The Connection of Water Reception's Conductivity with Sprout Rate That Influenced the Temperature and Long Immersion to Papaya (*Carica papaya* L.) Seeds

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Abstract: High requirement of papaya fruit to local market and international, give promising opportunities to this commodities. Accordingly, to Indonesia's land for the production of tropical fruit gives fresh air for the farmer but the obstacle to face in production is the minimum availabilityof seed, because of the difficulty of papaya seed to germinate. Many ways and effort have been done like soaking many various of solvent, releasing sarcotesta, drying, but still the result come in variation. The purpose of this research is to get the connection of water reception's conductivity with sprout rate that influenced the temperature and long immersion to papaya seeds (Caricapapaya L), and obtain optimal treatment for germination of papaya seeds. This research is using three factors, which is the first factor long immersion consist of three variations (12 hours, 24 hours, 36 hours). The second factor temperature immersion consist of four variations (normal water temperature, 30^{O}C temperature, 50^{O}C temperature, dan 70^{O}C temperature). The research was conducted in a seed laboratory by using 50 seeds in every treatment. Based on this research the effect of temperature treatment and the best long immersion in treatment P_2S_0 with sprout rate 4.99 days and including those with the smallest damage.

1 INTRODUCTION

Papaya plant is including wet tropical species and its growth is quite rapid between 10-12 months after planting the fruit can already be harvested (Suketi*et al*.,2010). The germination of papaya seeds (*Caricapapaya* L) is affected in many factor, like environment, temperature, light, pH, oxygen, humidity temperature, (Hutasoit, 2017; Lange, 1961; and Marbun*et al*,2014;). Papaya seeds have phisical dormancy with slow and unlikely germination process (Lopes and Souza, 2008). Germination can occur in 10-21 days after planting, and can germinate up to 35-40 days (Bhattacharya dan Khuspe, 2001; Chen dan Tseng, 1996; Indriyani N.L.P. *et al*, 2008).

For some research that has been done, there are differences of opinion about the nature of papaya seeds, between the nature of intermediates and orthodoxy. The research that grouping papaya seeds is orthodox nature based on resistance to desiccation until moisture content reaches 6-7% (Sari, 2005),even on the moisture content level 5% (Wood *et al.*, 2000). Juhanda (2013) said that one of the first treatment effort to the seeds that intendedbreak dormancy and speed up the occurrence of likely germination seeds is immersion. Papaya seeds' dormancy break can be done by soaking the seeds in various water temperature. Besidethat, immersion plays to soften the skin of the seeds and making the water easy to absorb by seeds so the physiology processes inside the seed can be happen and the occurrence of germination (Fitriyani *et al*., 2013).

Plant depence of specific temperature to simulate germination and development of seedlings associated, according to plant species (Martyn *et al.*, 2011; Milbau *et al*., 2009; and Mondoni *et al.*, 2008). Response of germination to temperature have potential to increase response of plant to the change of climate (Martyn *et al*, 2011; Milbau *et al.*, 2009; Mondoni *et al.*, 2009; and Ooi *et al.*, 2009), especially most of the species who breed generatively (Venn and Morgan, 2009). By soaking

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the seeds of IPB 1 papaya, the result can accelerate and germination of papaya seeds (Sari, 2005). As the temperature increases, it affects the increased of germination of seeds, but inthesomelimit (Finch-Savage *et al.*, 2006).

Based on the previous research, the researcher wants to do a research about connection of the connection of water reception's conductivity with sprout rate that influenced the temperature and long immersion to papaya seeds (*Carica papaya* L). A research purpose at obtaining the right treatment for the best germination.

2 MATERIALS AND METHODS

The research held in seeds technology laboratory North Sumatra University, Medan with altitude of ± 25 meters above sea level by using the materials of planting *Calina papaya* seeds (IPB 9).

The research is using Completely Randomized Block Design factorial with 2 factors. (The old immersion factor (P) occurring over 3 levels (12 hours of immersion (P_1), 24 hours of immersion(P_2), and 36 hours of immersion(P_3)). (Immersion temperature factor (S) which consist of 4 levels (normal water temperature (S0), 30 ^oC temperature (S1), 50 ^oC temperature (S2), and 70 ^oC temperature (S3)).

The parameters who being observed in this research like leakage of membrane and sprout rate, first data was taken 12 hours treatment by measure the conductivity value of the seed immersion water by using electro conductivity (EC) meters (Milwaukee EC60). sprout rate was observed 1st day after treatment. The result of data analysis on the real effect then continued with different test using Duncan test with 5% levels.

3 RESULTS AND DISCUSSIONS

From the result of the research and analysis of research variance known by temperature treatment and long immersion of papaya seed effect on membrane leakage parameter and germination rate (day). More details can be seen in the table below.

