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Hydro Priming Efficacy on Rubber Plant Seeds (*Hevea brasiliensis*) Growth

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ABSTRACT

Among the plantation products, rubber is critical to economic activity within Indonesia. Rubber is also identified as one of Indonesia's export products, which is significant as an export revenue source apart from the oil and gas sector. Malaysia is the world's second-largest rubber producer and exporter of natural rubber after Indonesia. Besides having more open export opportunities and stimuli, the domestic rubber market is still large. Therefore, this study aims to ascertain the efficiency of hydro priming of rubber seeds on germination time and power as well as sprout height. The research was conducted in the greenhouse at the experimental garden in the Faculty of Agriculture KU IMS in Kuantan Singingi, which are given at geographical coordinates 00 00-10 00 LS 1010 02 – 1010 55 BT. The research was conducted in November-December 2023. The questionnaire survey was conducted in November and December of 2023. The average air temperature of the research location for November and December 2023 was 28. ranges from 8 0C to 32 0C with relative humidity of about 81%. The research approach was conducted in a qualitative manner utilizing mathematical techniques. Data is generally put in a tabular form and analyzed. Various treatment levels were under Control, 12h, 24h, 36h and 48h of hydro priming. In this research, the parameters recorded include time taken for germination, germination strength and sprout height. According to the outcomes of the assessments made in this study, the hydro priming treatment conducted on the rubber plant seeds showed the fastest germination time characteristics in the 48-hour treatment, which is 3. 4 days. The maximum germination capacity was observed in the hydro-priming treatment of 36 hours, which was 90. 0%. On the other hand, the tallest observation parameter of the height of the sprouts was in 48 hrs of Hydro Priming, with a height of 26. 3 cm.

Keywords: *Effectiveness, Growth, Hydro priming, Rubber Plants, Seeds*

1. INTRODUCTION

Rubber is one of the plantation products that has a significant role in Indonesia's economy to some extent. Rubber is also one of Indonesia's products, a big export commodity besides oil and gas. The export of rubber has ranked Indonesia as the largest producer and exporter of rubber in the world. In addition to exportation opportunities growing more liberal, the domestic rubber market remains significant. Some future markets that can consume rubber marketing are the tyre, automotive and asphalt industries.

Indonesian rubber plantations are classified based on operations into large plantations (PB) and community plantations (PR). Large Plantations include Large State Plantations (PBN) and Large Private Plantations (PBS). PBN rubber area of Indonesia was found to be 132 in 2020. 88 thousand hectares, which is 2 less compared to the previous year. 73 percent to 129. 22000 hectares in 2021 thousand hectares in 2019, twenty-five thousand hectares in 2021. For 2022 it is expected that the area will be 128. They have decreased to 76 thousand hectares or by 0. 379 percent. However, the production of Indonesian rubber PBS in 2020 was reported to be at 225. Thousand hectares were sown with crops; this was 4 thousand hectares less than the previous year. 952 percent to 213. 96 thousand hectares at the end of the year 2021. By 2022, the area will be 165. 2 thousand hectares or by 22. 788 percent. Information on rubber PR in Indonesia is extracted from the Director General Plantation, Ministry of Agriculture. The changes exhibited over the three years showed that PR's area is cyclic in nature. Field area cultivated by PR in 2020 is 3368. 19 thousand hectares, it has been expanded by 1. It rose by 932 percent or to 3,433. It slightly reduced 28 thousand hectares in 2021 and in 2022 by around 4 thousand hectares. 956 percent to an 3 263. 13 thousand hectares (Badan Pusat Statistik, 2022).

Rubber plantations are now slowly reducing its expansion and growth because many of those lands have been converted to oil palm plantations thus harboring less produce. However, if we aim to preserve rubber plants' existence in Indonesia, more research is still needed. On the part of germination which forms very important factor in the series of rubber plant cultivation, there is the need to pay vital attention. The speed of the growth of sprouts, capacity of the sprout to grow and the height of the sprouts produced can also be seen as choosing a good sprout. When it comes to the germination process of these seeds to be planted, the hydro priming aspect that demands your attention is that of yielding good sprouts. Because seeds that have been prepared under hydro priming will cause the seed inbibition process to occur optimally. Hydro priming is the process of initiating seeds through water absorption before germination. In his research, Nugraheni et al., 2018) stated that water is critical in seed germination and shoot formation. If seeds do not have adequate water, they will develop poor germination because cell division is limited, but if conditions are favorable, they will produce the best germination.

