Jurnal Scientia
Volume 13, Number 03, 2024, DOI 10.58471/ scientia.v13i03
ESSN 2723-7486 (Online)
https://infor.seaninstitute.org/index.php/pendidikan

An Increasing Berry Fruit Production (Antidesma Bunius L. Spreng) With Hybrid Fertilizer Processing Based On Coconut Water Fragmentation

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Article Info
Keywords:
Berry Fruit Plants,
Fermented P Fertilizer,
Coconut Water.

ABSTRACT
Berry fruit plants are plants that are usually planted in open places or in secondary forests. Berry fruit plants can be cultivated vegetatively, namely by cuttings and being treated with fermented P fertilizer and coconut water. The aim of this research was to determine the effectiveness of fermented P fertilizer and coconut water on the growth of berry fruit plant cuttings. This research using the Factorial Randomized Block Design (RAK) method with 2 factors, namely fermented P fertilizer and coconut water. Fermented P fertilizer treatment consists of 4 levels, namely M0= 0 ml/plot, M1= 200 ml/plot , M2= 300 ml/plot and M3= 400 ml/plot. The coconut water treatment consisted of 4 levels, namely P1= 50 ml/liter of water, P2= 100 ml/liter of water, P3= 150 ml/liter of water and P4= 200 ml/liter of water. The parameters observed were the age at which shoots emerged (days), shoot length (cm), number of shoots (stems) and shoot diameter (mm). This paper described a results showed that fermented P fertilizer had no significantly different effect on the parameters of shoot emergence age, shoot length, number of shoots and stem diameter. Providing coconut water had no significantly different effect on the parameters of shoot emergence age, shoot length, number of shoots and stem diameter. The interaction between fermented P fertilizer and coconut water did not have a significantly different effect on all parameters.

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INTRODUCTION

Buni in scientific language is named Antidesma bunius (L.) Spreng. Buni has various benefits. Ripe buni fruit can be eaten fresh. The fruit juice leaves colored marks on the fingers and mouth. This fruit also has the potential to be used as a refreshing drink. The young leaves can also be eaten with rice, either raw or cooked first. The bark and leaves contain alkaloids which have medicinal properties, although according to some reports they can also be poisonous (Hariyana, 2013).

In the Philippines, this plant is usually planted in open places or in secondary forests. Antidesma bunius (L.) Spreng plays an important role in the reclamation process of degraded lands. The leaves, bark and roots of A. bunius contain saponins and tannins, besides that the bark also contains flavonoids. Can be used for high blood pressure,

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young leaves can be eaten as fresh vegetables. The leaves and fruit can be used as a medicine for anemia, dirty blood, rajasinga and gonorrhea. The leaves are useful as a medicine to cover wounds and the ripe fruit is useful for increasing breast milk (Hariyana, 2013).

Cutting is plant propagation which is done by planting pieces of the parent tree into a medium so that they grow into new plants. The vegetative material used is stems, shoots, leaves or roots. However, for vegetative propagation of forestry trees, the materials commonly used are stems and shoots. The advantages of propagating plants by cuttings are: The technique is simple, fast and cheap, no problems incompatibility as arises from propagation by grafting or grafting, many seeds can be produced from one parent tree, seed production does not depend on the fruit ripening season and all seeds that can be produced have the same genetic characteristics as the parent plant/tree (Achmad, 2016)

To accelerate the success of seeding techniques through vegetative propagation, it is necessary to use growth regulators to help root growth (Sudomo et al., 2012). For this reason, natural ZPT is used with the addition of P fertilizer. According to Surachman (2011) coconut water is often used as a substitute for BAP. Coconut water is endosperm or liquid food reserves which contain nutrients and growth regulators or usually referred to as ZPT which contains cytokinins. Cytokinins play a role in stimulating cell division, proliferation of tip meristems, inhibiting root formation and encouraging chlorophyll formation in callus.

One inorganic fertilizer that can be used to increase growth is phosphate fertilizer. TSP (Triple super phosphate) fertilizer is an inorganic fertilizer that contains P and Ca with P levels2O5reaches 44 – 46% and CaO reaches 20%. Phosphate is really needed by plants during seed formation so that they become perfect in shape and to speed up fruit ripening and be resistant to drought. P deficiency in most plants occurs when the plants are still young, because there is no balanced ability between P absorption by the roots and the P needed (Rosmawaty et al., 2018).

