Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(5): 616-621
Received: 10-07-2019
Accepted: 12-08-2019

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Seed viability and dormancy breaking in selected plants in Fabaceae

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Abstract
This study was carried out to investigate to evaluate the seeds germination by conventional method and breaking the seed dormancy and to compare the viability and dormancy between the methods and the seeds sample were collected in wild species in Jogimatti forest of different places in the forest.

Keywords: Seed germination by conventional plant, seed dormancy, seed viability and different methods breaking of seed dormancy

Introduction
Seed is a key element in plant production that, it exercise a very great influence on the success and failure of both natural and artificial regeneration (Nwoboshi, 1982) in this case success depends largely on the quality and quantity of the seeds of desirable species available in the regeneration area.

Seeds a dispersal unit of the plant, plays an important role in the higher plant life cycle. Many seeds plants evolve some mechanism to rise successful generation by setting the timing of germination. Therfore, many mature seeds commited to enter a dormant state. Seeds dormancy, the term devoted regarding the inability of viable seed to germinate under the environmental condition favorable for germination.

Seeds structure plays a critical role in the dormancy establishment. In typical angiosperm seeds, the embryo are surrounded by two covering layers i.e. the endosperm and testa (seed coat). These components may contribute both in single or combination in the dominat state of the seed. Morphologically formed dormancy represented by seeds that have an immature embryo and need extended time to grow and germinate. Another type of dormancy that imposed by water- impermeable seed coat is known as physical dormancy. Endosperm breakdown followed by seed coat rupture is the two important events that intiate germination in several seeds.

Materials and Methods
A) Collection of seed sample: seed sample were collected in the month of January and February 2019. And the plants were identified by referring literature. Physical impurities were removed from the freshly fallen seeds while collection. During the study aboutb 2000-2500 seeds were collected in polythene bags separtley and then labelled to maintain identity and carried to the laboratory for the study.

B) Seed germination by conventional method: the seeds were allowed for the germination by conventational method to check the percentage of germination and dormancy effect on the selected seeds.

The three conventational method of germination were followed, they are
- Standard blotter method (SBM)
- Sand method
- Paper towel method

i) Standard blotter method
Materials Required: Blotter discs, petriplates, 400 seeds of *Tamarindus indica*, Delonix regia, and *Abrus precatorius*, distilled water, tray, foreceps etc.

Procedure: two blotters discs were taken and marked with data of experiment results respected data type of seeds etc then it is dipped into a tray containing distilled water. The dipped blotter sheets were allowed for 1-2 min, to remove the chemicals if present in paper and then sheets ate lifted with the help of forceps and pulled against the tray to remove the excess of water.

The moistened blotter discs are placed on the lower plate of petriplate and then the seeds of Delonix regia, Tamarandus indica were plated.100 seeds at the rate of 10 replicates were maintained while plating the seeds. Care must been taken to maintain the uniform, distance and then plates were allowed for 8 days. After incubation, the percentage of germination was calculated by using formulae.

$$\text{Percentage of germination} = \frac{\text{No. of seeds germinated}}{\text{Total no. of seeds plated}} \times 100$$

ii) Sand Method

Materials required: 150 Delonix regia, *Tamarindus indica* and *Abrus precatorius* seeds and tray, sand, water, forceps etc.

Procedure: Aplastic tray was taken and filled it with sand about 3/4 th of it. The sand washed thoroughly for 3-4 times in running tap water to remove the plant debries and other chemicals, suppose to be present in it. The tray was kept in slanted position to remove the excess water. furthur 50 seeds are slanted or sown in the tray in an equidistant manner.
The experiment setup are maintained for 8 days at laboratory condition and results observation were made and recorded the results.

$$\text{Percentage of germination} = \frac{\text{No. of seeds germinated}}{\text{Total no. of seeds sown}} \times 100$$

iii) Paper towel method

Materials required: 150 Delonix regia *Tamarindus indica* and *Abrus precatorius* seeds, germination paper, tray, water, rubberbands, foreceps, etc

