

# Assessment of Pre-sowing Treatments on Germination and Early Growth of Tamarind (*Tamarindus indica* L.)

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## Abstract

Germination of seeds is often very difficult for many useful species principally because of dormancy. In order to achieve the aim of any regeneration programme, seed collection and germination must be taken into consideration. In view of this, germination and early growth assessment of *Tamarindus indica* L. were conducted to determine the suitable medium for germination and early growth. The viable seeds of the study species were treated with four concentrations of cow milk and four concentrations of coconut milk (1 molar, 2 molar, 3 molar and 4 molar) and five treatments at a time (14 hours) which constituted main and sub-plot treatments, with four replications. After treatment, seeds were washed with distilled water, air-dried for 30 minutes and treated with fungicides (vinclozolin). Treated seeds were sown in 4cm depth of sterilized sand and 80ml of water per seed was applied regularly at two days interval. The data collected on the effect fresh cow milk and coconut milk on seed germination and mean germination time was subjected to two-way analysis of variance (ANOVA). The percentage germination value of seeds treated in all concentrations of coconut milk, for all treatments ranged from 65% to 100% while seeds soaked in all concentrations of fresh cow milk for all times of treatments ranged from 70% to 100%. Seeds soaked in all concentrations of coconut milk for all treatment time were statistically significant compared to control. However, growing *T. indica* with coconut milk concentration in the mixture of sand and poultry droppings after 14 hours pre-treatment was recommended.

**Keywords:** *Tamarindus indica* L., coconut milk, cow milk, germination.

## INTRODUCTION

*Tamarindus indica* is indigenous to tropical Africa, particularly in Nigeria (Aida *et al.*, 2015). It belongs to the dicotyledonous family leguminosae, sub family Caesalpiniaceae which is the third largest family of flowering plants with a total of 727 genera and 19,327 species (Lewis *et al.*, 2015). *Tamarindus indica* fruit pulp is used for the preparation of beverages in different parts of the world, including the Northern parts of Nigeria and other West African countries (Atawodi *et al.*, 2014). *Tamarindus indica* fruit contains high levels of carbohydrate, which provides energy and has good content of protein with many essential amino acids that help to build strong and efficient muscles (Atawodi *et al.*, 2014). It is also rich in the minerals: potassium, phosphorus, calcium, magnesium and can provide small amounts of iron as well as vitamin A (Samina *et al.*, 2018).

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Inadequacy of simple, cheap, fast, natural, accessible and adoptable modern physiological methods such as the use of fresh cow milk and coconut milk to break dormancy of the *T. indica* reduces the domestication potential of the species (Abubakar *et al.*, 2015). Most of the methods of pre-sowing treatment such as physical, chemical and mechanical scarification only degrade the seed coat for germination (Aliero, 2014; Abubakar and Muhammad, 2013); without, always, rapidly and uniformly influencing the physiology of the seeds (Dewir *et al.*, 2011) and seedlings (Gehlot and Kasera, 2012) as well as not overcoming physiological dormancy of seeds (Habib *et al.*, 2015).

In Nigeria, particularly in northern parts inhabited by the Hausa -Fulani tribes where it is known as *tsamiya*, the pulp is used as a sweetener in sorghum and millet porridge. The unique sweet/sour flavour of the pulp makes it popular in domestic cooking and flavourings (Kokwaro (2016), reported that leaves and bark of *Tamarindus indica* have medicinal properties.

Seed germination of tree species is important for development of plant growth to achieve the aim of regeneration programme. The role of *Tamarindus indica* on environmental protection cannot be over emphasized. The tree clearly shows its ability to provide protection from harsh weather as well as shade for humans and livestock, hence the need for conservation and management strategy. The purpose of the research is to examine the effect of tamarind (*Tamarindus indica*) to pre-germination seed treatments and growth performance under normal environmental conditions.

## **MATERIALS AND METHOD**

### **Study Area**

The research work was carried out at the Biological Science Laboratory, Department of Biology, Faculty of Science, Federal University Dutse. Dutse lies on latitude 11°42'04"N and longitude 9°20'31"E with an elevation of 439m, dry season commences from October to May, and wet season, which is between June to September.

