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RESEARCH PAPER

Impact of post scarification storage period on seed germination and quality in soapnut (*Sapinduas emarginatus*)

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Abstract : Soapnut (*Sapinduas emarginatus*) is one of the most primitive precious useful plants since ancient times. This plant was domesticated due to its multifarious usefulness. The study was conducted in College of Forestry, Sirsi during 2019-20 to know the influence of post scarification storage treatments on seed germination and quality in *Sapinduas emarginatus*. The seeds were collected from in and around Sirsi area. In soap nut, the basic problem is poor seed germination due to hard seed coat. The seeds were treated with concentrated H_2So_4 for 12min and stored under laboratory condition for six months. At monthly interval, seed samples were drawn and evaluated for post scarification germination. The germination behaviour remarkably influenced due to scarification and without scarification during experimentation. The untreated seeds recorded the maximum germination (68%) compared to scarified seeds (22.85%).Speed of germination was highest in seed without scarification treatment (2.7) compared to scarified seeds. Mean daily germination was highest in without scarified seeds (1.04) and lowest in the scarified seeds (0.32). Peak value was maximum in without scarified seeds (0.50) compared to scarified seeds (0.22). Seedling vigour index was significantly highest in without scarified seeds (1290) compared to scarified seeds (455). In general, scarified seeds with conc. H_2SO_4 for 12 min affected seed germination due high conc. H_2SO_4 because of chemical residues remaining in seed that affects the embryo. As the advancement in storage period the seed coat may lose the integrity so, germination was improved in without scarified seeds.

Key Words : Post scarification, Storage period, Seed germination, Quality in soapnut

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INTRODUCTION

Sapinduas emarginatus.Vahl belongs to family *Sapindaceae* and genus Sapinduas is a medium sized deciduous tree found in south India. The Tree is about 8m to 10 m tall and has branches. Sapinduas emarginatus is an economically significant tropical tree species meagerly distributed in diverse geographical provinces like Gangetic Plains, Western Ghats and Deccan Plateau in India (Cresswell and Nelson, 1972). It is commonly called as Soap nut tree and is the south Indian species of

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genus Sapindus. The fruit is known for saponins which constitutes upto 56.5 per cent of its drupe. Members of the genus are commonly known as soap berries or soap nuts because the fruit pulp is used to make soap. Investigations on contraceptive capability of plant Saponins have shown some spermicidal capacity. The species that presents a great diversity of chemical compounds like: saponins, sapindosid, fatty acids such as of arachidic, behenic, linoleic, oleic, palmitic, stearic, oleanolic acid, and sapindic acid etc, phenolicacids such as proto catechuic acid, cis-pcoumaric acid, p-hydroybenzoic acid and cinnamic acid (Mng'omba *et al.*, 2007). The fruit is small leathery-skinned drupe which is 1–2 cm (0.39–0.79 in) in diameter, which is yellow and turn blackish when ripen, containing one to three seeds. The seeds are big in size and having very hard seed coat which leads to seed coat dormancy. Scarification is one of the answer for breaking the seed dormancy and get high germination.

Scarification means weakening, opening, or otherwise altering the coat of a seed to encourage germination. Scarification is often done mechanically, thermally, and chemically. The seeds of many plant species are often impervious to water and gases, thus preventing or delaying germination. Any process designed to make the testa (seed coat) more permeable to water and gases (and thus more likely to germinate) is known as scarification (Ananthapadmanabha *et al.,* I988). Chemical scarification, which involves use of one or more chemicals to break the seed coat dormancy and promote germination in tree species. It can involve imbibing or soaking seeds in precisely concentrated acidic or basic solutions for varying amounts of time. Chemicals such as sulfuric acid or even household chemicals can be used to affect this process (Shivanna *et al,* 2007). The objective of present studies was to determine the impact of post scarification storage on seed germination, early establishment, seedling quality and vigour in Sapindus species.

Material and Methods

A laboratory study entitled as "Impact of post scarification storage period on seed germination and quality in Soapnut (*Sapinduas emarginatus*)" was conducted at College of Forestry, Sirsi, during 2019. Soapnut seeds were collected from the in and around Sirsi. Then the seeds were divided into two equal parts and one part was kept in the ambient storage condition and another part was imposed with conc. H_2So_4 treatments for 12 minutes and washed thoroughly and shade dried for one week. Both scarified seeds and without scarified seeds sown in sand tray beds for monthly germination studies. Meanwhile 20grams of scarified seeds and without scarified seeds weighed and crushed to small pieces for moisture content estimation.

