

Study on Hydro Priming of Pomegranate Seeds for Germination and Seedling Vigour

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ABSTRACT

Among various seed enhancement method, seed priming is an efficient and inexpensive method for increasing and improving seed vigour & germination and seedling growth. Therefore, the present experiment was carried out with hydropriming of pomegranate seeds where the seeds after being procured were dipped in water for 0, 10, 20 and 30 hours and for 40 and 50 minutes respectively. Completely Randomized Design (CRD) was followed with three replications for each treatment. From the study it was obtained that hydro priming treatment and soaking durations significantly increased growth parameters such as germination percentage, number of leaves, length of leaves, length of roots, number of rootlets and total length of seedling. Overall, the results revealed that hydro priming of the seeds for 30 hours followed by soaking in water for 40 minutes were the two best treatments that gave noticeable results for different parameters

Key words: *Pomegranate, Seeds, Soaking, Parameters, Study*

Introduction

The process of germination of a seed has been found to get influenced by many attributes which may include the medium of growing along with other abiotic parameters like illumination, aeration and temperature (Hartman *et al.*, 2001; Alabi, 2019). The process of germination can be said as a phenomenon where a chain of complex conversion happens within the seed and which leads the transformation of the embryo present into a small seedling (Raven *et al.*, 2005; Alabi, 2019). This process occurs when and after the seed imbibes moisture from its surrounding environment and thereafter the division of the seed coat takes place which ultimately results in the formation of a phototropic and geotropic growing point (Alabi, 2019). For the past thirty years, the system of priming of seeds has evolved as an important technique by which the capability of the seed to

germinate increases along with the consistency and occasionally the comprehensive seed germination also improves (Basra *et al.*, 2004; Taheri *et al.*, 2014). According to Carvalho *et al.*, 2011 this process of seed treatment or the priming is a very traditional way by which the development of the seed can be expedited along with the process of germination and somehow the maturation of seedling of multiple plants in non-suitable environmental condition also occurs.

Treatments of seed for fruit crops are an important area of study. Pomegranate is one such fruit which is indigenous to Iran and had widely been cultured and acclimatized from very early period in the entire portion of the area of the Mediterranean (Schubert *et al.*, 1999; Taheri *et al.*, 2014). The fruit is very much utilized as a source of household solution to many health-related problems. As it has been found that the fruit has many therapeutic capabili-

ties, therefore the title of 'super food' has been bestowed on it (Teixeira da Silva *et al.*, 2013; Taheri *et al.*, 2014). However, the aspect of propagation of a particular fruit crop becomes very important, in-order to implement suitable procedure for growth and development. It is seen that the plant of pomegranate in normal situation do multiplies by the help of asexual technique i.e. by the help cuttings of different types like for example the hardwood is suitable for spring and the softwood type is good for summer. However, the process of development by seed is only limited to the varieties where the asexual technique is not worthy. But the way of propagation through seeds becomes essential in order to obtain a plant free from any microbial issues and for preservation of precious germplasm (Taheri *et al.*, 2014). From earlier works it has been observed that seed treatment with hydro priming has got great prospective with respect to elevating the crop internal immunity against various unfavorable environmental situations. This in particular is achieved by speeding up the process of germination, plant development from seed, by regulating various anatomical processes and also through modifying gene and protein proclamation. Therefore, keeping in mind, the utility of priming of seeds and importance of pomegranate fruit the present study was undertaken with hydro priming as a pre-treatment for pomegranate seeds.

Materials and Methods

The experiment was conducted in the Department of Horticulture, Institute of Agricultural Science, University of Calcutta in the year of 2021. For this purpose, fresh organic seeds of Pomegranate were purchased. Thereafter seeds of pomegranate were soaked in distilled water with six different treatments viz. T₁: water immersion for 10 hours, T₂: water immersion for 20 hours, T₃: water immersion for 30 hours, T₄: water immersion for 40 minutes, T₅: water immersion for 50 minutes and T₆: water immersion for 0 hours. Then the seeds were taken out of water on filter paper to dry out under room temperature. Later the hydro primed pomegranate seeds were sown in pots which were filled with 50% soil and 50% coco peat. Seed were placed about 10 to 15 mm deep into the soil media. The statistical method used in the experiment was Completely Randomized Design (Gomez and Gomez, 1984; Sheoran *et al.*, 1984) with three replications for each

treatment. Observation for the study was taken at 20, 25 and 30 days after sowing. The parameters which were recorded germination percentage, number of leaves, length of leaves, length of roots, number of rootlets and total length of seedling.

Results and Discussion

Germination percentage

It is revealed from experimental results presented in Table 1 that the highest germination percentages was recorded as 60% in T₂ i.e. (water immersion for 20 hours) whereas the lowest germination percentages was 45% in T₁ (water immersion for 10 hours), T₄ and T₅ (water immersion for 40 min and 50 min) and this total observation was done on 20DAS. It is observed on 25 DAS the highest germination percentage, 80% was recorded in T₂ (water immersion for 20 hours) while the lowest germination percentage 55% was recorded in T₁ (water immersion for 10 hours). Last major observation was done on 30 DAS in which the highest 85% germination was recorded in T₂ (water immersion for 20 hours) and the lowest 55% germination was recorded in T₅ (water immersion for 50 minutes).

