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Effect of presoaking on the germination of *Psoralea corylifolia* Linn.

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Abstract

In the present investigation, seeds of *Psoralea corylifolia* Linn. were subjected to hot water pre-treatment to achieve early germination by breaking dormancy.

It was found that, on 7th day of sowing, 12% germination was achieved in case of seeds kept as control, 32% germination in case of seeds which were presoaked for 48 hours and 28% germination was found in case of seeds presoaked for 72 hours respectively whereas, 82% germination was recorded in case of seeds which were presoaked for 24 hours and prewashed with hot water (34°C).

In nature, the seeds of some plants easily germinate after sowing but the seeds of a number of plants do not germinate easily and exhibit dormancy for varying period of time. The dormancy may be due to internal factors such as; impermeability of seed coats to moisture and oxygen, immaturity of the embryo, dominance of germinating inhibitors in seeds and testa barrier, and due to external factors such as; unavailability of water, unavailability of oxygen, inappropriate temperature, and in some seeds due to unavailability of light. Certain plants may immediately germinate after the harvest, it can be best exemplified by the seeds of *Pisum sativum*, which sometimes germinate in the fruit itself which is still on the plant, a phenomenon known as vivipary. However, sometimes the dormancy period is very prolonged and can take months together for germination. This is true for the seeds of *Malus domestica* which has a hard seed coat and *Entada gigas* which has a very thick seed coat and do not germinate easily.

In the present study, seeds of *Malus domestica* were tested for their germination potential and shortening of dormancy period. Initial studies showed that the seeds are dormant and there is no germination even after one weak of sowing. Therefore, it was thought imperative to undertake this investigation to find out the substance that can break the dormancy of *Malus domestica* seeds. The seeds were subjected to acid scarification (H_2SO_4) and mechanical scarification (by making cuts on the seed coats by knives). The best treatment among these was found to be mechanical scarification (by making cuts on the seed coats by knives).

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According to Berlyn[2], germination is a sequential series of morphogenetic events that result in the transformation of an embryo into a seedling. The seeds of every plant have the capability to germinate but their germination is affected due to some factors, such as seed coat, hard seed coat, rudiment embryo, over-ripening, presence of plant growth inhibitors, due to absence of water, oxygen and due to unfavourable conditions.

Dormancy of seeds is due to external factors or due to internal factors. When it is caused due to internal factors, it is called as true dormancy or innate dormancy or primary dormancy. And when it is caused due to external factors, it is called as imposed dormancy or quiescent dormancy or secondary dormancy. Both of these primary and secondary dormancy influences are mutually dependent and can not be singled out. True dormant seeds do not germinate even if they are provided with suitable environmental factors. Secondary dormant seeds may germinate immediately after shed off. After some storage, they fail to germinate and thus exhibit secondary dormancy. Some seeds such as *Brassica alba, Ambrosia tripolia* and *Xanthium pennsylvanicum* exhibit secondary dormancy. Secondary dormancy is opposite to after ripening. Presence of high carbondioxide concentration, absence of light and very high or low temperature induce the secondary dormancy.

A number of techniques are available for breaking the dormancy of seeds, such as; scarification, exposure to light, alternating high & low temperatures, stratification, impaction, pressure, electric current, pretreatment with coumarins, kinetin, GA_3, H_2SO_4, thiourea, KNO_3 and hot water.

Studies on germination and dormancy of seeds have been carried out by various workers on different types of species. These include; the studies of Asha, P. and Illa, P.[1] on the effect of seed direction and growth media on *in vitro* seed germinarion and seedling establishment of *Pterocarpus marsupium*. Bewley and Black,[4] studied the physiology and biochemistry of seeds. Seed germination and dormancy have been studied by Bewley[3].

Chouard,[6] investigated vernalization and its relation to dormancy. Influence of low temperature in improving germination percentage was found out by Conville, (1920). In 1936, Crocker investigated the effect of visible spectrum upon the germination of seeds and fruits. Dave, *et al.*,[7] have investigated the Regulation of *Arabidopsis thaliana* seed dormancy and germination by 12-oxo-phytodienoic acid. *Entada phaseoloids* seed dormancy and germination: implications for conservation and restoration has been reported by Deepa and Shinde[8]. The effect of the use of temperature on the breakage of dormancy and the subsequent performance of rice (*Oryza* spp.) has been investigated by Doku[9].

Experimental induction of dormancy in *Betula pubescens* was investigated by Eagles & Wareing[10]. Evanari[11] has studied the physiology of seed dormancy after ripening and germination. Hayes & Klein[12] investigated special quality influence of light during development of *Arabidopsis thaliana* plants in regulating seed germination. Transcriptome analysis of seed dormancy after rinsing and chilling in ornamental peaches (*Prunus persica*) has been investigated by Kanjana *et al.*,[13].

