

Evaluation of Different Media for Date Palm Propagation through Offshoots

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ABSTRACT

Date palm (*Phoenix dactylifera* L.) is a vital fruit crop in arid and semi-arid regions. Offshoot propagation is a preferred and affordable method for maintaining true-to-type genetic nature. However, survival rates and rooting success vary with the planting media. This study evaluates different media for offshoot propagation over a three-year period. Nine treatments, including soil amendments such as farmyard manure (FYM), vermicompost, cocopeat, sawdust, poultry manure, and *Pseudomonas fluorescence*, were tested.

The results indicate that soil + cocopeat (1:1) produced the highest number of primary and secondary roots, while soil + vermicompost and soil + FYM had the highest survival rates.

Keywords Date palm, Offshoot propagation, Rooting media, Survival rate, Plant establishment.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) plays a crucial role in agriculture, particularly in arid regions. Worldwide it is considered an important crop for cultivation owing to its high nutritional value and calorific values. To propagate this important crop, there are currently three methods available, seeds, offshoots and tissue culture, where seed propagated show high variability, while offshoots and tissue culture plants shows true-to-type nature to the mother plants. However, tissue culture plants are comparatively expensive and protocols for each genotype varies. Thus, offshoots can be one of the desirable and economic methods of propagation to produce true -to -type plants to the mother plants (Al-Mana *et al.* 1996). However, one of the major challenges faced with offshoot production is the emergence of limited number of offshoots per plants which averages to 8-10 offshoots per plant in its life time, where mostly the offshoots emerge in the first ten years of its life (Sharma *et al.* 2022). However, the limited number of offshoots per palm necessitates efficient propagation techniques to max-

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imize survival. The choice of planting media and genotype significantly influences rooting success and survivability (Abbood 2022).

Earlier a single year trial was reported by Sharma *et al.* (2019) in the same environment. This is the multi-year trail of the similar experiment. This study aims to evaluate the effect of different filling media on the rooting and growth performance of date palm offshoots, with the objective of improving propagation efficiency and promoting sustainable date palm cultivation in India and other date-growing regions. By optimizing the propagation process, this research seeks to enhance the commercial viability of date palm cultivation, ensuring better growth, survival, and yield potential for farmers.

MATERIALS AND METHODS

The experiment was conducted at the Date Palm Research Station, Mundra-Kachchh, Gujarat, India under the Gujarat North West Agro-Climatic Zone (Zone-V) located at 22°50'22.27" N and 69°43'16.78" E. The average temperature of the area ranges from 6°C in January to 45°C in May. Plants were selected from the cultivar Barhee aging seven to ten. The offshoots were selected from uniform date palm plants with a weight range of 10-15 kg, ensuring consistency in plant material. A Randomized Block Design (RBD) with three replications for each treatment was employed conducted for three years. The bags were tied and filled with different media in the month of July and planting were done in the month of February-March of the following year. The survival percentage were observed during September-October month of the year of planting. For each observation a set of six offshoots were taken. The treatments were T1: Soil + FYM (1:1), T2: Soil + Vermicompost (1:1), T3: Cocopeat alone, T4: Soil + Cocopeat (1:1), T5: Soil + Sawdust (1:1), T6: Soil + Poultry Manure (1:1), T7: Soil + *Pseudomonas fluorescense* (50 ml in 10 kg soil/media), T8: Soil alone and T9: Soil alone without IBA (Control).

As a standard offshoot preparation method, the base of the offshoot is cleaned in the month of June, the soil around the offshoot is removed and the dried leaf stubs around the ball is cleaned. A base of the

offshoot is cleaned such that the white part of the base started appearing. In all treatments (T1 to T8) except T9, offshoots were treated with IBA 2000 ppm at the time of cleaning base. Plastic bag is wrapped around the offshoot such that the base of the wrap is sealed and the upper part is available as a bag to fill the media. The media is filled as per the treatments and were irrigated using 4 mm drip line twice a week to keep the media moist. Drip irrigation was installed to irrigate the mother plant supplying an average of 300 liters per palm. Offshoots are separated from the mother plant in the month of February-March of each year. The offshoots were separated from the mother plant using a sharp chisel and sledgehammer to ensure minimal damage. The outer leaves were pruned, leaving 5-7 central leaves intact to minimize transpiration stress. The data were analyzed using analysis of variance (ANOVA), and mean differences among treatments were compared using critical difference at $p \leq 0.05$ as using OPSTAT (Sheoran *et al.* 1998).