Table 1. Effect of hydro priming on germination percentage in pomegranate seeds

| Treatments | 20 days | 25 days | 30 days |
|----------------|--------------|--------------|---------------|
| T ₁ | 45 | 55 | 65 |
| T ₂ | 60 | 80 | 85 |
| T ₃ | 50 | 65 | 80 |
| T ₄ | 45 | 60 | 65 |
| T ₅ | 45 | 60 | 55 |
| T ₆ | 60 | 60 | 70 |
| CD | 9.714 | 8.993 | 10.385 |
| Sem± | 3.118 | 2.887 | 3.333 |

Number of leaves

It has been revealed from experimental results presented in Table – 2 that the collected highest number of leaves was 6.0 observed in the treatment of T₁ (water immersion for 10 hours) whereas lowest number of leaves was 4.0 in the treatment of T₆ (water immersion for 0 hours) and these above data were recorded on 20 DAS. Next leave counting was done on 25 Days according to which the highest number of leaves was 11.0 observed in T₄ (water immersion for 40 min) and T₆ treatment (water immer-

sion for 0 hours). The lowest number of leaves was 10.00 in T₁ (water immersion for 10 hours), T₂ (water immersion for 20 hours), T₃ (water immersion for 30 hours) and T₅ (water immersion for 50 minutes) treatment. Last reading was recorded on 30 DAS, the maximum number of leaves was 16.0 observed in T₆ (water immersion for 0 hours) and the minimum number of leaves was 12.0 observed in T₅ (water immersion for 50 min).

Table 2. Effect of hydro priming on number of leaves in pomegranate seedlings

| Treatments | 20 days | 25 days | 30 days |
|----------------|--------------|--------------|--------------|
| T ₁ | 6.0 | 10.0 | 14.5 |
| T ₂ | 5.0 | 10.0 | 14.0 |
| T ₃ | 4.0 | 10.0 | 15.5 |
| T ₄ | 4.0 | 11.0 | 13.0 |
| T ₅ | 4.0 | 10.0 | 12.0 |
| T ₆ | 4.0 | 11.0 | 16.0 |
| CD | 0.734 | N/A | 0.899 |
| Sem± | 0.236 | 0.333 | 0.289 |

Length of leaves

Various leaves length was recorded under different duration of water soaking treatments shown in Table - 3. As usual the first reading was second on 20 DAS which shows a highest leaf length of 1.10 cm in the treatments of T₃ and T₆ i.e., water immersion for 30 hrs and water immersion for 0 hrs whereas the lowest leaf length of 1.00 cm was observed in the treatments of T₁ i.e., water immersion for 10 hrs, T₄ and T₅ i.e. water immersion for 40 min and 50 min. In the next observation on 25 days, the maximum leaf length of 1.75 cm was recorded in treatment of T₅ and T₆ i.e., water immersion for 50 min and 0 hr and a minimum leaf length of 1.30 cm was observed in T₃ i.e., water immersion for 30 hrs while the last observation shows a maximum leaf length of 2.05

Table 3. Effect of hydro priming on length of leaves in pomegranate seedlings

| Treatments | 20 days | 25 days | 30 days |
|----------------|--------------|--------------|--------------|
| T ₁ | 1.00 | 1.35 | 2.05 |
| T ₂ | 1.05 | 1.35 | 2.05 |
| T ₃ | 1.10 | 1.30 | 2.05 |
| T ₄ | 1.00 | 1.50 | 2.05 |
| T ₅ | 1.00 | 1.75 | 2.05 |
| T ₆ | 1.10 | 1.75 | 2.05 |
| CD | 0.037 | 0.337 | N/A |
| Sem± | 0.012 | 0.108 | 0.029 |

cm in all the treatment.

Length of roots

It is being observed from experimental results shown in Table 4 that highest root length of 6.25cm was observed in T₁ (water immersion for 10 hrs) and T₆ (water immersion for 0 hrs) whereas the lowest root length of 4.75cm was observed in T₄ (water immersion for 40 min) on 20 DAS. Next highest root length of 8.50cm was observed in T₁ (water immersion for 10 hrs) whereas the lowest root length of 7.75cm was observed in T₄ (water immersion for 40 min) on 25 DAS. Last highest root length, 10.50cm was observed in T₃ (water immersion for 30 hrs) whereas the lowest, 8.25cm was observed in T₂ (water immersion for 20 hrs) on 30 DAS.

