

# EFFECT OF PRE-TREATMENT ON GERMINATION OF ANNONA RETICULATA SEEDS

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## ABSTRACT

Effect of pre-treatments on germination of *Annona reticulata* seeds was tested. Treatments used were T<sub>1</sub> (Treated with conc. H<sub>2</sub>SO<sub>4</sub>, 5 minutes), T<sub>2</sub> (Treated with conc. H<sub>2</sub>SO<sub>4</sub>, 10 minutes), T<sub>3</sub> (Soaked in hot water, 5 minutes), T<sub>4</sub> (Soaked in water, 24 hours) and T<sub>5</sub> (Soaked in water, 48 hours). It was found that treatments except T<sub>3</sub> showed faster and higher rates of germination when compared to control. T<sub>1</sub> was found to be the most effective treatment as the germination started at the 16<sup>th</sup> day of sowing. It took 30 days to start germination in control. Germination percentage was highest (83.33) in T<sub>1</sub> followed by T<sub>5</sub> (75). In control it was lowest (8.33). It was found that treating with conc. H<sub>2</sub>SO<sub>4</sub> for 5 minutes gives faster and uniform germination in annona.

**KEY WORDS**—bullock's heart, seed dormancy, seed treatments, viability

## INTRODUCTION

Annona is a genus of tropical fruit trees belonging to family Annonaceae. *Annona reticulata* L. (Bullock's heart or custard apple) is a native of West Indies but is cultivated throughout India and runs wild in many areas. The ripe fruit of custard apple is sweet and pleasant in flavour. The flesh may be scooped from the skin and eaten as it is or served with light cream and sugar, often added to milk shakes, custards or ice cream. The seeds, leaves and young fruits have insecticidal effect. As the tree needs no particular care after its establishment, and the fruits are rich in nutritional contents annona is attaining much more importance nowadays.

Seeds of many tree species germinate readily when subjected to favourable conditions of moisture and temperature. But for other species, mature seeds fail to germinate even under favourable conditions and this is termed as dormancy. Where dormancy is strong, some form of seed pre-treatment is essential in artificial regeneration in order to obtain a reasonably high germination rate in a short time. In *Annona reticulata* seed is the usual means of propagation but the germination rate ranges from low to medium (Prajapati et al., 2003). The seeds are very hard and thick. The endosperm is very large and ruminant and tiny embryo located near the hilum develops slowly in annona (Hayat, 1963). This can be classified under physical dormancy (Nikolaeva, 1977) and due to this, annona seeds take one to three months to germinate.

Pre-treatments are essential for breaking seed dormancy. The purpose of pre-treatment is to ensure both that seeds will germinate, and that germination is fast and uniform. In many species specific knowledge of seed dormancy is scarce. However, adoption of methods known to work for related species, or duplication or simulation of natural conditions believed to influence dormancy are often effective (Hartmann et al., 1997). Physical, mechanical as well as chemical scarification was

found to be increasing the rate and speed of seed germination in related species like *Annona muricata*, *A. squamosa* and *A. senegalensis* (Oumar et al., 2012)

## MATERIALS AND METHODS

The experiment was conducted at Sir Syed College, Kannur, India. The seeds of *Annona reticulata* used for the present study were locally collected, extracted from the fruits and dried in shade. The seeds were subjected to various kinds of treatments as shown in Table 1.

Table 1 Different pre-treatments carried out in the present study

Treatment No.	Pre-treatment
T <sub>1</sub>	Treating with conc. H <sub>2</sub> SO <sub>4</sub> for 5 minutes
T <sub>2</sub>	Treating with conc. H <sub>2</sub> SO <sub>4</sub> for 10 minutes
T <sub>3</sub>	Soaking in hot water for 5 minutes
T <sub>4</sub>	Soaking in water for 24 hours
T <sub>5</sub>	Soaking in water for 48 hours
T <sub>6</sub>	Control

**Water Treatment:** 20 seeds were soaked in hot water for 5 minutes, taken out and allowed to cool and sown. Other sets of 20 seeds were kept under normal water, taken out and sown after 24 hours and 48 hours of soaking.

