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THE USE OF POLLEN GRAINS AS NATURAL ORGANIC MATERIALS IN MICROPROPAGATION MEDIA OF DATE PALM (*Phoenix dactylifera* L.) SEWY cv.

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ABSTRACT

This work was carried out in Biotechnology Division, the Central Laboratory for Date Palm Research and Development. Shoot-tip excised from 10 – 15 cm was detached from adult date palm (*Phoenix dactylifera* L.) "Sewy" cv. and cultured on Murashige and Skoog medium supplemented with 100 mg/L Naphthalene acetic acid (NAA) and 3 mg/L Isopentenyladenin (2ip). Pollen grains of Sewy cv were used as natural organic material in the different concentrations (0.01, 0.05, 0.1, 0.25, 0.50 and 1.0 g/L) were evaluated at different stages. Data indicated that culturing of shoot-tips on Murashige and Skoog medium supplemented with 0.25 g/L pollen grains induced the best growth parameters. However, lower pollen grains concentrations (0.05 g/L) enhanced the number of plantlets and plantlets length and rooting.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is a monocotyledon and dioecious plant, propagated vegetatively by off-shoots. Off-shoot production is limited in date palm depending on plant vigour, age and variety. Tissue culture techniques are considered now the most promising means for rapid clonal propagation of date palm (Zaid, 1986 and Abo El-Nil *et al.*, 1986). Plantlets were successfully produced from shoot-tip explants of date palm off-shoots varieties (Zaid and Tisserat, 1983 and Wongkaew *et al.*, 1991). Recently, Tisserat *et al.*(1979) and El-Sharabasy (2000) obtained that good callus growth occurred from explants of date palm cultured on medium containing on 100 mg/L 2,4-D or NAA. Some investigators were found that using higher concentrations of 2,4-D produced abnormalities plantlets. The current work was designed to study possibility for using pollen grains as natural organic materials in micropropagation media for somatic embryogenesis in date palm.

MATERIALS AND METHODS

This study was carried out in the laboratory of Plant Cell and Tissue Culture Department, Biotechnology Division, The Central Laboratory for Date Palm Research and Development during the period from 2001-2002.

Plant materials and explant types:

Off-shoots, 10 – 15 cm in diameter, 4 – 6 kg in weight were detached from adult date palm (*Phoenix dactylifera* L.) "Sewy" cv. grown in El-Padrasheen region, Giza governorate. The white soft tissue nearer to the heart of the off-shoot were used as the plant material to obtain the apical tissues of stem (shoot-tip). Shoot-tips were considered as explants. The explants were soaked in a cold antioxidant solution (100 mg/L ascorbic acid

and 150 mg/L citric acid) and kept in a refrigerator for about 2 hours until surface sterilization.

Explants were surface sterilized by using ethylalcohol (70%) for 1 – 2 min then rinsed once with sterile distilled water and transferred to 50% Clorox (2.5% sodium hypochlorite) and two drops of Tween-20 for 20 min.

The explants were cultured on Murashige and Skoog medium supplemented with 100 mg/L inesotol, 100 mg/L glutamine, 1.5 g/L activated charcoal, 30 g/L sucrose and 6.5 g/L Difico Bacto agar. The pH of the medium was adjusted to 5.7 and autoclaved at 121°C under 15 lb/in^2 for 15 min. The cultured explants were incubated under 24 hours of dark with average temperature of 27±1°C. While, plants in proliferation and rooting stage were placed in darck for 24 hours with average temperature of 27±1°C. Different experiments were conducted as follows:

1- Establishment stage:

1.a. Callus initiation:

This experiment was planned to determine the best treatments that induce the highest callus initiation, so shoot-tip explants were cultured on MS basal medium supplemented with different treatments as follows:

1- Control [using 100 mg/L Naphthalene acetic acid (NAA) and 3 mg/L Isopentenyladenin (2ip)].
2- Control + 0.01 g/L pollen grains.
3- Control + 0.05 g/L pollen grains.
4- Control + 0.10 g/L pollen grains.
5- Control + 0.25 g/L pollen grains.
6- Control + 0.50 g/L pollen grains.
7- Control + 1.00 g/L pollen grains.

