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RESEARCH ARTICLE

Influence of Media and Sowing Condition on Field Emergence of Palmyrah (*Borassus flabellifer* L.)

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ABSTRACT

Studies were carried out to find the influence of media and sowing conditions on the field emergence of Palmyrah seeds. The seeds were sown in a sunken nursery bed, raised nursery bed, and direct sowing to observe field emergence. The experiment was conducted in a Randomized Block Design with eight replications of 50 seeds sown in each treatment. The observations were recorded at monthly intervals up to 24 months after sowing. The results revealed that Palmyrah seeds sown in a raised bed containing red earth, sand and farmyard manure 2:1:1 ratio recorded the highest field emergence of 78.67 % followed by seeds sown in sand and field conditions. This study concluded that Palmyrah seeds sown in raised bed containing red earth, sand and farmyard manure 2:1:1 ratio used for sowing/multiplication purpose.

Keywords: *Palmyrah nursery; Media; Sowing condition; Field emergence; Seedling growth*

INTRODUCTION

Palmyrah is one of the most economic palms in India. Almost every part of the palm is utilized, but most of the products from the palm are made by traditional methods known from time immemorial (Sangheetha *et al*., 2014). The oldest known use of Palmyrah is probably the use of its leaves for writing the manuscript. The unfermented sap is a nutritious and refreshing beverage. Palm candy and sugar are made from the sap. Both jaggery and candy are rich in carbohydrates, minerals and vitamin B. The soft, jelly-like endosperm of tender fruits is edible. Several kinds of fiber are obtained from Palmyrah palm, which is useful for broom and brush making. The fruits are used for construction and agricultural purpose in rural areas. The physical structure of the medium in which seeds are germinated is crucial for germinated and early seedling establishment. A good seed bed should provide a balance between moisture and aeration. A loose and fine structure assures a good contact between seed and soil so that water can be supplied continuously, yet provides adequate aeration for respiration by the roots (Schmidt, 2000). At the same time, soil structure should allow easy penetration by roots. Both too loose and too compact soil may influence germination and establishment negatively. The soil should free from clods, and the surface should have a texture that will not form a crust (Hartmann *et al.*, 1997). A good growth for germination is provided by choosing an appropriate substrate, and by appropriate seedling, only the latter can be manipulated. For most species a medium loam texture, not too sandy and not too fine provides the best germination conditions. Incorporation of sand, peat or other material into the available soil type by mixing may be necessary to active the desired structure.

Palmyrah is mainly propagated through seeds and no vegetative method is available for its propagation (Masilamani *et al*., 2018). The seeds are available only for a short period of 2 to 3 months during September to November. Several problems are encountered in the germination of seeds in Palmyrah such as poor, protracted germination and prolonged nursery period. The Palmyrah seed takes 40-60 days to initiate germination and the eophyll (first leaf) emerge out after a period of 100 days from sowing (George and Karun, 2011; Masilamani *et al*., 2020). Besides germination, short viability is major problem in Palmyrah (Masilamani *et al*., 2021). Nursery men have to produce large number of seedlings in a shorter time to meet out the growing demand. In general thought, Palmyrah germination and seedling establishment are successful only in direct sowing in the field when compared to nursery sowing. To revisit the above statement, the Palmyrah seeds were sown in different nursery media and sowing condition on field emergence.

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MATERIAL AND METHODS

Experiments were conducted to evaluate the field emergence of Palmyrah seeds in nursery and field conditions at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli. Palmyrah fruits were collected from the existing plantation at Agricultural Engineering College and Research Institute, Kumulur farm, Tiruchirappalli, Tamil Nadu (10°4' N; 78°5 E; 70 masl). The matured fruit branches were selected based on a yellow tinge in the stylar region. After manually removing the fruit exocarp and mesocarp, the uniform size seeds were used for this experiment. The seeds were sown in sunken nursery bed (T_1), raised nursery bed (T_2) and direct sowing in the field (T_3).

The sunken nursery bed treatment, the nursery were prepared 60 cm downwards from the soil surface with the width of 1.0 meter and filled with course river sand and in the raised nursery bed treatment the nursery bed were prepared 60 cm height from the ground level with the width of 1.0 meter containing red earth + sand + farm yard manure 2:1:1 ratio, where as in field sowing treatment, the pit were prepared 45 cm^3 with the spacing of 3 m X 3 m and filled with native soil (sandy clay loam texture) and farm yard manure. In all the above treatments the seeds were sown 5 cm deep. The experiment was conducted in a randomized block design with eight replications of 50 seeds sown in each treatment. The moisture content was maintained at optimum level throughout the study period. The observations on the number of days taken for seedling emergence from the date of sowing and field emergence (%) were recorded in each replication. The results were subjected to analysis of variance and tested (t –test) for significant difference (Panse & Sukhatme, 1995).

