



ISSN: 0067-2904

Evaluation the activity of Ajwa of date palm fruits extract as promoter rooting for stem cuttings of cassia (*Cassia surattensis* Berm).

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Abstract

The present study was carried out in the nursery at Al – Dora (Baghdad). During spring 2015 under green hous conditions. The aim was to evaluate the effect of different concentration (0, 1.25 and 2.5) g./l of aqueous Ajwa date fruit extract on different cutting position (basal, sub terminal and terminal) for different dipping times (24, 48) hours, on cassia stem cuttings. After 2 months of planting the results showed that the 2.5 gm. /l of Ajwa date extract with basal cuttings for 48 dipping times accelerated the time of rooting to 3.7 weeks compared to 8 weeks in control treatment. This treatment increased rooting percentage to 77.7% compared to 0% in control treatment. It gave the highest value of both rooting numbers 2.2 per cutting and rooting lengths 2.89 cm. The results indicated that 2.5 gm./l of Ajwa date extract with sub terminal cuttings for 48 hours dipping times gave the highest results in leaves, leaflet numbers and leaflet area 2.88, 4.0 and 1.70 cm respectively. The analysis of ajwa date quantity showed the present of 50.38 and 48.82 $\mu\text{mole/g}$ of catalase peroxidase enzymes respectively with the absence of IAA, GA3 and Zeatin hormones.

Keywords: Aiwa date palm extract, *Cassia* stem cuttings positions, dipping time, rooting characteristics.

تقييم فعالية مستخلص ثمار تمور العجوة كمحفز لتجذير عقل سيقان الكاسيا

Cassia surattensis Berm

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الخلاصة

نفذت تجربة في احد المشاتل الاهلية في منطقة الدورة تحت ظروف البيت البلاستيكي خلال ربيع 2015 لتقييم فعالية مستخلص ثمر العجوة كمحفز لتجذير العقل الساقية لشجرة الكاسيا باستخدام تراكيز مختلفة (0 ، 1,25 و 2,5) غرام / لتر ، ولمواقع مختلفة من العقل الساقية (قاعدية ، وسطية و نهائية) ويفترات تنقيع (24 و 48) ساعة. اظهرت النتائج بعد شهرين من الزراعة ان معاملة 2,5 غرام/ لتر من مستخلص ثمر العجوة في فترة تنقيع 48 ساعة مع العقل القاعدية قد عجلت في فترة تجذير الى 3,7 اسبوع مقارنة مع 8 اسبوع في معاملة السيطرة، وكانت اعلى نسبة مئوية للتجذير % 77,7 مقارنة مع % 0 في معاملة السيطرة. واعلى معدل لعدد وطول الجذور 2,2 و 2,89 سم على التوالي. كما ووضحت النتائج ان العقل الوسطية المعاملة بتركيز 2,5 غرام/ لتر من مستخلص ثمر العجوة في فترة تنقيع 48 ساعة اعطت اعلى معدل لعدد الاوراق ، عدد الورقات والمساحة الورقية للورقة بمعدلات 2,88 ، 4.00 و 1,70 سم على التوالي. كشف التحليل الكمي لثمره ثمر العجوة بوجود 50,38 و 48,82 مايكرو مول/غرام من أنزيمات الاكسدة (الكاتاليز و البيروكسيديز) على التوالي. وعدم وجود منظمات النمو النباتية الاوكسين، الجبرلين والساتوكاينين.

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Introduction

Demand for ornamental shrubs had been increased lately due to dynamic development. Gardens have become an inseparable element of modern settings. In response to this trend the ornamental nursery production has been increased [1].

Cassia surattensis Burm the species considered to originate from Southeast Asia. It has now been widely introduced to tropical and subtropical regions around the world as an ornamental plant as well as for use as a hedge and shade tree in plantations [2].

The species introduced to Iraq few years ago as an ornamental tree with its attractive flowers that bloom throughout the year, but in Iraq the flowers failed to produce seeds and in some case the plant produce seeds and failed in germinations. In the other hand the maximum of rooting by stem cutting, reach about 45% as mentioned by nurseries and the specialist's officials in AL-Zawraa parking Baghdad. For this reason there was problem in its propagated that causes highest prices for customers in Iraq.