1.b. Callus development:

This study was designed to specify the best percentage of callus formation, number of callus and callus size. Therefore, the explants were cultured on MS basal medium supplemented with:

1- Control [using 10 mg/L Naphthalene acetic acid (NAA) and 3 mg/L Isopentenyladenin (2ip)].
2- Control + 0.01 g/L pollen grains.
3- Control + 0.05 g/L pollen grains.
4- Control + 0.10 g/L pollen grains.
5- Control + 0.25 g/L pollen grains.
6- Control + 0.50 g/L pollen grains.
7- Control + 1.00 g/L pollen grains.

2- Proliferation stage:

Isopentenyladenin (2ip) was added at 3.0 mg/L at the same concentrations mentioned before to enhance the highest shoot number (proliferation).

3- Rooting stage:

Naphthalene acetic acid (NAA) was investigated at 1.0 mg/L at the same concentrations mentioned before to determine the best one that induces good explant development parameters. In all experiments, each treatment consisted of 6 replicates with one explant for each in a completely randomized design. Both the number of axillary shoots that produced by each shoot and the average produced by each shoot and the average shoot length (cm) (the criteria for proliferation rate) was recorded at the end of each subculture (6 weeks passage). Also, the data were statistically analyzed according to Duncan (1955).

RESULTS AND DISCUSSION

1- Establishment stage:

Table (1) indicated that using 0.25 g/L of pollen grains gave the highest significant increase of Swelling size followed by 0.10 g/L then 0.05 g/L as compared with the other used treatments and the control in a descending order. On the other hand, number of Swelling and survival percentage did not show any statistical differences when different concentrations of pollen grains were used. Meanwhile, significant increase in number of callus initiation, survival percentage of callus and callus size were recorded when 0.25 g/L of pollen grains was used. Meanwhile, Table (2) reflect that using 0.25 g/L of pollen grains gave the highest significant increase of number of callus, callus formation percentage and callus size followed by 0.10 g/L as well as 0.05 g/L as well as the other used treatments and the control. The overall results are agreed with those mentioned by Zaid and Tisserat (1983). They found that embryogenic callus on MS medium containing 3 mg/L 2ip, the auxin level was represented by 100 mg/L 2, 4-D. Moreover, Abo El-Nil (1986) mentioned that initiation and growth embryogenic callus of date palm was superior on MS medium contain 50 µM NAA and 15 µM 2ip. The author added that the most active auxins for date palm callus induction and growth were 2,4-D, NAA and IAA. However, NAA above 10 mg/L induced good callus growth. On the other hand, Amer and Zahran (1999) mentioned the pollen grains contained estrogen, guercetin, β-amyrin, β-sitosterol, steroidal, cholesterols, and estrone. Also, date kernels contained estrogen, cholesterols, compesterol, stigmasterol, β-sitosterol.

Table (1): Effect of pollen grain levels on Swelling and callus initiation developed in Establishment stage of date palm "Sewy" cv.

Parameter	Swelling			Callus initiation		
Treatment (g/L)	No. of Swelling	Survival (%)	Swelling size (score)	No. of callus intiation	Survival (%)	Callus size (score)
Control	6.00 A	100.00 A	1.33 E	4.00 C	66.60 C	1.66 F
0.01	6.00 A	100.00 A	1.50 E	4.00 C	66.60 C	1.83 E
0.05	6.00 A	100.00 A	2.66 C	4.00 C	66.60 C	2.16 C
0.10	6.00 A	100.00 A	3.16 B	5.00 B	83.30 B	2.83 B
0.25	6.00 A	100.00 A	3.50 A	6.00 A	100.00 A	3.33 A
0.50	6.00 A	100.00 A	2.00 D	4.00 C	66.60 C	2.00 D
1.00	6.00 A	100.00 A	1.00 F	3.00 D	50.00 D	0.66 G

Means followed with the same letters are not significant at 0.05 level

Table (4): Effect of pollen grains on plant length, number of roots, root length and survival percentage of root parameters in rooting stage of date palm "Sewy" cv.