RESULTS AND DISCUSSION

The results on effect of sowing conditions (nursery and field sowing) on the field emergence of Palmyrah revealed that significant differences in the number of days taken for initial emergence ranged from 90 to 120 days. Seeds sown in nursery beds containing red earth, sand and farm yard manure 2:1:1 ratio took 120 days for initial emergence whereas seed sown in sunken beds containing sand and seed sown in the field took 90 days for initial emergence (Table 1). The percentage of field emergence at monthly intervals ranged from 0.67 to 62% in sand sowing and 0.67 to 52% in field sowing. The seeds sowing in sand media initiated the seedling emergence 3 months after sowing (0.67 per cent); the percentage of field emergence increased with the number of days from sowing. The highest field emergence of 62.67% was registered 15 months after sowing, after that, there was no increase in the field emergence up to 24 months after sowing.

The highest field emergence of 77.30% was recorded after 11 months of sowing in nursery medium containing red earth, sand, and farmyard manure 2:1:1 ratio after that there was no increase in the field emergence up to 24 months after sowing. The percentage of field emergence increased with the number of days from sowing. There was no appreciable difference found in the percentage of field emergence due to the media in the case of sand and field sowing (Table. 2 and Fig. 1). Where as in field sowing, months taken for initial emergence (0.67 per cent) was 3 months after sowing, it increasing trend up to 12 months after sowing (52 per cent) after that there was no increase in the field emergence up to 24 months. A number of leaves/seedling and shoot length revealed the same trend as on field emergence of 12 and 24 months after sowing (Table 3).

Table 1. Effect of sowing condition and media on days taken for initial emergence and field emergence (%) of Palmyrah seeds*

Treatments	Days taken for initial emergence	Field emergence (%)
T_1 - Seed sowing in sunken bed containing sand	90	60.67
T_2 - Seed sowing in raised bed containing red earth, sand and farmyard manure (2:1:1 ratio)	120	77.30
T_3 - Seed sowing in field	93	52.00

*Mean of eight replications

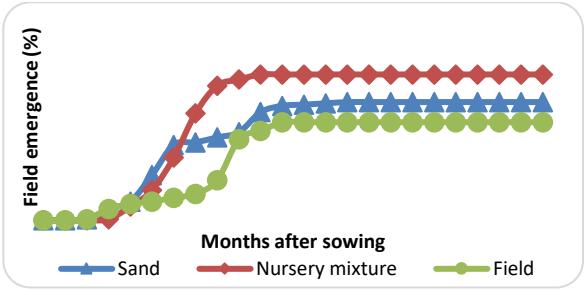

Fig 1. Effect of growing media and sowing condition on field emergence (%) of Palmyrah seeds

Table 2. Effect of sowing condition and media on field emergence (%) of Palmyrah seeds (24 months after sowing)

Months after sowing	Field emergence (%)		
	Sand	Nursery mixture	Field sowing
1	0.00 (0.286)	0.00 (0.286)	0.00 (0.286)
2	0.00 (0.286)	0.00 (0.286)	0.00 (0.286)
3	0.67 (0.286)	0.00 (0.286)	0.67 (0.286)
4	6.00 (14.17)	0.67 (0.286)	6.00 (14.17)
5	10.00 (18.43)	7.33 (15.34)	8.67 (16.43)
6	24.00 (29.33)	16.00 (23.57)	10.00 (18.43)
7	40.00 (39.23)	33.33 (35.06)	12.00 (20.26)
8	41.33 (39.81)	56.67 (48.44)	14.00 (21.97)
9	44.00 (41.55)	71.33 (57.41)	21.27 (27.27)
10	46.67 (42.70)	74.66 (59.34)	43.00 (40.97)
11	57.33 (49.02)	77.30 (61.34)	47.38 (43.28)
12	60.67 (50.76)	77.30 (61.34)	52.00 (46.14)
13	61.33 (51.35)	77.30 (61.34)	52.00 (46.14)
14	62.00 (51.94)	77.30 (61.34)	52.00 (46.14)
15	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
16	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
17	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
18	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
19	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
20	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
21	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
22	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
23	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
24	62.67 (51.94)	77.30 (61.34)	52.00 (46.14)
Mean	44.2 (41.55)	51.2 (45.57)	37.5 (37.46)
SEd	0.532	0.986	0.568
CD(p=0.05)	1.070	1.983	1.142

