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Effect of pretreatments on seed germination and seedling growth of *Buchanania lanzan*

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Abstract

Buchanania lanzan Spreng member of family Anacardiaceae known as chironji and charoli. Chironji seeds having high economic value in national and international market besides this, it is also used for medicinal purposes. Tribal folk lore reveals that, all plant part contains high medicinal value like leave, fruit, gum, root, seeds and seed oil and used for various disease like diarrhea, constipation, blood disease and skin disease etc. At present the species occurring in natural forests is depleting due to various reasons like low seed viability, seed characteristics (hard seed coat), destructive harvesting practices, slow growing, long fruiting period, biotic pressure and abiotic factors. Keeping the view of above facts nursery technique *i.e* Wire mesh structure and different seed pre-treatments are used to enhance the germination of *B. lanzan* at Forest Research Center for Skill Development (FRC-SD), Chhindwara. In this study total five pre-sowing seed treatments (T-1 to T-5) were used, which comprises of different treatments like water soaking (Different duration), mechanical damage and control (Without any treatment). Soil: Sand: FYM (1:1:2) potting media is used in nursery bags. Result concluded that Maximum germination *i.e* 85% were achieved when seed treated with mechanical treatment (T-4), followed by 75% germination when seeds were soaked in water for 24 hours (T-1), on the other hand minimum germination *i.e* 8.5% is obtained when seeds are not treated or control condition (T-5). The trend of germination percentage from maximum to minimum is T-4 > T-1 > T-2 > T-3 > T-5. Duration in germination process also differs from treatments to treatment maximum 37 days taken to complete the germination process by T-5 followed by T-3 and T-2 while in T-4 and T-2 completed this process within 19 and 21 days respectively. Maximum Average root length (11.7 cm.) and shoot length (12.3 cm.) was measured in T-4, followed by T-3 with 10.5 cm. and 8 cm root length and shoot length respectively. By adopting this nursery technique and seed pre-sowing treatment, provides healthy planting stock for afforestation and reforestation purposes with high survival percentage on nursery and field plantation.

Keywords: *Buchanania lanzan* Spreng, germination, nursery technique and pre-sowing treatments

Abbreviation: T-Treatment, FRC-SD-Forest Research Centre for Skill Development

Introduction

Buchanania lanzan Spreng also known as chironji belongs to the family Anacardiaceae. It is a moderate sized tree with a straight trunk, and suitable for clothing the dry hill (Troup, 1921)^[1]. This tree is originated in the Indian Sub-continent (Zevenand de Wet, 1982)^[2]. This tree grows on a variety of soil and attains height up to 15-20 m, and girth up to 1.25m. Chironji is a commercially useful tropical tree species. It is a medium evergreen deciduous tree in nature. It bears fruits and fruit containing a single seed known as chironji which is a popular edible nut with high market value in national and international market. The kernels are eaten raw or roasted and are commonly used in the milk based sweet meal and puddings. It is also used as medicinal purposes.

Chironji is vanishing fast from its natural habitat *i.e* natural forest area due to unsustainable harvesting of seed, poor seed germination due to hard seed coat, fallen seed eaten by the rodent and squirrel and abiotic factor influences the growth and regeneration of this tree. This tree suffers by the fungal and insect pest attack due to indiscriminate cutting and lopping of the branches besides this other biotic factors such as grazing, hacking, repeated fire in a area are also responsible (Meshram and Soni, 2014)^[3]. All part of the tree is useful to cure several diseases as folk lore of tribal's reveals; due to this reason overexploitation in unscientific manner is also responsible for extinction of this species from forest. Lack of knowledge of its nursery and propagation techniques the plantation has not been raised by forest department or by private tree growers. Keeping the view of above point is urgent need to conserve this species for near future. Object of this study is to prepare a package of nursery technique which can enhance the seed germination percent and produce quality planting stock for afforestation and reforestation of seedling with high survival rate.

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Material and Method

Experiment on effect of pre-sowing seed treatments of *B. lanzan* was conducted at Forest Research Center for Skill Development (FRC-SD), Chhindwara, Madhya Pradesh, India in nursery during the year 2014. For this experiment fully ripen fruits of *B. Lanzan* were collected from selected candidate plus tree during the second week of May, 2014. The experiment was conducted after one month of collection of fruits. Experimental design was completely randomized block design (CRBD) with five treatments and four replications, each replication contain hundred seeds, total four hundred seed were sown in each treatment. Treatment details are mention in table -1.

Seed sowing was done in the last week of June in polythene bags of 10"x5" size filled with a media which is mixture of Soil, Sand and FYM at a ratio of 1:1:2. Polybags were arranged in a pit of 10m*1m and 30 cm deep. A bamboo frame was made over on which iron wire mesh net was covered on the pit and sides are secured by putting weight (bricks) to protect the seed from the rodents and squirrel (Figure-2). Seedlings were watered in regular interval (Figure-3). Weeding and loosening of soil were also done as per requirement and data were recorded on germination percentage and days taken for complete germination. Data on root length (cm) and shoot length (cm) of seedling was also recorded after 2 months of sowing.

