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Impact of Different Pre-treatments on Seed Germination of *Gladitsia Triancanthos*

Research Project
Submitted to the department of (Forestry) in partial fulfillment of the requirements for the degree of BSc. in (Agriculture)

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APPROVAL SHEET

This undergraduate thesis entitled (**Impact of Different Pre-treatments on Seed Germination of *Gladitsia Triancanthos***) prepared and submitted to the department of Forestry by (**talar dilzar omar**) in partial fulfillment of the requirement for the degree of Bachelor of Science in Agricultural Engineering Sciences, is recommended for acceptance and approval for evaluation.

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Section 1: Introduction

Honey locust is a leguminous tree from the *Cesalpiniaceae* family, originating from south-eastern part of North America (Little 1971). It is considered one of the most successful woody leguminous invaders in different parts of the world (Richardson and Rejmánek 2011).

Gleditsia triacanthos L. is a deciduous tree with heights that can reach even 45 m in its origin country. The stem is straight enough, provided with large thorns upon 10-15 cm. The fruits of honey locust are flattened pods, often twisted, of 30-40 cm length, indehiscent. Honey locust has also become highly valued as an agro-forestry species in other parts of the world (Asl *et al.*, 2011). The small flat, brownish seeds, 8 to 12 mm in length, are embedded in a sweet pulp, the feature that attracts livestock and wildlife to the fruits (Holonec *et al.*, 2018).

From ecological point of view, this species is tolerant to high temperatures (Godoy *et al.*, 2011), resistant to drought and to the presence of salts in soil (Ertekin and Kirdar, 2010), loving the light, it presents a moderate to rapid growth speed (Burner *et al*., 2005). This species is a legume trees which is drought resistant, light lover, thorny and show moderate to fast growth speed (basbag *et al.*, 2010).

Honey locust seeds mature in autumn (September or October). They have the typical hard seed coats of legumes, which are thin but not impermeable to water. Impermeability of the seed coat to water is frequently a cause of dormancy. Thus, dormant and non-dormant seeds behave differently with regard to their patterns of water uptake (Ertekin and Kirdar 2010). This problem can be overcome by application of one of the several pre-treatments available (kumar *et al.*, 2020). The seeds are close to the same size and contain a thin, flat embryo surrounded by a layer of horny endosperm. The hard seed coats of honey-locust must be treated to make them permeable before germination can occur (Asl *et al.*, 2011). Physical dormancy is imposed upon the seed from factors outside the embryo including the seed coat and/or parts of the fruit. This type of dormancy is commonly referred to as physical dormancy or hard seeds (Hartmann *et al*., 2002).

Gleditschia triacanthos (Honey locust) is deciduous tree that is useful for windbreaks, shelterbelts, erosion control, wildlife food, and local wood products (posts and railroad ties) (Asl *et al*., 2011). Honey locust is also used for buffer strips along highways or in urban forests, where it can be successfully grown in areas with air pollution, poor drainage, salty soils, and drought (Asif *et al.*, 2018).

Due to the hard seed coat of *gledistia triancanthos*, the seeds will need pre-treatments before sowing, this study is designed to determine the best seed germination method for the seed of *gledistia triancanthos* tree.

Figure (1) gledistia triancanthos seeds

Section 2: Materials and Methods

The seeds of honey locust tree were collected and we picked the best seeds, and removed the unhealthy and defected looking seeds. The seeds were washed, dried then underwent five treatments including control, Seeds were germinated between the layers of filter paper and saturated with distilled water. 30 seeds used for each treatment, with three replications which means 10 seeds in each germinator (petri dish) for each treatment.

The treatments were:

1. T1 = **control** (untreated seeds)
2. T2 = **cold water** for **24 hours**
3. T3 = **hot water** for **4 hours** with temperature of **60-80 C°**
4. T4 = concentrated **H_2SO_4** **(%5)** for **30 minutes**
5. T5 = concentrated **NAOCL** **(%5)** for **30 minutes**

30 seeds were put in cold water for 24 hours and were put in three petri dishes, each petri dish containing 10 seeds. The same method was used for the hot water, H_2SO_4, NAOCL and control. The seeds were left for 7 days to germinate.

3-1- The Study Site

The study was conducted in Salaheddin university, college of Agricultural engineering sciences, Forestry department, laboratory department, in Erbil, the capital of Kurdistan region in Iraq.

3-2- Seed Collecting Location

The seeds of honey locust tree were collected from first to fourth November in 2021 in the college garden in their mature state.

3-3 Experimental Design

For this experiment completely randomized design (CRD) was utilized with three replications for each treatment and each treatment had thirty seeds. The number of experimental units is 15.

