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EFFECT OF DIFFERENT TYPES OF CUTTING AND PLANTING DATE OF *Conocarpus lancifolius*

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ABSTRACT: Two Field experiments on *Conocarpus lancifolius* were carried out at El-Qanater Horticultural Research station, Kalubiya, Governorate, Egypt for two successive seasons of 2018/2019 and 2019/2020 to evaluate the influence of planting date (March, July and September) and cutting types (terminal, medium and woody) and the combination effect between planting date and cutting type. Results revealed that terminal cutting type significantly improved the number of leaves/plant, roots fresh weight/plant, root length, root number/ plant and root volume cutting compared to the other cutting types under study. Moreover, medium cuttings type gave the highest values of plant height (cm), leaves fresh weight (g) and branch number/plant compared to the other dates under study in most cases during both seasons. In addition, planting date in July recorded the highest values of leaf number per plant, plant height, root number per cutting and root length compared to the other planting dates in both seasons. However, the lowest root and vegetative characteristics were recorded when planting in March. In general, the best combination treatment in enhance growth and root parameters was the of terminal cuttings type when planting in July month compared with the other combination treatments.

Key words: *Conocarpus lancifolius*, cutting types, planting date.

INTRODUCTION

Conocarpus lancifolius an ornamental tree belonging to Combretaceae family is commonly known as Damas. It is an evergreen tree distinguished by its resistance to heat and salt and its tolerance to drought (**Afifi, 2021**). The mature leaves are glossy in appearance with relatively fewer trichomes on both surfaces (**Baroon and Bazzaque, 2012**). It is an important ornamental tree in various parts of the world such as Dubai, Kuwait and Pakistan (**Redha *et al.*, 2012**). The general practice of multiplication for most of the perennial ornamental plants is by the use of vegetative plant parts including stem, leaves, terminal buds and roots, due to its simplicity and practicability in developing countries (**Al-Dulaimy 2016**; **Abdel-Rahman *et al.*, 2020**).

Vegetative propagation of ornamental plants through stem cutting is one of the cheapest and, sometimes, is the only method available for multiplication. However, under normal conditions, wide variability is noticed in different cultivars of the same species; while some cultivars root easily, others are either difficult or fail to root (**Eed *et al.*, 2019**). The difference in growth according to planting dates is based on total carbohydrate and total nitrogen levels, and the C/N ratio has been reported to influence the adventitious rooting of some species. These substances are the source of carbon and energy for the biosynthesis of nucleic acids and proteins, in addition to the synthesis of other essential substances to root formation. Cuttings with high levels of carbohydrates generally have a better-rooting percentage but these levels can change substantially depending on the season of the year. Seasonal variation in rooting efficiency is very common in woody plants, and the optimal season for rooting must be established individually for each species. (**Yamamoto *et al.*, 2013**)

Therefore, the goal of this study aimed at evaluating the rooting and growth of different types of *Conocarpus lancifolius* cutting and their response to different planting dates.

MATERIAL AND METHODS

Field experiments on *Conocarpus lancifolius* were carried out at El-Qanater Horticultural Research

station, Kalubiya, Governorate, Egypt for two successive seasons of 2018/2019 and 2019/2020 to evaluate the influence of planting date (March, July and September) and three cutting types (terminal, medium and woody) and the interaction effect between them.

Plant materials

Cuttings of *Conocarpus lancifolius* were obtained from El-Qanater Horticultural Research station, Kalubiya, Governorate, Egypt. The cuttings were collected on, March, July and September for each season from certain mother of nine years old tree. These cuttings had uniform length (23.1, 23.4 and 22.6cm) for the terminal, medium and woody cuttings in both seasons, respectively. The leaves of the cuttings were (3.7, 3.1 and 3.9) for the terminal, medium and woody cuttings in both seasons, respectively. The fresh weight was (7.5 /3.5 /3.4 g for the terminal-medium-woody cuttings in both seasons, respectively. Then the cuttings were treated with the IBA concentration at (50 ppm) before planting. The cuttings were planted in plastic bags (8 cm) diameter filled with clay soil. Then they were covered after planting with transparent white plastic bags to maintain high relative humidity. There was left an appropriate period before examining to know the percentage of germination and the most suitable time for planting.

• The soil analysis in the present on Table (1a,1b) physical and chemical properties of the soil of the experiment were determined at Water and Soil Lab. of the Faculty Agriculture (Moshtoher), Benha University, Egypt according to **Page *et al.* (1982)**.

Table (1a). Soil mechanical properties

Texture	Sand%		Clay%	Silt%
	Fine	Corse		
Clay	5.59	7.43	54.57	33.41

Chemical properties of experimental soil soluble actions and anions mMol/l available(ppm).

Table (1b). Soil chemical properties

pH	E.C ds/m	$SO4^{--}$	Cl^{-}	$HCO3^{-}$	Mg^{++}	Ca^{++}	K^{+}	Na^{+}	SAR	WHC	pf
6.45	1.58	6.50	5.80	3.50	3.10	6.20	1.50	5.00	2.31	44.00	31.61

Data recorded

vegetative growth: the recorded data included:

1- Number of leaves/ plants.

