

# Response Of Seed Hydro-Priming On Germination Of Argan (*Argania Spinosa*) Seeds Under Agro-Climatic Conditions Of Coastal Belt Of Pakistan

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**Abstract:** Argan is known for its valuable oil and unique ecosystem. It is well adapted to harsh conditions, with deep roots that help to prevent soil erosion and provide stability to the surrounding ecosystem. Germination of Argan seeds is a bit challenging due to their hard outer shell, but it is definitely possible with the right approach. All Argan seeds will not germinate, and success rate can vary. However, with patience and proper care, can increase chances of success in germination of Argan seeds and growth of healthy seedlings. In this trial Argan seeds were soaked in water for 72, 96 and 120 hours. Results showed that hydro priming has direct influence on germination. The highest germination (80%) was observed in pre-soaking for 72 and 96 hours in water. While survival percentage 90% was observed more in 120 hours of pre-soaking. The tallest plant height was observed in T<sub>2</sub> (8.5cm) and shortest was in T<sub>4</sub> (5 cm).

**Key words:** Argan, Seed Hydro-Priming, Pre-Soaking and Germination

## 1. Introduction

Argan (*Argania spinosa*) belongs to family Sapotaceae. It is a native specie of northeast of Morocco and Morocco have Mediterranean climate (Silvia *et al.*, 2018; Al-Menaie *et al.*, 2008). Argan is a perennial plant that plays a crucial role in food web and combat climate change. Argan wood cannot be destructed by insects, it has been used for centuries in carpentry, charcoal, construction, and utensils at local level (Silvia *et al.*, 2018; Barkaoui *et al.*, 2022). It is domesticated for fodder and oil production (Zohra *et al.*, 2014). Argan oil is used in the Cosmetic industries, helpful in laboratory research, determination of phytochemicals and has the chemical composition of medicines (Al-Menaie *et al.*, 2007; Barkaoui *et al.*, 2022). Mechqoq *et al.*, (2021) reported that 95% triacylglycerol and 80% poly unsaturated fatty acid found in Argan oil that have great potential in the treatment of dermatological problems, cosmetic, nutrition and medicinal uses (Berrougui *et al.*, 2003). Argan oil is rich in vitamin E and it has been reported to lower cholesterol levels, stimulate blood circulation, facilitate digestion, and strengthen the body's natural defenses. The nutritional and dietary properties of Argan oil is superior to extra virgin olive oil (Silvia *et al.*, 2018). Besides its remarkable socio-economic role, Argan also plays important role in environmental performance.

Germination of Argan seed is more difficult in the region of higher rainfall of the world. High atmospheric humidity are good for the successful growth of Argan plant. Hence, it is found in areas with a more or less marked oceanic influence (Berka & Harfouche, 2001). Recent studies found that it can be grown in coastal areas, where average rainfall is 250mm that is suitable for the growth of *Argania spinosa* (Ouswati *et al.*, 2022). Argan multiplication is limited due to low seed production (Charrouf and Guillaume, 2008). Propagation of Argan is commercially inefficient due to heterogeneity in seed viability, seed dormancy and seed size, which are strongly genotype-dependent (Nouaim *et al.* 2002; Justamante *et al.*, 2017; Miloudi and Belkhodja, 2009; Alouani and Bani-Aameur, 2004). It is hard to grow by seeds due to low rate of germination because *Argania spinosa* seed shell is too hard or thick (Ikinci, 2014).

Seed priming by pre-soaking in water is one of the best treatment for the germination of *Argania spinosa*, specific climatic conditions, such as soil moisture, temperature and light intensity also play important role in the establishment of viable Argan plantlets at early stages of germination (Alouani and Bani-Aameur, 2004; Benaouf *et al.*, 2016). Hydro-priming is an eco-friendly and economical method (Jamil *et al.*, 2012) which is performed by pre-soaking of seeds either in cold or hot water for a certain duration in any growing media or in field (Tania *et al.*, 2019). This facilitates the seed coat to get soft enough for fast and easy growth of embryo by imbibition of water (Pandita *et al.*, 2007). Likewise, the operative hydro-priming method makes metabolic pathways to trigger germination (Paparella *et al.*, 2015).

This research is designed to determine the influence of hydro-priming on germination of Argan seeds for different time period before planting under coastal region of Pakistan.

