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## **GROWTH AND YIELD OF DAYAK ONION (ELEUTHERINE PALMIFOLIA MERR) WITH NUTRITION AB MIX BULBS AND COMPOSITION OF GROWING MEDIA USING HYDROPONIC WICK SYSTEM**

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### **ABSTRACT**

This study was conducted to determine the effect of the concentration of AB Mix bulb nutrients with cocopeat and husk charcoal planting media on the growth of Dayak onions. This writing uses a completely randomized design (CRD) of divided plots with 2 factorials repeated 3 times. The first treatment factor is the provision of nutrients with each concentration of 1000 ppm, 1200 ppm, 1400 ppm and 1600 ppm. The second treatment factor is planting media 50% cocopeat: 50% husk charcoal, 100% husk charcoal and 100% cocopeat. This research was conducted at the Green House of the Agricultural Instrument Standards Agency (BSIP) of Central Kalimantan Province from April 8 to June 16, 2023. The results of the study showed that there was an interaction in the treatment of nutritional doses of AB mix bulbs with the treatment of planting media composition on the growth and yield of Dayak onions on leaf area, number of bulbs and root weight. There is no interaction on plant height, number of leaves, wet weight of bulbs and dry weight of bulbs. The best planting media composition treatment on the growth and yield of Dayak onions has a very significant effect on 50% cocopeat planting media: 50% husk charcoal on the number of bulbs. The best AB mix bulb nutrition treatment is at a dose of 1200 ppm which has a significant effect on the number of bulbs, wet weight of bulbs and dry weight of bulbs.

### **KEY WORDS**

Eleutherine palmifolia Merr, hydroponic, nutrition, planting media.

Dayak onion (*Eleutherine palmifolia* Merr) is a typical plant of Central Kalimantan. Dayak Onion is a biopharmaceutical plant derived from indigenous resources that is habitat suitable in Kalimantan and has been experimentally and clinically demonstrated to be an effective medicinal plant with the potential to be developed. The highest grade raw materials can be used to produce onion bulbs with the greatest nutritional value. The synthesis and amount of bioactive chemicals in tubers are determined by factors including plant physiology, genetics, geography, and environment (Francisco et al, 2012). Cultivation methods and the type of soil used for plant cultivation are environmental elements that have an impact on them. Dayak farmers in Central Kalimantan have a very diverse agricultural system, both in terms of their soil types and cultivation methods (Atikah et al, 2023). In general, Dayak onions are grown conventionally, in open and wide land on a production scale, with the increasingly narrow land now, Dayak onions can be produced by utilizing narrow land with a simple innovation, namely using the wick system.

Hydroponics is a method of plant propagation without using soil media. Usually, this method is used to overcome the shortage of planting land, especially in big cities, where yards are almost non-existent (Hidayati et al, 2018). The Wick System is a hydroponic system that is simple, easy to make, inexpensive and causes minimal plant decay. The advantages of hydroponic wick systems from NFT, DFT, Dutch bucket and other hydroponic systems are that they do not require large costs, tools and materials that are easy to find and use such as boxes, used bottles and flannel, do not require electricity, are suitable for plants that do not really need lots of water.



The difference between conventional and hydroponic planting lies in the planting medium, conventional using soil media while hydroponic soil media is replaced with water. In this study, with a hydroponic system, the alternative wick system for planting media used was cocopeat and rice husk charcoal. Cocopeat is an alternative planting medium that can be used for cultivating various types of plants, especially for hydroponic farming systems. In farming, not only soil can be used as a planting medium, but cocopeat can too. This planting medium has a quality that is not inferior to soil. Cocopeat has properties that easily absorb and store water. Cocopeat also has pores that facilitate air exchange and sunlight (Kuntardina, 2022).

Charcoal husk is an organic growing medium so it is environmentally friendly, pH neutral, has fairly good water holding capacity and good aeration, sterile from bacteria and fungi. Charcoal husk is able to bind water needed by plants and has higher air circulation because it has many pores on the surface of the media. So that plant roots are able to develop optimally and of course it will have a good effect on plant growth and production (Susanto, 2002).

The nutrients used in hydroponics are nutrients in the form of compound or single nutrients, both macro and micro, which are formulated, macro elements are usually given the symbol for nutrition A and micro are given the symbol for B after being formulated. AB mix nutrition is a nutrient commonly used in hydroponic system cultivation which contains 16 essential nutrients needed by plants (Agustina, 2004). In addition to providing proper nutrition, the planting medium is the most influential factor in the growth and yield of quality plants. A good planting medium is porous and light, able to retain moisture and store water (Simbolon, 2018).