2- Fresh weight of leaves (g).

3- Plant height (cm).

4- Number of branches /plants 5- Fresh weight of roots (g).

6- Length of root (cm).

7- Number of roots/plants.

8- Volume of root.

Statistical analysis

Data collected during both season of the study were subjected to analysis of variance as a factorial experiment in a complete randomized block design (**Sndecor and Cochran, 1989**) L.S.D at 5% was used to compare variation between the mean values of different treatment by MSTAT-C.

RESULTS AND DISSCUSION

Effect of type of cutting on vegetative and root measurements (cm) of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

Concerning the effect of cutting types, it is evident from the obtained data in Table (2) that the terminal recorded the highest root number and root length per rooted cutting, which reflected in improving the vegetative growth characteristics (number of leaves/ plant, roots fresh weight/plant, root length, root number/ plant and root volume) compared to the medium and woody ones during both seasons. In addition, **Kashefi *et al.* (2014**) indicated that the effect of the season depends on type of cuttings taken and the concentration of the auxin utilized. Similar results were also obtained by **Mohamed *et al.* (2014)**, **Al-Dulaimy (2016)** and **Abdel-Rahman *et al.* (2020)** who indicated that propagation of *Conocarpus spp.* by tip cuttings significantly improved the root and shoot parameters comparing with middle and basal ones.

Table 2. Effect of type of cutting on vegetative and root measurements of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

Parameters / Type of cutting (C)	Number of leaves/ plant	Plant height (cm)	Leaves fresh weights (g)	Branches number/ plant	Roots fresh weights (g)	Root length (cm)	Number of roots /plants	Root volume
	1st season							
Terminal	14.35	20.65	3.03	0.60	0.55	12.62	4.08	0.99
Medium	11.58	21.36	3.73	0.83	0.48	7.53	3.32	0.57
Woody	10.04	17.18	3.38	0.80	0.44	7.38	2.53	0.55
LSD at 0.05%	0.27	0.43	0.18	0.13	0.11	0.17	0.24	0.14
	2nd season							
Terminal	14.67	20.36	2.92	0.85	0.95	13.10	4.31	0.83
Medium	12.80	21.26	2.61	1.09	0.87	12.17	2.42	0.68
Woody	9.08	16.31	1.76	0.90	0.29	6.18	1.63	0.35
LSD at 0.05%	0.32	0.72	0.13	0.12	0.06	0.10	0.12	0.08

Effect of planting date on vegetative and root measurements of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

The obtained results in Table (3) indicate that planting date considerably affected vegetative and root measurements in all cutting types of *C. lancifolius* in both seasons. It is evident from the data that planting date in July significantly improved the number of leaves /plants, plant height (cm), leaves fresh weights (g) branch number/plant, roots fresh weight/plants, root number, root length, and root volume cutting compared to the others planting dates. However, the lowest root and vegetative characteristics were recorded when planting in March. Several investigations have shown that. **Sami *et al.*, (2014)** on *Conocarpus lancifolius* results showed that the dates of planting had a significant effect on the rooting of cuttings and vegetative growth.

Table 3. Effect of Planting, date on vegetative and root measurements of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

Parameters / Planting Date (A)	Number of leaves/ plant	Plant height (cm)	Leaves fresh weights (g)	Branches number/ plant	Roots fresh weights (g)	Root length (cm)	Number of roots /plants	Root volume
	1st season							
March	8.67	17.01	1.80	0.00	0.48	9.71	3.17	0.79
July	16.64	20.41	2.69	1.22	0.55	10.77	4.00	0.73
September	10.7	21.77	3.65	1.02	0.44	7.07	2.77	0.58
LSD at 0.05%	0.27	0.43	0.18	0.13	0.11	0.17	0.24	0.14
	2nd season							
March	9.35	17.10	1.54	0.33	0.79	11.30	2.25	0.68
July	16.92	20.40	2.47	1.48	0.48	12.05	3.80	0.58
September	10.28	20.42	3.25	1.03	0.83	8.11	2.31	0.59
LSD at 0.05%	0.32	0.72	0.13	0.12	0.06	0.10	0.12	0.08

Effect of combination between planting date and cutting types on vegetative and root measurements of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020

The obtained results in Tables (4) clearly show that number of leaves /plants and plant height (cm) of *C. lancifolius* cuttings was significantly affected by different planting date, cutting types and their combination during both seasons. Best treatment according to Table (4) planting in July with terminal cutting. On the other hand, the low rooting percentage of basal cuttings may be due to higher lignification rate of the basal cutting tissues which can represent a mechanical barrier for root emergence (**Trobec *et al.*, 2005**). Similar results were obtained by **Mohamed *et al.* (2014)**, **Al-Dulaimy (2016)** and **Abdel-Rahman *et al.* (2020)**, who indicated that propagation of *Conocarpus spp.* by tip cuttings significantly improved the root and shoot parameters comparing with middle and basal ones. Also, **Padekar *et al.* (2018)** revealed also that using the tip in propagation of *Momordica dioica* resulted in the best root and shoot characteristics of rooted cuttings compared to middle and basal ones. The increment in root and vegetative characteristics of *C. erectus* tip cuttings may be due to high content of endogenous root-promoting substances in the tip cutting tissues and the anatomical structure of the stem.