A Completely Randomized Design (CRD) with two factors was adopted in three replications for each treatment. For each replication 100 seeds were sown to explore the effect of post scarification storage period on seed germination and quality. The samples were drawn at monthely intervel and seeds sown in sand trays and watered at 3 days interval to evaluate germination parameters. The post scarification storage seed treatments details used in the experiment are furnished below:

Factor –I: Scarification treatments

S_1 –Scarification
S_2– Without scarification.

Factor – 2: Storage periods:

T_1- Immediately after scarification
T_2 – Ist month of storage
T_3 – 2nd month of storage
T_4 – 3rd month of storage
T_5 – 4th month of storage
T_6 – 5th month of storage
T_7 – 6th month of storage

Germination parameters *viz.,* percentage of germination, speed of germination, time taken for initial and completion of germination, peak value of germination, shoot length, root length, dry weight of seedling and vigour index have been recorded on 28th day of germination test.

Results and Discussion

Germination percentage was significantly influenced due to scarification and without scarification during experimentation. Among the treatments, without scarified seeds recorded the maximum germination (68%) compare to scarified seeds. In general, scarified seeds with conc. Sulphuric acid for 12 min affected seed germination (Campbell, 1983). Germination percentage was significant due to different storage period in *sapinduas sps*. Among storage periods, the seed sown immediately after collection without scarification

recorded highest germination (52%) and least in the 3rd month of storage (28%).The decreasing trend of seed germination was noticed as the storage period increases in both the treatments. The treatment combination of seeds without scarification immediately after collection recorded significantly highest germination (82%) compare to others. The least germination percentage was observed in the post scarified seeds with 6 months storage (Table 1 and Fig. 1). In general, scarified seeds with conc. H_2SO_4 for 12 min affected seed germination due to High concentration. H_2SO_4, chemical residues

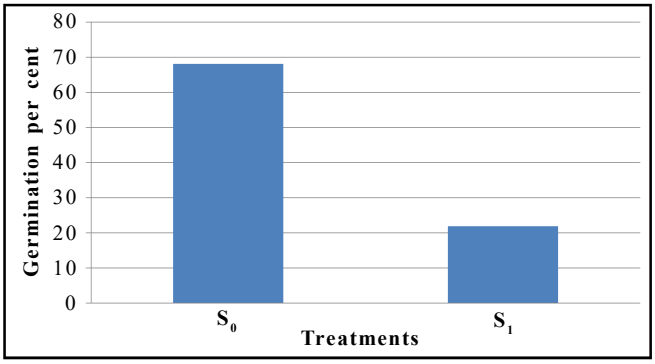

Fig. 1: Influence of scarification treatments on seed germination

Table 1: Influence of post scarification on seed germination parameter in Sapinduas

Treatments	Germination%	Speed of germination	Mean daily germination	Peak value
Scarification treatments				
Without scarification-S_0	68.00	2.70	1.04	0.50
With scarification-S_1	22.00	1.06	0.30	0.22
S.E.±	1.30	0.07	0.02	0.02
C.D. (P=0.05)	3.90	0.02	0.05	0.08
Storage months				
M_1-Immediately sown	52.00	2.40	0.81	0.51
M_2-1st month of storage	50.00	2.30	0.85	0.45
M_3-2nd month of storage	28.00	1.07	0.46	0.27
M_4-3rd month of storage	47.00	1.30	0.72	0.26
M_5-4th month of storage	45.00	2.20	0.44	0.32
M_6-5th month of storage	52.00	2.30	0.83	0.37
M_7-6th month of storage	43.00	1.30	0.68	0.32
S.E.±	2.55	0.10	0.03	0.05
C.D. (P=0.05)	7.42	0.40	0.10	0.15
Interaction				
S_0*M_1	82.00	3.50	1.34	0.73
S_0*M_2	78.00	3.50	1.34	0.70
S_0*M_3	36.00	1.00	0.60	0.35
S_0*M_4	63.00	1.70	0.98	0.32
S_0*M_5	67.00	3.42	0.58	0.42
S0*M_6	80.00	3.50	1.33	0.53
S_0*M_7	70.00	2.50	1.14	0.46
S_1*M_1	21.00	1.22	0.27	0.30
S_1*M_2	23.00	1.20	0.35	0.20
S_1*M_3	21.00	1.10	0.32	0.19
S_1*M_4	30.00	0.90	0.46	0.21
S_1*M_5	22.00	1.10	0.31	0.23
S_1*M_6	24.00	1.10	0.33	0.20
S_1*M_7	16.00	0.60	0.23	0.18
S.E.±	3.60	0.20	0.05	0.07
C.D. (P=0.05)	10.50	0.60	0.15	NS

NS= Non-signficant

remaining in seed that affects the embryo. As the advancement in storage period the seed coat may lost integrity so, germination was improved in without scarified seeds (Mahabale, 1987).

