betulaefolia*), Bacteria strains for 2hr induced the highest signicantly root number. Regarding the effect of IBA and bacteria strains treatments on average shoot number per cutting, bacteria strains for 2hrs induced the highest signifcant shoot number in both seasons. The highest significant rooting percentage resulted from cutting collected in May treated with IBA at 3000 ppm Regarding the kind of cuttings, softwood cutting prepared and planted in May to August gave the highest precentage of rooting compard with semi-hardwood cuttings. This result may be due to total soluble sugers,indoles and amino acid were the highest contents in softwood cuttings during May.

Tne anatomy studies in all treatments shows clearly that advanced development of adventitious roots

INTRODUCTION

Propagation by cutting is one of common vegetative methods of the reproduction by which great numbers of plant species, including pear, apple rootstocks and others fruits. The timing of cutting preparation in relation to plant maturity is a very important factor affecting root ability of the cutting with easily rooted rootstocks. Timing is not critical but as the difficulty of propagation increases, the exactness of the timing becomes more important. Pieber(1983) reported that the mist propagation on the *Pyrus betulaefolia* rootstock using softwood cuttings taken in June 96% when the cutting were treated with 0.8% or 2.0% IBA powder and 77% with 2500 ppm IBA solution, while only 50% of un treated cuttings rooted. IBA also significantly increased the number of roots/ cutting and final shoot length. Fadl *et al* (1986) found that hardwood cuttings taken in Nov., Dec., Jan., and Feb. from 15 year old le-conte pear trees, treated with IBA at 1000- 8000 ppm. Or IBA and pyrogallol, Vitamin B complex and boron various combinations. All treatments increased rooting in relation to the control. Removal of buds enhanced rooting in Nov. and Dec. but decreased it in Jan. pyrogallol showed a synergistic effect with auxin in both budded and disbudded cuttings taken in Jan. but was antagonistic on other dates. IBA + vitamin B had the most beneficial effect on rooting in both budded and dis budded cutting in Dec. Both pyrogallol and vitamin B increased the effect of IBA at 2000 ppm.

Cuttings treated with 4000 ppm. IBA + 0.5 Bin Jan showed the highest rooting (86.7%).

Oydvin and Hanse (1986) revealed that the cutting of pear rootstock Old Home x Farmingdale 333 (0H × F333) was successfully propagated from cuttings, which rooted well when treated with 2500 ppm IBA.

Tikhomirov (1992) found that pear rootstock Kiparisouka was propagated in trials between 1987 and 1991. IBA treatment gave the best rooting which ranged from 76% to 91.8% . Data as also tabulated on cutting growth, number of roots, and root weight.

Sato and Hosoe (1998) studies the methods to vegetative propagated pear (*Pyrus betulaefolia*) rootstocks were investigated in Japan. The best one for inducing rooting was IBA, particularly at lower concentration (500 compared with 1000 and 2000 ppm). After IBA treatment, rooting was observed in Kanuma soil and in a peat : Kanuma soil mixture (3 :2), but not in sand. Cuttings with 2 leaf buds rooted better than those with 1 or 3 leaf buds. Rooting was also influenced by leaf number, with the best rooting observed from cuttings with 6-7 leaves; defoliation reduced percentage rooting. Better rooting was observed from cuttings taken from the middle part of shoot compared with those taken from the base or apex of shoots.

Esitken *et al*, (2003) evaluated the effects of average of IBA concentrations (250, 500, and 750 my (liter) alone and in combination with three strains of Agro bacterium rubi (A1, A16 and A18) on the rooting capacity of wild sour cherry softwood and semi hardwood cuttings. The bacterial strains used in the present study were isolated from the foliage of pome fruits growing in the eastem. Anatolia Vegian of Turkey. No rooting was observed on cuttings of wild sour cherry with the control treatment in both types of cuttings, while cuttings treated with IBA and bacteria were rooted. The highest rooting percentages were 65% for softwood and 70% for semi– hardwood cutting when they were treated with 250mg IBA 1litre + A16 treatments. In softwood cutting treatments, A16 (43.8%) and A1 (42.5%) were more effective than A18 (18.8%) and the control (13.1%). Among the hormone doses, the best rooting percentage at 250mg IBA 1litre (39.4%). In semi- hardwood cuttings the highest rooting percentage among the bacterial strains and hormone doses was obtained with the treatments of A16 (49.4%) and 750mg IBA/liter (46.9%). The results indicate that the combination of IBA + bacteria is highly effective in increasing rooting capacity compared to the control, bacteria, or IBA treatments alone.

MATERIAL AND METHODS

This study was conducted for two successive seasons 2003 and 2004 in order to find out the best procedure that induce the maximum rooting percentage for soft wood and semi - hardwood cuttings of *Pyrus betulaefolia* pear rootstock.