## 2. Materials and Methods

A research trial was conducted to find out the effect of time period of hydro-priming on germination of Argan seeds. The seed material of Argan bought from Morocco was used in the optimization of hydro-priming of seed for various soaking duration

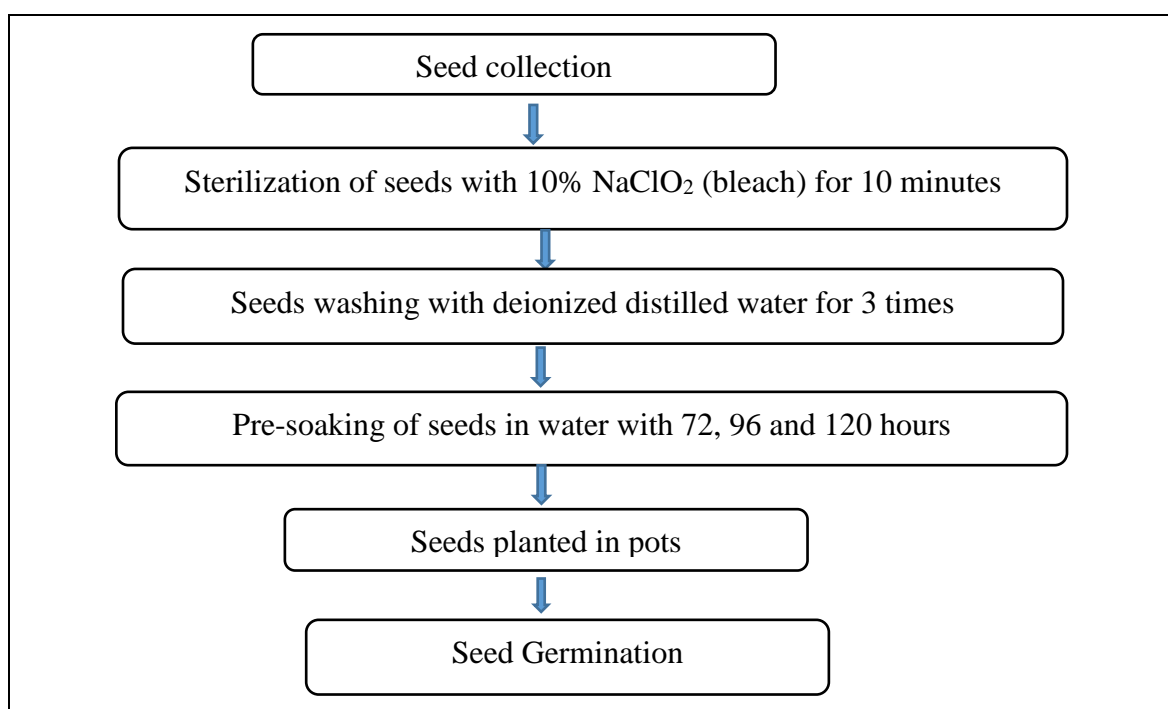
and concentration in order to select the standardized pre-soaking duration, which can be followed in further experiments. The trial was started in the month of November, 2023 at Southern Zone Agricultural Research Center (SARC). The Argan seeds were surface sterilized with 10 % sodium hypochlorite for 10 minutes and then washed three times with deionized distilled water. Total 36 seeds were used in four treatments. The treatments were  $T_1$ =without soaking,  $T_2$ =soaking of seeds for 72 hours,  $T_3$ =soaking of seeds for 96 hours,  $T_4$ =soaking of seeds for 120 hours and in each treatment nine seeds were used. After completion of pre-soaking period, the seeds were drained from water and dried back to optimal moisture content. Then Argan seeds were shifted in 6 inch pots having mixed media of soil, well decomposed farmyard manure and peat moss in the ratio of 1:1:1. The pots were kept in sunlight with 16-26°C and irrigation was done after 48 hours interval.

### 3. Statistical Procedure

This trial was performed following the Randomized Complete Block Design (RCBD). The Statistix 8.1 software was used for analysis of variance of data recorded and LSD at  $P \leq 0.05$  was applied for mean comparison (Steel and Torrie, 1980).

