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Seed Scarification Test and ZPT Immersion on Germination of Watermelon Seeds (*Citrullus Vulgaris Schard*)

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ABSTRACT

Purpose of this study was to determine the effect of the combination of seed scarification treatment and ZPT immersion on the power of watermelon seed germination; to find out the effect of treatment of seed scarification on watermelon seed germination; to find out the effect of ZPT immersion treatment on the power of watermelon seed germination. This experiment was carried out in the laboratory of the Faculty of Agriculture, Merdeka University, Surabaya. Place height of approximately 5 m above sea level. The experiment was arranged factorially in Randomized Block Design (RBD), consisting of two factors: Treatment of seed scarification with 2 levels of treatment and length of immersion of ZPT with 4 treatment levels. Each treatment combination was repeated three times and each combination treatment consisted of 50 seeds watermelon. Factor I is the treatment of seed scarification consisting of without stripping, and stripping Factor II which is the soaking time of ZPT which consists of without soaking; 10 minutes immersion; 20 minutes soaking and 30 minutes soaking. Observations were made every day until the germinated seeds did not germinate again (7 days after germination), observations made included: Germination rate, germination percentage, radicle length, plumula length. The results of statistical analysis showed that the overall combination of seed scarification and soaking of ZPT against watermelon seed germination had not yet given a real interaction effect. Separately the seed scarification treatment had a significant effect on root growth of watermelon sprouts, and did not affect the growth of plumula length, germination percentage and sprout speed, but ZPT immersion treatment significantly affected the percentage of germination, sprout speed, root length growth, and length of plumula growth. . The average percentage of germination, germination rate, length of the plumula and the length of the watermelon seed radicles were best obtained in ZPT immersion treatment with 30 minutes soaking time, which was then followed by other treatments.

Keywords: Skarification, ZPT and Germination.

1. INTRODUCTION

Watermelon (*Citrullus vulgaris Schard*) is one of the most important horticultural crops in the tropics even in subtropical regions because watermelon plants can provide considerable benefits (Anonymous, 2010)._ And Watermelon is a fruit plant in the form of herbs that grow in English which is called *Water Mellon*. Watermelon is included in the family of pumpkin-fruit (*Cucurbitaceae*) in the area of origin is very favored by humans / animals that exist on the continent, because it contains a lot of water, so the spread becomes fast (Anonymous, 2010).

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Watermelon plants (*Citrullus vulgaris. Scard*) are plants originating from the continent of Africa, precisely in the desert of Kala day. Spread to India, China, America and Indonesia. Watermelon fruit has its own charm from fresh and sweet fruit. The water content reaches 92%, carbohydrates 7% and the rest is vitamins. (Anonymous, 2010).

Watermelon plants grow well in the lowlands to highlands 0-1000 m asl. The area with calcareous and contains a lot of organic material (fertile) with a relatively dry climate is preferred (Anonymous, 2009). The ideal height for watermelon planting areas is: 100 - 300 m above sea level. The fact is that watermelons can be planted in areas near the coast that have heights below 100 m above sea level and above hills with an altitude of more than 300 m above sea level **(**Prihatman, K. 2000)

Ideal rainfall for watermelon planting areas is 40-50 mm / month. The entire watermelon plantation area needs sunlight from dawn to sink. Lack of sunlight causes a decline in harvest time.

Watermelon plants will be able to grow and produce fruit optimally at a temperature of ± 25 degrees C (daytime). The ideal air temperature for watermelon plant growth is the average daily temperature that ranges from 20-30 mm (Kalie, MB, 2000).

Air humidity tends to be low when sunlight shines on the planting area, meaning dry air that is poor in water vapor. This condition is suitable for the growth of watermelon plants, because in their home areas watermelon plants live in a desert environment that is dry air. Conversely, too high humidity will encourage the growth of plant-destroying fungi (Rukmana, R., 1993).

Land conditions that are suitable for watermelon plants are soil that is quite loose, rich in organic matter, not acidic soil and dried garden / rice fields. Soil acidity (pH) is needed between 6-6,7. If pH 6, 50 kg of dolomite is needed (Hariyadi, Ali, & Nurlina, 2017).