RESULTS AND DISCUSSION

The observations made during the experiment period are presented in the Table 1. Based on the pooled analysis the highest number of primary roots (73.95) and longest primary root length (57.33 mm) were observed in the soil + cocopeat (T4) treatment. Cocopeat, known for its excellent water retention capacity and aeration properties, likely facilitated better root proliferation by maintaining optimal moisture levels around the offshoot base. Similar results were recorded by Raut *et al.* (2015) in pomegranate where highest rooting was observed in cocopeat base media. Treatments T1 (Soil + FYM) and T2 (Soil + Vermicompost) also showed promising results in root proliferation. Organic amendments such as FYM and vermicompost improve soil structure, enhance microbial activity, and supply essential nutrients, all of which contribute to better root formation and overall plant vigor.

The maximum number of secondary roots (100.50) and longest root length (19.47 mm) followed similar trend with soil + cocopeat (T4) treatment, followed by soil + FYM and soil + vermicompost treatments. The highest survival rates were recorded in soil + vermicompost (88.88%) and soil + FYM (83.33%).

Table 1. Effect of different media on root characters and survival of date palm offshoots.

Treatment	Number of primary roots*				Av length of primary roots (cm)			
	Year 1	Year 2	Year 3	Pooled	Year 1	Year 2	Year 3	Pooled
T1 = Soil + FYM	5.26 (26.83)	7.56 (57.66)	6.45 (40.66)	6.37 (41.72)	16.67	13.66	29.08	19.80
T2 = Soil + vermi	5.75 (32.33)	6.07 (35.50)	6.52 (41.66)	6.02 (36.54)	15.50	20.50	28.58	21.85
T3 = Cocopeat	5.59 (30.33)	7.50 (56.50)	5.91 (34.00)	6.28 (40.31)	13.67	12.33	18.50	14.83
T4 = Soil +cocopeat	6.54 (28.33)	11.48 (41.83)	6.78 (135.00)	8.25 (73.95)	17.50	18.66	22.83	19.66
T5 = Soil + sawdust	5.39 (28.83)	6.32 (41.00)	5.49 (29.33)	5.70 (32.94)	16.67	18.83	21.84	19.11
T6 = Soil +poultry	5.88 (33.83)	7.74 (64.50)	4.49 (19.33)	6.06 (39.22)	18.50	20.66	23.94	21.03
T7 = Soil + <i>P. fluorescence</i>	5.91 (34.00)	6.44 (41.50)	5.38 (28.00)	5.85 (34.50)	18.83	15.50	24.31	19.55
T8 = Soil alone	4.52 (19.50)	4.67 (21.16)	6.42 (40.33)	5.09 (26.98)	22.67	18.33	22.21	21.06
T9 = Soil without IBA	6.06 (35.83)	7.46 (55.00)	4.57 (20.00)	5.95 (36.93)	21.33	20.33	20.58	20.75
Mean	5.57 (31.42)	7.26 (56.42)	5.69 (33.18)	6.17 (40.34)	17.92	54.22	23.54	19.72
SEm ± (T)	0.21	0.95	0.18	0.12	2.01	3.46	1.87	1.09
CD @ 5 % (T)	0.66	2.88	0.55	0.34	NS	NS	5.66	3.11
SEm (Y)				0.06				0.63
CD @ 5 % (Y)				0.19				1.80
SEm (Y×T)				0.20				1.90
CD @ 5% % (Y×T)				0.59				5.40
CV	6.69	22.82	5.45	5.90	19.44	33.97	13.77	16.66

Table 1. Continued.