Procedure: Germination paper of size 42x32cm was used during the study. Then in the corner of the paper the experiment date and results expected date all details are labelled. Then the sheet is dipped in the tray containing water for 2 min, excess of water was removed by holding the paper with the help of forceps. Then 50 seeds per sheet were placed in equidistant manner, then the sheet was rolled in such way that, the seeds should not touch each other. The end role was tied with the help of rubber band to avoid the failing of seeds.
The experiment set up was maintained for 8 days at laboratory condition and on 8th day it was observed for germination and percentage of germination was calculated by using the formula

$$\text{Percentage of germination} = \frac{\text{No of the seeds germinated}}{\text{Total no. of seeds sown}} \times 100$$

C) **Breaking of seed dormancy:** The available literature explains about the method of breaking of dormancy. To break the seeds dormancy the seeds were subjected to dormancy breaking treatments they are
   a) Soaking treatment
   b) Hot water treatment
   c) Scarification method

Results

Table 1: Seed germination by conventional method

Sl. No.	Seeds	Standard blotter method			Sand method			Paper towel method			Average germination percentage
		Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	
01.	*Delonix regia*	50	8	16	50	4	8	50	4	8	10.66
02.	*Tamarindus indica*	50	12	24	50	10	20	50	12	24	22.66
03.	*Abrus precatorius*	50	1	0.5	50	00	00	50	0	0	0.165

Table 2: Seed germination by soaking method

Sl. No.	Seeds	Standard blotter method			Sand method			Paper towel method			Average germination percentage
		Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	
01.	*Delonix regia*	50	22	44	50	25	50	50	20	40	44.66
02.	*Tamarindus indica*	50	14	28	50	20	40	50	8	16	28
03.	*Abrus precatorius*	50	4	8	50	1	2	50	3	6	5.33

Table 3: Seed germination by hot water treatment

Sl. No.	Seeds	Standard blotter method			Sand method			Paper towel method			Average germination percentage
		Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	
01.	*Delonix regia*	50	27	54	50	41	82	50	28	56	64
02.	*Tamarindus indica*	50	35	70	50	38	76	50	31	62	69.33
03.	*Abrus precatorius*	50	7	14	50	2	4	50	6	12	10

Table 4: Seed germination by scarification method

Sl. No.	Seeds	Standard blotter method			Sand method			Paper towel method			Average germination percentage
		Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	Total no of seeds	No of seeds germinated	Percentage of germination	
01.	*Delonix regia*	50	35	70	50	43	86	50	20	40	65.33
02.	*Tamarindus indica*	50	34	68	50	45	90	50	29	58	72
03.	*Abrus precatorius*	50	9	18	50	3	6	50	11	22	15.33

Table 5: Comparison of viability and dormancy between the methods studied

Sl. No.	Percentage of germination				
	Name of the seed	Conventional method	Treatments given		
			Soaking treatment	Hot water treatment	scarification
01.	*Delonix regia*	10.66%	44.66%	64%	65.33%
02.	*Tamarindus indica*	22.66%	28%	69.33%	72%
03.	*Abrus precatorius*	0.16%	5.33%	10%	15.33%

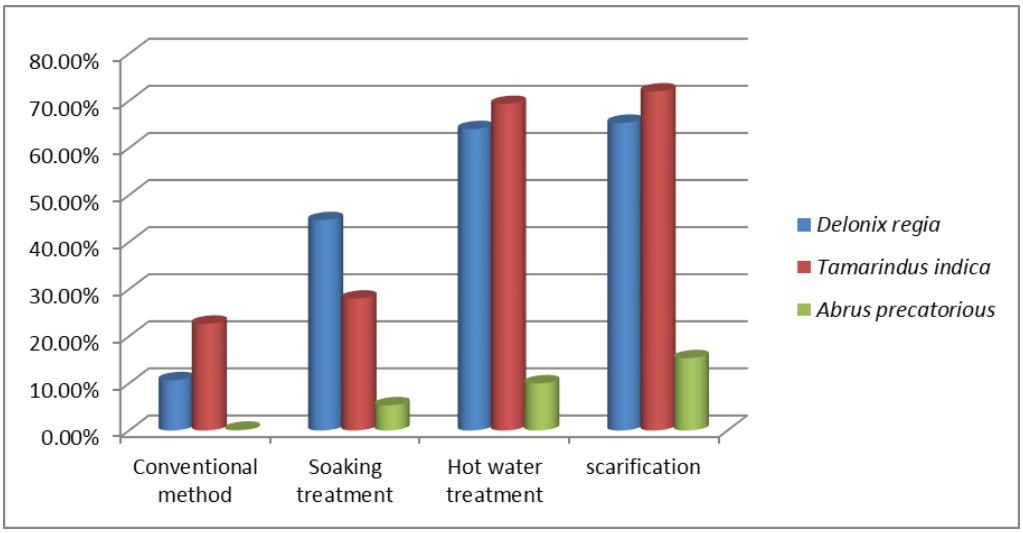

Fig 1: It shows the germination of seed by conventional method, where more in *Tamarindus indica* highest germination in standard blotter method and sand method and paper towel method more germination is *Tamarindus indica* and second highest *Delonix regia* than compare to *Abrus precatorius*