3-4- determination of germination parameters

1. **Speed Germination**

Speed of germination was calculated by the following formula:
Speed germination = $n_1/d_1 + n_2/d_2 + n_3/d_3$ ……
Where, n= number of germinated seeds
d= number of days

2. **Mean Germination Time (MGT)**

Mean germination time was calculated by the formula:
MGT = $n_1 \times d_1 + n_2 \times d_2 + n_3 \times d_3 =$ ……. / Total number of days
Where, n= number of germinated seeds
d= number of days

3. **Mean Daily Germination (MGD)**

Mean daily germination can be calculated by the following formula:
MDG = total number of germinated seeds / total number of days

4. **Peak Value (PV)**

Peak value was calculated by the following formula (PV)
PV = highest seed germinated / number of days

5. **Germination Value (GV)**

Germination value was calculated by the given formula:
GV = PV × MDG (Gariola *et al.*, 2011)

Also, growth characteristics will be measured:

1. Height of shoot
2. Number of leaves

3. Root length

Section 4: Results

Table 1: Show the Results of Control, Hot Water and Cold-Water Treatment

Treatments	No. of Days	Germination Ratio	No. of Days	Germination Ratio
Control	2	%0c	4	%0c
Cold Water	2	%90b	4	%100b
Hot Water	2	%100a	4	%100a

Table 2: Show the Results of NOACL and H_2SO_4 Treatments

Treatments	No. Of Days	Germination Rate	No. Of Days	Germination Rate
NAOCL	2	%0c	4	%0
H_2SO_4	2	%0c	4	%0

Table 3: Determination of Germination Parameters

Parameters	Hot Water	Cold Water	control	NAOCL	H2SO4
SG	15a	14.25a	0c	0c	0c
MGT	15b	16.5a	0c	0c	0c
MDG	7.5a	7.5a	0c	0c	0c
PV	15a	13.5b	0c	0c	0c
GV	112.5a	101.25b	0c	0c	0c

Section 5: Discussion

5-1- effect of hot and cold water on germination seed of g. triancanthos

5-1-1- Speed Germination (SP)

the fastest germination rate was occurred by the hot water treatment, following by cold water as shown on (table 3).

5-1-2- Mean Germination Time (MGT)

Cold water treatment took longer time period than hot water, determined by the results shown on (table 3)

5-1-3- Mean Daily Germination (MDG)

Depending on the formula result, both cold and hot water treatment had same results by the fourth day (figure 2).

5-1-4- Peak Value (PV)

As shown on (table 3), peak value of hot water treatment was higher than cold water treatment.

5-1-5- Germination Value (GV)

Germination value of hot water treatment resulted as better than cold water treatment as shown on (table 3).

The final result is that the hot water treatment was more successful and effective than cold water treatment.

5-2- Effect of Chemical Treatments on Germination Seed of G. Triancanthos

The chemical treatment of both NAOL and H2SO4 shown no results of germination, the germination rate was %0 (table 2).

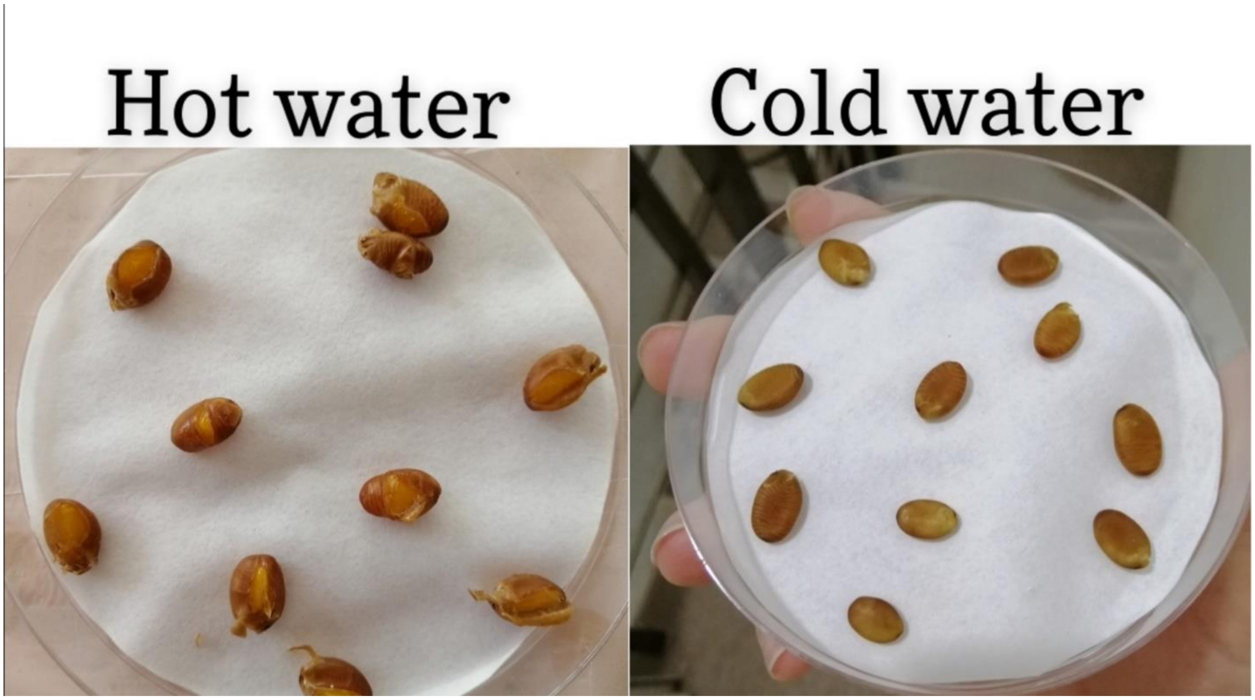

Figure (2) hot water and cold-water treatme

Figure (3) control, NAOCL and H2SO4 treatment

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