Treatment	Number of secondary roots*				Av. length of secondary roots (cm)				Survivability after 6 months of planting			
	2017	2018	2019	Pooled	2017	2018	2019	Pooled	2017	2018	2019	Pooled
T1 = Soil + FYM	6.02 (37.66)	4.87 (22.83)	7.51 (56.00)	6.04 (38.83)	10.83	18.33	21.78	16.98	90.00 (100.00)	74.99 (83.33)	74.99 (83.33)	70.98 (83.33)
T2 = Soil + vermi	7.11 (49.83)	5.42 (29.33)	8.21 (66.66)	6.86 (48.64)	9.16	24.00	17.17	16.78	90.00 (100.00)	74.99 (83.33)	74.99 (83.33)	75.40 (88.88)
T3 = Cocopeat	5.99 (35.00)	11.11 (139.83)	7.46 (54.66)	8.36 (76.49)	10.66	28.00	19.77	19.47	29.98 (33.33)	44.98 (50.00)	59.98 (66.66)	57.70 (66.66)
T4 = Soil +cocopeat	7.67 (58.00)	12.55 (163.16)	9.03 (80.66)	9.78 (100.50)	9.16	23.66	17.13	16.65	44.98 (50.00)	44.98 (50.00)	59.98 (66.66)	48.85 (55.55)
T5 = Soil + sawdust	4.82 (23.33)	5.43 (29.00)	6.48 (41.33)	5.49 (31.20)	7.66	16.66	14.56	12.96	59.98 (66.66)	59.98 (66.66)	59.98 (66.66)	62.13 (72.22)
T6 = Soil +poultry	6.91 (46.83)	5.29 (29.50)	6.36 (39.66)	6.18 (38.83)	12.33	14.33	22.62	16.42	74.99 (83.33)	74.99 (83.33)	44.98 (50.00)	62.13 (72.22)
T7= Soil+ <i>P. fluorescence</i>	6.88 (46.83)	5.01 (24.50)	6.92 (47.00)	6.20 (39.44)	10.83	16.50	20.06	15.79	44.98 (50.00)	59.98 (66.66)	59.98 (66.66)	62.13 (72.22)

Table 1. Continued.

Treatment	Number of secondary roots*				Av. length of secondary roots (cm)				Survivability after 6 months of planting			
T8 = Soil alone	6.96 (47.50)	5.52 (29.66)	7.37 (53.66)	6.54 (43.60)	11.00	20.16	16.90	16.02	90.00 (100.00)	44.98 (50.00)	59.98 (66.66)	53.27 (61.11)
T9 = Soil without IBA	5.25 (27.16)	4.53 (20.16)	6.84 (46.00)	5.46 (31.06)	10.33	17.16	20.35	15.94	74.99 (83.33)	59.98 (66.66)	44.98 (50.00)	48.85 (55.55)
Mean	6.32 (53.91)	4.18 (17.75)	7.28 (53.91)	6.77 (49.83)	10.22	19.87	18.92	16.34	65.08 (75.92)	57.70 (66.66)	57.70 (66.66)	60.16 (69.75)
SEm ± (T)	0.53	1.34	0.31	0.22	1.30	4.00	2.18	1.01	10.00	11.86	13.69	6.52
CD @ 5% (T)	1.62	4.05	0.94	0.64	NS	NS	NS	2.87	30.24	NS	NS	18.46
SEm (Y)				0.13				0.58				11.44
CD @ 5 % (Y)				0.37				1.65				32.38
SEm (Y×T)				0.39				1.75				11.30
CD @ 5% % (Y×T)				1.11				4.97				31.98
CV	14.55	34.95	7.35	10.01	22.16	34.90	19.98	18.55	25.99	34.25	39.55	32.38

*Values are sq. root transformed value, **Value in the parenthesis is retransformed value.

The control treatment (T9: Soil alone without IBA) had significantly lower survival rates. The ability of cocopeat to maintain consistent moisture levels likely enhanced root branching, a factor crucial for nutrient uptake and establishment (Hartmann *et al.* 2010, Renuka *et al.* 2015). Similar trends were reported in a study where organic-rich substrates such as peat and compost-based mixtures significantly increased root biomass and branching (Qadri *et al.* 2021). Although soil + cocopeat exhibited superior root development, its survival rate was moderate (55.55%). These results suggest that organic media containing decomposed organic matter support better moisture retention, microbial activity, and root-soil interaction, thus improving the adaptability of transplanted offshoots (Umar *et al.* 2021). This is in agreement with prior studies, which demonstrated that organic amendments increase survival by providing slow-release nutrients and enhancing soil microbial diversity (Parasana *et al.* 2013, Gebregiorgs *et al.* 2021, Patel *et al.* 2019).

However, low survival rate in cocopeat despite having higher number of roots might be due to lack of essential macro- and micronutrients required for prolonged establishment. Supplementing cocopeat with nutrient-rich amendments could potentially enhance its effectiveness for date palm offshoot propagation.

The control treatment (T9: Soil alone without IBA) recorded significantly lower survival rates.

This confirms the well-established role of Indole Butyric Acid (IBA) in promoting root induction and improving overall survival of offshoots. Several studies have demonstrated that IBA application enhances root elongation, increases the number of adventitious roots, and improves overall transplant success in date palm (Rizk 2006, Bakr *et al.* 2010, Darwesh *et al.* 2013).