## MATERIAL AND METHODS OF RESEARCH

This research was carried out in April 2023 – July 2023, taking place at Green house of Agricultural Instrument Standardization Center (BSIP) Central Kalimantan Province.

The materials used in this study were Dayak onion bulbs, 12 boxes of fruit measuring 43 cm x 36 cm, 36 pots with a hole diameter of 15 cm and a pot depth of 15 cm, planting medium of husk charcoal and cocopeat, flannel cloth, AB-Mix nutrients tubers. The tubers selected are tubers with good quality, namely seeds that are free from pests and diseases with a tuber weight of 6-10 g (Atikah et al, 2021) and the age of the Dayak onion bulb seeds used is 3 months old from the start of planting.

The tools used are TDS (Total Dissolved Solids) meter, pH meter, measuring cup, 1 L aqua bottle, scissors, scales, label paper, ruler, solder, punch heater, stationery and camera.

This experiment used a Completely Randomized Design (CRD) of split plots with a split plot design. Factorial consists of 2 treatment factors with 3 (three) replications.

Treatment factor I (main plot) consisted of 3 levels of planting media composition: M1= 50% husk charcoal: 50% cocopeat; M2= 100% husk charcoal; M3= 100% cocopeat. Factor II (subplot) consisted of 4 levels of dosage of AB mix tuber nutrition: N0= 1000 ppm (control); N1= 1200 ppm; N2= 1400 ppm; N3= 1600 ppm. From the composition of the planting medium (M) and AB nutrient mix tubers (N), 12 treatment combinations were obtained and repeated 3 times to obtain 36 experimental units with a total of 36 planting holes, one experimental unit consisting of 3 planting holes as well as plant samples. Variables observed in this study included: leaf area (cm), tuber wet weight (g), tuber dry weight (g), number of tubers, and root weight (g). Analysis of the data used to determine the effect of the treatment; the observed data were analyzed for variance (F test) at 5% level. If the results of the analysis of variance show a real and very significant effect, then proceed with the mean value test using the honest significant difference test (HSD) at the 5% level.

## RESULTS AND DISCUSSION

Based on the results of analysis of variance, it was shown that there was an interaction between nutrient treatment and growing media on leaf area at 10 WAP. There was no significant effect of nutritional treatment on leaf area at 10 WAP.



Table 1 – Average leaf area (cm<sup>2</sup>) in the application of nutrients and the composition of the different planting media using the hydroponic wick system

Nutrients (N)	Planting media (M)			Average
	M1 Cocopeat 50%: husk charcoal 50 %	M2 Husk charcoal 100%	M3 Cocopeat 100%	
N0 (1000 ppm)	40.70 a A	49.05 b A	45.51 b A	45.09
N1 (1200 ppm)	41.81 a A	49.94 b B	35.53 a A	42.43
N2 (1400 ppm)	41.84 a A	38.28 a A	44.21 ab A	41.44
N3 (1600 ppm)	43.75 a A	39.97 a A	41.36 ab A	41.69
Average	42.03	44.31	41.65	
HSD 5%	N x M= 11.20			

Table 1 show the largest leaf area obtained in the combination treatment of 100% rice husk charcoal and 1200 ppm nutrients (N2M2) of 49.94 cm<sup>2</sup>. The effect of AB mix tuber nutrition on the area of Dayak leeks contains macro nutrients in the form of NO<sub>3</sub> and CaO. Based on the results of preliminary research Suryantini (2018) also found that the addition of calcium and nitrate fertilizers to curly lettuce plants with the DFT hydroponic system. able to increase the leaf surface area. According to Aziz and Kurnia (2015), nitrogen can be absorbed by plants in the form of NH<sub>4</sub><sup>+</sup> and NO<sub>3</sub><sup>-</sup>. Adequate nitrogen supply in plants can accelerate vegetative growth of plants in stems, branches and leaves. According to Poli (2009), in his research which suggested that by increasing the area of plant leaves it will automatically increase the fresh weight of plants because leaves are organs that contain water. So that the wider the leaf area, the higher the water content of the plants and the higher the fresh weight of the plants. On charcoal media, the husk is porous and advantageous, friable and sufficient to store water.

Based on the analysis of variance, there was no interaction between nutrient treatments and planting media on fresh weight of tubers aged 10 WAP.