Table 4. Effect of the combination between planting date and type of cutting and their combination on number of leaves/ plants and plant height of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

Parameters	Number of leaves /plants			Plant height (cm)		
	Type of cutting (c) Mean			Type of cutting (c) Mean		
Planting date (A)	Terminal	Medium	Woody	Terminal	Medium	Woody
	1st season					
March	10.50	10.0	5.50	17.75	22.28	11.00
July	16.15	16.75	17.03	21.20	20.40	19.65
September	16.40	8.00	7.60	23.00	21.40	20.90
L.S.D at 0.05	A X C=0.48			A X C= 0.74		
	2nd season					
March	11.05	14.00	3.00	19.90	21.65	9.75
July	18.75	16.00	16.00	19.58	21.42	20.20
September	14.20	8.40	8.25	21.60	20.70	18.97
L.S.D at 0.05	A X C= 0.57			A X C= 1.25		

As shown in Table (5), it was noticed that the terminal cutting planting in July with 50 ppm IBA recorded significantly higher root fresh weight (g) and root length (cm) compared to other cutting without IBA. Similar results were reported by **Al-Dulaimy (2016)** results of *Conocarpus lancifolius* showed that the terminal cuttings were surpassed significantly in increasing rooting percentage (93.39%), high number of root (32.53% cutting) and significant increasing of growing characters. Cutting origin is an important factor for rooting performance medial and basal cuttings. This may be attributed to the higher content of storage carbohydrates.

The obtained results in Table (6) indicate that planting date and type of cutting considerably affected number of roots/plant and root volume measurements in all cutting types of *C. lancifolius* in both seasons. The best combined treatment of terminal cutting treated with 50 ppm IBA and planted in July which recorded the highest number of roots /plant and root volume. These results are in close conformity with the findings of **Sabatino *et al.*, (2014)** who found that the number of roots in *Teucrium fruticans* was affected by cutting type. Moreover, the difference in rooting ability of the cutting position can be related to the difference in the chemical composition of the shoots (**Otiende *et al.*, 2017**). Also, **Tawfik *et al.* (2018)** on *rosa hybrida* cv eiffel tower Our results indicated that the effect of the season depends on type of cuttings taken and the concentration of the auxin used.

Table 5. Effect of the combination between planting date and types of cutting and their combination on root fresh weight and root length(cm) of *C. lancifolius* during the first and second seasons (2018/2019 and 2019/2020)

Parameters	Roots fresh weights (g)			Root length (cm)		
	Type of cutting (c) Mean			Type of cutting (c) Mean		
Planting date (A)	Terminal	Medium	Woody	Terminal	Medium	Woody
	1st season					
March	0.60	0.55	0.30	14.62	9.00	5.50
July	0.44	0.57	0.65	11.95	9.65	10.70
September	0.61	0.34	0.38	11.30	3.95	5.95
L.S.D at 0.05	A X C= 0.19			A X C= 0.29		
	2nd season					
March	0.45	1.72	0.21	13.75	18.40	1.75
July	0.41	0.62	0.42	13.95	11.55	10.65
September	1.98	0.27	0.25	11.62	6.55	6.15
L.S.D at 0.05	A X C=0.11			A X C=0.17		

Table 6. Effect of the combination between planting date and types of cutting and their combination on number of root s/plant and root volume of *C. lancifolius* during the first and second seasons (2018/2019and 2019/2020)

Parameters	Number of roots /plants			Root volume		
	Type of cutting (c) Mean			Type of cutting (c) Mean		
Planting date (A)	Terminal	Medium	Woody	Terminal	Medium	Woody
	1st season					
March	3.75	5.25	0.50	1.05	0.83	0.50
July	4.55	3.20	4.25	0.85	0.60	0.75
September	3.95	1.50	2.85	1.07	0.27	0.40
L.S.D at 0.05	A X C= 0.42			A X C= 0.24		
	2nd season					
March	4.25	2.00	0.50	0.80	1.0	0.25
July	4.65	3.25	3.50	0.63	0.60	0.50
September	4.05	2.00	0.88	1.07	0.43	0.30
L.S.D at 0.05	A X C= 0.21			A X C= 0.14		

Similar results were obtained by **Abdel-Rahman *et al.* (2020)** on *Conocarpus spp*., who revealed that rooting percentage of the tip cuttings was better than those taken from the middle and basal portion of the branch. The difference in rooting percentage of tip, middle and basal cuttings may be attributed to higher concentration of endogenous root promoting substances in the tip cutting tissues and also more cells which are capable of becoming meristematic.

Conclusion

This study provides preliminary results concerning vegetative propagation of *Conocarpus lancifolius* by cutting for the first time. Our

recommendation to propagate this plant by cuttings is to plant terminal cuttings type at July month. Further works will be needed to enhance cutting root ability of this serious ornamental tree.

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