JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

DORMANCY OF STORED BUCHANANIA LANZAN SPRENG SEEDS-A SOUTH EASTERN REGION ENDANGERED MEDICINAL PLANT

Author

Pushpa Salo Linda

Assistant Professor
Department of Botany
Jamshedpur Worker's College
Kolhan University

ABSTRACT

Buchanania lanzan Spreng. (Anacardiaceae) is a critically endangered medicinal tree native to the South Eastern Region of India that has been exploited for its seeds due to its high demand as a treatment for diarrhea, diabetes, and other skin conditions. A reliable protocol for overcoming the dormancy of seeds that have been preserved for a year. The seed coat is removed by gently smashing the seeds after they have been surface sterilized with 4% HgCl2 for 10 minutes. Seeds were scarified with a combination of hot and cold water, and then subjected to chemical treatment with varying concentrations of H_2SO_4 and GA_3. Over the course of 28 days, they monitored the germination of 100 seeds planted in greenhouse seed flats every day. The majority of seeds (89%) germinated after being treated with 200ppm GA3, whereas 60% germinated after being treated with 4% H_2SO_4. Only 56% of seeds grew after being subjected to cold water treatment, whereas only 25% of untreated seeds sprouted. Furthermore, no germination was seen in intact seeds with an impervious seed coat. Positive results indicating reactions to treatments, whereas extended dormancy in undamaged control seeds may be the result of an impervious seed coat.

Keywords:- Buchanania lanzan Spreng, seeds, Dormancy, Stored.

INTRODUCTION

Ex situ germplasm storage is essential for the long-term conservation of plant genetic resources. Methods that keep seeds alive for longer are crucial to preserving their genetic integrity. The plant Buchanania lanzan Spreng (also known as char, achar, and chironji) is a member of the Anacardiaceae family. Francis Hamilton was the first to provide a detailed account of it in 1798. It is native to the dry deciduous tropical woodlands

of India, where it grows to a modest height of 10-15 meters and has a straight, cylindrical trunk with branches that resemble tomatoes. It has a hard, dark grey or black bark that is between 1.25 and 1.75 centimeters thick, with prominent square cracks. It blooms for the first time in November, and its coriaceous leaves are broadly rectangular with a rounded base. The fruit is a drupe that contains a single edible seed known as a chironji, and the oil pressed from the nut is used as a substitute for olive and almond oils. The South eastern region of India, are home to this plant, and the contrast between its dark grey crocodile bark and red flame and the bright yellow sandy loam soil is striking. This species of tree is in danger of extinction due to widespread deforestation, a long dormant period, and excessive seed harvesting. Oil extracted from these seeds is used by the local population of South Eastern Region, India. Diabetic ulcers are treated with an extract of the stem bark, while diarrhoea is alleviated with an extract of the seed coat because, B. lanzanis seeds are more vulnerable to fungal and microbial invasion, they are only accessible for a limited period and germination is problematic. The seeds also have a strong coating that stops them from germinating, which is a major issue. The future availability of this commercially significant tree species depends on the development of new breeding methods. There is a certain series of changes that must be made to dormant seeds in order for them to germinate, even under optimal conditions. As a result, members of this species' population are under serious danger and are always on edge. Also recognizing this species' precarious situation was the IUCN's Red Data Book. Breaking the seed's dormancy processes is necessary for complete germination. It is possible that the time it takes for seeds to germinate might be decreased by the use of physical and chemical preparation of dormant seeds to encourage germination. Scientists have successfully reawakened several species of previously thought extinct or critically endangered animals. The effect of long-term storage on germination in B. lanzan seeds is unknown at this time. The purpose of this study was to explore whether dormancy could be broken in long-stored seeds with the use of physical and chemical treatments.

MATERIALS AND METHOD

Collection of the seeds

In the month of March 2018, freshly ripened seeds of B. lanzana were collected from a mixed population in Dandeli Wildlife Sanctuary, from Koderma District of Jharkhand state in India. The seeds procured were pooled separately for each population and brought to the laboratory, cleaned thoroughly for impurities, and dried at room temperature for 15 days. Before further processing, all seeds for each population were mixed thoroughly to minimize effects of single source plant on germination and these seeds are coated with neem oil and air dried for 1 hour and stored in a plastic container for a future experiment in the lab condition.

