No. Issue: 1 | *Implementation* | ***pp. 13-19***

Seed Priming Application to Improve the Physiological Quality of True Shallot Seed (TSS)

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Abstract: Shallots are one of vegetable that can be cultivated with bulb or seeds. Shallot seeds better known as True Shallot Seed (TSS). Shallot cultivation using TSS still encounters several obstacles including low physiological quality of seeds. Physiological quality of seed can be improved by seed priming. One of popular natural seed priming is coconut water. The goal of this experiment was to determinate the best application of seed priming to improve TSS physiological quality. This experiment use factorial completely randomized design with 3 replications. First factor is 3 kind of soaking liquid (water, warm water dan coconut water). Second factor is soaking time (1 hour, 6 hour, 12 hour, 18 hour dan 24 hour). TSS used in this experient was Tisula. The result showed that soaking TSS in coconut water for minimal 18 hours has been shown to improve seed physiological quality.

Keywords: TSS, Coconut water, immersion time

1. Introduction

Increasing shallots productivity is faced by the problem of scarcity of availability of quality seed, low yielding and expensive (Andayani, 2020). One of the solution offered is to used botanical seed or we know as True Shallot Seeds (TSS). TSS has many advantages when compared to bulb, TSS need for seed about 7,5 kg per hectares less than bulb which is need 1,5 ton per hectares. TSS also free viruses and seed borne diseases. TSS can reducing seed costs, producing healthier plants and higher yield (Basuki, 2009).

True Shallot Seed (TSS) is a mature ovule that has been fertilized, has an embryo, food reserves and a protective layer. TTS has round shapes, flat wrinkled with irregular shape and has a black protective coating. TSS are produced from ripe shallot flower (Pangestuti & Sulistyaningsih, 2011). TSS has long been a commercial seed in sub-tropical countries and a promising alternative seed in tropical countries. However, TSS has several constraints like low physiological quality (W. Setyawan, 2020).

TSS physiological quality can be improved by applying seed priming. Seed priming is seed invigoration treatments, which includes coating and pelleting. Seed invigoration is a treatment given to seed before planting to improving germination and sprout growth (Kurnianingsih & Sefrila, 2018). The principle of this technology is based on the seed imbibition stage, so the water absorption is a fairly important process in seed germination and growth (Goenadi, 2008). Seed priming can increase germination

rate, germination percentage, uniformity growth and germination speed. The solvent used in seed priming is water or other ingredients that contain hormones and nutrients, and coconut water is one of the options. Coconut water contains hormones such as cytokinin, auxin and gibberelins as weel as other compounds that can stimulate germination. According to (Samudi & Saptaria, 2018), coconut water contains organic materials that can be used to stimulate embryonic development.

2. Methodology

This research was carried out on March 4 until May 17 2020 at Agro technology Laboratory, Agriculture, Kadiri Islamic University (UNISKA) Kediri. Instrument used in this research were petri sidhes, tweezers, weight measuring instrument, length measuring instrument, sprayer and documentation tools. Material used were TSS by Trisula Variety with a shelf life of 2 years, parchment paper, equates and coconut water (Hastuti & Setyawan, 2021).

This Research used Completely Randomized Factorial Design with 3 replications. First factor is kind of solvent material and the second factor is immersion time (Soeprajitno et al., 2019).

First Factor (3 levels)	Second Factor (5 levels)
Water	1 hour
Warm Water by 40^{o}C	6 hours
Coconut Water	12 hours
	18 hours
	24 hours

TSS seeds that have been treated are planted on parchment paper which are cut according to the shape of petridish. We used 5 sheets parchment paper in each petridish, each treatment need 100 TSS and sown in 4 petridish, so each petridish contain 25 TSS and all of them were samples. The data obtained will be analyzed for variance and if there is a real effect, then it will have tested with Honestly Significant Different Test. Observed Variable: Sprout Growth, Vigor Index, Germination rate, Germination score, Normal Seed Percentage

3. Research Results

Sprout Growth

The type of solvent and duration of immersion have an interaction in optimizing the germination of TSS and increasing the percentage of normal sprout growth. The longer the immersion the higher the germination. The best treatment to increase TSS sprout growth is water imeersion for 24 hour, warm water for 24 hour and coconut water for 24 hours. So to increase efficient germination is to immersion TSS for 24 hour in any solvent.

Immersion TSS for 24 hours ensures that the seeds have absorbed water optimally so that seeds can reach optimum imbibition, where the first step in germination process is the imbibition which is followed by cell division and activation seed enzymes.

Table 1. Germination strength of True Shallot Seed (TSS) (%)

Treatment		Germination strength	
Water	**1 hour**	58,67	a
	6 hours	59,33	a

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	12 hours	62,00	ab
	18 hours	72,00	cde
	24 hours	82,00	f
Warm Water	**1 hour**	63,33	abc
	6 hours	64,67	abc
	12 hours	65,33	abc
	18 hours	67,33	bcd
	24 hours	79,33	ef
Coconut Water	**1 hour**	64,33	abc
	6 hours	68,33	bcd
	12 hours	69,67	bcd
	18 hours	73,67	de
	24 hours	83,00	f
HSD 5%		**7,869**	

Vigor Index

Vigor index is one of physiological qualities of seeds to indicate the ability of seeds to germinate and grow under sub-optimum conditions (Delouche & Caldwell, 1960); (W. H. Setyawan, 2017). The results of variance analysis showed that there was an interaction between solvent and immersion time (table 2).