**Chemical treatment:** Two sets of seeds were treated with conc. H<sub>2</sub>SO<sub>4</sub> for 5 minutes and 10 minutes, followed by one rinse with running tap water and 5 rinses with sterile distilled water.

Germination trials were conducted in plastic trays filled with river sand as the medium. The pre-treated seeds were sown at a depth of one cm below with a uniform spacing. Irrigation was provided regularly and uniformly twice a day. Daily germination counts were recorded and the seed germination parameters such as germination percentage, Peak value of germination (PV), Mean Daily Germination (MDG) and germination value (GV) were calculated. The germination value was calculated using the following formula (Czabator, 1962).

$$GV = \text{Final Mean Daily Germination (MDG)} \times \text{Peak Value of germination}$$

The mean daily germination is calculated as the cumulative per cent of full seed germination at the end of germination test, divided by the number of days from sowing to the end of the test. Peak value of germination is the maximum mean daily germination, recorded at any time during the period of test.

## RESULTS

Most of the pre-treatments enhanced germination of annona seeds. T<sub>1</sub> (Seed scarification using conc. H<sub>2</sub>SO<sub>4</sub> for 5 minutes) was found to be the most effective treatment for annona seeds as the germination started at the 16<sup>th</sup> day of sowing. It took 30 days to start germination in control treatment. In T<sub>3</sub>, no germination was obtained till the end of the experiment period. The number of days taken to initiate germination in each treatment is given in Fig. 1. It was found that T<sub>1</sub> gave better result than T<sub>2</sub> i.e. soaking seeds in conc. H<sub>2</sub>SO<sub>4</sub> for 5 minutes was more effective than soaking it for 10 minutes.

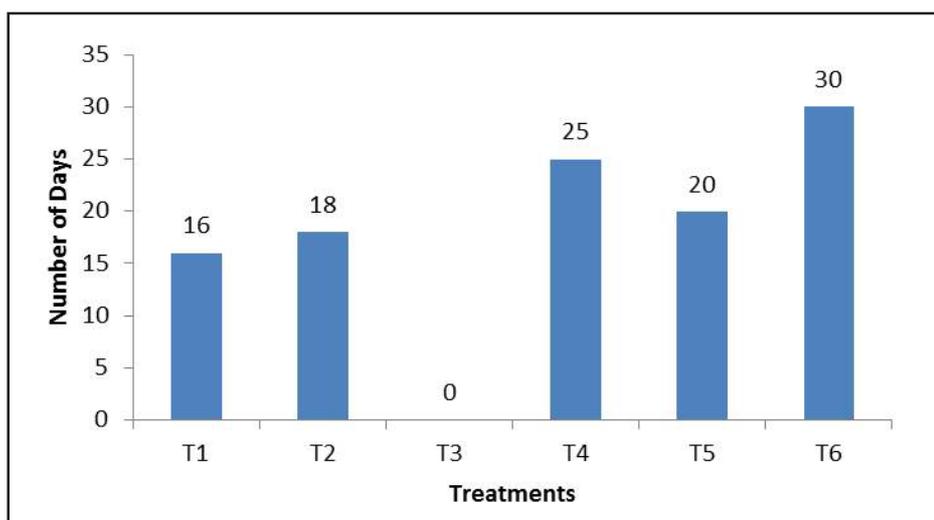


Fig.1. Number of days taken to start germination in seeds as affected by various pre-treatments

Germination was observed up to 35 days and the percentage of germination, peak value of germination, mean daily germination and germination value were calculated and the results are depicted in Table 2.

Table 2. Germination characteristics of annona seeds as affected by various pre-treatments

Pre-treatments	Germination characteristics of annona seeds			
	Germination percentage	Peak Value of germination	Mean of Daily germination	Germination value
T <sub>1</sub>	83.33	2.69	2.69	7.23
T <sub>2</sub>	66.67	2.15	2.56	5.51
T <sub>3</sub>	00.00	0.00	0.00	0.00
T <sub>4</sub>	47.80	2.01	2.01	4.04
T <sub>5</sub>	75.00	2.42	2.42	5.85
T <sub>6</sub>	08.33	0.27	0.28	0.07

