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Effect of Cow Dung Slurry and Termite Mount as Seed Treatment on Germination and Seedling Characteristics of Red Sanders (*Pterocarpus santalinus* L.f)

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Authors' contributions

This work was carried out in collaboration between both authors. Author KPV designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author PRR managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Pterocarpus santalinus L.f. is a highly valued timber species, because of its "heavy, dark -red heartwood," especially that possessing a 'wavy' grain. Propagated through mainly seeds; problem in seed germination because of hard seed coat, so limits poor seed germination production. Current study was carried out to find out best germination for enhancement treatment. The data were then analyzed by the 'f' test for significance at 0.05 levels by using statistical software agrees with completely randomized block design. Forest college and research institute Mettupalayam, Tamil Nadu agricultural university, one year study. Mature pods collected, were subjected to 4 treatments

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in 4 replications and the experiment was conducted in completely randomized block design. The results showed that Cow dung slurry 24 h and 72 h resulted more synchronized germination of 51 percent, followed by Cow dung slurry 48 h (44 %) as against 33% in control. Among all the treatment Cow dung slurry 24 h resulted more synchronized germination of 51 percent.

Keywords: Cow dung slurry; termite mounts; speed of germination; microbe.

1. INTRODUCTION

Red sanders distribution is largely confined to the southern portion of the Eastern Ghats, Andhra Pradesh, India [1]. The reddish and fragrant heartwood has range of medicinal, pharmaceutical industrial and timber value and thus economically placed in the same range as tusk and amber. The natural habitats of red sanders in India (the major supplier) are extensively exploited to the point of near extinction thus placing it in the red list of endangered species under IUCN guidelines. The species is propagated through seeds [2], seed propagation encountered with number of problems owing to low fruit set, hard pod and seed coat, dormancy of the seed; extended germination period up to 90 days; low poor germination of 20% and conversion of 34% restricted the area expansion [3].

Failure in seed propagation may adversely affected the important regeneration mechanism through quality seed, leaving only the coppicing mode for the survival of the species. Seed possessed with dormancy upto six months to one year, type of dormancy has not yet been elucidated [4]. Presence of dormancy cause prolonged germination. The growth of the seedling also not to the expected speed and vigour, due to number of reasons, resulting in poor crop establishment after transplanting [5].

Conventional vegetative propagation techniques such as grafting and air-layering have limitations in large-scale multiplication of this species and rooting of cutting was also found to be poor [6]. Tissue culture has proved to be a promising technique for conservation and large scale multiplication of several woody species. However the members of Fabaceae have been difficult to culture *in vitro* owing to their recalcitrant nature, roots were robust and vigorous in air layers compared to stem cuttings, but the rate of manipulation is comparatively low and not enough to transplant in the nursery and main field. Based on the above reasons, the multiplication of the species largely depends on seed.

2. MATERIALS AND METHODS

The study was carried out during 2015-16 at Forest College and Research Institute, Mettupalayam, Tamil Nadu, India. Seeds of *Pterocarpus santalinus* were collected during June, 2015 from the Chittoor, Andhra Pradesh sources.

2.1 Treatment Details

Four hundred pods from source were separately mixed with cow dung slurry and kept (1:2 ratio of water and cow dung) for different duration *viz*., 24, 48, and 72 h. and also pod are subjected termite digestion about 400 pods were exposed to live termite mound for ten days; after ten days pods were collected. Observations *viz*., days to initial germination, days to final germination, speed of germination, germination per cent, seedling length, dry weight of seedlings, vigour index and survival percentage were recorded.

2.2 Statistical Analysis

Result data (in per cent) were transformed to arcsine values before statistical analysis in order to unify the variance of the data [7]. The data were then analyzed by the 'F' test for significance at 0.05 level by using statistical software AGRESS.

3. RESULTS AND DISCUSSION

All the observed parameters were statistically significant. Exposure of the pod to termite mound from 1 to 10 days did not show any remarkable increase either for germination percentage and speed of germination (Table 1).

Among the observed parameters for the influence of cow dung slurry on seed germination and seedling characters, days to initial germination, final germination, speed of germination, germination percentage, seedling length, vigour index and survival percentage showed significant difference for treatmental effect (Table 2).

Table 1. Effect of treatment on seed germination characteristics

Treatment	Days to initiate germination	Days to final germination	Speed of germination	Germination %
T_0	14.00	53.00	00.22	34(35.66)
T_1	12.00	32.75	00.87	51(45.57)
T_2	10.00	28.75	00.78	50(45.00)
T_3	10.25	31.75	00.86	51(45.57)
T_4	13.00	50.75	00.21	36(36.86)
Mean	11.85	39.40	00.58	44(41.73)
SE.D	0.23	1.67	0.01	1.59
CD (P ≤0.05)	0.46	3.40	0.01	3.23

T_0- Control, T_1 - Cow dung slurry 24 h , T_2 - Cow dung slurry 48 h, T_3- Cow dung slurry 72 h, T_4 - Effect of Termite digestion

Table 2. Effect of treatment on seedling characteristics

Treatment	Seedling length (cm)	Dry weight (g)	Vigour index	Survival (%)
T_0	11.22	0.10	07.41	91.00
T_1	17.57	0.16	08.36	92.50
T_2	17.27	0.17	08.40	89.25
T_3	17.55	0.15	08.33	89.50
T_4	10.85	0.21	06.99	89.25
Mean	14.89	0.16	7.90	90.30
SE.D	0.61	0.01	1.58	0.4
CD (P ≤0.05)	1.25	0.02	2.60	0.8

The pods exposed to termite mound did not have any influence for all the recorded parameters and evidenced through statistical analysis. Even exposure of pod for a duration of 10 days did not have any positive effect and this might be due to hard veins on the surface of pod, shiny shell or due to presence of high quantity of phenols which might have prevented the termite activity. Such a non productive effort due to termite was reported by Sivaprakash [8] in *Terminalia chebula* and *T. bellerica* but in many cases termites have an influence of increasing the germination through weakening of the coat and make tiny holes which facilitated the entry of water. Absence of such positive mechanism in *P. santalinus* is yet to be studied.

The use of bio-regulators in enhancing seed germination and seedling vigour is well known [9]. Presence of biologically active substances, microbes, week acids of some bioregulators like cow dung resulted in enhanced germination in *Calophyllum inophyllum* [10]; Khirni (Shinde and Malshe) [11] and *Melia azadirachta* (Sujatha and Manjappa [12]).

4. CONCLUSION

In the present study, the pods mixed with cow dung slurry for 24 h, resulted in 17 percent increased germination than the control, apart from germination enhancement more uniform germination with higher seedling vigour and survival percentage was observed. This might be due to the corrosion of pod coat by the week acids, digestion of thin and strong veins by the microbes present in cow dung, both together might have resulted in the opening of pores; entry of growth stimulants of cow dung and adequate water through the opened pores might have resulted in positive performance.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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