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Effects of Different Methods of Breaking Seed Dormancy on the Germination of Flamboyant Seed (*Delonix Regia*) in Bauchi State, Nigeria

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Abstract:
The experiments was conducted in 2014 dry season at the soil science laboratory and also in the nursery of the Bauchi state college of Agriculture Bauchi, to investigate the effect of different methods of breaking seed dormancy on the germination of flamboyant seed (Delonix Regia). The treatments consisted of hot water at 100^0c, 75^0c, 50^0c, sulphuric acid at 1:5, 1:10, 1:15 and abrasion using knife, sand paper, stone and control. The treatments were laid out in a completely randomize design (CRD) with three replications. Data were collected on germination in the laboratory, number of days to emergence/germination and number of healthy seedlings produced after sowing in the nursery. All data collected were subjected to analysis of variance and least significant difference was adopted in separating the significantly different treatment means. The results of the experiment revealed that, there is a significant ($P<0.01$) difference among the various methods used in breaking seed dormancy of flamboyant tree. The result obtained on the use of hot water revealed that, the use of 75^0c and 100^0c were found to promote germination of flamboyant seed both in the laboratory and in the nursery better than the other treatments. On the various concentration of sulphuric acid used, however, the lower concentration of 1:15 was found to promote germination of flamboyant seed up to 8.33%, while the other treatments were found to be lethal. In abrasion methods, on the other hand, the use of knife was found to be better followed by sandpaper and then stone. The control treatment on the other hand recorded the least germination percentage in all the methods used. Based on the result of this finding, the use of mechanical scarification should be adopted in breaking flamboyant seed dormancy by farmers in the study area.

Keywords: *Flamboyant, Seed, Dormancy, Acid, Scarification*

1. Introduction

Delonix regia is a deciduous tropical tree with form like leaves that is considered one of the most beautiful trees in the world. Although it is a fast growing tree, it can take up to 10 years to mature. Flamboyant or royal Poinciana as it is called, blooms in dense cluster and burst into scarlet orange blossoms (Rahman *et' al*, 2004). During the dry season, it losses all of its leaves and begins to sprout immediately. However in climate when cold is not much dryer than hot, it is ever green tree (Rahman *et' al*, 2004). The tree of flamboyant is often more than 40 feet high with wide spreading branches from a domed top, sometimes even reach the ground. There are two varieties known: involucrate (paradise Poinciana) and regia. It has very thick root that is able to lift pavement up (Das, 2002). The many branches, broad, spreading flat-crowed deciduous tree is well-known for its brilliant displays of red-bloom, literally covering the tree tops from May to July. There are nothing like a royal Poinciana (or better yet group of them) in full bloom. Recently, the department of chemistry, university of Benin Nigeria, Lancaster environment centre, Lancaster University. Declared that the suitability of two common and ubiquitously distributed and exotic ornamental plant species in Nigeria (*Delonix regia* and *Casuarina equisetifolia*) as bio monitors and as effective bio accumulators of atmospheric trace metals (cd, zn, cu) has been evaluated. The bark of the plants was able to bio accumulate the trace metals, especially led which originate from anthropogenic contribution in the city (Ehiabhi *et al*, 2009). Flamboyant tree can tolerate drought and salty conditions and it is widely grown in many parts of the world. Delonix regia is regarded as neutralized in many of the locations where it is grown and is seen by some as an invasive species in some part of the world, partly because of its dense shade and root system which prevent the growth of other species under it (Cowen, 1996).