Germination percentage was highest (83.33) in T<sub>1</sub> (Seed scarification using conc. H<sub>2</sub>SO<sub>4</sub> for 5 minutes) followed by T<sub>5</sub> (Soaking in water for 48 hours) (75). In control it was lowest (8.33) (Fig.2)

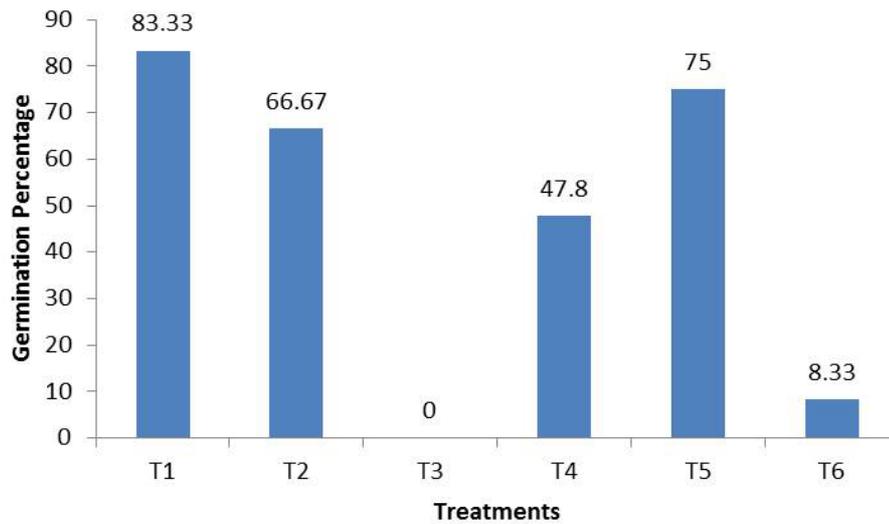


Fig. 2. Germination percentage of annona seeds as affected by various pre-treatments

Peak value of germination was the highest in  $T_1$  (Seed scarification using conc.  $H_2SO_4$  for 5 minutes) (2.69), followed by  $T_5$  (Soaking in water for 48 hours) (2.42) and it was the lowest in  $T_6$  (Control, 0.27), excluding the treatment  $T_3$  as there was no germination took place in it. The mean daily germination was also highest in  $T_1$  (2.69), followed by  $T_2$  (2.56), and  $T_5$  (2.42). The lowest value was observed in control (0.28).

## DISCUSSION

As hard seed coat is the main cause of dormancy in annona, all treatments resulted in softening of it except hot water treatment ( $T_3$ ). Prolonged exposure of seeds to boiling water might kill the embryos. A similar reduction in viability was reported in *Cassia siamea* (Kobmoo and Hellum, 1984), *Cassia fistula* (Babeley et al., 1988), *Paraserianthes falcataria* and *Albizia procera* (Sajeevukumar et al., 1995).

Duration of acid pre-treatment aims at reaching a balance in which the seed-coat is sufficiently ruptured to permit the seed to imbibe, but without the acid itself reaching the embryo. In *Cassia siamea*, 15-45 minutes of seed soaking in conc.  $H_2SO_4$  highly effective, resulted in about 98% germination, while germination was lower for both shorter and longer exposure (Kobmoo and Hellum, 1984). In *Albizia lebbbeck*, soaking in conc.  $H_2SO_4$  for 40 minutes was effective while both 20 minutes and 60 minutes soaking gave poorer germination (Brahman, 1996).

The concept of germination value aims to combine in a single figure an expression of total germination at the end of the test period with an expression of germination energy or speed of germination (Czabator, 1962). Germination value was the highest in  $T_1$  (7.23) i.e. the seeds treated with concentrated  $H_2SO_4$  for 5 minutes and it was the lowest in Control (0.07). All except hot water treatment increased the germination rate in *Annona reticulata*.

## CONCLUSION

The present investigations on efficacy of seed pre-treatments on germination of *Annona reticulata* L. reveal that all treatments, except soaking in hot water increased speed of germination. Dipping in concentrated H<sub>2</sub>SO<sub>4</sub> for 5 minutes showed fastest germination. The results of the study indicate that the pre-treatments can be applied effectively in annona seeds to obtain uniform and early germination.

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