(Figures in parenthesis are arc sine transformed values)

Table 3. Effect of sowing condition and media on number of leaves/seedling and shoot length (cm) of Palmyrah (12 and 24 months after sowing)*

Treatments	12 months after sowing		24 months after sowing	
	No of leaves/seedling	Shoot length (cm)	No of leaves/seedling	Shoot length (cm)
T_1 - Seed sowing in sunken bed containing sand	2.1	24.2	3.8	50.4
T_2 - Seed sowing in raised bed containing red earth, sand and farmyard manure (2:1:1 ratio)	4.1	22.1	5.2	63.75
T_3 - Seed sowing in field	3.2	23.5	9.6	62.3

*Mean of eight replications

Among the sowing conditions, seeds sown in raised bed containing red earth + sand + farmyard manure 2:1:1 ratio recorded maximum field emergence (77.30 per cent), when compared to sowing in sand media in the sunken bed (62.69 per cent) and field sowing (52 per cent). The seed placed for germination in the normal nursery mixture of red earth + sand + farm yard manure at 2:1:1 ratio showed a stimulatory effect on germination. Since the imbibing seeds involve enzymatic activities, the presence of the extra available nutrients in red earth: sand: farm yard manure solution might have promoted the various enzymatic process leading to faster cell division, and radical elongation besides improving germination. Similar observations were made by Kannapiran (1995) in *Acacia nilotica*, *Albizia lebbeck* and *Pongamia pinnata,* Masilamani and Dharmalingam (1999) in *Tectona grandis* and Masilamani *et al*., (2012) in Jack. Besides that, red earth has available nitrate and presence of NPK in the farm yard manure, these nitrate and NPK ameliorate the nursery media and giving nourishment of the growing radical and plumule of the Palmyrah seedling. Singh and Sharma (1993); Sudahakaran *et al*., (1995); Bana *et al*., (1996) reported that equal

proportion of soil: sand: FYM is considered an appropriate growing medium for several climatic conditions and species. Ancha *et al*., (2020) cited that raising of *Prosopis africana* seedlings with a mixture of topsoil with poultry droppings had better performance in nursery. According to Akinlande *et al*., (2021), top soil should be utilized in the nursery for optimum growth and development of *Piliostigma thonningii* seedlings for a successful afforestation program. According to Peter *et al*., (2021), poultry droppings added in potting mixes exhibited great potentials to improve *Pterocapus erinaceus* seedlings in nursery. Panda *et al*., (2021) demonstrated that a vermicompost: sand: soil ratio of l:l:l resulted in the maximum sprouting (100%) and the lowest time span for sprouting completion on teak. Adam ali *et al*., (2022) revealed that a 1:1:1 mixture of clay +sand + goat's manure had a stimulatory impact on germination in Acacia sp. cow-dung medium is suggested for optimum germination and growing quality seedlings of *Hymenodictyon orixense* in the nursery (Islam *et al*., 2022).

Conclusion

From this study it is concluded that Palmyrah seed sown in nursery media containing red earth + sand + farmyard manure 2:1:1 ratio in the raised bed registered maximum field emergence (77.30%) when compared to seed sown in sand media (62.67%) and field sowing (52.0%) for 24 months after sowing. It is recommended that Palmyrah seeds sown in raised bed nursery media containing red earth + sand + farm yard manure 2:1:1 ratio gave maximum field emergence. In depth study is required for transferring the nursery grown seedling to field planting and their survival potential.

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Ethics statement

No specific permits were required for the described field studies because no human or animal subjects were involved in this research.

Originality and plagiarism

We ensure that we have written and submitted only entirely original works, and if we have used the work and/or words of others, that has been appropriately cited.

Consent for publication

All the authors agreed to publish the content.

Competing interests

There was no conflict of interest in the publication of this content

Data availability

All the data of this manuscript are included in the MS. No separate external data source is required.

Author contributions

Research grant - PM, Idea conceptualization - PM, Experiments- PM, CI, SV, Guidance - PM, CI, SV, Writing original draft - PM, CI, SV, Writing- reviewing & editing - PM, CI, SV.

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