### 4. Results and Discussion

#### 4.1 Days to Germination



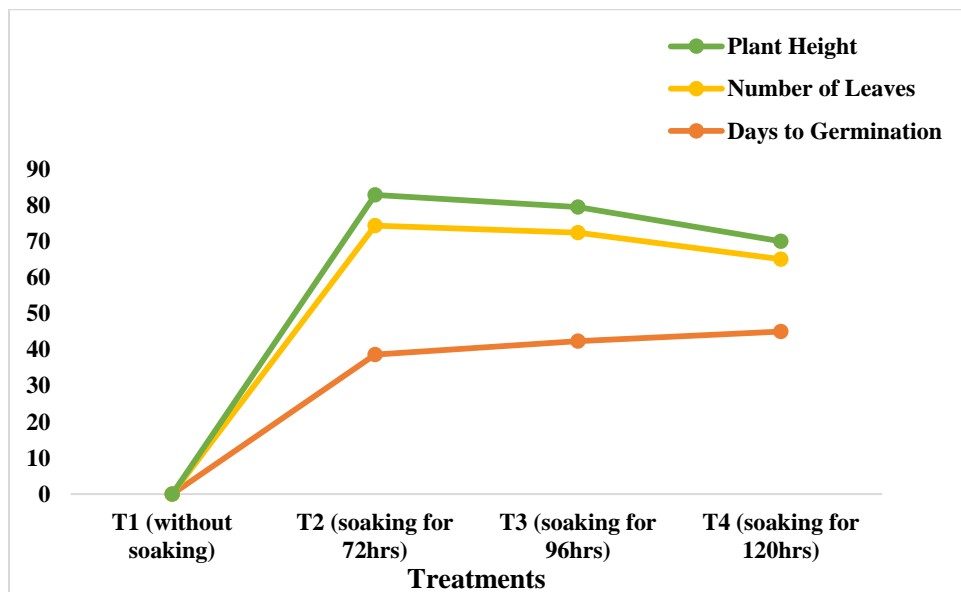
Germination of Argan seed is very complex process due to its hard seed coat. The data reveals that germination was significantly different at 5% probability level. The lowest number of days to germinate (39) was observed in  $T_2$  followed by  $T_3$  with 42 days respectively. While the highest days to germinate i.e., 45 days were recorded in  $T_4$ . The results showed that with increasing hours of soaking germination delayed. Results revealed that days to germinate depend not only on pre soaking of seeds but on various factors too including genetic variation, climatic conditions and the origin of the supplier country (Ikinci A, 2014). Similarly, in agro-climatic conditions of Pakistan  $T_2$  and  $T_3$  had taken almost same number of days for germination of Argan seeds. Hence, the Ogbuehi *et al.*, (2013) proposed that hydro priming is a worthwhile treatment of improving stand establishment, seedling emergence. Rajpar *et al.*, (2006) stated that in comparison to control, seeds took less days to emergence and attain maturity significantly.

#### 4.2 Germination rate (%)

As Argan has hard seed coat so number of factors involved in breaking of seed coat. In the trial highest germination rate (80 %) was observed in  $T_2$  &  $T_3$  while 60 % germination was noted in  $T_4$ . No germination taken place in  $T_1$ . Ikinci (2014) reported that pre-soaking of seeds for 96 hours shows maximum germination percentage. Lowest percentage of germination was observed in  $T_4$  may be due to over imbibition, which carried out electrolytes from the seeds as reported by Al-Menaie *et al.*, (2008). Perry and Harrison (1974) stated that the seed germination was negatively influenced by excess water soaking, which might be due to surplus imbibition producing decline in activity of enzymes (hydrolytic) essential for backup of mobilization of stored food (Heydecker *et al.*, 1971).

### 4.3 Plants Survival Percentage (%)

Survival rate is directly affected by the climatic conditions, soil and irrigation. Maximum number of plants were survived in T<sub>4</sub> i.e. 90 % while T<sub>2</sub> and T<sub>3</sub> shows 75 % survival percentage amongst the plants germinate. Dormancy breaking of Argan is one of the most difficult stage (Al-Menaie *et al.*, 2008). After germination, various traits of seeds produce difficulties in the survival of a plant. Therefore, it is not necessary that all the seeds germinated can be survived. In the trial as few seeds cannot survived in T<sub>2</sub> and T<sub>3</sub>. Comparable results were noted by Orzeszko-Rywka and Podlaski (2003) in Beta vulgaris.