Number of rootlets

Table 4. Effect of hydro priming on length of roots in pomegranate seedlings

| Treatments | 20 days | 25 days | 30 days |
|----------------|---------|---------|---------|
| T ₁ | 6.25 | 8.50 | 8.50 |
| T ₂ | 5.50 | 8.25 | 8.25 |
| T ₃ | 5.25 | 8.25 | 10.50 |
| T ₄ | 4.75 | 7.75 | 9.25 |
| T ₅ | 6.00 | 8.00 | 10.00 |
| T ₆ | 6.25 | 8.25 | 9.50 |
| CD | 0.734 | N/A | 0.861 |
| Sem± | 0.236 | 0.236 | 0.276 |

It is noticeable (in Table 5) that the highest number of rootlets, 14.5 was observed in T₅ (water immersion for 50 min) where as lowest number of rootlets, 9.0 was observed in T₁ (water immersion for 10hrs). The above data were collected from the observation on 20 DAS. Next observation was done on 25 DAS which shows the highest number of rootlets was 15.5 observed in T₄ and T₆ (water immersion for 40

Table 5. Effect of hydro priming on number of rootlets in pomegranate seedlings

| Treatments | 20 days | 25 days | 30 days |
|----------------|---------|---------|---------|
| T ₁ | 9.0 | 14.0 | 19.0 |
| T ₂ | 13.0 | 15.0 | 21.0 |
| T ₃ | 12.0 | 14.5 | 19.0 |
| T ₄ | 12.5 | 15.5 | 22.0 |
| T ₅ | 14.5 | 15.0 | 24.5 |
| T ₆ | 11.5 | 15.5 | 19.0 |
| CD | 2.172 | N/A | 2.109 |
| Sem± | 0.697 | 0.514 | 0.677 |

minutes and 0 hrs respectively) and lowest number of rootlets was 14.0 observed in T₁ (water immersion for 10 hrs). In last observation on 30 DAS the highest number of rootlets was 24.5 observed and the lowest number of rootlets was 19.0 that were observed in T₅ (water immersion for 50 min) and then T₁ (water immersion for 10 hrs), T₃ (water immersion for 30 hrs) and T₆ (water immersion for 0 hrs) treatments respectively.

Total length of seedling

Table 6 shows the highest seedling length of 10.60 cm which was observed in T₁ (water immersion for 10 hrs) whereas the lowest seedling length 8.25 cm was observed in T₄ (water immersion for 40 min) on 20 DAS. Next, the highest total length of seedling, 14.25 cm was observed in T₆ (water immersion for 0 hrs) and the lowest length of seedling, 12.00 cm was observed in T₂ (water immersion for 20 hrs) on 25 DAS. Last the highest length of seedling, 18.00 cm was observed in T₆ (water immersion for 0 hrs) while the lowest length of seedling, 16.25 cm was observed in T₂ (water immersion for 20 hrs) on 30DAS.

Table 6. Effect of hydro priming on total length in pomegranate seedlings

| Treatments | 20 days | 25 days | 30 days |
|----------------|--------------|--------------|--------------|
| T ₁ | 10.60 | 13.25 | 16.50 |
| T ₂ | 8.75 | 12.00 | 16.25 |
| T ₃ | 10.25 | 12.25 | 17.00 |
| T ₄ | 8.25 | 14.00 | 17.50 |
| T ₅ | 10.30 | 12.25 | 17.00 |
| T ₆ | 10.25 | 14.25 | 18.00 |
| CD | 0.402 | 0.636 | N/A |
| Sem± | 0.129 | 0.204 | 0.604 |

Seed priming has been demonstrated as an effective strategy for improving the germination of seeds. Significantly, higher germination percentage was observed in hydro primed seeds as compared to non-primed seeds. A higher germination percentage, 85% was recorded in seeds that were hydro primed for 20 hours. Similar work has been done by Venudevan and Srimathi (2013) where they reported that, hydro primed seeds responded with significant increase in germination performance of seeds. Number of leaves, length of leaves showed remarkable growth after treated with hydro priming. Likewise, Satiskumar (2005), reported that brinjal seeds responded with increased the number

of leaves, plant height, fruit length, fruit yield after treated with osmo priming. Day by day the number of rootlets per seedling was increased. As coco peat helps the root to accumulate adequate amount of air (O₂) so the rootlets numbers were enhanced. Root length was improved after treatment with hydro priming. Rehman *et al.*, 2021 executed an experiment to signify the role of seed priming in root development and crop production which is similar to this experiment. Among different treatment T₆ (cold water immersion for 0 hr) significantly responded in case of highest seedling length as compared to the other treatment. The lowest seedling length 8.25 cm was recorded in T₄ (water immersion for 40 min) on 20 DAS. Similar experiment was conducted by Duarte and Suchini (2001), in sapota with respect to seedling height and stem diameters.

Conclusion

Maximum progress was observed in the seedlings of T₃ (water immersion for 30 hrs) but the seedlings of T₄ (water immersion for 40 min) also gave almost equal respond. Overall, the 30 hrs hydro priming treatment showed best results on pomegranate seed with a better germination percentage and with respect to the other growth parameters. So, it can be suggested that we can go with the water immersion for 30 hrs along with water immersion for 40 minutes, as pre sowing treatments of pomegranate seed.

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