Original Research Article

Effect of cow dung slurry and Termite mount as seed treatment on germination and seedling characteristics of Red sanders (*Pterocarpus santalinus* L.f)

Abstract

Aims:- *Pterocarpus santalinus* L.f.is a highly valued timber species, because of its "heavy, dark claret-red heartwood," especially that possessing a 'wavy' grain. Propagated through seeds; problem in seed germination limits seedling production.. current study was carried out to find out best germination enhancement treatment.

Study design: - The data were then analyzed by the 'f' test for significance at 0.05 level by using statistical software agress with completely randomized block design.

Place and duration of study: - Forest college and research institute mettupalayam , tamil nadu agricultural university, one year study.

Methodology:- Mature pods collected, were subjected to 4 treatments in 4 replications and experimental was conducted in completely randomized block design.

Results:- The results showed that Cow dung slurry 24h and 72h resulted more synchronized germination of 51 percent followed by Cow dung slurry 48h (44 %) as against 33% in control.

Conclusion:- Among all the treatment Cow dung slurry 24h and 72h, resulted more synchronized germination of 51 percent .

Keywords:- *Cow dung slurry, Termite mount, Speed of germination , microbe*

1. Introduction

Red sanders distribution is largely confined to the southern portion of the Eastern Ghats, Andhra Pradesh, India . 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, 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. In view of conversion, logging was banned; but illegal felling and smuggling ends with a claim life of 20 smugglers on encounter. The species with xenogamous seed production mechanism is dependent on the overall population size as well as the availability of good quality seed. In addition to over exploitation, poor seed germination (20-35 %), prolonged drought, recurrent wildfire, and grazing are considered responsible for regeneration failure.If the degradation of red sander forests is not controlled, extinction of remnant fragmented populations is imminent. There is a need to develop cost-effective and practical restoration strategies to ensure its survival.

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 (Rao and Raju, 2002). 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 (Kalimuthu and Lakshmanan, 1995).

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 (Kesava Reddy *et al.,* 1990). 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 (Rao and Raju, 2002). Based on the above reasons, the multiplication of the species largely depends on seed (Dayanand and Lohidas, 1988).

2.Materials and method:-

The study was carried out during 2015-16 at Forest College and Research Institute, Mettupalayam, Tamil Nadu, India.

2.1.Seed source

Seeds of *Pterocarpus santalinus* were collected during June, 2015 from the Chittoor, Andhra Pradesh sources.

2.2.Treatment details

2.2.1.Cow dung slurry

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.

Preparation of cow dung slurry

About 500 g of cow dung slurry was mixed with 500 ml of water and mixed well to make slurry.

2.2.2.Effect of Termite digestion on seed germination and seedling germination

About 400 pods were exposed to live termite mound for ten days; after ten days pods were collected.

3. The observations made are described as follows.

3.1.Days to initial germination

The nursery bed was observed daily, for seedling emergence. The day on which the first seedling emerged was expressed as days to initial germination.

3.1.2.Days to final germination (Mauromicale and Cavallaro, 1995)

The number of days on which the last seedling emerged was recorded and expressed as days to final germination.

3.1.3. Speed of germination

Speed of germination was calculated by the following formula,

Speed of germination= n1/d1+n2/d2+n3/d3+----------

Where, n = number of germinated seeds; d= number of days

3.1.4. Germination per cent

The number of normal seedlings produced in each replication was counted, and average was expressed in per cent.

$$\text{Germination percentage} = \frac{\text{Number of normal seedlings}}{\text{Total number of seed sown}} \times 100$$

3.1.5.Seedling length

All normal seedlings of each treatment were measured for length from root tip to shoot tip and the average was expressed in cm.

3.1.6. Dry weight

All normal seedlings were dried under shade for 24 h and then dried in hot air oven maintained at 85 ± 1℃ for 48 h. It was cooled in a desiccator for 30 minutes and weighed. The values were expressed as 'g seedlings^{-1}'.

3.1.7.Vigour Index (Abdul-Baki and Anderson, 1973)

Vigour index (VI) was computed using the following formula and expressed as whole number.

VI = Germination percentage x dry weight (g/seedling)

3.1.8.Survival percentage

One month old seedlings were transplanted to polythene bags (size 23 cm x 15 cm) containing nursery mixture; after one month of transplanting number of survived seedlings were counted and expressed in percentage.

3.2.Statistical analysis

Result data (in per cent) were transformed to arcsine values before statistical analysis in order to unify the variance of the data (Ansari *et al*., 2012). The data were then analyzed by the 'F' test for significance at 0.05 level by using statistical software AGRESS.

3.3 .Result and discussion

All the observed parameters were 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).

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 (2003) 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 (Tendolkar, 1978; Singh *et al*., 1989 and Pampanna and Sulikeri, 2001). Presence of biologically active

substances, microbes, week acids of some bioregulators like cow dung resulted in enhanced germination in *Calophyllum inophyllum* (Rajesh *et al.,* 2011).

In the present study, the pods mixed with cow dung slurry for 24 h, resulted in 17 per cent 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.

Table 1. Effect of treatment on seed germination characteristics

Treatment	Days to initiate germination	Days to final germination	Speed o 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 24h , T_2 - Cow dung slurry 48h, T_3- Cow dung slurry 72h, 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**

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