Seed treatment

The germination potential of seeds held for one year was assessed using physical and chemical properties. Seeds for each germination test were first cleansed with mercuric chloride solution (4% w/v) for five minutes to reduce the possibility of a fungal attack. Each experiment used 70 seeds that were mechanically scarified to remove the seed covering. First Experiment: scarification 12 hours were spent heating seeds to various temperatures of 50, 60, 70, and 80 degrees Celsius. In the second Experiment, the seeds are submerged for 12

hours at 10°C, 4°C, -1°C, and -5°C in distilled cold water. In the Third Experiment: After scarification, seeds were exposed to 100 mg, 200 mg, 300 mg, and 400 mg of gibberellic acid for a total of 12 hours at room temperature. In the Fourth Experiment: is soaking the seeds for an hour in H2SO4 solutions with concentrations ranging from 2% to 8%.Using plastic trays with a 1:2 ratio of soil to sand, the experiment was conducted in a greenhouse under controlled circumstances at a temperature of 25 °C () 2 °C and a relative humidity of 95% in partial shade (50 % shadow). The observation data were documented daily for up to 30 days and included the rate of germination, plant vigor, height, number of leaves, and shoot length of the plant.

Results

Scarification data on the significant effects of treatments on germination efficacy and growth metrics, including days to commence germination, the rate of germination, plant height (cm), and dead seeds of B. lanzanas impacted by physical and chemical components, are reported.

Table 1:- Hot water scarification

	Temperature			
	50°C	60°C	70°C	80°C
Days of initiate germination	24	17	19	25
Rate of germination %	46	56	42	22
Plant height (in CM)	4	5	4	3
% dead seeds	53	42	56	77

Seeds are tested in hot water treatment at temperatures of 50°C, 60°C, 70°C, and 80°C. Of these, the 60°C treatment, which is shown in the table above, resulted in 56% of the seeds germinating..

Table 2:- Coldwater scarification

	Temperature			
	10°C	5°C	-1°C	-5°C
Days of initiate germination	19	24	21	23
Rate of germination %	43	51	46	53
Plant height (in CM)	4	4	5	5
% dead seeds	51	46	50	45

When tested in cold water at 10°C, -5°C, -1°C, and -5°C, 53% of the seeds germinated, as indicated in the table above.

Table 3:- H_2SO_4 scarification

	Percentage			
	2%	4%	6%	8%
Days of initiate germination	23	20	26	25
Rate of germination %	59	60	51	44
Plant height (in CM)	4	5	4	4
% dead seeds	41	39	49	56

At concentrations of 2%, 3%, 4%, and 5%, the impact of H2SO4 on releasing the seeds' dormancy was examined. At 4% H2SO4 concentration, scarified seeds exhibited 60% germination after 1 hour of treatment. After 30 days of incubation, shoot length increased over 5 cm compared to control, and 8% H2SO4 showed the lowest percentage of germination.

Table 4:- GA_3 scarification

	Gibberellic acid			
	100mg	**200mg**	**300mg**	**400mg**
Days of initiate germination	16	14	17	22
Rate of germination %	66	89	71	63
Plant height (in CM)	5	6	7	5
% dead seeds	33	11	26	35

The seeds were incubated for 12 hours, as stated in the table above, and the treatment with GA3 at a dosage of 200 mg/l showed the greatest percentage (89%) of seed germination.

DISCUSSION

Because B. lanzana seeds are very hard, mechanical scarification is required to open them. Germination was found to be 20% in the control condition, and it is lower in the stored seeds. The mechanically scarified seeds of B. lanzana that had been stored for a year were subjected to a range of physical and chemical methods in order to be released from their dormant condition in the present study. According to the claim, scarified seeds have improved germination potential following a 1-hour hot water treatment at 60 °C. Heat promotes seed coat cracking and seed germination. Using hot water treatment, the hard seed coat was effectively relaxed and rendered permeable to water entry. Increased water temperatures led the leginin content in the outer seed coat to rapidly degrade, enabling water to enter through the hilar region. However, seed germination was lower at 80°C than in the control because the growing tip of the embryo was injured by the high temperature for a longer length of time.