Watermelon plants are one of the horticultural plants that need to get attention among other horticultural plants. This is because the watermelon has a price that is relatively higher than the average horticulture plant. And it is hoped that it can provide many benefits to farmers or watermelon farming entrepreneurs. So as to make it possible to improve Indonesia's economic order, especially from agriculture (Prihatman, K. 2000).

Considering the watermelon seed skin is thick enough, so that in order to meet people's needs quickly, it is necessary to assist with the process of scarifying or breaking the seed coat so that the prospective watermelon roots are easy to grow (Anonymous, 2010). Besides the mechanical way accelerating germination can also be done by using growth regulators.

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Substance regulating growth in the germination process, has an important meaning. According to King (1965), said that growth regulators can affect plant growth and development through the germination phase. Handoko *et.al.*(1987), said that soaking seeds in a solution of growth regulators will produce a double advantage, first the seeds can absorb water, so the seeds germinate quickly, and the two active ingredients contained in growth regulators can improve the growth of seedlings.

Manurung (1985), states that Atonik is a chemical that can stimulate biochemical processes and plant physiology, so it is expected to be used to improve yield and quality. But the presence of phenol in the active ingredients causes in addition to encouraging growth, in certain quantities it can also inhibit growth. Therefore Atonik is not classified as a hormone but as a growth regulator.

Takayasu *et al* (1982), said that Atonik has properties such as: Very easily absorbed by leaves, young shoots, flowers and plant roots and can affect the cell flow process, intensify growth, improve cell pollination process, thus ensuring the occurrence of fruit, increasing the percentage seed germination, root growth in cuttings and prevent fall of flowers and fruit.

According to Abidin (1983), that growth regulator (Atonik) is an organic compound that is not nutrient, which in a small amount can support, accelerate germination. Considering the importance of both of the above, it is necessary to do research on seed scarification and soaking of ZPT against the power of germination of watermelon seeds.

2. RESEARCH METHODS

This research was conducted in the laboratory of the Faculty of Agriculture, Merdeka University, Surabaya. Place height of approximately 5 m above sea level. The research materials and tools used were: paper straw, germination tub, sprayer, watermelon seed, Atonik growth regulator, measuring cup, spoon and the measuring instrument was

arranged factorially in Randomized Block Design (RBD), consisting of two factors: Treatment scarification of seeds with 2 treatment levels and ZPT immersion time with 4 treatment levels. Each treatment combination was repeated three times and each combination treatment consisted of 50 watermelon seeds.

The first factor is the treatment of seed scarification consisting of without stripping, and stripping. Factor II is the soaking time of ZPT which consists of without immersion; 10 minutes immersion; 20 minutes soaking and 30 minutes soaking.

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Observations are made every day until the germinated seeds have not germinated again (7 days after germination), observations made include:

a. Germination rates : can be measured by counting the number of days needed for the appearance of radicles or plumules, can be written with the formula:

$$\text{Average days} = \frac{N_1 T_1 + N_2 T_2 + \ldots\ldots\ldots\ldots\ldots N_X T_X}{\text{Total number of seeds that germinate}}$$

Where: N : number of seeds germinating at unit time tt.
T : shows the amount of time between the start of the test to the end of the interval on an observation

b. Percentage of germination: shows the amount of normal sprouts that can be produced by seeds in certain environmental conditions within a predetermined period of time, can be written with the formula:

$$(\%) \text{ germination} = \frac{\text{The normal amount of sprouts produced}}{\text{Number of samples of seed tested}} \times 100\%$$

c. Radicle length: measured from the root of the neck to the longest end of the root, observations were made at the end of the observation.

d. Plumula length: measured from the root of the neck to the tip of the plumula, observations were made at the end of the observation

3. RESULTS AND DISCUSSION

3.1. Percentage of Watermelon Seed Germination Variation

Analysis results showed that the interaction due to seed scarification and ZPT immersion did not significantly affect the percentage of watermelon seed germination. Separately the treatment of seed scarification did not significantly affect the percentage of watermelon seed germination, but the treatment of ZPT immersion had a very significant effect.

The average percentage of watermelon seed germination due to the treatment of seed scarification and soaking of ZPT can be seen in Table 1.