In this case, the kind of seed and the type of dormancy are major factors that determine the degree to which water can penetrate and enter the seed. Rubber seeds fall for physical dormancy because they have a hard seed coat among the three types of dormancy. As stated by (Schmidt, 2022), physical dormancy usually stems from small, hard and non-permeable fruit skin or covering that hinders imbibition and gas change. Hence, suitable management is required to treat rubber seeds to remove their dormant status. Positive changes in germination capacity and germination percentage of rubber seeds can be obtained using hydro priming with various

time exposures. As mentioned by (Zainal et al. 2016), one of the activities done for hydro priming is placing rubber seeds in water, whereby the activity is meant to ease water intake into the seeds to make the seed coat lysed and weak.

According to the findings of a research study done by (Damalas et al. 2019), it was pointed out that hydro priming treatment of faba beans for 0, 8, 16, 24, 36, and 48 h enhanced the germination rate by 16%. 2%: Germination synchronization by 20. At the beginning of the experiment, the germination percentage was noted to be 85%, the germination rate was 7%, and the seedling vigor index was 13. 4%.

On the other hand, research done by (Mangardi et al. 2021) indicated that hydro priming performed on rubber seeds for 24 hrs effectively enhanced the percentage germination by 10. Mitigation of seed hardness by up to 32% and germination speed by 1. 96%.

The research aimed to establish the extent of hydro priming of rubber seeds based on germination time, germination power, and sprout height. Therefore, this study's findings will be significant in the overall process of rubber plant cultivation, particularly in matters about the hydro-priming of rubber seeds.

2. MATERIAL AND METHODS

The study was done in the greenhouse of the Experimental Garden at the Faculty of Agriculture, Kuantan Singingi Islamic University. The coordinates for the area are 0^0 00-1^0 00 LS 101^0 02 – 101^0 55 BT. The research took place in November-December of 2023. The mean air temperature at the investigation site at the end of November and December 2023 was 28. The temperature inside the jacket was 8 0C, and the relative humidity was 81%. The materials and tools include rubber seeds sourced from a number of holder plantations in Jake village, central Kuantan District, ordinary water, river sand, Dithane, PE plastic containers, buckets, hand sprayers, and stationery. The research approach applied in this study was quantitative analytical. Information is also discussed in tabular form. Treatment levels include no immersion, 12 hours immersion, 24 hours immersion, 36 hours immersion and 48 hours immersion. The research flow diagram is highlighted in Figure 1, which is shown below.

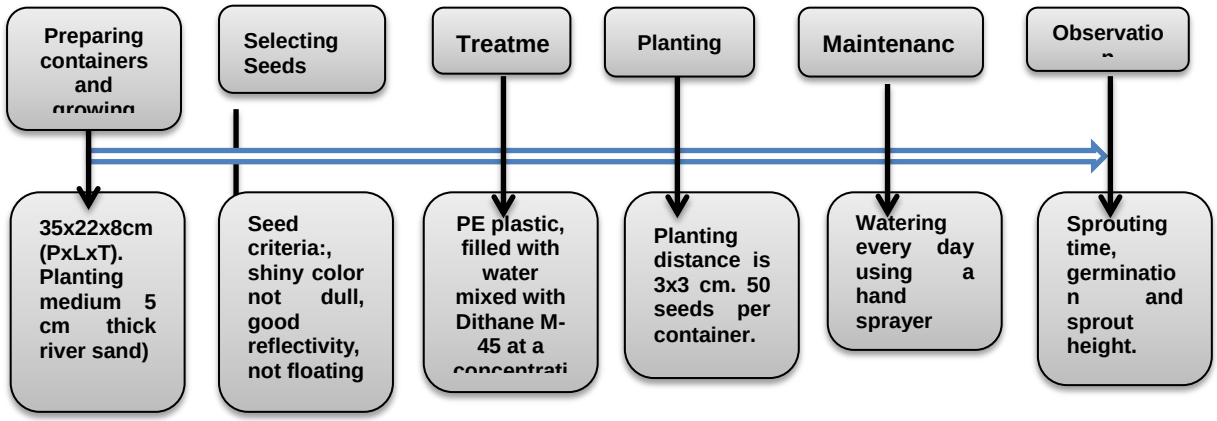

Figure 1. Flowchart of Research Implementation of Hydro Priming Treatment of Rubber Seeds.