Speed of germination significantly varied among the scarification and without scarification treatments. Among the treatments, without scarification treatment recorded higher values (2.71) than scarified seeds (1.06). There was noticeable difference in speed of germination in storage period in sapinduas species. Seeds of immediate collection were recorded highest speed of germination 2.40 and least in the third month. The treatment combination of seeds without scarification immediately sown after collection was recorded highest speed of germination (3.47) compares to others combinations. The least was observed in post scarification seeds with 7 month storage (0.67). The marked decrease in quality parameters during the post scarification storage may be attributed to seed ageing and induced physiochemical seed deterioration, lipid peroxidation leading to production of toxic metabolites (Harty, 1983 and Mahabale, 1987).

There were significant differences were observed in peak value of germination in sapinduas due to scarification and without scarification treatments. Highest peak value of 0.50 was observed in without scarified seeds. The low peak value of 0.22 was observed in scarified seeds. There were noticeable differences in peak value on storage period. Fresh seeds recorded highest peak value (0.5) and least value was at 4th month storage. Interaction exhibited non-significant variation on peak value. Highest peak value (0.73) observed in without scarified seeds and lowest in scarified seeds (0.18). The peak value was shown gradually decreasing trend as advancement in storage period during the experimentation. This may be due to non-availability of minerals which is required for germination. This study was in confirmative with studies made by Fang *et al.* (2006) and Kamble *et al.* (2012).

Mean daily germination remarkably influenced due to scarification and without scarification. Without scarification seeds recorded highest mean daily germination (0.85) compare to that scarified seeds (0.32). The seeds sown one month after storage recorded highest mean daily germination (0.85) compare to that on 5th month storage (0.43). Interaction effect exhibited significant variation on mean daily germination the treatment combination of seed without scarification immediately sown after collection recorded highest mean daily germination (1.31) and least mean daily germination was observed post scarification with seven month storage. The seeds of sapinduas fail to germinate even under most favourable condition due to hard seed coat. The hard seediness was ecological mechanism that allows the seeds to germinate under favourable condition (Lowry *et al.*, 1981 and Mahabale, 1987).

Shoot length exhibited significant differences among the scarification and without scarification treatments. Higher shoot length of 14.97 cm was observed in scarified seeds and lower in without scarified seeds were 13.90 cm. There was increase in shoot length as storage month increases. Interaction effect exhibited significant variation for shoot length. The treatment combination of seeds without scarification with first month storage recorded highest shoot length (15.10cm) and least shoot length (13.40cm) was observed in without scarification with seven months of storage. The increase in trend of shoot length may be due the marked decrease in quality parameters during the post scarification storage may be due to induced physiochemical seed deterioration (Saini *et al.,* 1999) (Table 2).

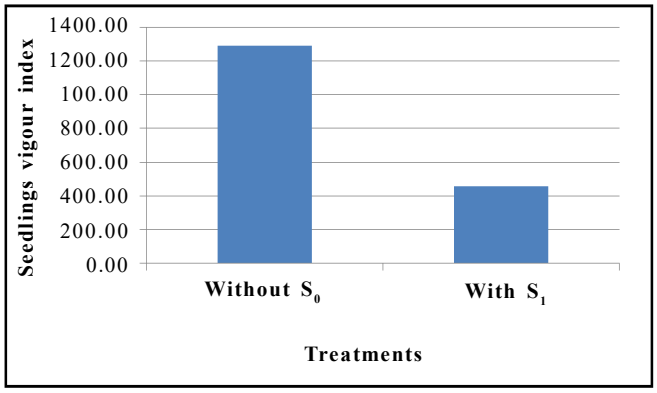

Fig. 2: Influence of scarification treatments on seedling vigour index

Root length found non-significant due to scarification and without scarification treatments during experimentation. However, maximum root length of 4.94cm was observed in scarified seeds and in without scarified seeds was 4.90cm. Interaction effect exhibited non-significant variations on root length. The treatment combination of seed without scarification with seven month storage recorded highest root length (5.20cm) and least root length (4.70cm) was observed in without scarification with one month storage. Treating seeds with conc. H_2SO_4 may softens the hard seed coat and to

initiate the germination under favourable conditions. The concentration and duration of the chemicals may further prevent the changes that take place within the seed as seed storage prolongs (Thapa and Gautam, 2006).