Literature Review

Conditions for Growing Buni Fruit Plants

The growth and development of berry fruit plants is influenced by climate and soil. For the growth of berry plants, they really need a hot and humid period and can grow successfully in humid and hot areas with a temperature range between 18^0C -28^0C does not require too special conditions for growth, but for optimal production climate and soil factors must be taken into account. Berry still grows well at temperatures of 30^0C -35^0C. Berry plants can be planted in any season because apart from being drought resistant, berry is also resistant to rainy season conditions as long as it is not flooded. The ideal rainfall for the growth of berry plants is 1700 - 3000 mm/year, with full sunlight (Gruezo, 2010). Berry plants can grow well in lowland areas (0 meters above sea level) to 1000 meters above sea level. Berry plants like well-drained soil. Loose soil with sufficient moisture is very suitable for this plant, in sandy soil organic matter needs to be added, while in dense soil it is necessary to till the soil before planting. Berry plant can grow well

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at a pH ranging from 5.5-7, in general the suitable type of soil is soil that has a loose texture and can channel water, such as latosol or alluvial. Sandy clay soil containing high levels of organic matter is very suitable for berry plants (Gruezo, 2010).

Fermented P Fertilizer

Fertilizer is material given to the soil, both organic and inorganic, with the aim of replacing nutrient losses from the soil and aiming to increase plant production under environmental factors. Fertilization means providing food substances in the soil that have been lost or absorbed by plants that can be replaced, as well as improving soil structure (Setya, 2011). Phosphorus is a growth stimulant for plant roots and is a raw material for growth and formation of a number of proteins as well as helping assimilation and respiration and even accelerating the disposal of ripening seeds and fruit (Sutedjo, 2010).

Phosphorus plays an important role in energy transfer in plant cells, for example: ADP, ATP. Plays a role in the formation of cell membranes, for example fat phosphate, and increases the efficiency of function and use of nitrogen. Phosphorus for plants is useful for stimulating root growth, especially the roots of seeds and young plants. In addition, phosphorus serves as a raw material for the formation of certain proteins. When compared with several other P source inorganic fertilizers, TSP (Triple Super Phosphate) fertilizer contains P2O5higher, reaching 43 - 45% so it is better used to increase P nutrients in soils that are poor in phosphate nutrients (Purba, 2017).

Phosphorus also functions as a building block for fats and proteins, the nutrient P forms cell nuclei and accelerates physiological processes. The function of phosphorus accelerates root growth, strengthens plant stems, accelerates the flowering process, increases the production and ripening of fruit and grain. Phosphorus is an element that is really needed by plants. The nutrient P is a nutrient that is really needed by plants and is an element that is often deficient in the soil. Providing P fertilizer at planting time will improve the levels of phosphorus elements in the forage thereby helping plant growth (Latief, 2014).

Phosphorus is found in the form of phytin, nuclein and phosphatide, and is part of the protoplasm and cell nucleus. As part of the cell nucleus, it is very important in cell division, as well as for the development of meristem tissue, phosphorus is taken up by plants in the form of H2P.O4and HPO4Phosphorus is a macro nutrient that is required for plant growth in fairly large quantities. The availability of P in soil is influenced by soil parent material, soil reaction (pH), soil organic C and soil texture (Sutedjo, 2010).

Coconut water

Growth Regulators (ZPT) are other compounds that have the same characteristics as hormones, but are produced endogenously (Zulkarnain, 2010). ZPT is responsible for regulating metabolism in plant growth. ZPT is added because the explants have not been able to produce growth hormone endogenously at the levels needed in the growth process.

Coconut water is the liquid endosperm in coconuts which is formed about 2 months after pollination. According to research, coconut water contributes 25% of the weight of the fruit, with the basic composition consisting of 95.5% water, 4% carbohydrates, 0.1%

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fat, 0.02% calcium, 0.01% phosphorus, 0.5% iron. Apart from its mineral composition, coconut water also contains amino acids, vitamin C and vitamin B complex and mineral salts (Winarto, 2015).

