

## Induce Seed Germination of Veralu (*Elaeocarpus serratus* L.)

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### Abstract

Veralu (*Elaeocarpus serratus* L.: Elaeocarpaceae) is an underutilized fruit tree which is indigenous to Sri Lanka. The fruits are high in starch and sugar and have low amounts of protein and iron. It may help treat diarrhoea due to its constipating effect. Due to the hard seed coat germination potential of this cultivar is very low and it takes more than 12 months in natural conditions. Therefore a study was undertaken to explore possibilities of improving the seed germination through mechanical, physical and chemical treatments and to develop a cost effective and rapid seed germination method. Complete Randomized Design (CRD) with four replicates and 10 seeds for a replicate was used for the study. Seeds of Veralu were treated with 29 different treatments and data were analyzed using SAS program (9.1.3). Veralu seeds when treated with 50% HNO<sub>3</sub> for 15 minutes recorded the highest seed germination (6 seedlings out of 40 seeds) followed by 75% HNO<sub>3</sub> for 15min (1.9 seedlings/40 seeds) and 25% HNO<sub>3</sub> for 15min (1 seedling/40 seeds) compared to untreated control (0%) and other treatments during eight months. The results obtained in this study will be useful for plant breeders and farmers who cultivate underutilized fruit species commercially as a fruit/vegetable crop or an ornamental crop.

*Keywords: Veralu (Elaeocarpus serratus L.), Seed, Germination*

### INTRODUCTION

Veralu (*Elaeocarpus serratus* L.: Elaeocarpaceae) is an underutilized, ornamental fruit tree which is indigenous to Sri Lanka producing smooth, ovoid green fruits. It is a medium sized tree which provides nice appearance for home gardens and as a landscaping tree. Recommended varieties are local (round and oval fruits). It is a very nutritious fruit with a high content of starch, sugar, vitamin C with other medicinal properties (Department of Agriculture, 1997). It may help treating fungal infections, dandruff, abscesses, joint swellings, eczemas and diarrhea due to its constipating effect (Department of Agriculture, 1997). Leaves, fruits and roots are the plant parts used in different productions. It is recommended to use mixture of 10 kg compost and 100 g of fruit fertilizer when cultivating to gain optimum yield (Edirisinghe *et al.*, 2010). Veralu can be propagated by seeds and cuttings. The traditional and natural method of propagation is by seeds. Seed germination continues for a period exceeding one year and complete germination takes even two years. The rate of germination is quite low (Basso, 1962). The extent of seed germination depends on the cultivar, stage of seed maturity, storage time and morphological factors including the presence of a very hard seed coat (Lalatta, 1959; Singh and Sharma, 1982., Lagarda *et al.*, 1983) while working on the seed germination of intact and excised seeds, found that seed-coat imposed a mechanical barrier to seed germination and they could not find any sign of seed dormancy inhibiting seed germination.

Voyiatzis and Porlingis (1987) and Canas *et al.* (1987) reported that germination frequency was higher in embryos of fruits collected at 4-6 months after full bloom. The percentage of germination appeared to be directly related to the total seed carbohydrates content, whereas the sucrose content was inversely related to the rate of germination. The long duration (more than 12 months) taken for seed germination is considered as one of the major constrains in the propagation of this species (Department of Export Agriculture 1995). With increasing consumer demand for

quality planting material of this specie, it has become necessary to conduct research to identify low cost and easy to follow methods to increase the germination potential of seeds. The present research was executed to find out the influence of different seed treatments and identify cost effective technique to enhance the germination potential of seeds of Veralu (*Elaeocarpus serratus*). The results obtained in this study will be important for plant breeders and farmers who cultivate underutilized crops with a hard seed coat, commercially or as an ornamental plant

## MATERIALS AND METHODS

Experiment was carried out faculty of Agriculture, University of Ruhuna, Sri Lanka. Fully ripened fresh fruits of Veralu (round) from one mother plant were collected. Then pericarps of seeds were removed and seeds were washed thoroughly until removed mucilage around the seeds. Bulk seed lot was subjected to selection of obtaining uniform seeds which were in uniform size, absence of abnormalities and pest attacks. Establishment of aseptic cultures: Seeds were surface-sterilized by washing tap water, soapy water, immersing in 70% ethanol for 3 minutes, three times from distilled water and soaking in a 20% Clorox for 20 minutes, respectively. Sterilized seeds were then rinsed three times in sterilized distilled water and inoculated on a medium comprised of half-strength MS (Murashige and Skoog, 1962) salts, 3% sucrose without hormones and the medium was solidified with 0.5% agar prior to autoclaving. The seeds were cultured under light for 10 days (Dahanayake *et al.*, 2010). Seeds of Veralu were subjected to 29 different seed treatments mechanical, physical and chemical. Treated seeds were thoroughly washed three times using distilled water and planted in trays. Treatments were replicated four times and each replicate included 10 seeds. Nursery media was Cow dung 1: Sand 1: Compost 1.

**Data collection and analysis:** Number of germinated seeds in each treatment was recorded separately in monthly interval. After recoding germination percentage was calculated. Analysis of Variance was done at the 0.05 significant levels by using SAS package (9.1.3) and mean separation was done by using Duncan's Multiple Range test (DMRT).