Softwood and semi-hardwood cuttings 12-15cm long were collected from the seedlings rootstock grown in the experimental orchard of Aly Moubark farm, cuttings were taken monthly in May, June, July and August in the two seasons. Basal leaves were removed, only one- leaf was left on the top of cutting and the basal portion of cuttings were dipped in one of the following solutions:

1- Bacterial strains for 1hr.
2- Bacterial strains for 2 hrs.
3- Benlet 0.1% + IBA at 2000ppm for 5 second
4- Benlet 0.1% + IBA at 3000ppm for 5 second
5- Benlet 0.1% + IBA at 4000ppm for 5 second
6- Benlet 0.1% + Tap water for 5 second (control).

So, cuttings were directly planted in plastic flats containing rooting media of sand + peatmoss (2 :1, v/v) in three replicates (15 cuttings of each) in a completely randomized design under mist irrigation.

The intermittent mist set for 5 second every 5 mints during the daylight hours. Rooting percentage, roots number, average root length, and number of new shoot growth were recorded after 8 weeks from planting.

Chemical analysis were determined to evaluate endogenous components of cutting tissues in relation to their rooting. Samples from the basal portion of soft and semi- hardwood cuttings were taken and kept in 85% ethylalchol at 0°c for 72 hrs the ethylalcohal being changed every 24hrs (Danial and George, 1972). The combined ethanolic was transformed into aqueous phase by evaporating ethanol at 40± 2°C. It was then diluted to a Known volume and used for the following chemical analysis determination:

(a) Total soluble sugars which were determined colorimetrically at 490 nm according to the method described by Smith *et al*, (1956).
(b) Total soluble indoles which were determined colorimetric at 530mu using the P-dimethylamino benzaldhyde test (Larsen *et al*, 1962; Selim *et al*, 1978).
(c) Total soluble phenoles using the Folin and Denis colorimetric method at 730nm (AOAC, 1975).
(d) Total amino acids using the nine-hydrine colorimetic method at 570 mu (Rosien,1957; Selim *et al*, 1978).

Anatomy studies:

Rooting of pear rootstocks (*pyurs betulaefolia*) by softwood and semi-hardwood cutting treatments with IBA and Bacteria. Samples of cuttings were taken randomly to examine anatomical structure and its relation with rooting behaviour. The basal portions (about 3cm) of the samples were cut and immediately killed and stored in FAA solution until sectioning. Sections of about 20-25 microns in thickness were prepared using rotary microtme. The sections were stained by safranin and fast green method (Johanson, 1940) cleared in xylol and mounted in Canada balsam, the microscopically examined for root initiotion, root primordia and root development.

Data were tabulated and statistically analyzed according to Snedecor and Cochran (1972). Means were compared using New LSD values at 5%

• Enveromental studies and research untis.
• Department of microbiology faculty of agriclture cairo university

level (Waller and Duncan, 1969). The percentages were transformed into angles before subjecting to statistical analysis.

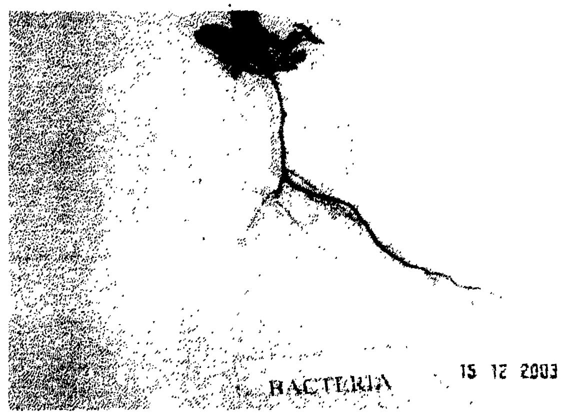
RESULTS AND DISCUSSION

Percentage of rooting:

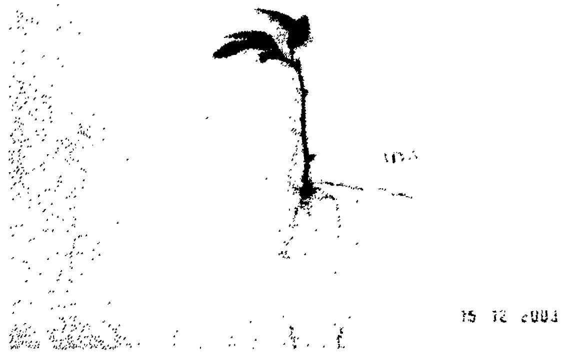
Treated and untreated (control) cuttings rooted but the percentage number differ between the treatments as shown in Table(1) and figure (1&2). The effect of IBA and different strains of Agro- bacterium treatment on average rooting percentage of pear rootstock (*pyrus betulaefolia*) involved in this study is presented in (Table 1). It could be noticed that all treatments promote rooting (IBA and bacterial strains)by increasing rooting percentage significantly. Data show that, cuttings treated with 3000ppm IBA gave the highest rooting percentage in both seasons, followed by IBA at 4000ppm, IBA at 2000ppm, bacterial strains for 2hrs, on the other hand, bacteria strains and untreated cuttings (control) obtained lowest rooting percentage in both seasons.