Result and Discussion

1. Seed germination percentage

The maximum seed germination (85%) was recorded in T-4, when stony endocarp of fruit was slightly damaged with small stone followed by 75% germination observed in case of ordinary water soaking in 24 hours (T-1) of seed. All other treatments exhibited significant reduction in seed germination. Minimum germination 8% was recorded in control (Without any treatments) i.e. T-5. It is also observed that T-4 not only gives the maximum percentage of germination but complete the germination process within the 19 days after sowing. Hot water treatment also hastens the germination process but gives only 30% germination. In case of control condition both germination percentage and germination process perform poor compare to other treatments shown in Table-1 & Figure-1. Higher germination percentage as a result of mechanical damage to the stony endocarp is attributable to the fact that it facilitates entry of water into the seed kernels which are otherwise are not able to germinate for want of proper moisture, Similar results was also reported by Hussain *et al.*, (1993) [4], Grice, 1996 [5], Hassen *et al.*, (2005) [6] and Saied *et al.*, (2008) [7] in *Z. nummularia*, *Z. mauritiana*, *Z. mucronata* and *Z. spina-christi* respectively. Choubey *et al.*, (1997) [8] recorded 60-80% germination with the seed soaking in 0.2% Tagastin for two

minutes. Shukla and Solanki, (2000) [9] reported that 83% seed germination when stony endocarp damaged mechanically before sowing the seed and satisfactory seedling growth achieved within 18 days.

Table 1: Effect of different Seed Pre-treatment on Seed germination of *B. lanzan*

Treatment No.	Treatments Detail	Mean±Standard deviation
T-1	Soaking in ordinary water for 24 hours	74.75±3.09
T-2	Hot water treatment	30.5±4.65
T-3	Boiling water treatment	25.25±1.71
T-4	Mechanical treatment	85.5±2.64
T-5	Sowing of dried fruit (Control)	8.5±3.87
	CD _(0.05)	5.09
	SE±	1.67

2. Days taken for complete germination

Data on days taken for complete germination revealed that (19 days) was taken for full germination when stony fruits were mechanically broken. Treatment likes boiling water (T-3) and hot water (T-2) took 24 and 21 days respectively to complete germination. The period increased in case of ordinary water soaking (23 days) and sowing of dried fruits takes 37 days. Early germination in case of mechanically damaged *B. lanzan* fruit may be due to fast imbibitions of water in to the seed tissues which is a prerequisite for seed germination. *B. lanzan* sown in the month of May in the nursery required 16 days for the start of seed germination Prasad *et al.*, (1988) [10].

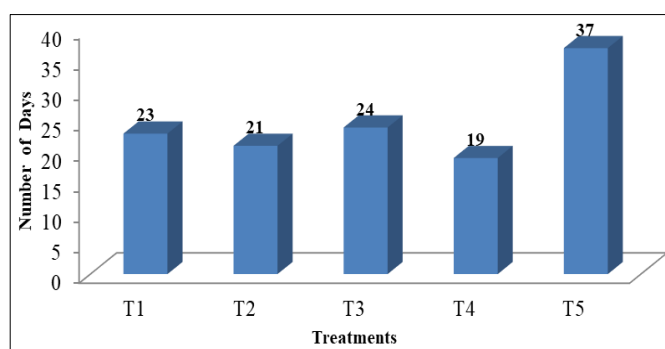


Fig 1: Number of Days taken by the seed for complete germination

3. Seedling Growth

Data of seedling growth were also recorded after two months of seed sowing, root length (cm) and shoot length (cm) was recorded (Table-2). Results indicated that maximum root length and shoot length was attaining by the T-4 with 11.7cm. and 12.30cm. respectively followed by T-3, T-2, T-1 while T-5 showed minimum growth performance in root length and shoot length i.e. 6.5 cm. and 6.7 cm. respectively.

Table 2: Average Root length and Shoot length of *B. Lanzan* in different treatments after 2 months of seed sowing

Treatments	Average Root Length (In cm.)	Average Shoot Length (In cm.)
	Mean ± Standard deviation	Mean ± Standard deviation
T-1	7.2 ± 1.42	7.9 ± 1.31
T-2	7.5 ± 0.79	7.10 ± 1.09
T-3	10.5 ± 1.34	8 ± 1.52
T-4	11.7 ± 2.96	12.3 ± 2.34
T-5	6.5 ± 1.46	6.7 ± 1.15



Fig 2: Wire mesh structure in nursery to protect seeds from rodents



Fig 3: Healthy seedling of *Buchanania lanzan*

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Conclusion

Above study concluded that mechanical treatment and water soaking in 24 hours gives maximum germination percentage when seeds of *B. lanzan* are one month old. Direct sowing of dried fruit is not gives satisfactory germination percentage. In nursery when pre sowing seed treatments i.e. mechanical treatment is followed by the wire mess structure not only improve the germination but also produce the healthy planting stock for afforestation and reforestation purposes with high survival percentage in nursery. This nursery and seed pre-sowing treatments are very useful for the Forest Departments and other Nursery growers.

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