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Table 1. Average Percentage of Watermelon Seed Germination Due to Treatment of Seed Scarification and ZPT Immersion

Original Data			transformation		
treatment	The average	Notation	Treatment	Average	Notation
Lo	95.3333	a	Lo	77.7733	a
L1	99.6667	b	L1	88.6450	b
L2	99.6667	b	L2	88.6450	b
L3	100.0000	b	L3	90.0000	b
BNT 5%	1.2862		BNT 5%	3.0507	
Po	98.8333	a	Po	86.5017	a
P1	98.5000	a	P1	86.0300	a
BNT 5%	tn		BNT 5%	tn	

Description: The numbers accompanied by different letters in the same column show significantly different from the 5% BNT test

tn: not real

Table 1 shows that immersion of ZPT with 30 minutes immersion time (L3) gives the highest germination percentage of 100% or 90% for transformed data, which is then followed by a 20 minute immersion time (L2), immersion time of 10 minutes (L1) and without immersion (Lo) , each of which has a yield of 99.6667% or 88.6450; 99.6667% or 88.6450 and 95.3333% or 77.7733%.

3.2. Speed of Germination Watermelon Seed Variation

Analysis showed that the interaction due to seed scarification and ZPT immersion did not significantly influence the speed of watermelon seed germination. Separately the treatment of seed scarification did not significantly affect the speed of germination of watermelon seeds, but the ZPT immersion treatment had a very significant effect.

The average speed of germination of watermelon seeds due to treatment of seed scarification and soaking of ZPT can be seen in Table 2.

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Table 2. Average Speed of Seedling Watermelon Germination Due to Treatment of Seed Scarification and Immersion of ZPT

Treatment	Average(days)	Notation
Lo	3.0800	c
L1	2.7700	b
L2	2.7867	b
L3	2.6333	a
BNT 5%	0.1002	
Po	2.8350	a
P1	2.8000	a
BNT 5%	tn	

Description: The numbers accompanied by different letters in the same column show significantly different from the 5% BNT test

tn: not real

Table 2 shows that ZPT immersion with 30 minutes immersion time (L3) gives the fastest germination rate of 2.6333, which is then followed by a 10 minute long immersion (L1) immersion time of 20 minutes (L2), and without immersion (Lo), which each yields 2.7700; 2.7867 and 3.0800.

3.3. Length of Watermelon Seed Radicles Variation

Analysis showed that the interaction due to the treatment of seed scarification and soaking of ZPT did not significantly affect the length of the radicle sprout watermelon. Separately, the scarification treatment of the seedlings had a significant effect on the length of the radicle sprouted watermelon, as well as the ZPT immersion treatment had a significant effect.

The average length of the watermelon sprout radicle due to treatment of seed scarification and soaking of ZPT can be seen in Table 3. Table 3 shows that immersion of ZPT with 30 minutes immersion time (L3) gives the longest sprout radicle length of 3.9767, which is then followed by long treatment immersion 20 minutes (L2), immersion time of 10 minutes (L1) and without immersion (Lo), where each of themyield of gets a3.8800; 3.7750 and 3.4733. Likewise, the treatment of scarification ofseed the peeled(P1) results in the longest radicle length of 3,9200, followed by the treatment of seed scarification without peeling (Po) which yields a yield of 3.6325.

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Table 3. Average Length of Radicle Sprouts of Watermelon Due to Treatment of Seed Scarification and ZPT Immersion

Treatment	Averageof	Notation
Lo	3.4733	a
L1	3.7750	a
L2	3.8800	b
L3	3.9767	b
BNT 5%	0.3241	
Treatment	Average(cm)	Notation
P o	3.6325	a
P 1	3.9200	b
BNT 5%	0.2291	

Note: The numbers accompanied by different letters in the same column show significantly different from the 5% BNT test

tn: not real

3.4. Length of Watermelon Sprout Plumula

The results of the variance analysis showed that the interaction due to the treatment of seed scarification and soaking of ZPT did not significantly affect the length of the plumula sprout watermelon. Separately the scarification treatment of seeds did not significantly affect the length of the watermelon sprout plumula, but the ZPT immersion treatment had a very significant effect.

The average length of watermelon sprout plumula due to seed scarification and ZPT immersion can be seen in Table 4.