These results are in line with those reported by many investigators ,since Bal *et al.*, (2000) found that IBA treatments at 3000 and 4000ppm gave the best rooting percentage of the new plum cultivars . Also, El- shazly and El-sabrout (1994) working on root formation of Le conte pear cutting. They found that, the best rooting percentage (30.0 and 32.75% in the first and second seasons, respectively) and number of roots cutting (18.55 and 22.03 in the first and second seasons) were obtained from cuttings dipped in 4000ppm IBA.

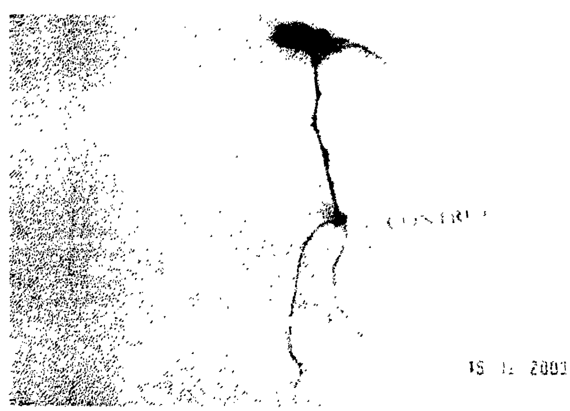
Moreover, Tikhomirov (1992) reported that IBA treatment at 30mg/L gave the best rooting which ranged from 76% in soft wood cuttings of pear rootstock to 91.8% in soft wood cuttings of apple rootstock 54 –118 . Also, Gali *et al.*,(1988) and El- Khawas (1990) in vitro experiments using *Triticum durum* and different strains of *Azospirillum brasilense* were carried out to investigate the relative importance of the *Azospirillum* nitrogen fixing capacity and phytohomone production. Results suggest that an increase in the number and length of lateral roots is due to the production of auxin type substances by the microorganisms. Moreover, Esitken *et al* ., (2003) found that, the highest rooting percentages were 65% for softwood and 70% for semi-hardwood cuttings of wild sour cherry when they were treated with 250mgil IBA + bacterial strain (A16) treatments. In softwood cutting treatments, A16 (43.8%) and A1 (42.5%) were more effective than A18 (18.8%) and the control (13.1%)



Rooted cutting of *P- betulaefolia* treated with bacteria



Rooted cutting of *P- betulaefolia* treated with IBA



Rooted cutting of *P- betulaefolia* untreated (control)
Fig (1)