3.1 Membrane Leakage

Table 1 shows that four of the immersion temperature treatment produce different electrical conductivity values between each temperature. The higher the immersion temperature, the greater the electrical conductivity value of the soaking water of the seed. It can be seen that the treatment that shows highest electric conductivity values contain need on highest temperature that is on 70^oC (S_3) temperature for amount of 0.51 mS/cm and the lowest on water normal temperature treatment (S_0) for amount of 0.28 mS/cm, which is appropriate to the Putra's (2011) research who said that the increased of the temperature will increased the electrical conductivity of the coffee seed immersion water.

Table 1: Average Old Role and Various Temperature of Immersion Papaya Seeds

Membrane Leakage						
Treatment	**S0**	**S1**	**S2**	**S3**	**Average**	**Total**
P1	0.27 g	0.31 f	0.42 d	0.49 b	0.37 c	1.50
P2	0.28 g	0.29 g	0.45 c	0.52 a	0.38 b	1.54
P3	0.28 g	0.34 e	0.44 c	0.51 ab	0.39 a	1.58
Average	0.28 d	0.31 c	0.44 b	0.51 a		
Total	0.83	0.94	1.32	1.52		
Rate of Germination						
P1	5.81	6.05	5.67	6.31	5.96 a	23.84
P2	4.99	5.38	5.01	5.82	5.30 b	21.21
P3	5.31	5.75	5.33	5.99	5.60 b	22.38
Average	5.37 b	5.73 b	5.34 b	6.04 a		
Total	16.11	17.18	16.01	18.13		

Information : The numbers followed by different letters shows the real of different according to the Duncan's multiple test at α=5%.

The highest electric conductivity 0.39 mS/cm occur in 36 hours (P3) long immersion treatment and the lowest in 12 hours (P_1) long immersion treatment for amount of 0.37 mS/cm. The bigger of membrane leakage in 36 hours long immersion shows that the seeds' condition in 36 hours long immersion is more deteriorate than the seeds that soaked for 12 and 24 hours. The longest it takes for the seeds' immersionmakes the damage on the seeds' skin and cells membrane in coffee seeds and sawo (Hartawan, 2006; Putra *et al.,* 2011 and Hartuti *et al.*,.2015).

Interaction connection immersion temperature and long immersion for electric conductivity can be seen on Table 1 and Image 1, P_2S_3 seems effecting not real to the treatment of P_3S_3 and different to the other treatment. For the interaction of immersion temperature treatment with long immersion, shows that the highest electricity conductivity value is contain in the P_2S_3 treatment for amount of 0.52 mS/cm and the lowest electricity conductivity value is in P_1S_0 treatment (0,27 mS/cm). Perhaps this caused by high temperature can lowered the seed viability, however have been done on tomato seeds. (Marbun *et al.*, 2014).

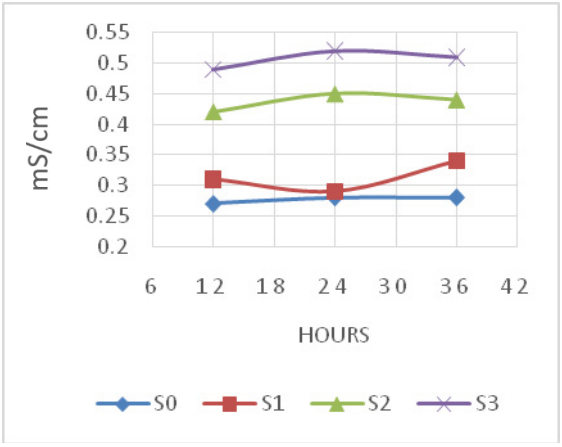

Figure 1: Electric conductivity on each Long and Immersion Temperature

3.2 Rate of Germination (Days)

Based on variance analysis known that immersion temperature treatment, long immersion real effect on rate of germination. Rate of Germination average and Duncan's distance test result can be seen on Table 1. The fastest rate of germination on 24 hours long immersion (5.30 Days) shows that, this long immersion is more affective to process ambition, than 12 and 36 hours of immersion. In accordance with Putra's statement (2011) and Webster *et al.* (2016) that rate of germination effected by long seed immersion (coffee and papaya) as effort to help soften seed's skin as long as the water can enter cotyledon. The fastest long immersion obtained at immersion temperature treatment at 70 ºC for about 6.04 days. This shows that an increase in immersion temperature can improve rate of germination of papaya seeds. This thing is corresponding with the result of the Putra's research (2011) who report that the increased of immersion temperature can increase the rate of seed germination of coffee.

Interaction betweenlong immersion and immersion temperature not real effect to rate of germination. On the Table 1. It can be seen that the fastest rate of germination on the treatment P_2S_0 for about 4,99 days and the longest on the treatment P_3S_3 for about 6,05 days. From the result of the research tend not to be interconnected, the possibilityof the internal and external effect than can beeffectingthe seeds germination and growth, because considering the research environment is not homogeneous. The same thing put forward by Copeland and McDonald, (2001), that environmental conditions such as moisture and seed conditions also affect the germination and the growth of plant. it can be seen from the seeds that obtained do not come from one of the same fruits, the same trees, the same maturity. This thing is corresponding with Dias's statement (2014), that fruit maturity level can be affected papaya seeds' physiologyquality. For more details can be seen in the Figure 2.

