The Effect Of Soaking Of Ridged Gourd Seeds (Luffa Acutangula) In Papaya's Leaves Extract On Speeding Up The Germination

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Abstract: The study aimed at finding out the effect of soaking of ridged gourd seeds (Luffa acutangula) in papaya's leaves extract on speeding up the germination of the seeds. Ridged gourd is one kind of vegetables which is favored by societies. The breeding of this plant is through its seeds. The problem is that the outer layer of the seed skin is hard and therefore the seed is in trouble to germinate. Thus the seeds need softening before sowing. One way to soften the hard outer skin of the seeds is by soaking them in papaya's leaves extract. The papaya's leaves extract contains papain compound that can function to mince the hard layer of the seed skin. The treatments in the study involve several levels namely, G0: no soaking (control); G1: the soaking in the extract with 400 ml of water for 30 minutes; G2: the soaking in the extract with 500 ml of water for 30 minutes; G3: the soaking in the extract with 600 ml of water for 30 minutes; G4: the soaking in the extract with 400 ml of water for 60 minutes; G5: the soaking in the extract with 500 ml of water for 60 minutes; G6: the soaking in the extract with 600 ml of water for 60 minutes; G7: the soaking in the extract with 400 ml of water for 90 minutes; G8: the soaking in the extract with 500 ml of water for 90 minutes; G9: the soaking in the extract with 600 ml of water for 90 minutes. The study resulted that the soaking of the ridged gourd seeds in the papaya's leaves extract within 400 ml of water for 30 minutes demonstrated the highest speed of germination signified with longest seedlings and longest roots.

Index Terms: ridged gourd, papain, soaking of the seeds

1 INTRODUCTION

Ridged gourd is known as "oyong" and is one kind of vegetables that has good commercial potentials. The plant can be bred and cultivated by its seeds. Fine quality of the seeds can yield best ridged gourd plants to produce good fruits (Maulidah and Ashari, 2017). The seed is the starting point of the growth which plays very important role in the early stage of breeding the plant. High quality seed is one of core factors to insure the success of the plant production. The quality of certain seeds is highly related to vigor and viability of the seeds (Lesilolo et al., 2013). These two aspects are indicators to label the seeds of high quality (Ridwansyah et al., 2017). The vigor of the seeds is the ability of the seeds to grow normally in both optimum and suboptimum environmental conditions whereas the viability of the seeds is the ability of the seeds to grow normally under optimum environmental condition (Ilyas, 2012). The viability of the seeds is much related to the germination of the seeds. Germination is the metabolic process of the seeds that starts growth of the germination components (plumula and radicula) in normal state (Marthen et al., 2013). In fact, each seed has variable viability so that certain treatment is applied to the seeds to decide whether the seeds have the ability to become sprouts. The most common problem in technological production of the seeds lies in the aspects of production, cultivation, storage, and seed testing (Maulidah and Ashari, 2017). In the production of ridged gourd, the deterioration of seed quality frequently occurs due to the physical characteristics of the seed layer. Ridged gourd has hard outer skin. This hard structure of the skin can prevent imbibitions and gas diffusion in the seeds and therefore the germination is disrupted (Hartman et al., 2011). Soaking the seeds is then done to trigger the germination (Hanegave et al., 2011). The soaking of the seeds within a solution is intended to enable the fission of protein, carbohydrate contained in the seeds. One alternative choice of the solution to be used to carry out the treatment is the utility of papaya's leaves extract that contains many papain enzymes. These enzymes are identical with thick white colored sap. The enzymes function to decompose protein and carbohydrates which are proteolytic. The most common problem in technological production of the seeds lies in the aspects of production, cultivation, storage, and seed testing (Maulidah and Ashari, 2017). In the production of ridged gourd, the deterioration of seed quality frequently occurs due to the physical characteristics of the seed layer. Ridged gourd has hard outer skin. This hard structure of the skin can prevent imbibitions and gas diffusion in the seeds and therefore the germination is disrupted (Hartman et al., 2011). Soaking the seeds is then done to trigger the germination (Hanegave et al., 2011).

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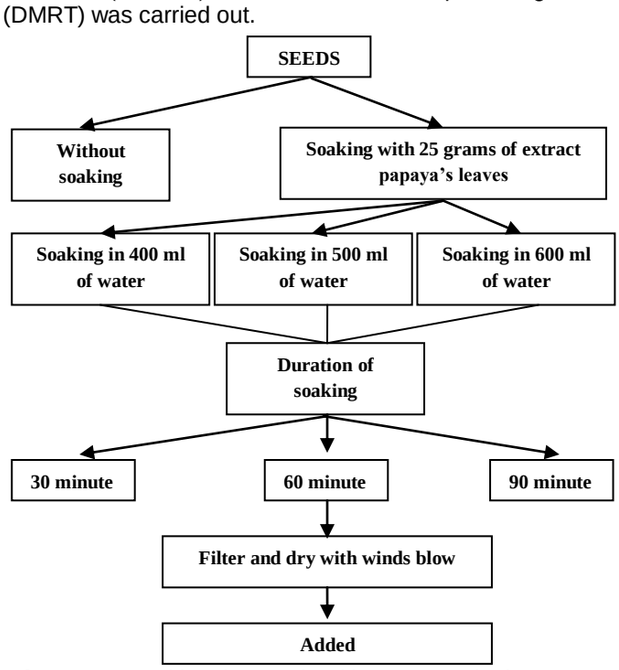
2 MATERIALS AND METHODS