The highest rate of deforestation of some species e.g. *Delonix regia* arouse considerable concerns as the tree (*Delonix regia*) is been destroyed at an alarming rate in recent years than its replacement. The depletion is due to the formidable pressure exerted by industrialization, urbanization and fuel wood as a result of rapid increase in population (Etal *et al.* 1996). The effect of such depletion reduced most of the benefits derived from the species and result in a severe economic implication. It is important to note that, despite the importance of this tree (*Delonix regia*) and the consequences of its deterioration, effort aimed at its conservation did not yield a positive result (Musa, 2010). This is largely due to lack of up to date technique of proper method of breaking seed dormancy and nursing the seedling in the nursery for afforestation programme. The need to find out a lasting solution to the best method or technique of breaking seed dormancy in *Delonix regia* is of great concern (Garcia *et al.* 2004). Therefore there is an urgent need to conduct a research to find out the best method of breaking seed dormancy in flamboyant seed (*Delonix regia*) as one of the most promising species in combating desertification, provision of fuel and timber in addition to environmental beautification. This study was carried out to evaluate different methods of breaking flamboyant seed dormancy, find out the most effective method for breaking seed dormancy in flamboyant seed and to determine the effects of the method used on germination of the seed.

2. Materials and Methods

The experiment was conducted at the soil science laboratory and also in the nursery of Bauchi state college of agriculture during the dry season of 2014 to study the effects of different methods of breaking dormancy in flamboyant seed. The materials used for the experiment are flamboyant seed and polythene bags both obtained from the college nursery, Petri dish, sulphuric acid (H_2SO_4) test tube, beaker, thermometer, knife and hand gloves were all obtained from the college laboratory. The treatments consisted of hot water at 100^0c, 75^0c, 50^0c, sulphuric acid 1:5, 1:10, 1:15 and abrasion using knife, sand paper, stone and control. The experiment was laid out in a completely randomized design (CRD) consisting of twelve treatments with three replications. Data were collected on germination in the laboratory, number of days to emergence and number of healthy seedlings produced after sowing in the nursery. The results obtained were analysed using analysis of variance and least significant difference was adopted in separating the significantly different treatment means.

3. Results and Discussion

3.1. Effect of Hot Water Treatment on Germination of Flamboyant Seed

Table 1 presented the result on the effect of hot water treatment on germination of flamboyant seed. The result revealed that, there exist a significant ($P<0.01$) difference between the treatments used. The result further shows that, flamboyant seeds treated with hot water at 100^0c and 75^0c had significantly ($P<0.01$) higher germination percentage than 50^0c in the laboratory, whereas control treatment recorded the least. In nursery on the other hand, there is significant ($P<0.01$) difference between the treatments on germination percentage. The higher germination was recorded on 100^0c, while 75^0c and 50^0c were found to be statistically ($P<0.01$) similar. Control on the other hand, recorded the least. The study on hot water treatment under which the temperature of 75^0c and 100^0c were found to be better than the other treatments used revealed the importance of hot water treatments in breaking flamboyant seed dormancy. The difference observed between the different temperatures used in this study could be as a result of the effect of heat in softening the seed coat. The result of this study is in agreement with the result of Malcom *et al.* (2003). However, the role of temperature in breaking dormancy to influence germination can be noticed due to the erratic nature of the germination which calls for the standardization of both the temperature of the water and length of cooling as suggested by (Owunubi, 2004) who stated that soaking seeds in water from 12-24 hours in rain water or stagnant renewed daily is effective for most species.

	Germination (%)	
Treatment	Laboratory	Nursery
	Temperature (^{0}c)	
Control	0.00	0.00
50^0c	66.70	73.02
75^0c	75.00	73.60
100^0c	75.00	76.20
LS	**	**
LSD	0.39	0.69

Table 1: Effects of hot water treatment on germination of flamboyant seed

*LS = Level of significance, LSD = Least significant difference, ** = significant at 0.01 probability level.*