Parameter observations made in this study are as follows:

a. Germination time (days)

The germination time is calculated on which day the seeds germinate, using the radicle criteria already appearing on the surface of the planting media. The formula for germination speed is:

$$\textbf{Germination time} = \frac{\mathbf{N1}}{\mathbf{T1}} \mathbf{x} \frac{\mathbf{N2}}{\mathbf{T2}} \boldsymbol{x} \frac{\boldsymbol{N3}}{\boldsymbol{T3}} \frac{\boldsymbol{Nx}}{\boldsymbol{Tx}} \mathbf{x}$$

Note:

N : Number of seeds germinated Tx time,
T : Time required to germinate, X : 1, 2, 3,.

b. Germination rate (%)

Germination was observed by looking at seeds that germinated, which was marked by the release of radicles up to 21 days after sowing. The formula for germination is:

$$\textbf{Germination time} = \frac{\textbf{Number of normal germinating seeds}}{\textbf{Total germinated seeds}} \boldsymbol{x100}$$

c. Plant Height (cm)

Plant height was measured when the sprouts were 21 days after sowing. Plant height was measured using a meter starting from the root neck to the highest growing point.

3. RESULT AND DISCUSSION

3.1 Germination Time (Days)

Based on the results of observations regarding the germination time of rubber seeds, it can be seen in Table 1:

Table 1. Germination Time for Rubber Seeds in Hydro Priming Treatment (days).

Seed Treatment	Germination Time (days)
Without *hydro priming*	10.9
hydro priming 12 hours	7.9
hydro priming 24 hours	16.0
hydro priming 36 hours	5.3
hydro priming 48 hours	3.4

As such, the shortest average germination time of rubber seeds was under the 48-hour hydro priming treatment of 3. 4 days, 36 hours hydro priming treatment to be specific 5. , 3 days, and 12 hour hydro priming treatment, particularly 7. Treatment was given in 9 days and treatment without soaking in 10 days. 9 days, the longest germination time was observed in the 24-hour hydro priming treatment, which was recorded as 16 days. 0 days.

Overall germination time obtained with the help of 24 hour treatment was also higher, 16. 0 days. This was because the seeds used for research material were not taken from the same mother and garden; thus, the seeds used were not uniform, resulting in poor germination time. As per (Matinahoru, 2022), there is evidence that the mother tree of seed plays a role in seed size where different types of plants have varying seed weights and also choose the germination of the seed. These imply that the parent seed tree will produce seeds of different sizes and weights depending on the environment in which the parent tree is grown.

It was also noted that the longer the rubber seeds are subjected to hydro priming, the shorter the germination duration. Similarly, the shorter the hydro priming period or without hydro priming, the longer the germination time because seeds given a good period of hydro priming will be more responsive than seeds that are soaked in water for a short time such that they have a high water content. Above that of seeds without hydro priming, the cotyledons and the testa splits are swelling. This is supported by the statement that Rozen et al (2016) noted that seeds exhibit hygroscopicity, enabling seeds to absorb water from the environment. Water absorption brings this about during the soaking process, which enhances the embryo and endosperm

formation. When water is added, it helps in the germination process to develop the embryo and endosperm, the availability of oxygen enhances the metabolic activity within the seed and thus, the germination of the seed.

Concerning the Imbibition process as described by (Bintoro et al. 2014), it is the absorption of water by imbibition as illustrated by the absorption of water by the seed in the initial periods of germination, as the seed swells up, the seed coat cracks, and growth starts and this is evidenced by the release of the radicle from inside the seed.

The finding established that the longer the hydro priming time was, the shorter the time was taken for the germination of rubber seeds. This is in concordance with the hydrofarming done earlier in bitter melon seed research conducted by (Adhikari et al. 2021), which identified that the days of hydro-priming had a significant effect on the germination and biomass of bitter melon seeds. Hydro priming for 36 hours and 48 hours enhances the rate of water imbibition for germination, the height of seedlings, and the vigor index of seeds.

3.2 Germination Rate (%)

Based on the results of observations on the germination capacity of rubber seeds, it can be seen in Table 2 below:

Table 2. Germination of Rubber Seeds in Hydro Priming Treatment (%).

Seeds Treatment	Germination Rate (%)
Without *hydro priming*	65.5
hydro priming 12 hours	65.0
hydro priming 24 hours	82.5
hydro priming 36 hours	90.0
hydro priming 48 hours	77.5

The Rubber Seed Germination noted in Table 2 Above shows that the hydro priming treatment of 36 hours was the highest to give Rubber Seed Germination of 90. 0% The next observation was made on the 24 hour hydro priming results, 82. 5%. In terms of intensity, the 48 hour hydro priming treatment was 77. 5%, and the least level of germination was observed in the treatment without hydro priming, and the hydro priming was done for 12 hours, at 65. 5% and 65. 0% respectively.

