Effect of pre-sowing treatments on seed germination of *Hydnocarpus pentandra* Buch-Ham

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ABSTRACT

Hydnocarpus pentandra is one of the species from genus Hydnocarpus and is highly valued for its seed oil which is used for treatment of lepromatous leprosy and has an anti-helmintic action against human tapeworm. Large scale exploitation of fruits of this species is going on from natural forests owing to its medicinal properties thus causing threat to its population in wild since the natural regeneration of *H pentandra* is found to be low. Hence there is need to standardize seed pre-treatment for this species for early and maximum germination in order to domesticate it by raising plantation. Keeping this in view present investigations were carried out to assess the influence of different pre-sowing treatments on the germination of *H pentandra.* Total twelve pre-treatments were applied out of which alternate wetting and drying in cow dung slurry for fifteen days treatment gave maximum germination percentage (72.67) in comparison to control (31.0) followed by alternate wetting and drying in water for 3 days (58.0). Differences were not significant in soaking in cold water and mechanical scarification treatments. Lowest germination percentage was observed in treatment with bleaching powder (8.00).

Keywords: Cow dung; germination; *H pentandra*; pre-treatment, seeds

INTRODUCTION

India is one of the world's 12 regions having largest biodiversity. It has 45000 plant species of which 15000-20000 possess proven medicinal value (Trivedi 2004). Most of the plant material for medicinal purpose is extracted from wild. Such mass and unchecked destructive collection of medicinal plants from wild has led to rapid decrease of populations of these species. *Hydnocarpus pentandra* is one such species. It belongs to family Flacourtiaceae. This family consists of about 85-89 genera and 800-1250 species distributed throughout tropical and subtropical world (Sambamurty 2005). *H pentandra* is valued for its seed oil. The oil is used for treatment of lepromatous leprosy and is effective in decreasing size of nodules, anaesthetic patches and skin lesions (Yadav and Sardesai 2002). It also has an antihelmintic action against human tapeworm (Raj 1975). The oil is gaining more and more importance nowadays and the raw material is extracted from natural forests since the species is not yet domesticated. This large scale and unchecked exploitation of fruits from wild has threatened regeneration of this species as its natural seed germination is found to be very low thus pushing it into vulnerable category by International Union for Conservation of Nature (IUCN) status (Troup 1975). So in order to domesticate and commercialize this species and raise plantation there is need to develop techniques to have early germination which will reduce the nursery period of seedlings. Hence the present investigations were carried out to find out effective seed treatments to have early germination of *H pentandra* seeds.

MATERIAL and METHODS

The investigations were conducted at nursery of College of Forestry, Sirsi, Karnataka. The seeds were collected from forests around Sirsi area during April- May. Mature fruits were identified on the basis of size and brown color. The fruits were opened and

seeds extracted manually. Seeds embedded in lemon colour pulp having strong bitter smell were first washed in water and later rubbed against rough cloth to remove pulp. The experiment was conducted in completely randomized design with three replications. The uniform, mature and healthy seeds extracted from fruits were pretreated with twelve different pre-sowing treatments while untreated seeds were taken as control. Various treatments given to seeds were soaking in water, hand scarification, alternate wetting and drying in water, scarification and later soaking in GA_3 at different concentrations, bleaching powder treatment, alternate wetting and drying in cow dung slurry for different periods, soaking in kinetin and GA_3 solution, soaking in potassium nitrate solution and chemical scarification using sulphuric acid.

After imposing all the treatments seeds were sown in nursery bed. Aftercare like watering and weeding was done regularly as and when required throughout the experiment. Observations on seed germination were recorded from date of sowing up to 65 days and germination percentage was estimated. Parameters like germination percentage, mean daily germination, peak value, germination value and germination rate were estimated. The method of statistical analysis and interpretation of data were followed as described by Panse and Sukhatame (1961).