Another method that can be used to help speed up plant growth is by using coconut water (Cocos nucifera L.) as a substitute for chemical fertilizers. Coconut water is a plant product that can be used to increase plant growth. There is no harm in coconut water, which is often thrown away by traders in the market, if used as a plant waterer. Research results show that coconut water is rich in potassium, minerals including Calcium (Ca), Sodium (Na), Magnesium (Mg), Ferum (Fe), Cuprum (Cu), and Sulfur (S), sugar and protein. Besides being rich in minerals, coconut water also contains 2 natural hormones, namely auxin and cytokinin, which act as supporters of plant cell division. Based on laboratory tests, the ZPT content in young coconut water is higher than in old coconut water, because ZPT tends to be produced in young tissue that is still actively dividing (Kristina and Sitti, 2012).

According to research by Wati (2013), the use of 100% coconut water increases the germination parameters of red rosella seeds. According to research by Ratnawati (2013), soaking cocoa seeds in young coconut water affects the height of the seedlings with a concentration of 250 ml of coconut water.

METHODS

The materials used in this research were berry fruit plant stems (Antidesma bunius L. Spreng), fermented P fertilizer, coconut water, topsoil, polybags, rice husks, paranet, plastic lids, plastic ropes and water. The tools used in this research were a hoe, raffia rope, measuring tape, gembor, saw, name plank, marker, paper, pen, book, machete, handsprayer, bucket, roller and caliper. This research method used a factorial randomized block design (RAK) consisting of 2 treatment factors with 16 treatment combinations and 2 replications so that the total number of plots was 32 research treatment plots.

Before the research is carried out, the land used must first be cleaned of weeds, twigs or stones so that they do not become a source of pests and disease. Preparations are carried out to make it easier to carry out research. Next, measurements of the land used are carried out so that making plots becomes easier. It is best for this research to be close to a water source to make it easier to water the research plants.

After cleaning the weeds, the soil was then processed while forming a research plot of 0.5 m x 6 m which was repeated 2 times as a differentiating repetition. Each replication consisted of 16 research plots, the distance between plots was 20 cm and the distance between replications was 30 cm.

The construction of the research plot was completed and then shade was installed using bamboo and paranet. This shade is used so that the research plants are not directly exposed to direct sunlight, where this research is a study of stem cuttings of buni fruit plants which cannot be exposed to direct sunlight.

The planting medium used in this research is top soil mixed with rice husks in a ratio of 10: 1. This rice husk is used so that the planting medium is not too dense and

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thus provides space for root growth. After the top soil and rice husks are mixed evenly in a predetermined ratio, they are then put into a poly bag measuring 10 cm x 20 cm (1 kg). This polybag will later be used as a medium for growing stem cuttings of buni fruit plants. 128 polybags were provided with 4 polybags per treatment. Once completed, they are arranged in a research plot.

The P fertilizer used in this research was TSP fertilizer. The initial stage in making fermented P fertilizer requires 6.5 kg of TSP fertilizer and 25 liters of water, then fish waste POC is added. The fish used is fish that is almost rotten with the characteristics of the fish's eyes being pale white. Then the ingredients are mixed evenly in a jerry can, then fermented for 45 days and opened every day for the first 10 days.

The stems of buni fruit that will be cuttings come from buni fruit plants that grow healthily and are protected from disease so that the cuttings can grow healthily. The stems of the buni fruit are cut using hedge scissors so that the stem cambium is not damaged and cut into 20 cm pieces per cutting. Where 128 stem cuttings of buni fruit plants were provided.

500 ml of ready-to-use coconut water and 4 liters of water (distilled water can be used) are provided. Then the coconut water is separated according to the specified treatment, then blended and mixed with water/distilled water. Water The coconut used in this study where the treatment used was P1(50 ml coconut water in 1 liter of water), P2(100 ml coconut water in 1 liter of water), P3(150 ml coconut water in 1 liter of water), P4(200 ml coconut water in 1 liter of water). Next, this coconut water is used in soaking the stem cuttings of the buni fruit plant.