The variation in the average germination results was due to the hydro priming time in each treatment being done at different times, which led to variation in the germination capacity. The study of (Septian et al. 2021) was done based on an opinion that variability in the length of hydro priming leads to variability in the perfect growth of seeds. Consequently, the more time seeds are soaked, the more water penetrates the endosperm of the seeds. This makes germinating easier for the seeds as they have a suitable environment and conditions.

However, as per the findings of Bajang et al. (20215), it is important to note that there are limits to the hydro-priming time for seeds. If the seeds are hydro-primed excessively, they can rot and damage. This phenomenon was observed in the long hydro priming treatment of 48 hours in the present study, which decreased germination capacity to 77.5%. This observation is further supported by the research conducted by Srilaba et al. (2018), who also highlighted that prolonged hydro-priming can lead to the formation of rotten or damaged seeds due to the presence of fungi and bacteria.

In light of the seed criteria established in this study, it is worth mentioning that the condition of the seeds was classified as either good or very good. Furthermore, compared to the research conducted by Berlian et al.

(2016), the maximum germination capacity achieved by the seeds in this study was 90.00%, surpassing the previous study's maximum of 85%. The germination capacity of rubber seeds from each treatment can be seen in Figure 2 below.

Figure 2. Germination of Rubber Seeds at 21 Days After Sowing (I=48 hours, II=36 hours, III=24 hours, IV=12 hours, V=no hydro priming).

3.3 Germination Height (cm)

Based on the results of observations of the height of rubber seed sprouts can be seen in Table 3. Based on the data presented in Table 3 regarding the height of rubber seed sprouts, it is evident that the 48-hour hydro priming treatment resulted in the tallest sprouts, measuring 26.3 cm. This was followed by the 12-hour hydro priming treatment at 25.4 cm, the 36-hour hydro priming treatment at 20.25 cm, the 24-hour hydro priming treatment at 17.8 cm, and the treatment without hydro priming producing the shortest sprouts at 13.3 cm.

Table 3. Height of rubber seed sprouts in hydro priming treatment (cm).

Seeds Treatment	Germination Height (cm)
Without *hydro priming*	13.3
hydro priming 12 hours	25.4
hydro priming 24 hours	17.8
hydro priming 36 hours	20.2
hydro priming 48 hours	26.3

The findings suggest that the duration of hydro priming directly impacts the height of the sprouts, with longer priming times resulting in taller plants. The growth of plants is a complex process that relies on the efficient utilization of growth factors. As Kustyorini et al. (2020) noted, plant growth is influenced by internal and external factors. Internal factors such as hormones genes and external factors like nutrients, water, temperature, light, and humidity play a crucial role in determining plant height. Water availability, temperature, and light intensity can also significantly affect the overall plant height.

Alghaniya et al. (2021) emphasized that plant height is impacted by the light intensity level, with an increase in plant height being closely associated with the rate of photosynthesis and the resultant photosynthate.

In the treatment without hydro priming, the height of the seedlings was only 13.3 cm due to the suboptimal imbibition process in the seeds. The seeds relied solely on water sprayed during daily maintenance, leading to

inadequate activation of gibberellin growth regulators within the seeds. As a result, the sprouts were shorter than those in other treatments. According to Adnan (2017), gibberellin is crucial in stimulating seed cell development, facilitating quicker germination and organ formation. The enhancement of germination is directly proportional to the seed growth potential.

4. CONCLUSION

The research outcomes indicate that the hydro-priming treatment applied to rubber plant seeds led to the fastest germination time, with the 48-hour treatment showing a germination time of 3.4 days. The highest germination rate was observed in the 36-hour hydro priming treatment, with a rate of 90.0%. Furthermore, the tallest sprouts were recorded in the 48-hour hydro priming treatment, reaching a 26.3 cm height.

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REFERENCE

Adhikari. B., Dhital, P.R., Ranabhat., S., Poudel,H. 2021. Pengaruh lama waktu *hydro-priming* benih terhadap perkecambahan dan pertumbuhan bibit tanaman pare (*Momordica charantia*). *PLOS ONE* https://doi.org/10.1371/journal.pone. 0255258 August 5, 2021.