The research was conducted at Seed Technology Laboratory, Indonesia Methodist University. The research started in August 2016. The research method applied in the study was Non factorial Completely Randomized Design that were durations of the treatment on the soaking of the ridged gourd seeds in papaya's leaves extract (weighing 25 grams of the extract)(G): G_0: without soaking, G_1: 25 grams of papaya's leaves extract soaked in 400 ml of water for 30 minutes, G_2: 25 grams of papaya's leaves extract soaked in 500 ml of water for 30 minutes, G_3: 25 grams of papaya's leaves extract soaked in 600 ml of water for 30 minutes, G_4: 25 grams of papaya's leaves extract soaked in 400 ml of water for 60 minutes, G_5: 25 grams of papaya's leaves extract soaked in 500 ml of water for 60 minutes, G_6: 25 grams of papaya's leaves extract soaked in 600 ml of water for 60 minutes, G_7: 25 grams of papaya's leaves extract soaked in 400 ml of water for 90 minutes, G_8: 25 grams of papaya's leaves extract soaked in 500 ml of water for 90 minutes, G_9: 25 grams of papaya's leaves extract soaked in 600 ml of water for 90 minutes. Each of the treatment was conducted five times repeatedly. If the effect of the treatment on the seeds is real different on Analysis of Variance (ANOVA), then Duncan's Multiple Range Test (DMRT) was carried out.



Figures 1. *Soaking the seeds with 25 grams in the papaya leaf extract.*

3 RESULT AND DISCUSSION

The soaking of the seeds in the papaya's leaves extract can soften the seed skin. This is possible because the characteristics of the papain enzymes which is proteolitic to decompose protein (Simanjorang et al., 2012) which contained in the skin of the seeds. This enables the water absorption through the skin (Schmidt, 2002) and the imbibitions process can operate well. Other than papain enzymes, the extract of the papaya's leaves contains some other minerals like potassium, calcium, magnesium, copper, iron, and manganese, which can help the plant germinate. In Milind and Guardita (2011), it is stated that the papaya's leaves extract do not only contain papain, flavonoids, karpinin alkaloids, carpain, and pseudocarpain, vitamin C and E, but it also contains minerals which are needed by plants to grow well, like potassium, calcium, magnesium, copper, iron, and manganese.

Table 1. *Speed germination (%) of ridged gourd seeds in extract papaya's leaves age 8 days after planting.*

Treatment	Speed Germination
	Age (days after planting)
	8
	…. % ….
G_0: Without soaking (Control)	97a
G_1: Soaked in 400 ml of water for 30 minutes	100b
G_2: Soaked in 500 ml of water for 30 minutes	100b
G_3: Soaked in 600 ml of water for 30 minutes	100b
G_4: Soaked in 400 ml of water for 60 minutes	100b
G_5: Soaked in 500 ml of water for 60 minutes	100b
G_6: Soaked in 600 ml of water for 60 minutes	100b
G_7: Soaked in 400 ml of water for 90 minutes	100b
G_8: Soaked in 500 ml of water for 90 minutes	100b
G_9: Soaked in 600 ml of water for 90 minutes	100b

Note: *Average numerical followed by the same Alphabetical at the same column shows no significantly at p<0.05 using DMRT.*

The study resulted that (Table 1) indicated that the treatment of the soaking the ridged gourd seeds in papaya's leaves extract with 400 ml of water for 30 minutes (G_1) had the highest germination speed compared to all the other treatments. In Matsushima and Sakagami (2013), it is stated that one of invigorative methods that can be used to speed up seeds' germination and to yield seeds with good vigor, is by soaking the seeds. One of sample treatments is by soaking the seeds in papaya's leaves extract for different durations. The soaking of the seeds for some different duration can increase the germination speed and its percentage (Lubis et al., 2014). Ridged gourd is one kind of plants that has epigeous germination type. This kind of germination process is affected by outer and inside factors of the seeds. The inside factors involve genetic characteristics of the seeds and outer factors involve such as the soaking of the seeds. The treatment of the soaking the seeds in papaya's leaves extract in fact triggers the emergence of radiculas as the early stage of the germination process. In the germination process of the seeds, by availability enough water going through the skin of the seeds, the giberelin hormones will be activated after the imbibitions of water occur and then encourage the formation of hydrolytic enzymes such as α−amylase, protease, ribonucleic, β−gluconase, and phosphatase. These enzymes will diffuse into endosperm and catalyze backup food materials inside the endosperm to become glucose, amino acid, nucleosides that support the growth of embryo during the germination process.