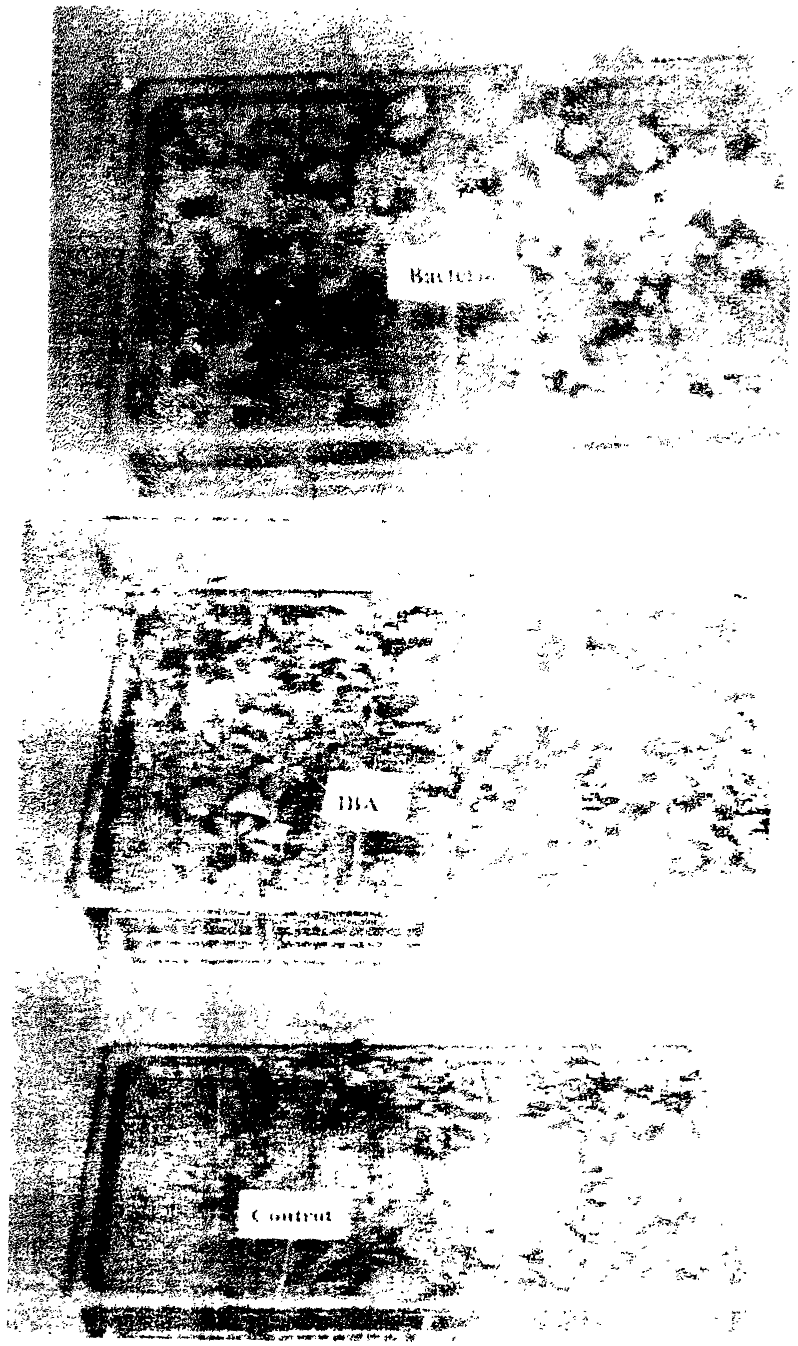


Figure (2):Treated and untreated (control) cuttings rooted but the percentage number differ between the treatments

Table (1): Effect of bacteria strains and IBA concentration in rooting percentage of soft and semi hardwood cutting of pear rootstock(*Pyrus betulaefolia*) on seasons 2003 and 2004

		First season					Second season				
Type of cutting	**Treatment**	**May**	**June**	**July**	**Aug.**	**mean**	**May**	**June**	**July**	**Aug.**	**mean**
Softwood	Bact (1 h)	27.00	22.50	17.5	14.50	20.38 g	26.00	21 50	16 00	13 50	19.25 i
	Bact (2h)	46.67	41.00	36.50	24.50	37.16 d	44.67	34 00	34.50	22.50	35.17 f
	IBA 2000ppm	51.43	43.5	38.50	26.50	39.43 c	48.00	42 00	37 00	23.50	37.63 e
	IBA 3000ppm	71.00	65.50	55.67	43.67	58.96 a	76.00	64.00	54.67	44.67	61.08 a
	IBA4000ppm	64.33	54.00	44.00	32.00	48.58 b	60.00	50 00	41.50	30.00	45.38 C
	Control	12.17	10.00	7.00	5.50	8.67 l	14 00	12 00	9 00	7.00	10.50 k
	Mean	45.43 a	34.42 b	33.19 c	24.44 d	35 62 A	44.78 a	38.42 b	32.11 d	23.53 f	34.83 A
Semi-hardwood	Bact (1 h)	23.00	14.17	15.50	12.00	17.42 h	24.00	20.00	15.00	13.00	18.00 j
	Bact (2 h)	35.67	24.17	23.00	18.00	26.46 f	36 50	34.50	31.00	14.00	30.25 h
	IBA 2000ppm	41.50	32.33	27.50	22.00	30.83 e	39 50	37 50	32 50	14.50	32.25 g
	IBA3000ppm	63.00	55.00	44.00	30.00	48.00 b	67 00	61 00	49 00	38.00	53.75 b
	IBA4000ppm	57.50	50.00	26.73	25.50	39.93 C	52.50	48 00	39 30	28 33	42.03 d
	Control	9.25	6.67	5.17	3.67	6.14 i	10 50	9 50	6.50	5.00	7.88 l
	Mean	38.32 b	32.06 c	23.65 d	18.53 e	28.14 B	38.33 b	35.08 c	28.88 e	20.47 g	30.69 B

New LSD at 5% level.

Roots number per cutting:

The effect of different IBA treatments and different strains of Agro bacterium on average roots number per cutting of pear rootstock during the two seasons, data precedent in table (2) show that, all tested treatments significantly increased roots number per cutting of pear rootstock. Among all treatments used, bacterial strains for 2hrs induced the highest significant root number followed by IBA at 3000ppm, IBA at 4000 ppm, Bacterial strains for 1hr, IBA at 2000 ppm, while the least root number of pear rootstock cuttings resulted from the untreated cutting in both seasons.

