Plant Archives Vol. 17 No. 1, 2017 pp. 282-284 *ISSN 0972-5210*

EFFECTIVENESS OF VARIOUS TREATMENTS IN OVERCOMING SEED DORMANCY IN WHITE *ABRUS PRECATORIUS* L.

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Abstract

The current study investigates the effectiveness of various methods to overcome the seed dormancy in white *Abrus precatorius*. Seeds were subjected to different treatments like mechanical scarification by rubbing with sand paper, chemical scarification using concentrated H_2SO_4, GA_3 (25,50,75 and 100ppm) and 0.1% and 0.3% KNO_3, hot water treatment (75 and 100ºC), soaking and refrigerated scarification. The results revealed the effectiveness of mechanical scarification (sand paper rubbing) in breaking the seed dormancy followed by 75 ppm GA_3. Not much effect on seed germination of white *Abrus* was noticed in treatments like water soaking, H_2SO_4, 0.1% KNO_3, 50ppm and 100 ppm GA_3 and hot water treatment.

Key words : *Abrus precatorius*, seed dormancy, mechanical scarification, GA_3, H_2SO_4, KNO_3.

Introduction

A dormant seed is one that is unable to germinate in a specified period of time under a combination of environmental factors that are normally suitable for the germination of non-dormant seed. Knowledge about the causes of seed dormancy and the strategies to overcome the dormancy is a prerequisite for the large scale cultivation of economically important plant species and the conservation of endangered plant species. Over the last three decades, a number of works have dealt with general aspects of the environmental control of germination and dormancy (Bewley and Black, 1982, 1994; Mayer and Poljakoff, 1989). Various methods have been used by seed scientists and technologists to break seed dormancy in plants.

The present study screens the effectiveness of various seed dormancy breaking methods to enhance early germination of white seeded variety of *Abrus precatorius*, a medicinal plant. In the field conditions, seeds of *A. precatorius* takes at least one year for the germination. This facts indicate the existence of seed dormancy in this plant and no literature is available describing the seed dormancy breaking methods to bring about early germination in white *Abrus precatorius.*

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Materials and Methods

Seeds of white *Abrus precatorius* were collected from the St. Mary's College Campus at Thrissur, Kerala, India. Germination studies were conducted in sterilized petri dishes lined with sterilized filter paper at room temperature. The table surface was also sterilized by 90% alcohol. The seeds moistened with distilled water were kept as control. The treatments used to break the seed dormancy were:

a) Mechanical scarification by rubbing with sand paper,

b) Chemical scarification by using concentrated H_2SO_4, GA_3 (25,50,75 and 100ppm) and 0.1% and 0.3% KNO_3.

c) Hot water treatment (75 and 100 ºC)

d) Soaking

e) Refrigerated scarfication

Recording of the results was done after every 24 hours. The following germination parameters were recorded for a period of 7 days.

a) Germination percentage (GP)

GP was calculated using the formula:

$$GP = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds}} \times 100$$

b) seedling length

c) Seedling vigour index (SVI)

SVI was calculated as:

SVI = Seedling length × germination percentage.

Results and Discussion

Germination started on 3rd day in mechanical scarification and soaking treatment. In mechanical scarification germination percentage was reached to 90% on 8th day of the treatment while, it was only 20% in water soaked seeds (table 1). No germination was noted in refrigerated scarification and 100ºC hot water treatment. All the treatments, except 100ppm GA_3, revealed higher seedluing length than control. Maximum radicle length was observed in seeds treated with 0.1% KNO_3 with an average length of 4.45 cm on 7th day of treatment which was 32% more than that of control. Seeds that undergone sand paper scarification displayed a seedling length of 2.9 cm with 16% increase over the control on the final day of the experiment. Seedling vigor index (SVI) was maximum in rubbed seeds (262) followed by 75ppm GA_3 (97) (table 2).