Table 6: Standard Blotter method

Sl. No.	Seed	Percentage of Germination			
		Normal viability	Soaking treatment	Hot water treatment	Scarification
01	*Delonix regia*	16%	44%	54%	70%
02	*Tamarindus indica*	24%	28%	70%	68%
03	*Abrus precatorius*	0.5%	8%	14%	18%

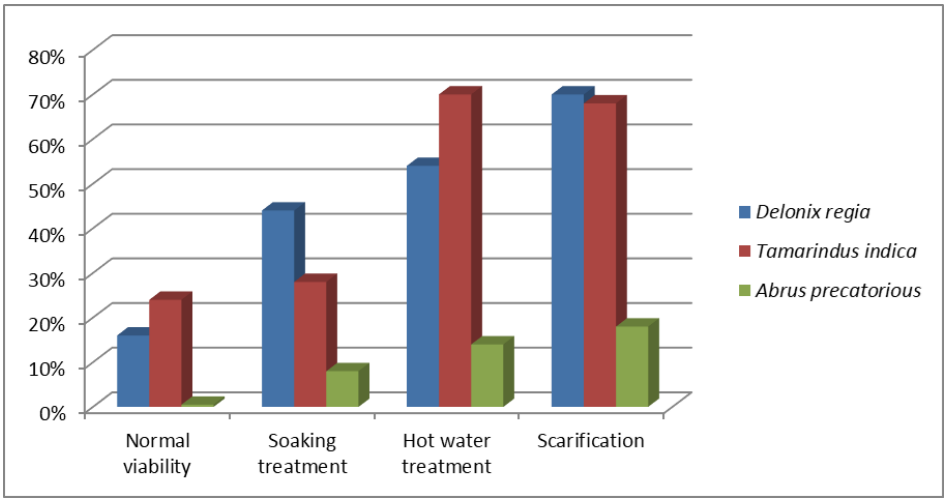

Fig 2: Seed viability is more *Tamarindus indica* is more than compare to *Delonix regia* and *Abrus precatorius*

Table 7: Sand method

Sl. No.	Seed	Percentage of germination			
		Normal viability	Soaking treatment	Hot water treatment	Scarification
01	*Delonix regia*	8%	50%	82%	86%
02	*Tamarindus indica*	20%	40%	76%	90%
03	*Abrus precatorius*	0%	2%	4%	6%

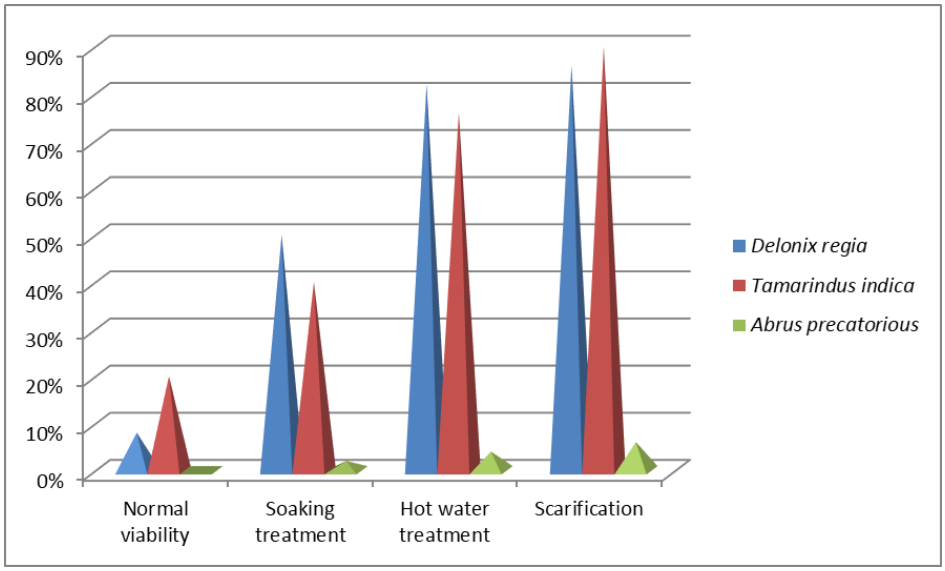

Fig 3: Normal viability and soaking treatment and hot water treatment and scarification is more in Tamarindus indica than compare to *Abrus precatorius* and *Delonix regia* in normal viability in all the method

