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The Effect of Coconut Water and Planting Media to the Growth of Christmas Palm (*Veitchia merilli*)

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***Abstract*—Christmas palm seed is one types of seeds that are difficult to germinate. This study aims to determine the effect of coconut water and different growing media on germination of Christmas palm seeds. The experiment was conducted at the Faculty of Agriculture screen house, from October 2017 to February 2018. The material used was Christmas palm seeds obtained from the Faculty of Agriculture Experiment Garden, hybrid coconut water, wulung coconut (medicinal coconut) water, soil, red yellow podsolic soil (RYP), manure, and compost. The experimental design used a randomized complete block design consisting of 8 combinations of treatment between immersion with coconut water (hybrid and wulung coconut water and coconut water) with the type of planting media (humus soil, red yellow podsolic soil, mixed soil with manure, and compost). Each experimental unit consisted of 5 pots and was repeated three times. The results showed that the red yellow podsolic soil treatment with wulung coconut water gave the best results on all observed variables. Thus it can be recommended to use coconut water in an effort to accelerate the germination of princess palms.**

Keywords: Christmas palm, coconut water, planting media

I. INTRODUCTION

Christmas palm (*Veitchia merilli*) is an ornamental plant commonly used as a garden element or as a shade plant on the roadside. Its attractive appearance makes this type of palm much sought after by consumers. In addition, Christmas palms are more expensive than other types of palm which make this plant have a high economic value [1]. In general, Christmas palms are propagated generatively by seeds. One obstacle in generative propagation is slow germination [2].

Various efforts can be made to accelerate the germination of Christmas palm seeds. Chemical treatments that can accelerate the germination of Christmas palm seeds include H_2SO_4 and KNO_3 treatment [3]. Exogenous growth regulators can also accelerate the germination and growth of seedling. The study showed that the application of gibberellins (GA_3) growth regulators significantly affected germination of red palm seeds [4]. Besides gibberellins, another growth regulator that plays a role in the growth of seedling and germination is cytokines.

Coconut water is one of the natural sources of growth regulator or phytohormone. In micro propagation or tissue culture, coconut water is often used as a growth regulator [5]. This is due to its unique chemical composition [6]. The main content of coconut water is sugar and minerals [5]. The phytohormons contained in coconut water are auxin (IAA and ABA), gibberellins, and zeatin (cytokines) in different amounts [7]. However, the chemical composition varies according to the stage of growth of coconuts, varieties, and cultivation techniques [5]. Therefore, the phytohormone content will be different in different types of coconuts. The difference in phytohormone content in different varieties of coconut is thought to have a different effect on germination of Christmas palm seeds.

In addition to tissue culture, coconut water has also been widely used to accelerate seed germination and root growth in plant cuttings. In stevia, soaking with coconut water gave a different growth of cuttings. The results showed that the age of the different coconuts had different effects on the germination of cucumber seeds treated with coconut water [8]. However, soaking with coconut water has no significant effect on the process of germination and growth of red palm seedlings [9].

In the germination process, sprouts obtain nutrients needed from the stored food rather than from the environment. However, a good growing environment is needed to support decomposition of stores food, so that the germination process can take place properly. Different types of planting media will have different effects on the growth of stevia cuttings [10]. In that study, the mixture of soil with compost gave a better effect than that of land without compost. Compost causes the planting media to become loose so that the roots can be easily penetrated. However, palm trees require a dry environment, so we need a planting medium that has good drainage. The use of organic material such as compost and manure will make the soil loose but will cause the planting media to become moister. The study of Sumiasri and Priadi showed that different growing media have different effects on germination and growth of Christmas palms [1].

This study aims to determine the effect of coconut water from two different types of coconut (hybrid coconut and medicinal coconut or Wulung) as well as different growing media on germination of Christmas palm seeds. Research on the effect of various types of coconut as a source of plant hormones has never been done before. Research that has been done in general does not distinguish between types of coconuts, but observes different age of picking.

II. RESEARCH METHODS

The experiment was conducted at the screen house of the Faculty of Agriculture UGJ Cirebon. The location is located at an altitude of 7 m above sea level (asl), from October 2017 until February 2018. The materials used in this experiment are palm seed, coconut water from hybrids and Wulung (medicinal) coconut, red yellow podsolic soil (RYP), humus soil, manure, and compost while the tools used is a 9 cm diameter pot, shovel, calipers, hands payer, ruler, stationery, plastic, labels, and others.