CONCLUSION

The study concludes that a mixture of soil + vermicompost or soil + FYM is the most effective media for date palm offshoot propagation due to high survival rates and economic viability. Although soil + cocopeat promotes extensive root development, its lower survival rate makes it less preferable. Date growers are advised to use soil + FYM or soil + vermicompost (1:1) for offshoot planting to enhance rooting and survival.

REFERENCES

- Abbood, S. M. (2022). Stimulating roots formation and vegetative growth for survival stiff date palm offshoots (*Phoenix dactylifera*). *International Journal of Agricultural and Statistical Sciences*, 18 (Supp 1), 1898-1899.
- Al-Mana, F. A., Ed-Hamady, M. A., Bacha, M. A., & Abderlrahman, A. O. (1996). Improvement root development on ground and aerial date palm offshoots. *Principes*, 40(4), 179-181.

- Bakr, E. I., Haseeb, G. M. M., El-Kosary, S. E., & Bakir, M. A. M. (2010). Using date palm suckers as material for vegetative propagation by growth regulators injection. *Bulletin, Faculty of Agriculture Cairo University*, 61, 63-78.
- Darwesh, R. S., Madbolly, E. A., & Gadalla, E. G. (2013). Impact of indole butyric acid and paclobutrazol on rooting of date palm (*Phoenix dactylifera* L.) offshoots cultivar Zaghloul. *Journal of Horticultural Science and Ornamental Plants*, 5(3), 145-150.
- Gebregiorgs, G., Tekeste, N., & Mengesha, B. (2021). Germination and seedling growth response of mango (*Mangifera indica* L.) cultivars to different nursery potting media. *Agriculture & Food Security*, 10, 1-11.
- Hartmann, H. T., Kester, D. E., Davies Jr., F. T., & Geneve, R. L. (2010). *Hartmann & Kester's Plant Propagation: Principles and Practices*, 8th edition. Pearson Education Inc: New Jersey, 915 pp.
- Parasana, J. S., Leua, H. N., & Ray, N. R. (2013). Effect of different growing medias mixture on the germination and seedling growth of mango (*Mangifera indica* L.) cultivars under net house conditions. *Bioscan*, 8(3), 897-900.
- Patel, M. V., Parmar, B. R., Halpati, A. P., Parmar, A. B., & Pandey, A. K. (2019). Effect of growing media and foliar spray of organics on seedling growth and vigor of acid lime. *International Journal of Chemical Studies*, 7(1), 1-4.
- Qadri, R., Hussain, S., Akram, M. T., Khan, M. A., Hussain, K., Khatana, M. A., Nadeem, S., Khan, M., & Khan, U. A. (2021). Impact of different growing media and gibberellic acid (GA₃) concentrations on rough lemon (*Citrus jambhiri*) seed germination and its growth attributes. *International Journal of Modern Agriculture*, 10(2), 4471-4482.
- Raut, U. A., Avachat, S. A., & Bhogave, A. F. (2015). Effect of IBA and different rooting media on pomegranate cuttings. *Trends in Biosciences*, 8(9), 2227-2233.
- Renuka, K., Chandrasekhar, R., & Pratapm, M. (2015). Effect of different media treatments on rooting of carnation (*Dianthus cryophyllus* L.) cutting of c Baltico under poly-house condition. *Asian Journal of Horticulture*, 10(1), 118-121.
- Rizk, S. A. Y. (2006). Some factors affecting on rooting ability of Sewy date palm offshoots in Sewa Oasis, Egypt, 2-Effect of offshoot weight and auxin application on rooting % and growth of Sewy date palm. *Minufiya Journal of Agricultural Research*, 31(4), 1007-1015.
- Sharma, K. M., Muralidharan, C. M., & Baidiyavadra, D. A. (2022). Offshoot preparation in date palm: Methods, maintenance and care. *Indian Horticulture*, 67(1), 29-32.
- Sharma, K. M., Muralidharan, C. M., Baidiyavadra, D. A., Panchal, C. N., & N. R. Medat. (2019). Effect of different rooting media on rooting characters of date palm offshoot cv KCCL-63. *ISAH-Indian Journal of Arid Horticulture*, 1(1), 26-28.
- Sheoran, O. P., Tonk, D. S., Kaushik, L. S., Hasija, R. C., & Pannu, R. S. (1998). Statistical software package for agricultural research workers. Department of Mathematics Statistics. CCS HAU, Hisar: 139-143.
- Umar, A., Marzuki, S. U., & Warman, R. (2021). Replacing the growing media to reduce the seedling weight of citrus (*Citrus nobilis* var. *Microcarpa*) and its effects on seedling growth. *IOP Conf Series: Earth and Environmental Science*, 759, 012058.