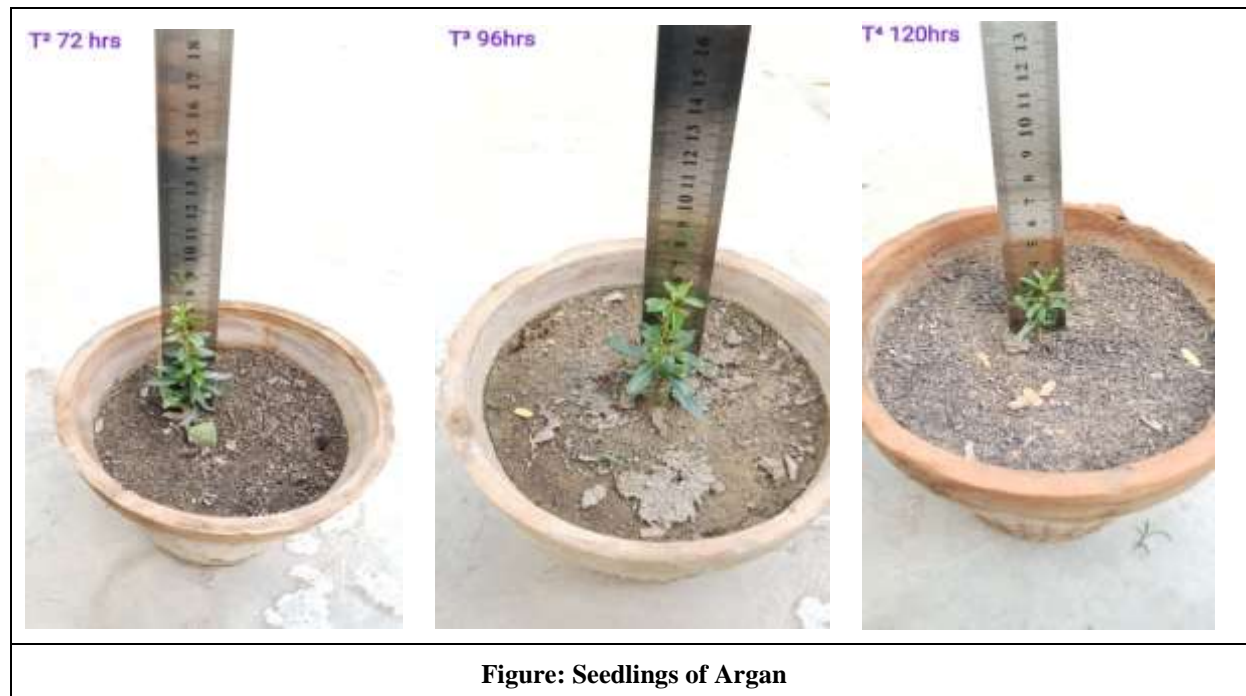
### 4.4 Number of Leaves

Leaves play important role in photosynthesis, higher the number of leaves greater the rate of photosynthesis. The data shows that number of leaves were significantly different at 5% probability level. Highest number of leaves were recorded in T<sub>2</sub> (36) while lowest number of leaves recorded in T<sub>4</sub> (20). Zohra *et al.*, (2014) reported that with the increase in age, number of leaves also increased as it directly effect on the plant height. Therefore T<sub>2</sub> (36) and T<sub>3</sub> (30) have more number of leaves than T<sub>4</sub> (20). Likewise, the effect of priming on the number of leaves per plant was significant. At the early stage of growth, the number of leaves produced more gradually. Ogbuehi *et al.*, (2013) reported that when crop is close to maturity leaves production were increased. This statement is in link with Chivasa *et al.*, (2000), who stated hydro-primed seeds had ominously produced increased number of leaves and had more plants in sorghum.

Treatments	Parameters				
	Days to Germination	Germination rate (%)	Plants Survival percentage (%)	No.of leaves	Plant height
T1	0.00c	0.00c	0.00c	0.00d	0.00d
T2	38.67b	80.00a	74.67b	35.67a	8.53a
T3	42.33ab	79.67a	75.00b	30.00b	7.17b
T4	45a	60.33b	89.67a	20.00c	5.00c
LSD ( $\alpha=0.05$ )					

### 4.5 Plant Height (cm)

The data express that plant height was significantly different at 5% probability level. The tallest plant height was observed in T<sub>2</sub> (8.5cm) while shortest height was noted in T<sub>4</sub> (5 cm). In T<sub>3</sub> (7.1cm) was recorded. Plant height is significantly effected by days to germinate. The seeds who had shown early germination have more plant height as in T<sub>2</sub> (72 hours) and T<sub>3</sub> (96 hours). Plant growth is a complicated phenomenon controlled by various environmental factors and the plant indigenous factors helps to combat all environmental barriers (Zohra *et al.*, 2014). This is in accordance with results of Ogbuehi *et al.*, (2013) that by pre-soaking in water in maize, plant height was increased.



**Figure: Seedlings of Argan**

## 5. Conclusions and Recommendations

In the present study, the Argan seeds were soaked in water for 72, 96 and 120 hours under the agro-climatic conditions of coastal area of Pakistan. From the current study, it may be concluded that, seeds which were not soaked in water did not germinate. The highest germination (80%) was recorded in the treatment in which Argan seeds were soaked in water for 72 and 96 hours, where as 60% germination was recorded in the treatment in which Argan seeds were soaked for 120 hours. This may be due to over imbibition, which drained out electrolytes and other enzymes from the seed. It is also inferred from the results that, lowest days to germination (39) were recorded in 72 hours seed soaked in water followed by (41) days to germination in the treatment where seeds were soaked for 96 hours. Based on the results of the study, hydro-priming has remarkable impact on germination and other morphological characteristics of Argan seeds. Hence, it is recommended to soak Argan seeds in water for 72 hours before sowing to achieve best results.

## Acknowledgment:

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## Novelty Statement

Argan is a new introduction in Pakistan's coastal belt, therefore suitable hydro-priming period shortens the seed germination duration of Argan.

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