Adnan. 2017. Pengaruh Konsentrasi dan Lamanya Perendaman Dalam Larutan Giberellin Terhadap Perkecambahan Benih Kakao. *AGROSAMUDRA, Jurnal Penelitian Vol. 4 No. 2 Jul - Des 2017.30-40.*

Alghaniya, G. S., L. Khairani dan I. Susilawati. 2021. Pengaruh Lama Penyinaran Menggunakan Lampu LED terhadap Produktivitas Fodder Hanjeli (*Coix lacryma-jobi* L.) Hidroponik. Ziraa'ah. 46(1): 38- 43.

Badan Pusat Statistik 2022. Statistik Karet Indonesia. Volume 16, 2023

Bajang, M. E., A. Rumambi, W. B. Kaunang dan D. Rustandi. 2015. Pengaruh Media Tumbuh dan Lama Perendaman terhadap Perkecambahan Sorgum Varietas Numbu. Jurnal Zootek. 35(2): 302-311.

Berlian, Z., , Syarifah., Hidayat, A. 2016. Pengaruh Perlakuan Perendaman Air Panas dan air Dingin Terhadap Perkecambahan Benih Karet (Hevea brasilliensismuell.arg) dan Sumbangsihnya Pada Mata Pelajaran Biologi Materi Pertumbuhan Tumbuhankelas xii SMA / MA. Jurnal Bioilmi Vol. 2 No. 2 Agustus 2016. 102-107.

Damalas, C.A., Koutroubas, S.D., Fotiadis, S. 2019. Efek *Hydro-Priming* pada Perkecambahan Benih dan Kinerja Lapangan Kacang Faba pada Penaburan Musim Semi. Agriculture 2019, 9, 201.

Kustyorini, T. I. W., A. T. H. Krisnaningsih dan D. Santitores. 2020. Frekuensi Penyiraman Larutan Urin Domba terhadap Tinggi Tanaman, Jumlah Daun dan Produksi Segar Hidroponik Fodder Jagung (*Zea mays*). Jurnal Sains Peternakan. 8(1): 57-65.

Lubis, Y.,A. Riniarti, M.,Bintoro, A. . 2014. Pengaruh Lama Waktu Perendaman Dengan Air Terhadap Daya Berkecambah Trembesi (*Samanea saman*). Jurnal Sylva Lestari. Vol. 2 No. 2, Mei 2014 (25—32)

Luklukyah, Z., Rahayu, t., *., Septian, M., H. 2021. Pengaruh Lama Perendaman Benih Terhadap Pertumbuhan Sorghum Green

Fodder Hidroponik. Prosiding Seminar Teknologi dan Agribisnis Peternakan VIII–Webinar: “Peluang dan Tantangan Pengembangan Peternakan Terkini untuk Mewujudkan Kedaulatan Pangan” Fakultas Peternakan Universitas Jenderal Soedirman, 24-25 Mei 2021, ISBN: 978-602-52203-3-3. 339-346.

Mangardi., Lestari, S.U dan Sutoyo3 .2021. Perkecambahan Benih Karet (*Hevea brasiliensis* muell. arg) Akibat Skarifikasi dan Perendaman. Piper, Volume 17 Nomor 1 April 2021. 36-43

Matinahoru, J.M. 2022. Analisis Hubungan Antara Berat Benih Dan Perkecambahan Benih Tanaman Rao (*Dracontomelon dao*, Hask). AGROLOGIA: Volume 11, Nomor 2, Oktober 2022, halaman 89-98.

Nugraheni, F.T., Haryanti, S., Prihastanti, E. 2018. Pengaruh Perbedaan Kedalaman Tanam dan Volume Air terhadap Perkecambahan dan Pertumbuhan Benih Sorgum *(Sorghum Bicolor* (L.) Moench). *Buletin Anatomi dan Fisiologi*. Volume 3 Nomor 2 Agustus 2018, halaman 223-232.

Rozen et al. 2016. Pematahan Dormansi Benih Enau (*Arenga pinnata*) dengan Berbagai Perlakuan Evaluasi Pertumbuhan Bibit di Lapangan. J. Biodiv Indon 2(1) : 27-31.

Srilaba, N., J. H. Purbadan dan I. K. N. Arsana. 2018. Pengaruh Lama Perendaman dan Konsentrasi Atonik terhadap Perkecambahan Benih Jati (*Tectona grandis* L.). *Agro Bali (Agricultural Journal)*. 1(2): 108-119.

Schmidt, L. 2002. *Pedoman Penanganan Benih Tanaman Hutan Tropis dan Subtropis*. *Buku*. Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial Departemen Kehutanan, Jakarta. 530 h.