Table 2. *Length root (cm) of ridged gourd seeds in extract papaya's leaves age 8 days after planting.*

Treatment	Length Root
	Age (days after planting)
	8
	…. % ….
G_0: Without soaking (Control)	4.1 a
G_1: Soaked in 400 ml of water for 30 minutes	15.1 i
G_2: Soaked in 500 ml of water for 30 minutes	14.4 h
G_3: Soaked in 600 ml of water for 30 minutes	12.8 g
G_4: Soaked in 400 ml of water for 60 minutes	10.2 f
G_5: Soaked in 500 ml of water for 60 minutes	8.3 e
G_6: Soaked in 600 ml of water for 60 minutes	7.6 d
G_7: Soaked in 400 ml of water for 90 minutes	5.2 c
G_8: Soaked in 500 ml of water for 90minutes	5.1 c
G_9: Soaked in 600 ml of water for 90 minutes	4.5 b

Note: *Average numerical followed by the same Alphabetical at the same column shows no significantly at p<0.05 using DMRT.*

In table 2, it demonstrates the longest root is in the soaking of the seeds in the papaya's leaves extract with 400 ml of water for 30 minutes (G_1) that is 15.1 centimeters. The optimal growth of root will increase the speed in the nutrient and water absorption from the soil (Tiara et al., 2017). A plant of large volume of root has the ability to absorb more water (Palupi and Dedywiryanto, 2008) that are used while germination. The growth of germination which is signified by the emergence of sprouts in open or on the surface, is one factor that shows good vigor of the seeds and this vigor is affected by genetic factor (Dwipa and Saswita, 2017). The speed of the germination is the number of seeds that germinate in a certain time unit. In the table, it can be seen that the average speed days needed to germinate ridged gourd seeds on the treatments of the soaking the seeds in 400 ml, 500 ml, 600 ml of water for 30 minutes, is less than two days. While the soaking of the seeds in 400 ml, 500 ml, and 600 ml of water for both in 60 and 90 minutes needs more than two days to germinate in its speed.

Table 3. *Speed germination of ridged gourd seeds in extract papaya's leaves*

Treatment	Speed Germination
G_0: Without soaking (Control)	5.7 i
G_1: Soaked in 400 ml of water for 30 minutes	1.3 a
G_2: Soaked in 500 ml of water for 30 minutes	1.5 b
G_3: Soaked in 600 ml of water for 30 minutes	1.8 c
G_4: Soaked in 400 ml of water for 60 minutes	2.6 d
G_5: Soaked in 500 ml of water for 60 minutes	2.9 e
G_6: Soaked in 600 ml of water for 60 minutes	3.1 f
G_7: Soaked in 400 ml of water for 90 minutes	3.2 fg
G_8: Soaked in 500 ml of water for 90 minutes	3.4 gh
G_9: Soaked in 600 ml of water for 90 minutes	3.5 h

Note: *Average numerical followed by the same Alphabetical at the same column shows no significantly at p<0.05 using DMRT.*

Statistically, the study resulted that over all the treatments, the treatment of the soaking the ridged gourd seeds in papayas leaves extract with 400 ml of water for 30 minutes (G_1) proved the highest speed germination index. The ability of the seeds to germinate fast is supported by the high ability of the seeds to germinate (Lesilolo et al., 2013). This treatment of the soaking of the seeds is conducted to increase the germination process through imbibitions so that the seed skin softens and cracks (Pancaningtyas et al., 2014).

Table 4. *Speed germination index of ridged gourd seeds in extract papaya's leaves*

Treatment	Speed Germination Index
G_0: Without soaking (Control)	3.8a
G_1: Soaked in 400 ml of water for 30 minutes	16.7 i
G_2: Soaked in 500 ml of water for 30 minutes	15.1 h
G_3: Soaked in 600 ml of water for 30 minutes	13.9 g
G_4: Soaked in 400 ml of water for 60 minutes	8. f
G_5: Soaked in 500 ml of water for 60 minutes	7.8 e
G_6: Soaked in 600 ml of water for 60 minutes	7.4 d
G_7: Soaked in 400 ml of water for 90 minutes	7.2 cd
G_8: Soaked in 500 ml of water for 90 minutes	6.9 bc
G_9: Soaked in 600 ml of water for 90 minutes	6.8 b

Note: *Average numerical followed by the same Alphabetical at the same column shows no significantly at p<0.05 using DMRT.*

In tables 3 and 4 it is clearly seen that the germination speed indexes are in line with the seed germination speeds. If seeds in the germination process need longer time, then the point in the germination speed index becomes lower. This means that the more time is needed by the seeds to germinate, and then the lower is the point in the germination speed index. It can be inferred that the lower value/ point of the germination speed index indicates that the seeds need more days to fulfill the germination (Lesilolo et al,. 2013).

4. CONCLUSION

Based on the result found out in the study, it is concluded that the treatment of the soaking the ridged gourd seeds in papaya's leaves extract with 400. 500, 600 ml of water for

30, 60, and 90 minutes (G1) triggered the germination power by 100%, 13.38 centimeters tall, and the highest seed germination speed index 16.7 and shortest time to germinate 1.3 days.

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