The best interaction to increase between solvent and immersion time is water immersion for 24 hours, warm water immersion for 24 hours, and coconut water immersion for 24 hours. So it can be concluded, seed vigor can be increased immersion for 24 hours.

Table 2. Vigor Index of True Shallot Seed (TSS)

Treatment		**Germination Rate**	
Water	**1 hour**	42,00	a
	6 hours	48,00	abc
	12 hours	48,67	abc
	18 hours	53,67	cd
	24 hours	68,67	e
Warm Water	**1 jam**	44,67	ab
	6 jam	46,67	abc
	12 jam	50,00	abc
	18 jam	54,67	cd
	24 jam	66,00	e
Coconut Water	**1 jam**	49,00	abc
	6 jam	49,00	abc
	12 jam	51,33	bc

	18 jam	53,33	cd
	24 jam	61,33	de
HSD 5%		**8,543**	

Germination Rate

The germination rate showed an interaction between solvent and immersion time (table 3). The best treatment to increase TSS germination rate can be done by water coconut immersion for 24 hours.

Table 3. Germination Rate of True Shallot Seed (TSS)

Treatment		**Germination Rate**	
Water	**1 hour**	3,52	a
	6 hours	3,65	ab
	12 hours	3,82	abc
	18 hours	4,07	bc
	24 hours	4,13	bcd
Warm Water	**1 hours**	3,67	ab
	6 hours	3,76	abc
	12 hours	3,73	ab
	18 hours	4,03	bc
	24 hours	4,25	cde
Coconut Water	**1 hour**	3,99	abc
	6 hours	4,62	def
	12 hours	4,71	ef
	18 hours	4,84	f
	24 hours	5,36	g
HSD 5%		**0,501**	

Germination Score

Germination score shows the daily germination percentage value in a seed lot. The treatment coconut water immersion for 18 and 24 hours, water immersion 24 hours and warm water immersion 24 hours showed the most optimal germination score. According to Hedty, et, al. (2014); (Goenadi, 2008), water coconut is a solution that can be used to accelerate the germination process because it contains nutrients and growth regulators, each of which has a role in the germination process.

Saptaria & Setyawan (2021) certify that coconut water is endosperm in liquid form which contains nutrients and growth regulators such as cytokines and gibberellins that can stimulate germination. Cytokinins function to stimulate cell division in seed embryos.

Table 4. Germination Score of True Shallot Seed (TSS)

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Treatment		Germination Rate	
Water	1 hour	6,00	a
	6 hours	6,52	abc
	12 hours	6,76	abc
	18 hours	8,31	d
	24 hours	9,51	e
Warm Water	1 hours	6,11	ab
	6 hours	6,67	abc
	12 hours	7,14	bc
	18 hours	8,32	d
	24 hours	9,44	e
Coconut Water	1 hour	6,51	abc
	6 hours	6,97	abc
	12 hours	7,33	cd
	18 hours	9,95	e
	24 hours	10,43	e
HSD 5%		1,061	

Normal Sprout Percentage

The result of this study showed that longer the immersing time, the lover percentage of abnormal seed, perish seed and harsh seed. Water coconut treatment able to suppress the emergence of abnormal seeds, perish seed and harsh seed (Bito et al., 2021). This is related to the hormone contain in coconut water.

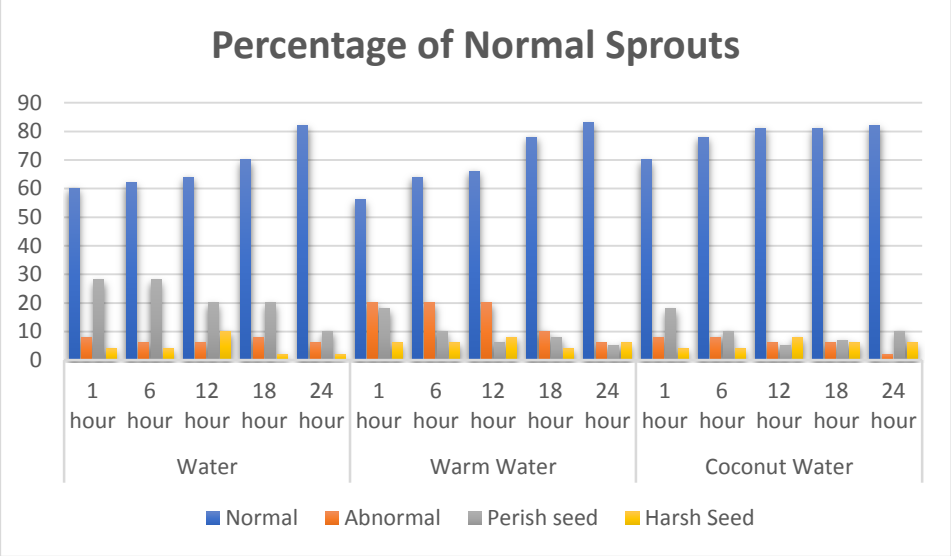

Figure1. Percentage of Normal Sprouts

5. Conclusion

The treatment that can improve TSS physiological quality is coconut water immersion for 24 hours.

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