Effect of pre-sowing treatment on seed germination of Babchi *(P. corylifolia)* and Senna *(Cassia angustifolia)* in nursery has been reported by Koppad and Umarbhadsha,[14].

Ribosome and enzyme changes during maturation and germination of the castor bean seeds was investigated by Marre[15]. Effect of different pretreatments and seed coat on dormancy and germination of seeds of *Senna obustifolia* has been studied by Mensah and Ekeke[16]. Mishra[17] investigated the effect of temperature and light on the seed germination of *Sida cordifolia*. Musara, *et al.*,[18] have investigated the evaluation of different seed dormancy breaking techniques on Okra (*Abelmoschus esculentus* L.) seed germination. The release of dormancy, a wake-up call for seeds to germinate has reported by Nee, G., *et al.,* (2017). Isoenzymes of sugar phosphate metabolism in endosperm of germinating castor beans were studied by Nishimura[20]. Redwood, *et al.*,[21] have reported seed longevity and dormancy state in a disturbance-dependent forest herb, *Ageratina altissima.*

Siva, *et al.*,[22] have studied the enhanced seed germination of *P. corylifolia* L. by heat treatment. Germination pretreatments to break hard-seed dormancy in *Astragalus cicer* L. has been studied by Statwick[23]. Effects of light, temperature and their interaction on the germination of seeds was investigated by Toole[24]. Effect of various dormancy breaking treatments on seed germination, seedling growth and seed vigour of medicinal plants has investigated by Warghat, *et al.*,[25] and Zohra,*et al.*,[26] have reported the effect of salicylic acid on germination of *Ocimum gratissimum* seeds induced into dormancy by chlormequat.

Healthy seeds of *P. corylifolia* were collected from the seed market (Bhopal). The seeds were washed with running tap water three to four times and once surface sterilized with 0.1% H_gCl_2 solution for 5 minutes to remove the surface adhering microbes.

Uniform sized seeds were then transferred to sterilized Petri plates provided with filter paper pads. Three replicates of presoaked and control seeds were kept for germination studies. The filter paper pads were moistened as and when needed. The emergence of radical was taken as germination. The seeds were soaked in water for 24 hours, 48 hours and 72 hours.

In the present investigation, seeds of *Psoralea corylifolia* were subjected to hot water pre-treatment to achieve early germination by breaking dormancy. It was found that, on 7th day of sowing, 12% germination was achieved in case of seeds kept as control, 32% germination in case of seeds which were presoaked for 48 hours and 28% germination was found in case of seeds presoaked for 72 hours respectively whereas, 82% germination was recorded in case of seeds which were presoaked for 24 hours and prewashed with hot water (34^{o}C). The results are shown below in table-1;

A perusal of table-1 indicates that presoaking of *P. corylifolia* seeds for 24 hours and washing with hot water (34^{o}C) improves the germination percentage compared to the seeds which are untreated and those which are presoaked for 48 hours and 72 hours. The

Table-1. Showing the effect of hot water pre-treatment on the germination of *P. corylifolia*

Treatments	Percentage Germination on 3rd Day	Percentage Germination on 5th Day	Percentage Germination on 7th Day
Control	5%	12%	12%
Presoaked for 24 hrs (& washed with hot water, 34^{0}C)	41%	69%	82%
Presoaked for 48 hrs	17%	28%	32%
Presoaked for 72 hrs	14%	27%	28%

duration to which the seeds were exposed to presoaking treatment affected the germination process to different extent.

As is evident, the best exposure time of the seeds of this plant to presoaking was found to be 24 hours (including pre-washing with hot water and daily washing with hot water (34^{0}C), in which 82% germination was achieved on 7th day of sowing whereas, it was 12%, 32% and 28% germination respectively under the seeds which were kept as control and those which were presoaked for 48 hours and 72 hours. Hence, presoaking with 24 hours (including pre-washing with hot water and daily washing with hot water (34^{0}C) proved to be germination enhancer compared to the rest. The dormancy in *P. corylifolia* may be due to germinating inhibitors present in the seed coat, which may be removed due to hot water treatment. In the present investigation, the ideal time of presoaking was found to be 24 hours which supported the highest germination percentage among the treated and untreated seeds. Hence, it is inferred that *P. corylifolia* seeds before sowing should be pretreated with hot water for 24 hours (including pre-washing with hot water and daily washing with hot water (34^{0}C) so as to achieve higher germination percentage but it is important that seeds should not be presoaked or washed with severe hot water, so that it may not damage the delicate embryonic tissues.

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