The influence of Ajwa date fruits extract in rooting of stem cutting has not documented. However, work is lacking on the use of stem cuttings for vegetative propagation in Iraq. Therefore the objective of this study was to evaluate Ajwa date fruits extract as promoter rooting to *cassia* stem cuttings.

Material and methods:

The experiment was conducted in a nursery in Dora region (Baghdad). During spring 2015 under green house conditions. The experiment were three factorial. 1- Ajwa date fruit extract in different concentrations (0, 1.25, 2.5 gm/l). 2- Type of cuttings position (terminal, sub terminal and basal). 3- Different dipping times (24, 48) hours. Factors laid out in a complete randomized design with nine replicate. Semi hardwood cuttings of *C. surattensis* collected from university of Baghdad in AL-Jaderia. The branches were cut into three pieces (basal, sub terminal and terminal). Stem length and diameter of these cutting are 12–14 cm and 7–8 mm respectively. The cuttings were immediately dipped into normal tap water and subsequently washed in distilled water before applying in different treatments.

Preparation of Ajwa date fruit

Ajwa date fruit (*Phoenix dactylifera* L.) collected from Saudi Arabia market. The fruit was washed under the running water, 2.5 g (fresh weight) mixed with 1000 ml distil water using an electronic blender for (10) minutes. The solvent was lifted for two hours, then filtered by cheese cloth finally centerfugated in 3000 round/minutes for 15 minutes. The filtrate represented the stock solution in concentration 2.5gm/l. From the stock solution made the other concentration 1.25 g. /l with distilled water by the following equation:

(volume 1x concentration 1= volume 2 x concentration 2). The control treatment represent distil water. The stock solution was stored in black container at low temperature for further use.

All leaves were removed from the lower part of the cuttings. Each type of cuttings was dipping in two period times 24 and 48 hours for each concentration, with nine replications for each treatment. The cuttings were cultured in the pots containing sand medium with fungicide (Radomel) in concentration 0.2 g/pot. The cuttings were regularly watered after planting. The rooting parameters for all sampling after two months of planting were counted and the data was recorded for all treatments. These traits were (time of rooting, rooting percentage, number, and roots length in cm). In addition to the (number of leaves, leaflet and leaflet area). leaflet area was measured according to [3]. Time of rooting means the beginning time of rooting in weeks. Rooting percentage = (numbers of rooting pots x100 / total pot numbers). Data were analyzed using Gen Stat [4] program. Analysis of variance (ANOVA) was performed to determine significant difference. Mean separation was carried out by the Least Significant Difference test (LSD) at level 5%.

Estimation of some chemical composition of date fruit

1- Quantitative analysis of free IAA, GA3 and Zeatin.

Extraction, purification and quantitative determination of free IAA, GA3 and zeatin in the date fruit extract were done with minor modifications according to the methods of [5].

2- Determination peroxidase and catalase activity enzyme.

The activity of catalase was determined according to [6]. Peroxidase activity was determined according to [7].

Results and discussion

1-Time of rooting.

The result in table 1 showed that 2.5 g/l concentration was the best in reducing the time of rooting which reach to 5.23 weeks compared to 8 weeks in control treatment. The 48 hours dipping time reducing the time of rooting to 5.93 weeks compared to 6.78 weeks in 24 hours. Basal cutting plays a role in reducing rooting time that gave 5.7 weeks compared to terminal cutting gave 7.45 weeks. The interaction between 2.5 g/l with 48 hours dipping time for basal cutting gave the lowest time of rooting 3.7 weeks compared to 8 weeks in the same interaction with control treatment.

Table 1- Effects of different concentrations of ajwa date fruit extract and types of cassia stem cuttings on time of rooting.

Ajwa date conc. in. g/l	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	8..0	8..0	8..0	8..0	8..0	8..0	8.0
1.25	4.3	4.0	5.3	4.2	8..0	7.0	5.52
2.50	4.1	3.7	5.3	3.9	7.0	6.9	5.23
Means	6.1	5.2	6.65	5.3	7.6	7.3	6.34
L.S.D	1.33						0.94
Means of cutting types	5.7		6.4		7.45		
L.S.D	1.02						
Dipping times in hours	24		48				
Means of dipping times	6.78		5.93				
L.S.D	0.77						

The quantities analysis of antioxidant enzymes in this study for Ajwa date fruit extract showed the presence of 48.82 and 50.38 $\mu\text{mole/g}$ of peroxidase and catalase respectively Table-2. These enzymes were very important in break down the activity of reactive oxygen species (ROS) [8]. In the same study suggested the accumulation of (ROS) with high levels in tissues cause changes in plant metabolism in several ways.