The experimental design used in this study was a randomized complete design (RCD). The treatment consisted of 8 (eight) treatment combinations, between coconut water (hybrid coconut and Wulung coconut) and planting media (topsoil, RYP soil, topsoil mixture + manure, and compost), each of which was repeated three times so that there were 24 unit experiments. Each experimental unit consists of 5 pots. So that the total pot used is 120 pots.

Palm seeds are soaked in 100% coconut water, according to the treatment, for 6 hours. For the treatment of soil mixture, a mixture of topsoil and goat manure was used in a ratio of 1: 1 (v / v). The seeds are then drained and planted in pots that have been filled with planting media in accordance with the treatment. The seeds are then watered and stored in a screen house. Maintenance is done only watering and weeding.

Observations were made on the percentage of germination, plant height, number of leaves, number of roots, and root length. For the percentage of germination measured at 21 days after seedling (DAS), plant height was measured at 21, 28, and 35 DAS while the other variables were measured at 35 DAS. To find out whether the treatment was significantly different, the F test was used. Meanwhile, to find out which treatment had a significantly different effect, the Duncan's Multiple Range test was used at the 5%.

III. FINDINGS AND DISCUSSION

A. Percentage of Germination

The combination of coconut water and planting media significantly affected the percentage of female palm seed germination (Table 1). RYP soil gives a significantly better percentage than other planting media, both in seeds soaked in green coconut water and wulung.

TABLE I. THE EFFECT OF COCONUT WATER AND PLANTING MEDIA TO PERCENTAGE OF GERMINATION

Treatments	Germination Percentage (%)
A : Soil + wulung coconut water	50,00 A
B : RYP soil + wulung coconut water	80,00 b
C : Mix Soil + wulung coconut water	65,00 a
D : Compost + wulung coconut water	47,50 a
E : Soil + hybrid coconut water	60,00 a
F : RYP soil + hybrid coconut water	65,00 ab
G : Mix soil + hybrid coconut water	62,50 a
H : Compost + hybrid coconut water	42,50 a

Note: The average number followed by the same letter shows no significant difference according to Duncan's Multiple Range Test at a level of 5%

The highest percentage of seeds that germinated was 80%, which indicates that the female palm seed is slow to germinate. The study of Setyaningsih on the red palms showed that in the treatment without coconut water immersion, the seeds only germinated 14 days after the seedlings (DAS) while in the immersion treatment the seeds had begun to germinate at 14 DAS [11]. In that research, the highest percentage of germination was 75% achieved at 28 DAS. This is because palm seeds experience physical dormancy due to their hard seed skin, which inhibits imbibition and gas exchange [3,11,12].

B. Plant Height

The treatment of coconut water and planting media significantly affected plant height at all ages of observation (Table 2). At the age of 21 DAS, wulung coconut water treatment gave significantly higher plants compared to hybrid coconut water treatment except for soil media. At 35 DAS, RYP soil media treatment with wulung coconut water gave significantly higher plants than the others (17.51 cm).

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TABLE II. THE EFFECT OF COCONUT WATER AND PLANTING MEDIA ON PLANT HEIGHT

Treatments	Plant Height (cm)		
	21 DAP	*28 DAP*	*35 DAP*
A : Soil + wulung coconut water	8,33 A	12,59 ab	15,46 abc
B : RYP soil + wulung coconut water	9,42 B	15,17 b	17.51 c
C : Mix Soil + wulung coconut water	8,61 B	14,11 b	16,83 b
D : Compost + wulung coconut water	6,41 B	11,51 a	13,61 a
E : Soil + hybrid coconut water	8,14 A	11,71 ab	15,84 abc
F : RYP soil + hybrid coconut water	12,93 a	12,83 ab	16,04 b
G : Mix soil + hybrid coconut water	8,52 a	13,59 ab	16,14 bc
H : Compost + hybrid coconut water	7,79 a	11,58 a	14,74 ab

Note: The average number followed by the same letter in the same column shows no significant difference according to Duncan's Multiple Range Test at a level of 5%

In this study, the growth of palm seedling in red yellow podsolic (RYP) soil was significantly higher than in other growing media. This is different from the results of research by Sumiasri and Priadi, which showed that Christmas palm seedling in RYP soil gave the lowest plant height [1]. The highest plants are obtained on compost growing media. The opposite, in this study the use of compost provides the shortest plants. This shows that the type of coconut water used has a good effect on seeds planted on PKM soil but not on compost.