Parameters Treatment (g/L)	Plant length (cm)	No. of roots	Root length (cm)	Survival of roots (%)
Control	14.45 A	3.50 C	4.00 B	100.00 A
0.01	15.15 A	3.90 B	4.10 B	100.00 A
0.05	16.90 A	4.50 A	4.70 A	100.00 A
0.10	14.20 A	3.00 D	2.25 C	80.00 B
0.20	10.00 B	1.10 E	1.55 D	50.00 C
0.50	8.60 B	0.50 F	0.25 E	30.00 D
1.00	5.70 C	0.00 G	0.00 F	0.00 E

Means followed with the same letters are not significant at 0.05 level

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استخدام حبوب اللقاح في البيئة المغذية للإكثار الدقيق لنخيل البلح

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المعمل المركزي للأبحاث وتطوير نخيل البلح

أجري هذا البحث بالمعمل المركزي لأبحاث وتطوير النخيل بمركز البحوث الزراعية بالجيزة خلال الفترة من ٢٠٠١-٢٠٠٢م وذلك بهدف استخدام المواد العضوية الطبيعية في البيئة المغذية وذلك لاكتشاف مدى تأثيرها على مزارع أنسجة نخيل البلح. تم فصل القمة النامية من نخيل البلح (صنف سيوي) وزرعت على بيئة موراشيج وسكوج مضاف إليها ١٠٠مللي/لتر نفثالين حمض الخليك و٣مللي/لتر أيزوبنتيل أدنين (كنترول) وأضيف إليها مستخلص حبوب اللقاح بتركيزات مختلفة (٠,٠١ ، ٠,٠٥ ، ٠,١ ، ٢٥٠٢ ، ٠,٥٠ ، ١,٠جرام/لتر) لكل مرحلة من مراحل الإكثار الدقيق لنخيل البلح صنف سيوي ، ووجد أن زراعة القمة النامية على بيئة موراشيج وسكوج المضاف إليها مستخلص حبوب اللقاح بتركيز ٠,٢٥جم/لتر أعطت أفضل قياسات للنمو. وشجع استخدام ٠,٠٥ جم/لتر من حبوب اللقاح على زيادة عدد النباتات وطولها. وكان التجذير أفضل ما يمكن باستخدام ٠,٠٥ جم/لتر مستخلص حبوب اللقاح.

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NEW MACHINERY OWNERSHIP COSTING PROCEDURE

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ABSTRACT

A quick conventional estimate of machinery operating costs is obtained by averaging the annual costs over the full period of ownership. This ignores the fact that depreciation is higher during the first year of ownership than in subsequent years, whilst repair and maintenance charges increase with age of the machine. This conventional estimating procedure provides a useful guide to average trends. The correct evaluation of annual costs is particularly important ascertain the economic life of a machine. For solutions to more complex machinery management problems, the annual machinery costs are calculated using the actual cash flows, which occur each year. The calculation of annual costs of machine ownership is based on three types of cash flows: (a) capital cost repayable by equal mortgage installments, (b) recurring annual repair and insurance charges and (c) income from selling the machine.

The net present value of an investment in farm machinery may be calculated using a series of steps. First and most important, the cash flow generated by the investment must be estimated for each year. Second, the cash flow is discounted by a present value factor. Third, the discounted cash flow is assumed over the number of years analyzed. The discounted annual interest charge paid on the borrowed capital is affected by the amount of the loan and its period. For a given standard tax rate, the tax relief is calculated for repair and insurance costs and annual capital allowances deducting the actual balancing charge. This study is aimed to give an accurate estimate of the annual costs of a machine and to provide a comparison of the present annual cost of machine ownership with and without the effects of tax allowance and tax relief.

The present annual cost of machine ownership is substantially altered by tax considerations. Allowing 30% tax rate in calculation of machine costs reduces tractor present annual cost from a current value (CV) of 2916 to a CV of 2032 (30% reduction) compared to a CV of 2440 calculated using the conventional method. The present approach yields an intermediate cost figure within the range spanned by the present annual ownership costs with and without tax.

Keywords: Current Value (CV), Capital Allowance (C_A), Balancing charge (B_c), annual interest charge (I_A), Repair cost (R_c), Mortgage value, (M_V), Insurance charge, (I_{NS},) Resale value (S_N), Annual cost (A_N), Loan rate I_r, and Inflation rate, j_f.

INTRODUCTION

Batterham (1973) and Liang *et al.* (1979) used terms of the present value of a future sum, which brings the future sum back to the value of the present sum at a discounted investment rate. Statistical models were developed by Schoney and Massie (1979), Schoney and Finner (1981) and Rotz (1985) to estimate "as is" value during periods of high inflation rate for five categories of farm tractors and three groups of combines. The results indicated that, at current inflation rates, most tractors and combines were likely to retain a very substantial portion of their original prices. Tractors and combines represent sizeable investments generating – substantial ownership costs for most farmers, where 60 to 70 percent of the total cost of ownership