The increases of peroxidase activity regulate auxin levels during rooting process and could be triggered by wounding [9] In other study suggested the peroxidase play role in the biosynthesis of lignin, suberin in addition to some phenolic compounds during cell division and differentiation in the rooting formation [10].

Ajwa date fruit rich in simple sugars such as glucose and fructose (65% - 80%) and some essential minerals [11]. The large amount of carbohydrates is essential to initiate the rooting process. Carbohydrates act as a source of energy for the newly formed cells [12] Glucose in the induction phase and sucrose in the formation phase was beneficial for root number per rooted cutting, root length and rooting speed of *Eucalyptus globulus* [13].

The analysis of ajwa date extract detected the absence of the endogenous hormones. The levels of endogenous hormones changes during ripening these hormones decreasing with the later stage of fruit ripening [14].

In other study indicated that there was balance of endogenous hormones concentration among all stage of fruit growth. The study indicated that the level of inhibitors such as (ABA and ethylene) were highest at late stage of fruit growth while the promoters decline. The inhibitor **is the only growth regulator detectable** at the mature stage of the fruit and the rate of fruit growth slows [15].

Table 2-The analysis quantity of antioxidant enzymes (catalase & peroxidase) and the endogenous hormone in Ajwa date extract.

Ajwa date	Antioxidant enzymes in $\mu\text{mole/g}$		Endogenous hormone conc.(mg /g)		
	Catalase	Peroxidase	IAA	GA3	zeatin
	50.38	48.82	0.00	0.00	0.00

2- Rooting characters

The results in Tables-3, -4 and -5 indicated that the interactions between basal cutting treated with 2.5 g/l for 48 hours gave the highest rooting percentage 77.7% , rooting numbers 2.2 and the highest rooting length 2.89 cm compared to control treatment gave (0) rooting percentage.

The previous tables showed that basal cutting was the best for cassia cutting rooting from the rest cuttings. Some researcher indicated that the basal cuttings contain high level of carbohydrate, nitrogen compounds, cofactors and endogenous auxin in greater amount compared to sub terminal and terminal cuttings [16]. The same study indicated that endogenous auxin plays an important role in the synthesis of roots formation. In addition to the activity of polyphenol oxidase enzyme during primary root initiation which is high in the basal cuttings than the rest cuttings.

The most important components of dates are the carbohydrates in particular sugars, which can constitute up to 78% [17] and provide a readily available source of energy. Carbohydrates contribute to the formation of adventitious roots (AR) by supplying energy. Carbon necessary for cell divisions, establishment of the new root meristems and root formation [18]. The higher content of soluble sugars and starch in the rooting zone were associated with higher rooting response in *Tectona grandis* cuttings [19].

Table 3- Effects of different treatments of Ajwa date fruit extract, type of cassia stem cuttings on rooting percentage (%).

Ajwa date conc. in. g/l	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.25	66.6	66.6	66.6	66.6	0.00	22.2	48.10
2.50	66.6	77.7	66.6	66.6	22.2	22.2	53.65
Means	44.4	48.1	44.4	44.4	7.4	14.8	33.91
L.S.D	0.23						0.04
Means of cutting types	46.25		44.4		11.1		
L.S.D	0.07						
Dipping times in hours	24		48				
Means of dipping times	32.1		36.8				
L.S.D	0.05						

Table 4- Effects of different treatments of Ajwa date fruit extract, type of cassia stem cuttings on rooting numbers.

Ajwa date conc. in. g/l	Type of cuttings						Means of conc.
	Basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.25	1.76	1.89	1.75	1.87	0.0	0.22	1.25
2.50	1.88	2.20	1.87	2.00	0.22	0.33	1.42
Means	1.21	1.36	1.20	1.29	0.07	0.18	0.89
L.S.D	0.46						0.32
Means of cutting types	1.30		1.27		0.13		
L.S.D	0.32						
Dipping times in hours	24		48				
Means of dipping times	0.82		0.94				
L.S.D	0.11						

Table 5- Effects of different treatments of Ajwa date fruit extract, type of cassia stem cuttings on rooting long in cm.