### **Research Design**

To investigate the effect of fresh cow milk and fresh coconut milk on the germination of the *T. indica* seeds, a split-plot experimental design with four replications was adopted for each treatment. Four concentrations of fresh cow milk and fresh coconut milk (1 molar, 2 molar, 3 molar and 4 molar) and five treatments at a time (14 hours) constituted main and sub-plot treatments, respectively. One hundred (100) *T. indica* seeds were extracted from the fruits. Twelve (12) seeds were soaked in four concentrations of fresh cow milk and four concentrations of fresh coconut milk (1 molar, 2 molar, 3 molar and 4 molar) for 14 hours. The concentration of fresh cow milk and fresh coconut milk were conducted in the laboratory.

### **Seed preparation and Seed treatment**

After treatment, the seeds were washed with distilled water and air dried for 30 minutes and treated with fungicides (vinclozolin 50mg/kg) to prevent seed from fungi contamination which can negatively affect germination. Treated seeds were sown in 4 cm depth of sterilized sand and 80 ml of water per seed was applied regularly at two days interval. Seeds that were not soaked in fresh cow milk and fresh coconut milk serve as control. A seed was considered germinated when the radicle is able to break; open the seed coat at the sight of plumule emergence.

The germination percentage and mean germination time were calculated using the following

formula.

$$\text{Germination (\%)} = x \times 100$$

### **Viability Test**

Seeds of *T. indica* were soaked into a 400 ml beaker containing cow milk and coconut milk to observe and identify the viable seeds for few minutes. Floatation method was adopted, as it is the fastest way of testing seeds viability, which is based on the observation that empty or nonviable seeds float while viable seeds sink or settle down to the bottom of the container.

### **Germination Test**

#### **Seed Sowing**

The seeds of *T. indica* were pre-treated with concentrations of cow milk and coconut milk for 14 hours before direct sowing into the polythene bags for early growth assessment. With mixture of sand and cow dung for cow milk concentration and the mixture of sand and poultry droppings for coconut milk concentration, the seeds were planted at a depth of four times its diameter. However, in this study, the sowing depth was 4 cm. Watering was carried out once in a day (early morning) and twice in a day after complete germination (i.e., early morning and late evening).

#### **Early Growth**

Generally, early growth assessment is of paramount importance in the choice of species to plant in any plantation establishment. Because if the choice is not properly conducted, experience has shown that no matter how carefully the crop is subsequently tended, the final result will be poor and mostly unprofitable, therefore in any plantation programme attempt should always be made to plant the right species in the right place (Abubakar *et al.*, 2015).

#### **Data Analysis**

The data collected on the effect fresh cow milk and coconut milk on seed germination and mean germination time was subjected to two-way analysis of variance (ANOVA). Separation of significant means was carried out using Least Significant Difference (LSD).

## **RESULTS AND DISCUSSION**

### **RESULTS**

**Table 1:** Effect of concentrations of fresh cow milk on the germination of *T. indica* Seeds

The results of main effect of different concentrations of cow milk on the germination of *T. indica* seeds presented in this table 3 shows that, there was no significant germination percentage recorded among seeds soaked in different concentrations of cow milk.

Concentrations of fresh cow milk (M)	Seed germination (%)	MGT (days)
1	91.50	18.70
2	92.00	18.60
3	93.50	18.88
4	92.50	18.88

**Table 2:** Effect of treatment times of fresh cow milk on the germination of *T. indica* seeds

The results of main effect of treatment times on the germination of seeds soaked in fresh cow milk are presented in Table 2. The percentage germination value was lowest (72.50%) for control treatment and highest (98.75%) for seeds soaked in fresh cow milk for 14 hours (Table 2). Significant percentage germination was recorded for the seeds soaked for all treatment times compared to control. It can be deduced that variation among treatment time did not influence germination percentage of *T. indica* seeds. Increase in treatment time did not significantly increase the germination percentages of seeds. This result is contrary to the documentation of Adelani *et al.* (2016) who reported that germination percentage value of *Balanites aegyptiaca* seeds increased with increasing hydro-priming hours. Interactive effect of concentrations and treatment times of fresh cow milk on the germination of *T. indica* seeds a significant germination percentage was recorded for seeds treated in fresh cow milk for treatment times compared to control. This is an indication that component of fresh cow milk as hormone influenced the seed germination percentage for treatment times.

Treatment times of fresh Cow milk (%)	Seed germination (%)	MGT (days)
0	72.50	13.63
1	95.63	20.00
2	96.88	20.00
3	98.13	20.00
4	98.75	20.00

**Table 3:** Effect of varying concentrations of fresh coconut milk on the germination of *T. indica* seeds

Table 3 shows the results of main effect of different concentrations of coconut milk on the germination of *T. indica* seeds presented in this table shows that, there was no significant germination percentage recorded among seeds soaked in different concentrations of coconut milk.