RESEARCH RESULT

Age of Shoot Appearance (days)

Observation data on the average age at which shoots emerge after application of P fertilizer fermentation and coconut water are shown in appendix 3. Meanwhile, fingerprint analysis The variations are shown in Appendix 4. Based on the results of observations and statistical analysis, it is known that application of fermented P fertilizer had no significant effect on the age at which shoots emerged. Providing coconut water had no significant effect on the age at which shoots emerged and There is no effect on the interaction between fermented P fertilizer and coconut water It is obvious that at the age the shoots appear Results: The average age at which shoots emerge as a result of fermentation P fertilizer and coconut water after being tested using the Duncan Distance Test can be seen in Table 1.

Table 1. Average age of emergence of shoots (days) after application of fermented P fertilizer and coconut water on the growth of cuttings of Buni fruit plants.

Treatment		Age of Shoot Appearance (days)	
M0	(0 ml/plot)	7.75	a A
M1	(200 ml/plot)	6.63	a A
M2	(300 ml/plot)	6.50	a A
M3	(400 ml/plot)	6.38	a A
P1	(50 ml/liter of water)	8.00	a A

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Treatment	Age of Shoot Appearance (days)
P2 (100 ml/liter of water)	7.50 a A
P3 (150 ml/liter of water)	7.25 a A
P4 (200 ml/liter of water)	4.50 a A

In Table 1 it can be explained that the application of fermented P fertilizer to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has an effect It was not significant regarding the age parameter for shoot emergence, where the fastest shoot emergence was obtained in the M3 treatment (400 ml/plot), namely 6.38 days and the longest shoot emergence was obtained in the M0 treatment (0 ml/plot), namely 7.75 days.

In Table 1 it can also be explained that giving coconut water to the growth of cuttings of buni fruit plants (Antidesma bunius L. Spreng) had no significant effect on the age parameters for shoot emergence, where the fastest shoot emergence was obtained in the P4 treatment (200 ml/liter of water), namely 4.50 days. and the longest shoots to emerge were obtained in treatment P1 (50 ml/liter of water), namely 8.00 days.

Shoot Length (cm)

Observation data on average shoot length after application of fermented P fertilizer and coconut water are shown in appendices 5, 7, 9 and 11. Meanwhile, analysis of variance is shown in appendices 6, 8, 10 and 12. Based on the results of observations and statistical analysis, it is known that fermented P fertilizer has no significant effect on shoot length. Provision of coconut water had no significant effect on shoot length and the interaction between fermented P fertilizer and coconut water had no significant effect on shoot length.

Table 2. Average Shoot Length

Treatment	Shoot Length (cm) Week After Planting			
	6	8	10	12
M0 (0 ml/plot)	10.91 a A	12.63 a A	14.00 a A	15.43 a A
M1 (200 ml/plot)	11.66 a A	13.23 a A	14.87 a A	16.07 a A
M2 (300 ml/plot)	12.33 a A	13.61 a A	15.26 a A	16.89 a A
M3 (400 ml/plot)	12.42 a A	13.90 a A	15.51 a A	16.93 a A
P1 (50 ml/liter of water)	11.20 a A	12.74 a A	14.25 a A	15.78 a A
P2 (100 ml/liter of water)	11.22 a A	13.06 a A	14.60 a A	15.84 a A
P3 (150 ml/liter of water)	12.14 a A	13.57 a A	14.93 a A	16.32 a A
P4 (200 ml/liter of water)	12.76 a A	14.00 a A	15.86 a A	17.39 a A

In Table 2 it can be explained that the application of fermented P fertilizer to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has an effect not significant for the shoot length parameter which is the highest shoot length obtained in the M3 treatment (400 ml/plot) was 16.93 cm and shoot length

The lowest was obtained in the M0 treatment (0 ml/plot), namely 15.43 cm in Table 2 it can also be explained that giving coconut water to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has an effect not significant for the shoot length parameter which is the highest shoot length obtained in the P4 treatment (200 ml/liter of

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water) was 17.39 cm and shoot length The lowest was obtained in treatment P1 (50 ml/liter of water), namely 15.78 cm.

Observation data on the average number of shoots after application of P fertilizer fermentation and coconut water are shown in appendices 13, 15, 17 and 19. Meanwhile, the analysis of variance is shown in appendices 14, 16, 18 and 20. Based on the results of observations and statistical analysis, it is known that Fermentation fertilizer application had no significant effect on the number of shoots.