RESULTS and DISCUSSION

Treating seeds with different pre-sowing treatments revealed significant improvement in germination. *H pentandra* seeds showed epigeal type of germination. Effect of various treatments on germination percentage and other germination parameters are presented in Table 1. Among the various treatments applied alternate wetting and drying in cow dung slurry treatment for fifteen days showed superior seed germination percentage (72.67) over control. Similar results were reported by Lokesh (2007) in *Terminalia chebula* seeds treated with cow dung slurry for 30 days. These results are corroborated by earlier findings that cow dung attracts termites which in turn softens the seed coat making it permeable to water resulting in higher germination (Kulkarni and Ganapathi 2003, Basavraj et al 2005). Highest mean daily germination (1.11), peak value (2.79), germination value (0.43) and germination rate (0.79) were also recorded in cow dung slurry treatment for fifteen days in the present investigations which can be attributed to softening of the seed coat due to microbial fermentation leading to improved imbibition of water and thus resulting in early germination and reducing germination period (Rai 1999). Alternate wetting and drying of seeds in cold water for three days gave 58 per cent germination due to weathering action of water and was found to be second best germination treatment. Lowest seed germination was recorded in bleaching powder treatment (8.00%) which was less than control (31.0%) concluding that *H pentandra* seeds were destroyed due to bleaching powder. KNO_3 and H_2SO_4 treatments also gave germination percentage higher than control (54.00 and 46% respectively). This could be because KNO_3 causes some metabolic changes in seeds leading to increased germination (Frankland 1961) while treatment with H_2SO_4 might have led to thinning of seed coat resulting in imbibition of water and finally increased germination.

It was interesting to note that treatments like scarification (T_2), soaking in cold water for 24 h (T_1) and soaking in 50 ppm GA_3 (T_4) were found to be statistically at par with control (T_{13}). In GA_3 treatments for 12 h, 100 ppm GA_3 concentration (T_3) treatment displayed higher germination (40%) than control while the other two gave germination less than control (Chandra and Chauhan 1982). This can be due to the reason that 50 ppm GA_3 was lower concentration to enhance germination in *H pentandra* seeds and 150 ppm might have been lethal for seed embryo (Sinhababu et al 2007). Similar was the case with kinetin and GA_3 treatment where higher concentration proved lethal to seeds. In case of cow dung slurry treatment for 8 days the reduced germination can be attributed to lethal effect of higher concentration of uric acid in initial period which would have been reduced in later period ie after 8 days due to fermentation by microbes leading to increased germination in 15 days treatment with cow dung slurry.

CONCLUSION

The control treatment in the present studies resulted in 31 per cent germination which means that viable seeds of *H pentandra* germinate fairly well however the germination could be increased by pre-treating the seeds before planting so as to reduce germination period and have higher germination. Therefore in order to enhance optimum and uniform germination as well as seedling production alternate wetting and drying of seeds in cow dung slurry for fifteen days was recommended. This treatment is easy to carry out, cheap and also farmer-friendly as

Table 1. Effect of various pre-sowing treatments on germination parameters of *Hydnocarpus pentandra*

Treatment	Germination (%)	MDG	PV	GV	GR
T_1: Soaking in cold water for 24 h	34.00 (35.66)	0.52	0.83	0.43	0.39
T_2: Scarification	32.67 (34.86)	0.50	0.76	0.38	0.36
T_3: Alternate wetting and drying for 3 days	58.00 (49.60)	0.89	2.23	1.99	1.05
T_4: Scarify and soaking in GA_3 (50 ppm)	29.33 (32.79)	0.45	0.65	0.29	0.30
T_5: Scarify and soaking in GA_3 (100 ppm)	40.00 (39.23)	0.61	1.29	0.79	0.61
T_6: Scarify and soaking in GA_3 (150 ppm)	24.00 (29.28)	0.36	0.45	0.17	0.21
T_7: Scarify and treatment with bleaching powder	8.00 (16.35)	0.12	0.15	0.01	0.06
T_8: Alternate wetting and drying in cow dung slurry for 8 days	18.00 (25.08)	0.27	0.33	0.09	0.16
T_9: Alternate wetting and drying in cow dung slurry for 15 days	72.67 (58.52)	1.11	2.79	3.13	1.10
T_{10}: Soaking in KNO_3 (0.2%) for 12 h	54.00 (47.29)	0.70	1.74	1.46	0.90
T_{11}: Chemical scarification	46.00 (42.70)	0.83	1.48	1.05	0.70
T_{12}: Kinetin (100 ppm) + GA_3 (300 ppm)	26.00 (30.65)	0.40	0.57	0.23	0.28
T_{13}: Control	31.00 (33.83)	0.47	0.72	0.34	0.34
Mean	36.44 (36.60)	0.56	0.77	0.79	0.49
SEm±	1.34	0.02	0.07	0.11	0.08
$CD_{0.05}$	3.89	0.06	0.21	0.32	0.24

MDG= Mean daily germination, PV= Peak value, GV= Germination value, GR= Germination rate
Figures in parentheses are arc sine conversions

compared to chemical treatments that are costly and difficult to carry out in field conditions.

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