Cold scarification has been shown to increase germination in a range of plant types. The dissemination of seeds by the parent plant does not result in rapid germination. They need at least a brief time of cold scarification or dry storage at room temperature to establish the capacity to germinate. Cold scarification is essential to begin early and get the maximum germination rates. Other plant species growing along altitudinal gradients have also shown that scarification durations necessary for germination increase with seed source

elevation. It seems that, in addition to scarification, seeds need time to mature before germination (dry storage after ripening), since seed germination was higher in seeds maintained for longer periods of time from higher altitudes. Cold scarification had an effect on seed germination in B. lanzana at 60°C as well. Furthermore, after 4 years of storage at 10°C, cold-scarified Juniperus procera seeds germinated more often than control seeds. Acid scarification of seeds increases germination by increasing the permeability of air and water through the seed, encouraging early germination. After 1 hour of treatment with 4% concentrated H_2SO_4, 61% of the seeds in the present study germinated. Mechanically damaged Chironji seed coat seed germination after 24 hours of treatment with 5% H_2SO_4. Gibberellic acid treatment increased 90% of the seedlings' germination and growth parameter values when compared to the control. When compared to the other treatments, the removal of the hard endocarp, which allowed a considerable amount of GA_3 to enter the seed, may have led to the considerably greater germination rate. GA_3 produces alpha-amylase, which breaks down starch into simple sugar units that are transported to the embryo and eaten as sustenance. This might be because GA_3 promotes seedling germination. GA_3 stimulates the de-novo synthesis of photolytic enzymes such as amylase and ribonuclease in order to hydrolyze starch in the endosperm and release the essential sugars for the commencement of development processes. This might be because GA_3 is involved in cell division and cell proliferation, which have been demonstrated in several crops to be significantly influenced by the endogenous quantity of gibberellic acid. Cell division and cell elongation were shown to be greater in hybrid lilies, resulting in enhanced plant height. The percentage of plant germination was considerably influenced by different GA_3 concentrations.

CONCLUSION

Storage condition substantially impacts the seed germination percentage in B.lanzan storage length independent of storage environment. In the current work, physical and chemical scarification techniques are applied to break the dormancy of one year old seeds. It is determined that germination of stored seed of Buchanania lanzan may be increased up to 89.% per cent by seed treatment i.e., scarification of seeds with GA_3 200mg for 12hrs.

REFERENCES

1. Banerjee, S., & Bandyopadhyay, A. (2015). Buchanania lanzan spreng: A veritable storehouse of phytomedicines. Asian Journal of Pharmaceutical and Clinical Research, 8(5), 18–22.
2. Cavieres, L. A., & Arroyo, M. T. K. (2000). Seed germination response to cold scarification period and the thermal regime in Phacelia Secunda (Hydrophyllaceae) Altitudinal variation in the Mediterranean Andes of central Chile. Plant Ecology, 149, 1–8.
3. Joshi, C. J., Sharma, D. K., Gotur, M., & Rajan, R. (2017). Effect of Different Chemicals on Seedling Growth and Biomass of Chironji (Buchanania lanzan Spreng.). Int. J. Curr. Microbiol. App. Sci, 6(9), 1819-1823.
4. Kołodziejek, J., & Patykowski, J. (2015). Effect of environmental factors on germination and emergence of invasive Rumex confertus in Central Europe. The Scientific World Journal, 2015.

5. McDonnell, A., Grant, M., & Coons, J. M. (2012). Effects of hot water on breaking seed dormancy of the endangered Kankakee mallow (Iliamna remota Greene (Malvaceae). Erigenia, 8.
6. Rai, M. K. (2010). Biotechnological strategies for conservation of rare and endangered medicinal plants. Biodiversity, Journal of Biological Diversity, 11(3), 157–166.
7. Rai, P. K., Sharma, D. R., & Sharma, A. (2015). Buchananialanzan is a Pharmacognostic Miracle Herb. Research Journal of Pharmacognosy and Phytochemistry, 7(3), 182.
8. Siddiqui, M. Z., Chowdhury, A. R., Prasad, N., & Thomas, M. (2014). Buchanania lanzan: a species of enormous potentials. World J Pharm Sci, 2(4), 374-379.
9. Thompson K, Ooi MKJ. Germination and dormancy breaking: two different things. Seed Science Research 2013;23:1.
10. Zohary D, Hopf M, Weiss E. Domestication of Plants in the Old World, 4th Edn. Oxford: Oxford University Press 2012.