Root length:

Data regarding the effect of IBA and different Bacterial strains treatments on average root length in both seasons data in table (3) Showed that all treatments increased the average root length for all treatments used Bacterial strains for 2 hrs induced the highest average root length, followed by IBA at 3000 ppm, Bacterial strains for 1hr., IBA at 4000 and IBA at 2000ppm in the first season, while in the second, the highest treatment in the average root length was bacteria strains for 2hrs followed by bacteria strains for 1hr., IBA at 3000ppm, IBA at 4000ppm and IBA at 2000ppm. The least average root length was induced by the untreated cuttings in both seasons.

Table (2):Effect of bacteria strains and IBA concentration in root number of soft and semi hardwood cutting of pear rootstock(*Pyrus betulaefolia*) on seasons 2003 and 2004

		First season(2003)					Second season (2004)				
Type of cutting	Treatment	May	June	July	Aug.	mean	May	June	July	Aug.	mean
Softwood	Bact (1 h)	13.00	10.00	5.00	3.00	7.75 d	12.17	9.17	4.17	3.17	7.17 f
	Bact (2h)	19.17	16.17	11.17	7.17	13.42 a	24.50	14.50	14.50	10.50	17.25 a
	IBA 2000ppm	10.50	8.50	5.50	4.00	7.13 e	10.58	8.50	5.50	4.50	7.27 f
	IBA 3000ppm	15.83	12.83	8.83	5.83	10.83 b	22.42	17.42	13.42	10.42	15.42 b
	IBA4000ppm	14.17	11.17	6.17	4.17	8.42 C	13.67	10.67	7.67	5.67	4.42 d
	Control	6.00	5.00	3.50	2.50	4.25 g	6.50	5.50	4.50	4.00	5.13 h
	Mean	13.11 A	10.61 C	6.64 E	4.44 G	8.72 A	14.97 A	11.74 C	8.29 E	6.38 F	10.36 A
Semi-hardwood	Bact (1 h)	11.00	9.00	4.00	2.00	6.50 f	11.42	9.42	4.42	2.42	6.92 f
	Bact (2 h)	16.33	13.33	8.33	5.33	10.83 b	16.92	14.33	10.33	7.33	12.23 c
	IBA 2000ppm	9.50	7.50	4.50	3.00	6.13 f	8.00	7.00	5.00	3.50	5.88 g
	IBA3000ppm	13.50	10.50	6.50	4.50	8.75 c	21.33	16.33	8.33	4.33	12.58 c
	IBA4000ppm	12.17	9.17	4.17	3.17	7.17 e	13.00	10.00	6.00	4.50	8.38 e
	Control	4.50	3.50	2.50	1.50	3.00 h	5.00	3.83	2.83	1.83	3.38 i
	Mean	11.17 b	8.83 d	5.00 f	3.25 h	7.06 B	12.61 b	10.15 d	6.15 f	3.99 g	8.23 b

New LSD at 5% level

Shoot number per cutting:

Regarding the effect of IBA and different bacteria strains treatments on average shoot number per cutting in both seasons, data in table (4) show that, all tested treatments increased average shoot number compared with untreated ones. Among all treatments used, bacteria strains for 2hrs induced the highest significant shoot number followed by IBA at 3000ppm, bacteria strains for 1hr. and IBA at 2000ppm, while the least shoot number of pear rootstock cutting resulted from the untreated cuttings.

Date of cutting preparation:

Concerning the effect of date cutting preparation on the rooting ability of pear rootstock(*Pyrus betulaefolia*), it could be concluded from Table (1) that the highest significant rooting percentage resulted from cutting collected in May treated with IBA at 3000ppm followed by those prepared June and July for each type cutting. On the other hand, the least rooting percentage resulted from cuttings collected in August. There was significant interaction between date of cutting collecting, IBA and bacteria strains treatments and type cuttings.

These results support those reported by many researchers since Putsilo and Feburko (1980) found that, the best time for propagation softwood cuttings of the three dwarf apple rootstocks 49-118, 57-146 and 57-490 was May and June. Also, Stepanova *et al.*, (1984) indicated that. the best rooting of the softwood cutting of several fruits (including rootstock M.G) was obtained with cuttings taken at the end of May or the beginning of July and treated with and treated with IBA. El- sayed (1994)found that, May and June were the best for preparing and planting semi- hard wood and softwood cutting, and cuttings prepared in August gave the least rooting ability or failed to root, while cuttings prepared in July showed intermediate percentages.