Ajwa date conc. in. g./l	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.25	2.00	2.77	2.00	2.66	0.00	0.75	1.69
2.50	2.70	2.89	2.63	2.88	0.85	1.32	2.24
Means	1.56	1.88	1.54	1.84	0.50	0.69	1.36
L.S.D	0.46						0.32
Means of cutting types	1.72		1.69		0.84		
L.S.D	0.32						
Dipping times in hours	24		48				
Means of dipping times	1.20		1.47				
L.S.D	0.26						

Vegetative growth**(Number of leaves, leaflet and leaflet area in cm)**

The highest value were 2.88, 4.00 and 1.70 cm for the number of leaves, leaflet number and leaflet area respectively appears in the interaction between basal and sub terminal cuttings treated with 2.5 g/l Ajwa date palm fruit for 48 hours dipping time in Tables-6, -7 and -8.

The chemical composition of date fruit showed that dates were rich in carbohydrates constituted by sucrose, fructose and glucose in addition to amino acids. In addition the fruit was very rich in potassium (360.79 mg/100g) and contains appreciable amount of calcium and phosphorus (37.45 and 27.30 g/100g respectively) [20]. The date fruit rich in vitamins like riboflavin, biotin, thiamine, ascorbic and folic acid [21]. Which play an important role in improving the growth of the plants [22]. In addition to the high contents of antioxidant such as the coumaric acid and ferulic acid [23]. Moreover, it contains flavonoids, sterols, and high nutritive value [24]. From these components of date fruit extract we can conclude the important of date extract in improving the vegetative growth of cassia cuttings resembling in the number of both leaves with leaflets and leaflet area.

Table 6- Effects of different treatments of Ajwa date fruit extract and type of cassia stem cuttings on leave numbers

Ajwa date conc. in. g./l	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	2.11	2.22	2.00	2.22	1.11	1.11	1.79
1.25	2.33	2.66	2.33	2.66	1.33	1.55	2.14
2.50	2.33	2.88	2.33	2.88	1.33	2.00	2.29
Means	2.29	2.59	2.22	2.59	1.25	1.55	2.10
L.S.D	1.31						0.53
Means of cutting types	2.44		2.41		1.40		
L.S.D	0.53						
Dipping times in hours	24		48				
Means of dipping times	1.92		2.24				
L.S.D	0.30						

Table 7- Effects of different treatments of Ajwa date fruit extract and type of cassia stem cuttings on leaflet numbers

Ajwa date conc. in. g/l	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	1.78	1.89	1.78	2.0	1.76	1.89	
1.25	2.44	3.89	2.44	3.89	1.78	2.00	
2.50	2.55	3.89	2.66	4.00	1.78	2.00	
Means	2.25	3.15	2.29	3.29	1.77	1.96	
L.S.D	2.02						0.90
Means of cutting types	2.70		3.09		1.53		
L.S.D	0.90						
Dipping times in hours	24		48				
Means of dipping times	2.01		2.80				
L.S.D	0.70						

Table 8- Effects different treatments of Ajwa date fruit extract and types of cassia stem cuttings on leaflet area in cm.

Ajwa date conc. in. g/l	Type of cuttings						Means of conc.
	Basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	1.32	1.38	1.32	1.39	0.35	0.47	1.03
1.25	1.45	1.62	1.52	1.64	0.55	0.76	1.25
2.50	1.50	1.67	1.53	1.70	0.64	0.86	1.32
Means	1.42	1.56	1.45	1.58	0.51	0.69	1.20
L.S.D	0.48						0.19
Means of cutting types	1.49		1.52		0.60		
L.S.D	0.19						
Dipping times in hours	24		48				
Means of dipping times	1.12		1.28				
L.S.D	0.16						

Conclusion

The results of this study indicate that the aqueous extract of Ajwa date fruits with 48 hours dipping time applied to the basal cassia cutting resulting in accelerate the rooting time, gave the best rooting percentage, rooting numbers and rooting length. Moreover this extracts treatments also increasing the vegetative characters (Numbers of leaves , leaflets and increasing leaflet area.) with sub terminal cassia cuttings Thus we can consider Ajwa date palm fruit as good promoter for rooting and be used for enhance the vegetative growth in alternative method for using the synthesis growth regulators .

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