Concentrations of fresh Coconut milk (%)	Seed germination (%)	MGT (days)
1	91.00	17.70
2	91.50	17.50
3	91.50	17.30
4	91.50	17.20

**Table 4:** Effect of treatment times of fresh coconut milk on the germination of *T. indica* seeds

The results of main effect of treatment times on the germination of seeds soaked in fresh coconut milk are presented in Table 4. The percentage germination value was lowest (66.88%) for control treatment and highest (98.13%) for seeds soaked in fresh coconut milk for 8 hours (Table 4). Significant percentage germination was recorded for the seeds soaked for all treatment times compared to control. It can be deduced that variation among treatment time did not influence germination percentage of *T. indica* seeds.

Treatment times of fresh Coconut milk (%)	Seed germination (%)	MGT (days)
0	66.88	9.63
1	95.00	19.75
2	98.13	19.50
3	98.13	19.00
4	97.50	19.25

## **DISCUSSION**

The percentage germination values of seeds treated in all concentrations of coconut milk, for all treatment times ranged from 65% to 100%. Seeds soaked in all concentrations of coconut milk for all treatment time were statistically significant compared to the control. This is an indication that component of coconut milk as hormone. Similar findings have been reported by Adelani and Maisamari, 2016, influenced the seed germination percentage. There is evidence that different natural growth regulators improve germination of seeds and seedling vigor of many crops (Renugadevi and Vijayageetha, 2009).

This is in consonance with reports of Mngomba *et al.*, (2007) who stated that seeds or fruits contain plant hormones, which can either promote or inhibit seed germination. The hormonal components of seeds sometimes enhance seed germination of the same or different plants species (Bello *et al.*, 2015). The efficacy of hormones in promoting seed germination has been reported by Bello *et al.* (2015) (*Acacia senegalensis*), Agboola (1991) (*Ceibapentandra* and *Terminalia superba*), Idu *et al.* (2007) (*Huracrepitans*). Most works in plant hormones have clearly indicated that dormancy and germination are under hormonal control (Idu *et al.*, 2017). It has long been ascertained that plant hormones including auxins, gibberellins, cytokinin and ethylene etc., are involved in controlling developmental events such as cell division, cell elongation and protein synthesis (Tiwari *et al.*, 2011) which led to seed germination. A significant germination percentage was recorded for seeds soaked for treatment times compared to control. Germination percentage value of 100% was recorded for seeds soaked in 50% concentration of coconut milk for 14hours. Appropriate time duration for pre-sowing that influences germination percentage varied with seed species. Similarly, Aduradola and Shinkafi (2003) reported enhanced seed germination with increasing treatment time for *Tamarindus indica*. Similarly, treatment of *Adansonia digitata* seeds in 98% acid concentration for 1 hour had significant effect on germination of the seeds (Falemara *et al.*, 2013).

The least value of 9 days was recorded for mean germination time of control of 50% concentration of coconut milk (Table 4). Seeds that were not pre-treated (control) germinated fast. Pre-sowing treatment did not speed the germination of *T. indica* seeds. Increasing period of pre-sowing decreased speed at which seed germinated in this study. This finding is in consonance with the documentation of Afrasyab and Reza (2017) that reported a reduction in seed vigour index, germination rate and increased mean germination time by increasing immersion time in H<sub>2</sub>SO<sub>4</sub>.

## **CONCLUSION**

Based on the findings recorded in this study, it may be concluded that concentrations of coconut milk treatment gave the highest germination percentage, highest seedlings height and leaf number, which can be attributed to its ability to soften seed coat, thereby rendering it permeable for water and nutrients, thus hastening germination, the mixture of sand and poultry droppings was the best in terms of seedlings vigour which can be attributed to easy movement of water and nutrients as well as absorption by the root system. Considering the cost and availability of the inputs, where coconut milk is readily available everywhere, coconut milk pre-treatment is recommended.

## **RECOMMENDATIONS**

The present study makes the following recommendations:

Sand and poultry droppings mixture is the most readily available and effective input, therefore recommended as potting mixture for propagating *T. indica* in the nursery.

Government should encourage the propagation of *T. indica* in order to access the growth and germination rate in cow milk and coconut milk media because most people are unaware of its significance.

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