Table (3) : Effect of bacteria strains and IBA concentration in root length of soft and semi hardwood cutting of pear rootstock (*Pyrus betulaefolia*) on seasons 2003 and 2004

		First season (2003)					Second season (2004)				
Type of cutting	Treatment	May	June	July	Aug.	mean	May	June	July	Aug.	mean
Softwood	Bact (1 h)	6.67	5.62	4.16	3.11	4.89 bc	11.07	8.99	5.01	3.35	7.10 c
	Bact (2h)	8.70	7.30	5.23	4.07	6.33 a	13.40	10.12	7.11	4.24	8.72 a
	IBA 000ppm	5.47	4.34	2.41	1.41	3.42 ef	5.95	4.43	3.17	2.15	3.42 fg
	IBA3000ppm	7.96	6.78	3.43	2.86	5.38 b	8.75	7.77	4.54	3.20	6.07 d
	IBA4000ppm	6.46	5.33	3.33	1.83	4.24 cd	6.26	5.10	3.10	2.24	4.19 f
	Control	3.74	2.68	2.03	1.22	2.42 gh	3.58	2.48	1.54	1.35	2.25 i
	Mean	6.50 A	5.35 BC	3.52 D	2.42 E	4.45 A	8.17 A	6.48 C	4.09 E	2.76 G	5.38 A
Semi-hardwood	Bact (1 h)	5.93	5.56	4.17	3.18	4.71 Bcd	9.48	8.17	4.40	3.07	6.28 d
	Bact (2 h)	7.48	6.47	4.43	3.13	5.38 b	12.07	9.73	6.42	4.08	8.08 b
	IBA2000ppm	4.62	3.60	2.21	1.58	3.00 fg	4.90	3.84	3.04	2.08	3.48 h
	IBA3000ppm	6.93	5.87	3.23	1.90	4.48 cd	7.50	5.48	3.40	2.16	4.64 e
	IBA4000ppm	6.00	5.00	3.00	2.04	4.01 de	5.31	4.17	3.00	2.00	3.62 gh
	Control	2.82	2.14	1.60	1.11	1.42 h	2.56	2.04	1.21	1.23	1.76 J
	Mean	5.63 b	4.77 c	3.11 d	2.16 e	3.92 B	6.97 b	5.58 d	3.58 f	2.44 h	4.64 B

New LSD at 5% level

Table (4): Effect of bacteria strains and IBA concentration in shoot number of soft and semi hardwood cutting of pear rootstock(*Pyrus betulaefolia*) on seasons 2003 and 2004

		First season(2003)					Second season(2004)				
Type of cutting	Treatment	May	June	July	Aug.	mean	May	June	July	Aug.	mean
Softwood	Bact (1 h)	1.75	1.50	1.00	1.00	1.31 di	1.75	1.00	1.00	1.00	1.14 d
	Bact (2h)	2.50	2.00	1.50	1.50	1.88 a	2.25	2.25	2.00	2.00	2.13 a
	IBA 000ppm	1.25	1.25	1.00	1.00	1.13 fg	1.25	1.25	1 00	1.00	1 13 de
	IBA3000ppm	2.00	1.75	1.75	1.00	1 63 b	2 25	2 00	1 75	1.50	1.88 b
	IBA4000ppm	2.00	2.00	1.25	1.00	1.56 bc	2.00	1.75	1.75	1.00	1.63 c
	Control	1.00	1.00	1.00	1.00	1.00 gh	1.00	1.00	1.00	1.00	1.00 e
	Mean	1.75 a	1.58 b	1.25 cd	1.08 e	1.42 A	1.75 a	1.54 b	1.42 cd	1.25 e	1.49 A
Semi-hardwood	Bact (1 h)	1.75	1.25	1.00	1.00	1.25 ef	1 25	1 25	1 00	1 00	1.13 de
	Bact (2 h)	2.00	2.00	1.500	1.25	1.6 4b	2.25	2.25	2.00	1.75	2.06 a
	IBA2000ppm	1.25	1.25	1.00	1.00	1.13 fg	1.25	1.00	1.00	1.00	1.06 de
	IBA3000ppm	2.00	1.25	1.25	1.25	1.44 cd	2.25	2.00	1.75	1.25	1.81 b
	IBA4000ppm	1.75	1.50	1.25	1.00	1.33 de	1.75	1 50	1 50	1 25	1.50 c
	Control	0.75	0.75	1.00	1.00	0.88 h	0.01	1.00	1 00	1 00	0.75 F
	Mean	1.58 b	1.33 c	1.17 de	1.08 e	1.29 B	1.46 bcd	1.50 bc	1.38 d	1.21 e	1.38 B

New LSD at 5% level

Type cutting:

Regarding the variability of softwood and semi- hardwood on their rooting ability as affected by IBA and bacteria strains treatments. It could be noticed from Table (1) that among two type cuttings used, softwood cutting prepared and planted in May- August gave the highest percentage of rooting compared with semi- hardwood cuttings.

The highest rooting ability resulted by pear rootstocks (*Pyrus betulaefolia*) softwood treated, it could be noticed from presence of total soluble sugars, indoles, phenols and amino acids at their highest concentrations in softwood cuttings during May (the best time for rooting) may be among the factors affecting their rooting.

seasonal Fluctuations in Some Endogenous Components

(a) softwood cuttings

Data in table (5) showed significant differences in the seasonal changes in some endogenous components of pear rootstocks *Pyrus betulaefolia* softwood cuttings. In the first season, cuttings prepared in May had higher contents of indoles, phenols, total soluble sugars and amino acids than those prepared in August.