C. Number of Leaves

The combination of coconut water treatment with the type of planting media significantly affected the number of leaves (Table 3). Most leaves were obtained in PKM soil treatment with medicinal coconut water while the least was in compost with medicinal coconut water.

TABLE III. THE EFFECT OF COCONUT WATER AND PLANTING MEDIA ON NUMBER OF LEAVES

Treatments	Number of Leaves	
A : Soil + wulung coconut water	7,25	bc
B : RYP soil + wulung coconut water	7,75	c
C : Mix Soil + wulung coconut water	7,50	bc
D : Compost + wulung coconut water	1,50	a
E : Soil + hybrid coconut water	5,25	bc
F : RYP soil + hybrid coconut water	6,75	bc
G : Mix soil + hybrid coconut water	5,00	b
H : Compost + hybrid coconut water	0,25	a

Note: The average number followed by the same letter in the same column shows no significant difference according to Duncan's Multiple Range Test at a level of 5%

The first leaves that appear on a Christmas palm plant are usually larger when compared to the size of the plant. In addition, the shape is different from the leaves that appear next. The plant is still rosette, where the book is so short that it doesn't look like it has a stem.

The most leaves are obtained from the treatment of wulung coconut water with RYP soil (B), which is between 7-8 strands. Compost treatment, both with wulung (D) and hybrid (H) coconut water, gives the smallest number of leaves, which is between 1-2 strands. The more leaves formed, the higher the level of photosynthesis so that more photosynthesis is produced to support plant growth. The results of the study of Sujarwati et al. showed that coconut water immersion significantly affected plant height, leaf length, root length, and plant fresh weight compared with no immersion treatment [2]. However, different concentrations of coconut water do not have a real effect

D. Number and Length of Roots

Coconut water and the type of planting media significantly affected the number of roots and root length (Table 4). The most roots were obtained in RYP soil treatment with wulung coconut water while the longest root was obtained from mixed soil treatment (soil + manure) with wulung coconut water.

Root is the organ that first appears in Christmas palm germination. Therefore, roots grow faster than leaves. The average number of roots produced in the treatment of hybrid coconut water is less when compared to wulung coconut water, in all types of planting media. The longest root is produced by seeds soaked in wulung coconut water in a mixed soil. The results of this study are different from the results of the study of Sumiasri and Priadi which show that female palm roots grow better on compost growing media [1].

TABLE IV. THE EFFECT OF COCONUT WATER AND PLANTING MEDIA ON THE NUMBER AND HEIGHT OF ROOT

Treatment	Number of Root		Height of Root (cm)	
A : Soil + wulung coconut water	7,75	a	15,00	b
B : RYP soil + wulung coconut water	10,75	b	17,38	bc
C : Mix Soil + wulung coconut water	10,50	ab	17,63	c
D : Compost + wulung coconut water	6,50	a	14,63	b
E : Soil + hybrid coconut water	4,00	a	7,00	a
F : RYP soil + hybrid coconut water	8,25	ab	14,25	b
G : Mix soil + hybrid coconut water	7,00	a	15,38	bc
H : Compost + hybrid coconut water	5,25	a	11,68	b

Note: The average number followed by the same letter in the same column shows no significant difference according to Duncan's Multiple Range Test at a level of 5%

Soaking with coconut water has a significant effect on the growth of the king's palm roots. The longer soaking the longer the roots produced [11]. The same results were also obtained in Christmas palms [2]. However, the red palm germination, soaking of coconut water has no significant effect on root growth [9].

Coconut water contains growth regulators auxin, gibberellins, cytokines and abscisic acid [6]. Gibberellins play an important role in the germination process, because it functions to activate the enzymes that remodel food reserves. However, exogenous administration of gibberellins did not significantly affect the growth of red palm sprout roots [4]. In this study, it was suspected that in addition to growth regulators, planting media also had an effect on germination and subsequent germination growth.

IV. CONCLUSION

Soaking with coconut water and planting media significantly affected the growth variables of the Christmas palm seedlings. The treatment of red-yellow podsolic soil and wulung coconut water gave a better effect on the percentage of germination, growth of the shoot (plant height and number of leaves) compared to other treatments.

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