Providing coconut water had no significant effect on the number of shoots and interactions between fermented P fertilizer and coconut water had no significant effect on number of shoots. The average number of shoots resulted from the application of fermented P fertilizer and water coconut after being tested using the Duncan Distance Test can be seen in Table 3.

Table 3. Average Number of Shoots (Stems) After Fertilizer

Treatment		Number of Shoots (stems) Week After Planting							
		6		8		10		12	
M0	(0 ml/plot)	3.00	a A	3.71	a A	3.92	a A	4.00	a A
M1	(200 ml/plot)	3.33	a A	3.75	a A	4.08	a A	4.17	a A
M2	(300 ml/plot)	3.46	a A	3.83	a A	4.25	a A	4.33	a A
M3	(400 ml/plot)	3.96	a A	4.21	a A	4.46	a A	4.50	a A
P1	(50 ml/liter of water)	3.04	a A	3.63	a A	3.92	a A	4.04	a A
P2	(100 ml/liter of water)	3.17	a A	3.67	a A	4.13	a A	4.13	a A
P3	(150 ml/liter of water)	3.38	a A	3.87	a A	4.17	a A	4.29	a A
P4	(200 ml/liter of water)	4.17	a A	4.33	a A	4.50	a A	4.54	a A

In Table 3 it can be explained that the application of fermented P fertilizer to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has an effect not significant for the number of shoots parameter which is the highest number of shoots obtained in the M3 treatment (400 ml/plot), namely 4.50 fruit and long shoots

The lowest was obtained in the M0 treatment (0 ml/plot), namely 4.00 pieces. In Table 3 it can also be explained that giving coconut water to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has an effect not significant for the number of shoots parameter where the shoot length is the highest obtained in treatment P4 (200 ml/liter of water), namely 4.54 fruit and long shoots The lowest was obtained in treatment P1 (50 ml/liter of water), namely 4.04 pieces.

Effectiveness of Providing Fermented P Fertilizer on the Growth of Buni Fruit Plant Cuttings (Antidesma bunius L. Spreng)

Based on the results of statistical data analysis, it shows that the response of fermented P fertilizer to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has no significant effect on the parameters of shoot emergence age (days), shoot length (cm) 6, 8, 10 and 12 WAP, number of shoots (stems) 6, 8, 10 and 12 WAP and shoot diameter (mm) 6, 8, 10 and 12 WAP.

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Providing fermented P fertilizer on shoot emergence age showed no real effect because the dose of P fertilizer given was still not able to accelerate shoot growth. This is due to the low availability of P in the soil. Even though there is a large amount of total P in the soil, its availability for plants is very low. The P element provided through fertilization is only taken up by plants around 10-25% (Mikanova and Novakova, 2011).

According to Hanafiah (2010) phosphorus can play a role in the formation and development of fine roots and can increase the growth of young plants into adults. At the beginning of plant growth, phosphorus fertilizer plays an important role as a component of several enzymes and the availability of nucleic acids.

When observing shoot length, the application of fermented P fertilizer had no real effect, which is thought to be because the application of fertilizer has not been able to maximize shoot growth because there is a possibility of a lack of the nutrient P (phosphorus) in the fertilizer and the nutrient N in the soil for the growth of vegetative plants, specifically the shoots. According to Rahayu (2014), In the plant's growth period starts from the beginning of planting, fertilizer is needed that contains a lot of nitrogen for the growth of shoots and stems.

When applying fermented P fertilizer, observation of the number of shoots showed that the effect was not significantly different. The highest number of shoots was found in the M treatment3(400 ml/plot). This is because the formation of new shoots on buni fruit plant cuttings grows at the tip of the cutting so that the number of buds does not affect the number of shoots produced. The ability of the bud to produce shoots is largely determined by environmental conditions. Mashudi et al., (2011) stated that environmental conditions greatly influence shoot growth, such as humidity, nutrients or fertility of the planting media used and sunlight.