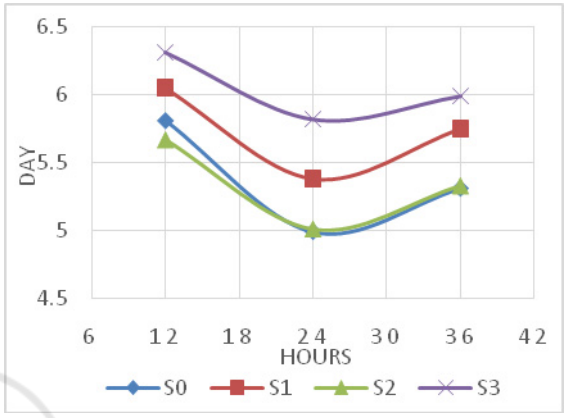

Figure 2: Rate of germination on each long and immersion temperature

3.3 Membrane Leakage's Connection with Sprout Rate

Membrane leakage's connection with sprout papaya seeds can be seen on Figure 3. Temperature Treatment combination and long immersion on pre-sprouts containers have no significant connection.

From Figure 3 shown that with high membrane leakage will slow the rate of sprout papaya seeds. Seen from Figure 1 and 2, high temperature and long immersion will break seeds, with marking the conductivity value of papaya seeds immersion water. Ma (2016) have been reported the same thing salix seeds. As well as the germination of papaya seeds increase almost linear with increase water immersion temperature (Aisah and Elfien, 2016). The immersion stipulatesa series of biochemical changes in pare seeds which is important to start the process such as breaking dormancy, hydrolysis, inhibitory metabolism, imbibition, enzyme activation but at certain temperature and long immersion (Jamil *et al.*,2016).

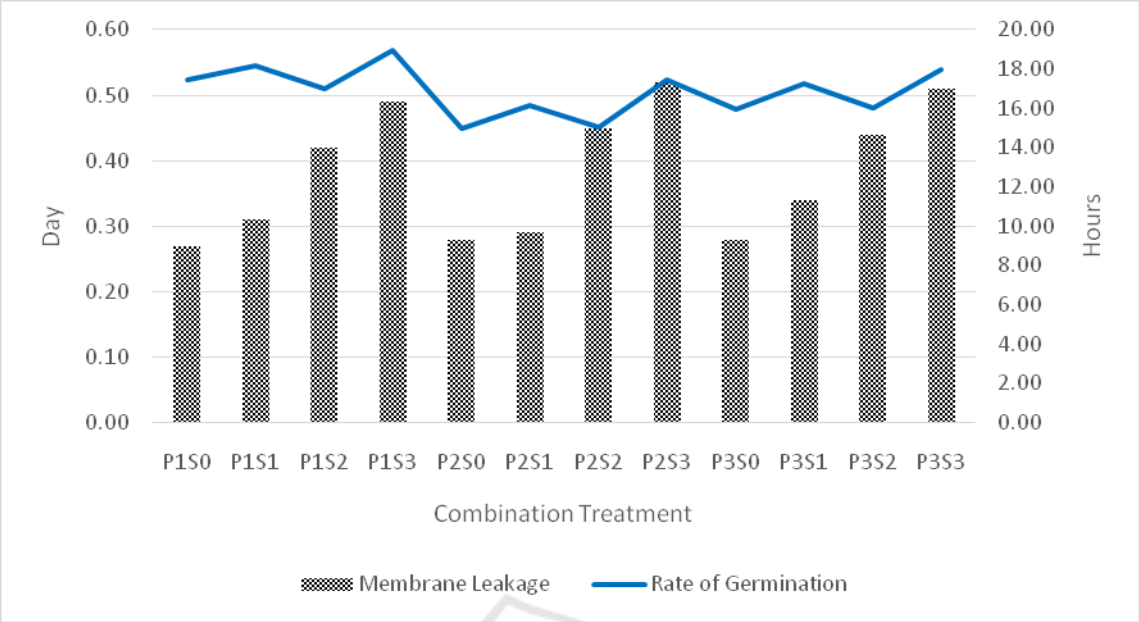

Figure 3. Membrane leakage connection and rate of germination oninteraction between temperature with long papaya seed immersion.

4 CONCLUSION

This result of the research shows that in a single treatment of the best treatment for membrane leakage at 12 hours of immersion, for the best immersiontemperature on normal water immersion treatment, because of the less damage level of seed than the other treatment. The best rate of germination for the best single on 24 hours long immersion and the best temperature treatment on 50 ^{o}C temperature, both of the treatment show the fastest rate of germination.

The best treatment interaction for rate of germination contained in the treatment P_1S_0 (4,99 days), it is possible that damaged caused by immersion for 24 hours is tolerable, possible with normal water temperature that do not damage the seeds.

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