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Effect of various pre-treatments for breaking the dormancy of *Baliospermum montanum* Willd.

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Abstract

In the present investigation, seeds of *Baliospermum montanum* were subjected to various treatments to achieve early germination by breaking dormancy.

It was found that, On 17th day, 88% germination was recorded in the seeds which were mechanically injured followed by 86% in the IAA treated seeds. It was 11%, 32%, 64%, 31%, 29%, 28%, 27%, 31%, 28%, 41%, 52%, 31%, 36% and 72% germination respectively in the seeds kept as control, those treated with hot water, scarification, stratification, alternating high and low temperature, KNO_3, thiourea, kinetin, GA_3, H_2SO_4, presoaking, electric current, coumarin and brassinolide. Thus, for B. montanum seeds, mechanical injury is the best option for achieving higher germination percentage, the other option being IAA (table-1).

The seeds of some plants easily germinate after sowing in nature 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 or may be due to external factors. 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.

Baliospermum montanum is a shrub of the family Euphorbiaceae and commonly known as Danti. Its twigs are used as tooth brush by villagers in Raisen district and adjoining areas. The plant grows in dry places, often in phosphorus rich soils. There is scanty flowering and fruiting. Because of the thick seed coat, germination of seeds under natural conditions is often very poor.

So, in the present study, seeds of this plant were tested for their germination potential and shortening of dormancy period. Initial studies exhibited that there was only 11%

germination till 17th day of sowing. Therefore, it was thought imperative to undertake this investigation to find out the substance that can break the dormancy of this plant. The seeds were subjected to various treatments which are mentioned in table-1.

According to Berlyn[3], 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 inûuences 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 Shull,[31] on the oxygen minimum and the germination of *Xanthium* seeds. A detailed account of seed dormancy mechanics was given by Crocker,[8]. Influence of low temperature in improving germination percentage was found out by Conville, (1920). Similarly, alternating temperatures to break the dormancy was used by Harrington, (1923). Morinaga,[24] has studied the germination of seeds under water.

Davis,[11] used high pressure to achieve higher seed germination. Denny & Stanton, (1928) suggested chemical treatments for breaking the seed dormancy. Joseph,[18] investigated the germination and vitality of birch seeds. Barton,[2] investigated on coniferous seeds. In 1936, Crocker investigated the effect of visible spectrum upon the germination of seeds and fruits. In 1938, Crocker[9] also gave an account of life-span of seeds.

Chouard,[7] has investigated vernalization and its relation to dormancy. Experimental induction of dormancy in *Betula pubescens* was investigated by Eagles & Wareing[14]. Evanari,[15] has studied the physiology of seed dormancy, after ripening and germination. Ribosome and enzyme changes during maturation

and germination of the castor bean seeds was investigated by Marre[21]. Effects of light, temperature and their interaction on the germination of seeds was investigated by Toole [34].

Hayes & Klein,[17] investigated special quality inûuence of light during development of *Arabidopsis thaliana* plants in regulating seed germination. Bewley and Black, (1978) studied the physiology and biochemistry of seeds. Isoenzymes of sugar phosphate metabolism in endosperm of germinating castor beans were studied by Nishimura[27]. Seed germination and dormancy have been studied by Bewley[5]. Improvement of seed germination in *Asparagus racemosus* has been reported by Gupta, *et al.,*[16].

Effect of pre-sowing treatment on seed germination of *Babchi* (*Psoralea corylifolia*) and Senna (*Cassia angustifolia*) in nursery has been reported by Koppad[20] and Umarbhadsha. Seed germination behaviour of *Asparagus racemosus* (*Shatavari*) under *in-vivo* and *in-vitro* conditions has been investigated by Raghav and Kasera[28]. Siva, *et al.,*[32] have studied the enhanced seed germination of *Psoralea corylifolia* L. by heat treatment. Musara, *et al.,*[25] have investigated the evaluation of different seed dormancy breaking techniques on Okra (*Abelmoschus esculentus* L.) seed germination. Asha and Illa,[1] have studied the effect of seed direction and growth media on *in vitro* seed germination and seedling establishment of *Pterocarpus marsupium*.

Cantoro, *et al.,*[6] have reported seed dormancy QTL identiûcation across a *Sorghum bicolor* segregating population. Dave, *et al.,*[10] 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[12]. 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, *et al.,*[13]. Transcriptome analysis of seed dormancy after rinsing and chilling in ornamental peaches (*Prunus persica*) has been investigated by Kanjana, *et al.,*[19].