Table 8: Paper towel method

Sl. No.	Seed	Percentage of germination			
		Normal viability	Soaking treatment	Hot water treatment	Scarification
01	*Delonix regia*	8%	40%	56%	40%
02	*Tamarindus indica*	24%	16%	62%	58%
03	*Abrus precatorius*	0%	6%	12%	22%

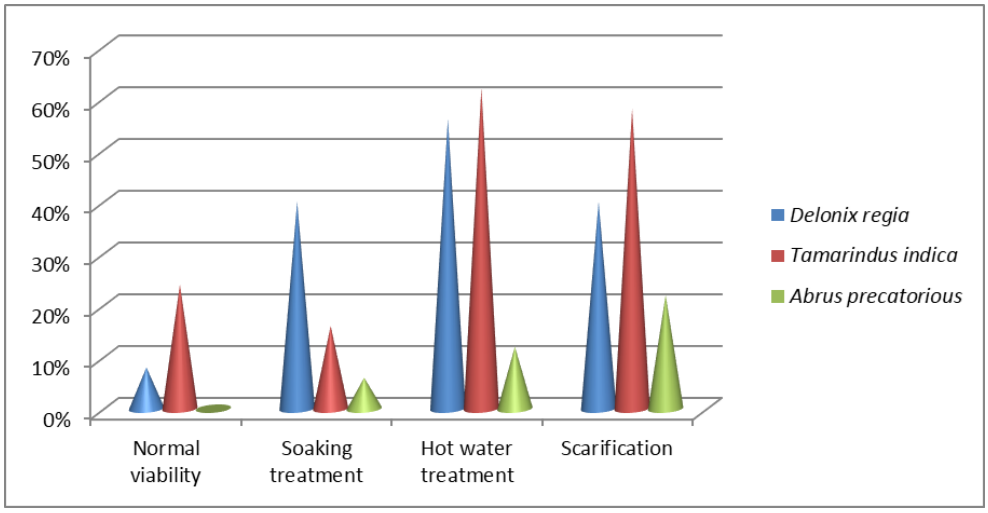

Fig 4: Shows all the method in fig description in all the method *Tamarindus indica* more viability and more germination than compare to *Delonix regia* and *Abrus precatorius* they show in graph

Results and Discussion

To study the viability of seeds, the seeds technologists have recognised many methods, they also studied many methods to study the dormancy of seeds. During our study of viability, Standard Blotter Method, Sand method and Paper towel method have been followed. The results obtained during the study, is discussed as follows.

The percentage of germination of *Delonix regia* in conventional method without any treatment showed 16% of germination in Standard Blotter Method, 8% in Sand method and 8% in Paper towel method. Where as in *Tamarindus indica*, it is observed that, 24% germination in Standard Blotter Method, 20% in Sand method and 24% in Paper towel method. In case of *Abrus precatorius* 0.5% germination was observed in Standard Blotter Method but there is no germination in other two methods. (Table-1)

Among all the three type of seeds, it is observed that, conventional method, especially Standard Blotter method showed better germination than other methods.

Freshly harvested seeds showed very poor germination before any seed treatments, whereas different dormancy breaking seed treatments recorded positive response on germination because of seed treatment germination percentage has increased and decrease in hard seed percent was observed. Germination has increased significantly after damaging the seed coat.

The dormancy treatments in *Delonix regia*, *Tamarindus indica*, *Abrus precatorius* have been discussed as follows.

In soaking treatment, *Delonix regia* showed 44% of germination in Standard Blotter Method, 50% in Sand method and 40% in paper towel method. *Tamarindus indica* showed 28% of germination in Standard Blotter method, 40% in sand method and 16% in paper towel method. In *Abrus precatorius*, it is observed that, 8% in standard Blotter method, 2% in Sand method and 6% in Paper towel method (Table-2, 6, 7& 8, Fig-2, 3 & 4).