3.2. Effect of Sulphuric Acid on Germination of Flamboyant Seed

The result as presented in table 2 revealed that, there is a significant ($P<0.01$) difference between the various concentrations of sulphuric acid in promoting germination of flamboyant seed. The result further depicts that, seeds treated with lower concentration of sulphuric acid (1:15) were found to be statistically ($P<0.01$) better and had a seed germinated six days after treatment, whereas seeds treated with higher concentration of sulphuric acid and control did not germinate throughout the study period in the laboratory. In the nursery however, data on number of days to seedlings germination after sowing was equally recorded, seed treated with lower

concentration of sulphuric acid (1:15) also germinated at 7 days after sowing in the nursery without germination recorded at higher concentration of 1:5, 1:10 and control. The study on the different concentration of sulphuric acid in which the concentration of 1:15 was proved to be better than the other concentrations indicated the effects of the acid in breaking flamboyant seed dormancy. The result observed in this finding is due to the effect of the sulphuric acid in softening seed coat. The result of this study is in agreement with the report of Schwechheimer *et al*. (2008) who reported that, the colorless concentrated sulphuric acid (H_2SO_4) when stirred with the seed using a stick changed to dark red and thick as a result of the removal of the seed coat and the container turned hot following the reaction. The result of this study also lend support from the study of Ibrahim and Otegbeye, (2004) who stated that, seeds require soaking in concentrated sulphuric acid for 20, 40 and 80 minutes respectively, in order to modify their seeds coats. Soaking seeds in concentrated sulphuric acid has also proved useful for *Albizia lebbeck*, *Cassia nodasa* and *Delonix regia* in Nigeria (Nwoboshi, 1982).

	Germination (%)	
Treatment	Laboratory	Nursery
Control	0.00	0.00
1:15	8.33	8.33
1:10	0.00	0.00
1:5	0.00	0.00
LS	**	**
LSD	0.39	0.69

Table 2: Effect of sulphuric acid on germination of flamboyant seed
*LS = Level of significance, LSD = Least significant difference, ** = significant at 0.01 probability level.*

3.3. Effect of Mechanical Scarification on Germination of Flamboyant Seed

Table 3 presented the results on the effect of mechanical scarification on germination of flamboyant seed. The result showed that, there is a significant ($P<0.01$) difference among the various abrasion methods used. The result further revealed that, the seeds abrased with knife and sandpaper were found to be significantly ($P<0.01$) better than those treated with stone as germination starts 2 days after treatment in the laboratory. In the nursery however, number of days to germination was significantly ($P<0.01$) different among the treatments. The seeds treated with knife were found to be statistically ($P<0.01$) better in terms of germination percentage followed with sand paper but all the treatments were better than the control which recorded the longest number of days without germination. The significant difference observed on abrasion method in which the use of knife, sandpaper and stone promoted the germination of flamboyant seed indicated the importance of the method in breaking seed dormancy. The result obtained as a result of mechanical scarification in this study could be due to the softening and breaking of the seed coat by the method. The result of this study is in agreement with the result of Owunubi (2005) who reported that, chipping the seed at one edge is sufficient to hasten its germination. A local modification in Nigeria is to use a concrete mixture of seed and coarse sand or sharp gravel of sizes very different from that of the seed to facilitate separation at the end (Nwoboshi, 1982).

	Germination (%)	
Treatment	Laboratory	Nursery
Control	0.00	0.00
Knife	83.33	93.65
Sand paper	83.33	88.89
Stone	75.00	77.78
LS	**	**
LSD	0.39	0.69

Table 3: Effect of mechanical scarification on germination of flamboyant seed
*LS = Level of significance, LSD = Least significant difference, ** = significant at 0.01 probability level.*

4. Conclusion/ Recommendation

Based on the results obtained in this study, it can be concluded that Abrasion method (mechanical scarification of flamboyant seed use of knife or sand paper) is effective than any other treatments used in this study. Precautionary measures should be taken in the course of acid and hot water treatments to avoid damaging the seeds. The use of knife and sand paper have proved to be more effective than sulphuric acid, temperature (Hot water) and control as shown in this study therefore it can be suggested that farmers in the study area should carefully try the use of knife and sand paper to break flamboyant seed dormancy. Further study is recommended on the use of different concentration of sulphuric acid to determine the concentration as best suited for breaking of dormancy in flamboyant seed.

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