Meanwhile, in the second season, the concentration of total soluble sugars, indoles and amino acids were significantly higher in May and June in softwood cuttings, followed by those of July, while August softwood cutting were the least in this respect. Concerning phenols, August softwood cuttings were significantly the highest in this respect, followed by July cuttings, while May and June ones were the least in this respect.

b) semi- hardwood cuttings

Data on chemical determination of total soluble indoles, phenols, sugars and amino acids during 2003 and 2004seasons on semi- hardwood cuttings of pear rootstocks(*Pyrus betulaefalia*) are shown in table (5). In the 2003 season, the highest amount of indole content was observed in May and June cuttings, then it decreased in July and August respectively.

Concerning the cuttings content of soluble phenols, it was high at May cuttings, followed by June and August cuttings, then it decreased in July samples. The total soluble sugars content were at its highest level at May cuttings, thereafter, reduction occurred in June, July and August cuttings, while the amino acids content were at its highest level at May samples, then a significant reduction occurred in June, July and August cuttings.

In the 2004 season, however, total soluble indoles content increased in May and June cuttings then it decreased in July and August cuttings. The total soluble phenols content increased gradually in cutting tissues from May till August concerning the cuttings content of total soluble sugars and amino acids, it was high at the beginning (May cuttings) then its decreased gradually in June, July and August.

These results agreed with those obtained by El sayed (1994) found that, the highest rooting ability of both semi- hardwood and softwood cuttings observed in May and June seemed to be concomitant with the high levels of total soluble sugars, indoles, amino acids as well as the moderate level of phenols

Anatomy studies:

Figure (3) Showed that cross sections in pear rootstocks (*Pyrus betulaefolia*) cutting . Different tissue layers in the cross section are the periderm consisting of layers number in the cross section are the periderm consisting of layers number followed by corted which often consists of several layers of chloroplast parenchymtic cells. The phloem is composed of sieve tubes, companion cells phloem parenchyma and fibers. A complete combium ring between the phloem and the xylem.
The pith is located in the core of the stem cutting.

The aforementioned anatomical structure of pear (*Pyrus betulaefolia*) stem cutting is nearly the same as what had been previously reported for different members of the Rosaceae family (Metcalf and Chalk, 1950)

Furthermore Fig (4) show that root primoridia initiation and started to root development from the pith zone.

Fig (5) shows clearly the advanced dvelopmentof advetitions roots. These resultes go in line with the findings of Abou- Amera (1976) ; Wally et al; (1981), Makarem (1985) on pear and Salama et al., (1994) on apricot.

Table (5):Effect of bacteria strains and IBA concentration some endogenous chemical of soft and semi- hardwood cutting of pear rootstock(*Pyrus betulaefolia*) on seasons 2003 and 2004

Type of cutting	First season(2003)					Second season(2004)			
	Months	Indols	Phenols	Total Sugars	Amino Acid	Indols	Phenols	Total Sugars	Amino Acid
Softwood	May	0685 A	8.016 A	31.12 A	2.535 A	0.989 A	6 933 D	32 24 A	3.518 A
	June	0.602 B	7.530 B	29.43 C	2.145 B	0.918 B	6.025 F	31 64 B	3.074 B
	July	0.424 D	5.122 F	21.12 F	1.426 D	0.512 D	7.035 C	22.33 E	2.225 D
	Aug.	0.412 D	7.028 D	20.32 G	1.003 E	0.408 E	8.011 A	20 50 G	1.022 F
	Mean	0.531 A	6.924 A	25.50 A	1.777 A	0.707 A	7 001 A	26 68 A	2.460 A
Semi-hardwood	May	0.522 C	7.283 C	31.02 B	2.213 B	0.720 C	5.736 G	30.42 C	2.591 C
	June	0.503 C	6.413 E	28.31 D	1.507 C	0.705 C	5.101 H	28 65 D	2.116 E
	July	0.418 D	4.566 G	21.52 E	0.829 F	0.434 E	6.355 E	21.18 F	1.055 F
	Aug.	0.325 E	6.351 E	20.01 H	0.626 G	0.373 E	7.710 B	20.03 H	0.580 G
	Mean	0.442 B	6.153 B	25.22 B	1.294 B	0.558 B	6.226 B	25 07 B	1.586 B