Table 4. Average Length Plumula Sprout Watermelon Due to Treatment of Seed Scarification

Treatment	Average (cm)	Notation
Lo	15.4533	a
L1	16.6700	b
L2	17.2483	c
L3	17.7050	c
BNT 5%	0.5237	
Po	16.6050	a
P1	16.9333	a
BNT 5%	tn	

Description: Numbers accompanied by letters different in the same column shows significantly different in the 5% BNT test

: not real.

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Table 4 shows that immersion of ZPT with 30 minutes immersion time (L3) gives the longest results of the longest watermelon sprout plumula, 17.7050, which is followed by 20 minutes soaking time (L2), immersion time of 10 minutes (L1) and without immersion (Lo), where each one gets 17.2483, 16.6 700 and 15.4533.

4. DISCUSSION

Overall, in general, the combination of seed scarification and ZPT immersion on watermelon seed germination has not yet had a real interaction effect. Separately the seed scarification treatment had a significant effect on root growth of watermelon sprouts, and did not affect the growth of plumula length, germination percentage and sprout speed, but ZPT immersion treatment significantly affected the percentage of germination, sprout speed, root length growth, and length of plumula growth(Hidayati & Huda, 2018).

The average percentage of germination, germination rate, length of the plumula and the length of the watermelon seed radicle was best obtained in ZPT immersion treatment with 30 minutes immersion time (L3), which was then followed by a 20 minute immersion time (L2), immersion time of 10 minutes (L1) and without immersion (Lo).

It is assumed that almost all seeds have reached physiological cooking so that they can produce normal sprouts with a high percentage and by soaking the seeds in a solution of growth regulators can cause the seeds to absorb water easily, so the seeds germinate quickly. In accordance with the opinion of Ilyas (1994), states that quality seeds are one of the factors that play an important role in the cultivation of plants and seeds that require a long imbibition before germination to achieve maximum germination.

Handoko *et.al.*(1987), said that soaking seeds in a solution of growth regulators will produce a double advantage, first the seeds can absorb water, so the seeds germinate quickly, and the two active ingredients contained in growth regulators can improve the growth of seedlings.

Anonymous (2007), also said that good seed germination techniques have an impact in determining the success of seeds to germinate. The ability of seeds to germinate is determined by several factors of seed quality, the environment of the planting media, growth stimulants (ZPT) and attack of seed diseases(Purwanti, Hidayati, & Nurlina, 2017). To further increase the success of germination seeds and faster germination time, the use of growth regulating substances can be done. In general, some cases of germination increase to 100% and seeds can germinate faster 4-5 days than normal. One of the growth regulators that can be used is Atonik (Polyphenol).

The treatment of seed scarification by peeling (P1) gave the longest radicle length results compared to the treatment of seed scarification without stripping (Po). It is presumed that the seeds that are not stripped, the absorption of water is blocked, but by stripping the skin can accelerate germination, because the seeds are easier to imbibition. In accordance with the opinion of Sutopo, L. (1984), who said that seeds that have hard seeds, water is blocked by seed skin, so by opening the skin will accelerate germination. In addition to stripping (mechanical) other ways that can be used to accelerate germination of seeds is to use growth regulators. The purpose of using this chemical is to make it easier for the skin to enter the water during the imbibition process.

Saleh, MS. (2003), said that seeds that were given special treatment, namely scrape the back or scarification can improve germination and germination rate of dfan would be better if done together with soaking chemicals, this needs to be done in order to eliminate the growth inhibiting power.

Takayasu *et al* (1982), said that ZPT Atonik has properties such as: Very easily absorbed by leaves, young shoots, flowers and plant roots and can affect the process of cell flow, intensify growth, improve cell pollination, thus ensuring the occurrence of fruit, raising percentage of seed germination, root growth in cuttings and preventing the occurrence of fall flowers and fruit.

5. CONCLUSION

Based on the results of the research and discussion, the following conclusions can be drawn: Combination of treatment of seed scarification and immersion of ZPT as a whole did not interact with watermelon seed germination, Treatment of seed scarification on watermelon germination had a significant effect on growth of radicle length, while germination percentage , the speed of germination does not have a real effect and The overall immersion of ZPT gave a significant effect on watermelon seed germination, where the highest yield was obtained in 30 minutes soaking.

Suggestion

To get better and more accurate information, further research is needed regarding the treatment of seed scarification and soaking of ZPT against germination of watermelon seeds

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