Effectiveness of different seed dormancy breaking mechanism in the red seed variety of *Abrus precatorius* was analyzed by Pallavi *et al.* (2014) and observed that damaging the seed coat by nicking enhanced germination from 32 to 84% followed by seeds soaked in gibberelic acid (100 ppm) for 24 hours. Similar results of enhancing seed germination in *A. precatorius* by various scarification methods were obtained by Pallab and Thushar (2014). The current investigation with the white seeds of *Abrus precatorius* revealed the effectiveness of mechanical scarification (sand paper rubbing) in breaking the seed dormancy where 35% of enhancement over control was observed in scarified seeds. This was followed by 75 ppm GA_3 which showed 15% enhancement in germination over control. Not much effect on seed germination was noticed in treatments like water soaking, H_2SO_4 treatment, 0.1% KNO_3, 50ppm and 100 ppm GA_3 and hot water treatment, which was contrary to those obtained by Pallavi *et al.* (2014) where the red *Abrus* responded positively to different seed dormancy breaking treatments yielding more germination percentage compared to control. External supply of growth hormones (GA_3, Kinetin, KNO_3) to seeds, help in the activation of enzyme responsible for the breaking down of reserved food materials and also counteract the inhibitors present in the seed there by facilitating the germination (Bright *et al.,* 2005; Eveneri, 1984). Increase in the SVI in KNO_3 and GA_3 (25ppm and 75 ppm) treatments indicates that seeds of white *Abrus* contain some inhibitors that also contribute to the seed dormancy of this plant.

The results of the current investigation reveal that the main causative agent of seed dormancy in white *Abrus* is the hard seed coat like in red Abrus. However, there exists some variations in the nature of seed dormancy in white and red *Abrus* as indicated by the differential response of these seed varieties against different dormancy breaking treatments. The most effective mechanism to break seed dormancy in white *Abrus* is found to be mechanical scarification followed by 75 ppm GA_3 treatment.

Table 1 : Effect of various seed dormancy breaking treatments on the germination percentage of white *Abrus precatorius.*

Treatment	Days of germination				
	3rd day	4th day	5th day	6th day	7th day
Control	0	0	10%	20%	20%
Rubbed seeds	10%	50%	80%	80%	90%
Soaked seeds	20%	20%	20%	20%	20%
H_2 So_4 treated	0	0	0	20%	20%
Seeds treated in 0.2% KNO_3	0	0	20%	30%	30%
Seeds treated in 0.1 % KNO_3	0	10%	10%	20%	20%
Seeds treated in 25 ppm GA_3	0	0	30%	30%	30%
Seeds treated in 50 ppm GA_3	0	0	0	10%	10%
Seeds treated in75 ppm GA_3	0	0	20%	50%	50%
Seeds treated in 100 ppm GA_3	0	0	10%	10%	10%
Seeds treated in 75^0 c boiled H_2O	10%	10%	10%	10%	10%
Seeds treated in 100^0 c boiled H_2O	0	0	0	0	0

Table 2 : Effect of various seed dormancy breaking methods on seedling length and SVI of white *Abrus precatorius*.

Treatment	Days of germination					Seedling Vigour Index (SVI)
	3rd day	4th day	5th day	6th day	7th day	
Control	**0**	**0**	**0.5±0.06**	**0.8±0.11**	**1.25±0.5**	**25**
Rubbed seeds	0.7±0.11	1.04±1.5	2.57±0.15	2.75±0.5	2.91±1	262
Soaked seeds	1.25±0.11	1.35±0.5	2.20±0.06	2.30±0.05	2.40±0.06	48
H_2 So_4 treated seeds	0	0	0	1.80±0.5	2.05±0.11	41
Seeds treated in 0.2% KNO_3	0	0	1.3±1,5	1.43±2.2	1.90±2	57
Seeds treated in 0.1 % KNO_3	0	1.7±1.5	3.6±0.5	3.8±0.15	4.45±1	89
Seeds treated in 25 ppm GA_3	0	0	1.46±2.2	1.66±0.06	1.83±0.11	54.9
Seeds treated in 50 ppm GA_3	0	0	0	1.5±0.5	1.7±2.2	17
Seeds treated in75 ppm GA_3	0	0	1.40±1	1.80±0.05	1.94±0.11	97
Seeds treated in 100 ppm GA_3	0	0	0.7±0.5	0.9±2.2	1.2±0.11	72
Seeds treated in 75^0 c boiled H_2O	2±0.5	2.5±0.06	3.2±1.8	3.7±1.6	3.97±2	39.5
Seeds treated in 100^0 c boiled H_2O	0	0	0	0	0	0

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