Moisture content was significantly differed due to scarification and without scarification treatments during experimentation. The maximum moisture content was observed in scarified seeds compared to without scarified seeds. There was slight increase in trend in moisture condition in seeds as storage period extended. Interaction effect exhibited significant variation on moisture content. The treatment combination of seed without scarification with seven month storage recorded highest moisture content (15.50) and least moisture content (11.70) was observed in without scarification with one month storage. Treating seeds with conc. H_2SO_4 may softens the hard seed coat and to incite the germination under favourable conditions.

Seedling vigour index was significantly influenced due to scarification and without scarification during experimentation. Among the treatment, without scarified seeds recorded the Seedling vigour index (1290) compare

Table 2: Influence of post scarification on seedling growth parameter in Sapinduas

Treatments	Root length	Shoot length	Moisture content	SVI
Scarification treatments				
Without Scarification-S_0	4.90	13.96	12.60	1290.00
With scarification-S_1	4.90	14.97	13.92	455.00
S.E±	0.60	0.07	0.00	26.00
C.D. (P=0.05)	NS	0.20	12.25	76.00
Storage months				
M_1-Immediately sown	4.85	14.45	12.50	986.00
M_2-1st month of storage	4.85	14.25	12.50	948.00
M_3-2nd month of storage	4.75	14.40	13.10	544.00
M_4-3rd month of storage	4.91	14.51	13.75	912.00
M_5-4th month of storage	4.93	14.55	14.25	863.00
M_6-5th month of storage	5.10	14.46	14.75	1009.00
M_7-6th month of storage	5.08	14.63	0.00	846.00
S.E±	0.12	0.13	0.00	49.00
C.D. (P=0.05)	NS	NS	12.00	143.00
Interaction				
S_0*M_1	5.00	13.66	12.00	1547.00
S_0*M_2	4.96	13.40	11.70	1435.00
S_0*M_3	4.70	13.90	12.50	669.00
S_0*M_4	5.00	14.20	13.00	1216.00
S_0*M_5	4.80	14.10	13.50	1275.00
S_0*M_6	4.90	14.13	14.00	1537.00
S_0*M_7	4.90	14.26	12.50	1356.00
S_1*M_1	4.70	15.23	13.00	426.00
S_1*M_2	4.70	15.10	14.00	461.00
S_1*M_3	4.80	14.90	13.30	420.00
S_1*M_4	4.80	14.83	13.70	609.00
S_1*M_5	5.60	14.93	14.50	452.00
S_1*M_6	5.20	14.80	15.00	482.00
S_1*M_7	5.20	15.00	15.50	337.00
S.E±	0.18	0.18	0.00	69.00
C.D. (P=0.05)	NS	0.54	0.00	202.00

NS= Non-significant

to scarified seeds (455). In general, scarified seeds with H_2SO_4 for 12 min affected seedling vigour index. Among storage period treatments, the seed sown immediately after collection without scarification recorded higher seedling vigour index (986) and least in the 3rd month of storage (544). Interaction effect between scarification and storage period exhibited significant variation on seedling vigour index. The treatment combination of seed without scarification immediately after collection recorded significantly highest Seedling vigour index (1547) compare to others. The least seedling vigour index germination was observed in the post scarified seed with 7 months storage. The marked decrease in quality parameters during the post scarification storage may be attributed lipid peroxidation leading to production of toxic metabolites (Naidu *et al.*, 2000).

Conclusion:

Germination per cent was significantly influenced due to scarification and without scarification during experimentation. The freshly collected seeds recorded the maximum germination (68%) compared to scarified seeds (22.85%). Germination percentage decreases as the storage period increases in both the treatments. The treatment combination of seeds without scarification sown after collection recorded higher germination (82%) compared to others. Speed of germination mean daily germination was higher in seeds without scarification compared to scarified seeds. Peak value was maximum in without scarified seeds (0.50) compared to scarified seeds (0.22). Root length and shoot length was slightly highest in scarified seeds compared to without scarified seeds Moisture content was slightly higher in scarified seeds (13.92%) compared to without scarified (12.61%). Seedling vigour index was significantly highest in without scarified seeds (1290) compared to scarified seeds (455). In general, scarified seeds with conc. H_2SO_4 for 12 min affected seed germination due high conc. H_2SO_4, Chemical residues remaining in seed that affects the embryo. As the advancement in storage period the seed coat may lose integrity so, germination was improved in without scarified seeds.

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