## RESULTS AND DISCUSSION

Veralu (*Elaeocarpus serratus* L.) has a problem in seed germination and the aim was to establish an efficient and effective seed germination method. There is a significant difference in germination of Veralu seeds under different seed treatments at ( $P < 0.05$ ) level. Means followed by the same lower case letters in each bar are not significantly different at 5% level in Duncan's Multiple Range Test. According to the results 50%  $\text{HNO}_3$  for 15 minutes was the best treatment for obtaining high number of germinated seeds of and it showed 6 seedlings out of 40 seeds (15%) within a short period of time (8 months) (Table 2 and Figure 1). The second best treatment was 75%  $\text{HNO}_3$  for 15 minutes but it produced 1.9 seedlings out of 40 seeds (4.7%). Third best treatment was 25%  $\text{HNO}_3$  for 15 minutes but it produced 1 seedling out of 40 seeds (2.5%). It is better to mention the % germination in control.

Mechanical treatments are the ideal for breaking seed coat dormancy of *Elettaria cardamomum* (Copeland and McDonald, 1995) but according to results obtained from these research chemical treatments ( $\text{HNO}_3$ ) is the best for breaking seed coat dormancy. For these experiment mechanical methods rubbed with coarse sand and sand papers, as well as some physical methods like seeds were soaked in water and hot water treatment are not given any significant effect on breaking seed coat dormancy.

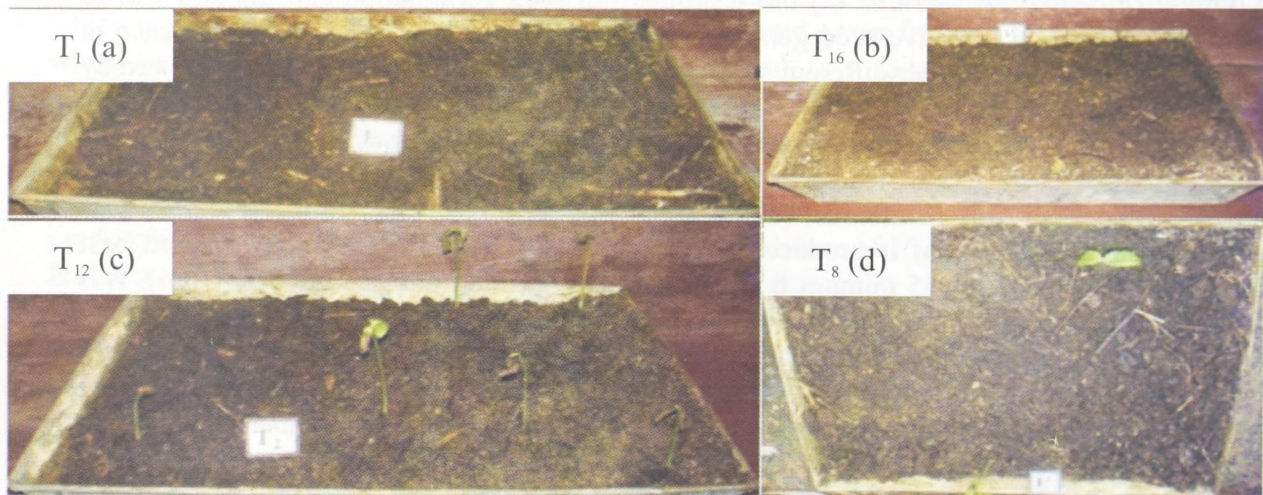
According to results mechanical methods, physical methods and chemical methods such as using  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$  and Alcohol did not show any seed germination during 12 months. This happened due to mechanical methods not properly damaged the hard seed coat or caused damaged to the embryo and reduced seed germination. Some chemical treatments such as  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$  not showed even one seed germinated it may due to chemicals caused death of embryos. According to this results the most treatments were not succeed.

Veralu (*Elaeocarpus serratus* L.) showed the highest number of seed germination (6 seedlings from 40 seeds- 15%) within a short period of time (8 months in the seed treatment 50% HNO<sub>3</sub> for 15 minutes. A chemical treatment (HNO<sub>3</sub>) was the best and cost effective to obtain high number of germinated seeds.

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## Figures



**Figure 1:** Germination of Veralu seeds under different seed treatments after eight months. (a). Control, (b). 25% HNO<sub>3</sub> 15 minutes, (c). 50% HNO<sub>3</sub> 15 minutes, (d). 75% HNO<sub>3</sub> 15 minutes

**Tables****Table 1: Seed treatments**

	<b>Treatments</b>	
	Control	T1
<b>Mechanical</b>	Rubbed with coarse sand	T2
	Rubbed with two sand papers	T3
<b>Physical</b>	Water soak 12hrs	T4
	Hot water 50 <sup>0</sup> C for 30 min	T5
<b>Chemical</b>	75% HNO <sub>3</sub> (5, 10, 15, 20 min)	T6, T7, T8, T9
	50% HNO <sub>3</sub> (5, 10, 15, 20 min)	T10, T11, T12, T13
	25% HNO <sub>3</sub> (5, 10, 15, 20 min)	T14, T15, T16, T17
	50% HCl (5, 10 min)	T18, T19
	25% HCl (5, 10 min)	T20, T21
	25% H <sub>2</sub> SO <sub>4</sub> (5, 10 min)	T22, T23
	50% H <sub>2</sub> SO <sub>4</sub> (5, 10 min)	T24, T25
	80% Alcohol (15, 30 min)	T26, T27
	50% Alcohol (15, 30 min)	T28, T29

**Table 2: Germination of Veralu seeds under different seed treatments within 12 months.**

<b>Treatment HNO<sub>3</sub>%</b>	<b>Number of seedlings</b>			
	<b>5 min</b>	<b>10 min</b>	<b>15 min</b>	<b>20 min</b>
<b>0</b>	0.0 b	0.0 c	0.0 d	0.0 b
<b>25</b>	0.2 b	0.8 c	1.0 c	0.1 b
<b>50</b>	1.2 a	2.5 a	<b>6.0 a</b>	1.0 a
<b>75</b>	0.9 a	1.1 b	1.9 b	0.2 b