In hot water treatment, *Delonix regia* showed 54% of germination in Standard Blotter Method, 82% in Sand method and 56% in paper towel method. *Tamarindus indica* showed 70% of germination in Standard Blotter Method, 76% in sand method and 62% in Paper towel method and in *Abrus precatorius* it is observed that, 14% of germination in Standard Blotter Method, 4% in Sand method and 12% in paper towel method (Table-3, 6, 7 & 8, Fig-2, 3 & 4).

In scarification, *Delonix regia* seeds showed 70% of germination in Standard Blotter Method, 86% in Sand method and 40% in Paper towel method. In *Tamarindus indica* it was recorded that 68% germination in Standard Blotter Method, 90% in sand method and 58% in paper towel method and *Abrus precatorius* showed 18% in Standard Blotter Method, 6% in sand method and 22% in Paper towel method respectively (Table-4, 6, 7&8, Fig-2, 3&4).

Overall, The *Delonix regia* seeds showed maximum germination (70%) in scarification method and minimum germination (44%) in soaking treatment, whereas *Tamarindus indica* showed maximum (70%) germination in hot water treatment, minimum (28%) in soaking treatment. In *Abrus precatorius*, it is observed that, maximum germination in scarification (18%) and minimum (8%) in soaking treatment in Standard Blotter Method (Table-6, Fig-2)

In sand method, *Delonix regia* seeds recorded maximum germination (86%) in scarification and minimum soaking method (50%). *Tamarindus indica* showed, maximum germination (90%) in scarification and minimum (40%) in soaking method and in *Abrus precatorius*, it is observed that, the maximum (6%) in scarification and minimum (2%) in soaking method (Table-7, Fig- 3)

In paper towel method, the *Delonix regia* seeds showed maximum germination (56%) in hot water treatment and minimum (40%) in both soaking and scarification methods. In *Tamarindus indica* it is observed that maximum germination (62%) in hot water treatment and minimum (16%) in soaking method and *Abrus precatorius* showed maximum (22%) in scarification method and minimum in (6%) soaking method (Table-8, Fig-4)

Summary

During the study of viability and dormancy, the following selected seeds such as, *Delonix regia*, *Tamarindus indica*, *Abrus precatorius*, were collected & they are dormant due to hard seeds coat which do not permit water and oxygen for the germination. So the attempt has been made to induce the germination in these seeds by some conventional methods.

The work was started in the month of January-2018. Initially based on the available literature, trees are identified and seeds were collected in polythene bags by hand picking by using forceps, collection was made nearly 4-5 times and approximately 2000-2500 seeds were collected for the work.

The collected seeds were stored under laboratory condition with proper labelling. For each method, 150 seeds were drawn from the bags.

The seeds are checked under normal method of germination that is without any treatment. Here three conventional methods have been followed. They are Standard Blotter Method, Sand method, Paper towel method and also followed some treatments like soaking, hot water and scarification to induce the germination.

The purpose to take up this work was to evaluate the percentage of germination and to break the dormancy and to study the effects of conventional method and treatment on dormancy of seeds. The seeds were subjected to germinate in normal methods, but it was observed that, low percentage of germination. This result may be due to the hard seeds coat and hence the seeds are subjected to some treatment and allowed to germinate.

The percentage of germination of *Delonix regia* in conventional method without any treatment showed 16% of germination in Standard Blotter Method, 8% in Sand method and 8% in Paper towel method. Whereas, it is observed that, 24% germination in Standard Blotter Method, 20% in Sand method and 24% in Paper Towel Method. In case of *Abrus precatorius*, 0.5% germination was observed in Standard Blotter Method but there is no germination in other two words.

In soaking treatment *Delonix regia* showed 44% of germination in Standard Blotter Method, 50% in sand Method and 49% in Paper Towel Method. *Tamarindus indica* showed 28% of germination in Standard Blottrer Method, 40% in Sand Method and 16% in Paper towel method. In *Abrus precatorius*, it is observed that, 8% in Standard Blotter Method, 2% in Sand Method and 65% in Paper Towel method.

Conclusion

Among all three methods of treatments scarification was more effective for germination of dormant seeds than the other two methods.

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