The results of statistical analysis showed that the shoot diameter parameter had no significant effect but the M treatment3(400 ml/plot) provides optimal results compared to other treatments because the cuttings already have sufficient leaves so that shoot growth and shoot diameter can be optimal. This difference in average shoot diameter is thought to be due to the distribution of photosynthesis results that are translocated in each plant body. The distribution of assimilation results is usually given to the utilization site closest to the source. According to Gardner et al., (2010) shoot lengthening and shoot stem diameter are activities of cell division and cell enlargement in plants, which is referred to as plant growth. The factors that influence growth are external factors and internal factors. Internal factors that influence the growth of cuttings include photosynthesis rate, respiration, resistance to climatic stress, distribution of assimilation results, N content sourced from leaves and other green tissues in plants, chlorophyll, location of meristems and cell differentiation.

Effectiveness of Giving Coconut Water on the Growth of Buni Fruit Plant Cuttings (Antidesma bunius L. Spreng)

Based on the results of statistical data analysis, it shows that the response of giving coconut water to the growth of buni fruit plant cuttings (Antidesma bunius L. Spreng) has no significant effect on the parameters of shoot emergence age (days), shoot length

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(cm) 6, 8, 10 and 12 WAP, number of shoots (stems) 6, 8, 10 and 12 WAP and shoot diameter (mm) 6, 8, 10 and 12 WAP.

Table 1 shows that all treatments of giving coconut water to buni fruit plant cuttings had no significant effect on the age at which shoots emerged. The results of observations showed that the treatment of P4with a dose of 200 ml/liter of water, the fastest shoot emergence time is 4.50 days. This is thought to be because this treatment contains cytokinin hormones which are good enough to stimulate shoot growth. According to Darlina et al., (2016) apart from containing calories, protein, minerals, auxin, coconut water also contains the hormone cytokinin, one of its functions is to stimulate shoot growth.

Coconut water is a natural ingredient that has cytokinin hormone activity to carry out cell division and encourage organ formation. The content of the hormones cytokinin and auxin in coconut water can cause an increase in several growth parameters of plant stem cuttings. This is confirmed by the results of Djamhuri's (2011) research, the cytokinin hormone allows the formation of buds simultaneously, preventing premature abortion and more active cell division and enlargement.

The results of the research showed that coconut water had no significant effect on shoot length parameters, but in each observation all treatments experienced an increase in shoot length because the higher the concentration given, the higher the content of growth regulators, so the growth of the cuttings was better. Shoot growth can be caused by smooth apical meristem activity so that the available carbohydrates obtained are used for the cell division process (Sitorus et al., 2015).

Coconut water contains 5.8 mg/l of cytokinin and 0.07 mg/l of auxin, which are hormones that function to stimulate the growth of shoots and roots from buni fruit plant cuttings. Good root growth will support the growth of other plant organs, because roots are one of the plant organs that play a very important role in absorbing nutrients and growth regulators that plants need to grow and develop (Yustisia, 2016).\

Coconut water treatment showed no significant effect on the parameters of number of shoots and shoot diameter. Tables 2 and 3 show that the highest average number of shoots and shoot diameter were found in the P treatment4with a dose of 200 ml/liter of water. This is thought to be due to the nutritional content and growth hormones in coconut water which play a role in helping the growth and development of plant tissue, so that cells experience differentiation (cell elongation). Widiastoety et al., (2010) stated that coconut water contains vitamins, amino acids, phosphorus nucleic acids, auxin growth substances and gibberellic acid which function as stimulants of tissue proliferation processes, facilitating metabolism and respiration processes, therefore coconut water can helps the process of cell division and cell differentiation. This results in rapid plant growth.

CONCLUSION

The treatment of fermented P fertilizer on buni fruit plant cuttings showed no significant effect on the parameters of shoot emergence age (days), shoot length (cm), number of

shoots (stems) and shoot diameter (mm). The treatment of giving coconut water to buni fruit plant cuttings also showed no significant effect on the parameters of shoot emergence age (days), shoot length (cm), number of shoots (stems) and shoot diameter (mm). The interaction between the treatment of fermented P fertilizer and coconut water on buni fruit plant cuttings showed no significant influence on the parameters of shoot emergence age (days), shoot length (cm), number of shoots (stems) and shoot diameter (mm).

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