New LSD at 5%level

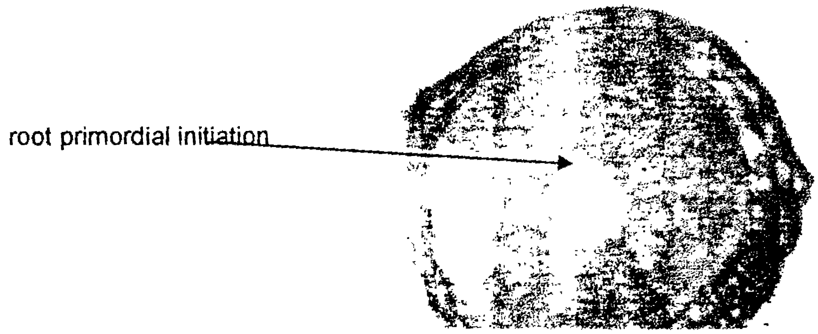


Fig (3): A cross section in pear rootstocks (Pyrus Betulaefolia) stem cutting showing root primordia initiated from the pith

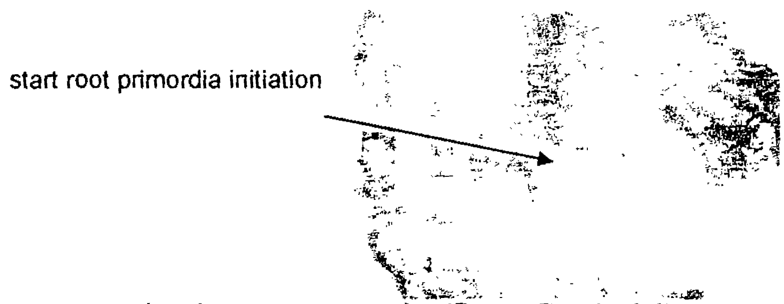


Fig (4):A cross section in pear rootstocks (Pyrus Betulaefolia) stem cutting showing start root primordia initiation from the pith

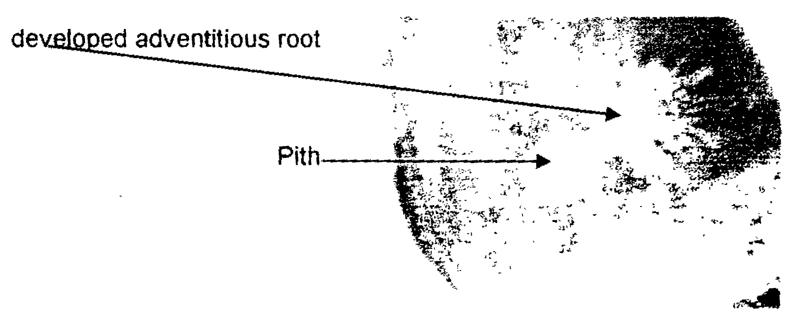


Fig (5) :A cross section in pear rootstocks (Pyrus Betulaefolia) stem cutting showing a well developal adventitious roots and their pentration throughout the cutting tissues.

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تأثير من سلالات البكتيريا وحامض الأندول بيوترك علي قابلية التجذير في العقـل الساقية لأصل الكمثري البتشليفوليا

عاطف معتمد حسين*، إيمان عبد الرحمن قنديل*، الغريب شبل البنا*، نبيـل إبـراهيم حجازي**

* معهد بحوث البساتين،مركز البحوث الزراعية

**كلية الزراعة،جامعة القاهرة

أجريت هذه التجربة بمعهد بحوث البساتين بالجيزة، أستخدم نوعين من العقل الساقية(عقل غضـه& عقـل نصـف خشبية) لأصل كمثرى التشليفوليا خلال موسمي٢٠٠٣،٢٠٠٤ .

تم معاملة العقل بتركيزات مختلفة من سلالات البكتيريا و حامض الاندول بيوترك وزرعت بالصوبة تحت الضباب.

كانت افضل النتائج المتحصل عليها كالاتي:

١-ارتفاع نسبة التجذير في العقل عموما باستخدام تركيز حامض الاندول بيوترك ٣٠٠٠جزء في المليون وكانت الأقل مع العقل الغير معامله (الكنترول).

٢-أعطت جميع المعاملات معنوية عالية من حيث عدد وأطوال الجذور للعقل تحت الدراسة .كانـت معاملـة العقـل بالبكتريا بغمس قواعدها لمده ساعتين أعلاها معنوية من حيث عدد الجذور والأفرع عن باقي المعاملات.

٣- كان افضل المواعيد لأخذ العقل شهر مايو حيث أعطى اعلي معنوية لنسبة التجذير مع المعاملة بحمض الانـدول بيوترك.

٤- أعطت العقل الغضه أفضل النتائج لنسبة التجذير بالمقارنة بالعقل النصف خشبية في جميـع المواعيـد تحـت الدراسة، ربما يرجع ذلك الي ارتفاع في محتوي العقل الداخلي من نسبة السكريات الكلية والاندولات والأحمـاض الامينية.

٥- تلاحظ من الدراسة التشريحيه لقواعد العقل خروج الجذور العرضية من النخاع.