Effect of different pretreatments and seed coat on dormancy and germination of seeds of *Senna obustifolia* has been studied by Mensah and Ekeke[22]. Mishra,[23] has investigated the effect of temperature and light on the seed germination of *Sida cordifolia*. Redwood, *et al.,*[29] have reported seed longevity and dormancy state in a disturbance-dependent forest herb, Ageratina. Germination pretreatments to break hard-seed dormancy in *Astragalus cicer* L. has been studied by Statwick[33].

Effect of various dormancy breaking treatments on seed germination, seedling growth and seed vigour of medicinal plants has investigated by Warghat, *et al.,* (2016). Zohra, *et al.,*[36] have reported the effect of salicylic acid on germination of *Ocimum gratissimum* seeds induced into dormancy by chlormequat. The release of dormancy, a wake-up call for seeds to germinate has reported by Nee,

Table-1 showing the effect of various treatments on the germination percentage of *B. montanum.*

D A S → Treatment	3days	5days	7days	9days	11days	13days	15days	17Days
Control	2	7	9	11	11	11	11	11
Hot water	10	12	18	23	27	31	32	32
Scarification	20	31	42	51	59	63	63	64
Stratification	8	12	17	24	31	31	31	31
Alt. high & low temp.	10	13	17	17	22	28	29	29
KNO_3	8	12	16	19	23	28	28	28
Thiourea	9	9	11	18	21	25	27	27
Kinetin	12	15	19	23	27	30	30	31
GA_3	11	11	17	21	25	27	28	28
H_2SO_4	13	18	26	35	35	41	41	41
Presoaking	14	18	27	38	42	49	50	51
Coumarin	0	0	11	25	29	36	36	36
Electric current	8	11	18	18	26	30	31	31
Brassinolide	19	27	39	53	68	71	71	72
Mechanical injury	27	39	51	65	78	86	88	88
IAA	30	42	56	68	81	84	85	86

et al.,[26].

Healthy seeds of *Baliospermum montanum* 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. After surface sterilization, the seeds were again washed with double distilled water. Uniform sized seeds were then transferred to sterilized Petri Plates provided with filter paper pads.

Three replicates of treated 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.

It was found that on 3rd day of sowing, the germination percentage was 2, 10, 20, 8, 10, 8, 9, 12, 11, 13, 14, 8, 27, 0, 19 and 30 respectively in the seeds kept as control, those subjected to hot water, scarification, stratification, alternating high and low temperature, KNO_3, thiourea, kinetin, GA_3, H_2SO_4, pre-soaking, electric current, mechanical injury, coumarin, brassinolide and IAA. There was much improvement in germination percentage on the 9th day after sowing. It was 11, 23, 51, 24, 17, 19, 18, 23, 21, 35, 38, 18, 65, 25, 53 and 68% respectively in the seeds kept as control, those treated with hot water, scarification, stratification, alternating high and low temperature, KNO_3, thiourea, kinetin, GA_3, H_2SO_4, pre-soaking, electric current, mechanical injury, coumarin, brassinolide and IAA. There

was no improvement in the germination percentage after 17 days, both in the treated and untreated seeds. On 17th day, 88% germination was recorded in the seeds which were mechanically injured followed by 86% in the IAA treated seeds. It was 11%, 32%, 64%, 31%, 29%, 28%, 27%, 31%, 28%, 41%, 52%, 31%, 36% and 72% germination respectively in the seeds kept as control, those treated with hot water, scarification, stratification, alternating high and low temperature, KNO_3, thiourea, kinetin, GA_3, H_2SO_4, presoaking, electric current, coumarin and brassinolide (table-1).

The seeds of *B. montanum* are not only dormant but their production is also not very high. The best method to achieve a higher germination percentage was found to be that of mechanical injury which resulted in 27% germination on the 3rd day and 88% on 17th day after sowing. Beyond 17 days, there was no further improvement in germination percentage. The IAA treated seeds also exhibited higher germination percentage (86%) on 17th day followed by brassinolide under which 72% germination was achieved (table 1). Thus, the best option for breaking the dormancy is mechanical injury of the seeds. This has been proved by Mcintyre *et al.*, (1996). Though, most of the workers are of the opinion that growth hormones do not promote germination but contrary to this assumption 86% germination in *B. montanum* was achieved in the seeds treated with IAA.

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