Table 2 – The average wet weight of tubers (g) in the provision of AB nutrients with a mix of tubers and growing media using the hydroponic wick system

Nutrients (N)	Planting media (M)			Average
	M1 Cocopeat 50%: husk charcoal 50 %	M2 Husk charcoal 100%	M3 Cocopeat 100%	
N0 (1000 ppm)	24.00	30.67	29.67	28.11ab
N1 (1200 ppm)	34.00	26.67	29.67	30.11a
N2 (1400 ppm)	19.00	21.00	26.00	22.00b
N3 (1600 ppm)	22.67	22.33	27.33	24.11ab
Average	24.92	25.17	28.17	
HSD 5%	N = 6.75			

Based on Table 2, there was a significant effect of nutritional treatment on the fresh weight of tubers at 10 WAP at a nutrient dose of 1200 ppm with an average fresh weight of tubers of 30.11 grams. There was no significant effect of planting media treatment on fresh weight of tubers aged 10 WAP. Based on the results of the HSD follow-up test, 5% nutritional treatment at a dose of 1200 ppm showed a significant effect on fresh weight of tubers compared to doses of 1000 ppm, 1400 ppm and 1600 ppm. It is suspected that doses that are too high can interfere with plant growth. Doses of 1400 ppm and 1600 ppm are too high for Dayak onions, while a dose of 1200 ppm is thought to be more appropriate and plants can get adequate nutrition without the risk of overdose. Cocopeat growing medium: 50% husk charcoal has better water holding capacity and nutrient retaining ability. With a dose of 1200 ppm, plants can more efficiently take the nutrients they need compared to higher doses.

According to Simbolon (2018) onion bulbs are plants that require potassium nutrients in the formation of tubers where optimal nutrition will contribute the potassium needed by plants. Adequate environment will support the formation of plants thereby increasing the wet



weight of tubers. Basically onion plants are plants that require potassium nutrients in the formation of tubers, where optimal nutrition will contribute the needed potassium.

The results of the analysis of variance showed that there was no interaction between nutrient treatments and planting media on dry weight of tubers aged 10 WAP.

Table 3 – The average dry weight of tubers (g) in the provision of AB nutrition with a mix of tubers and growing media using the hydroponic wick system

Nutrients (N)	Planting media (M)			Average
	M1 Cocopeat 50%: husk charcoal 50 %	M2 Husk charcoal 100%	M3 Cocopeat 100%	
N0 (1000 ppm)	7.67	6.33	4.67	6.22 b
N1 (1200 ppm)	9.00	8.00	7.33	8.11 a
N2 (1400 ppm)	6.67	4.67	6.00	5.78 b
N3 (1600 ppm)	6.00	6.00	6.67	6.22 b
Average	7.33	6.25	6.17	
HSD 5%	N = 1.86			

There was a significant effect of the nutritional treatment on the dry weight of tubers at 10 WAP at a nutrient dose of 1200 ppm with an average fresh weight of tubers of 8.11 grams. There was no significant effect of planting media treatment on fresh weight of tubers aged 10 WAP. In the 50% cocopeat treatment: 50% husk charcoal. In table 3 the highest number of tubers was in the treatment of 50% Cocopeat growing media: 50% rice husk charcoal with a nutrient dose of 1200 ppm (N1M1) and 100% cocopeat growing medium with a nutrient dose of 1400 ppm the average yield was 10.33. Cocopeat media has micro pores that can inhibit large water movements causing high water availability. Rice husk charcoal media has good porosity for root development and has high water holding capacity (Simbolon, 2018). Nutrient solutions as a source of water and minerals are important for the growth and quality of hydroponic plant results. The element nitrogen (N) is very influential in the formation of leaves. Stems and tillers so that when used in optimal amounts it will increase plant growth (Ruhnayat. 2007).

The results of analysis of variance showed that there was an interaction between nutrient treatments and planting media on the number of tubers aged 10 MST. There was a significant effect of nutritional treatment on dry weight of tubers at 10 WAP at a nutrient dose of 1200 ppm. There was a very significant effect of the planting media treatment on the wet weight of tubers aged 10 WAP on 50% cocopeat treatment: 50% husk charcoal.

Table 4 – The average number of tubers in the provision of AB nutrition with a mix of tubers and growing media using the hydroponic wick system

Nutrients (N)	Planting media (M)			Average
	M1 Cocopeat 50%: husk charcoal 50 %	M2 Husk charcoal 100%	M3 Cocopeat 100%	
N0 (1000 ppm)	8.33 ab AB	6.33 ab A	9.33 a B	8.00
N1 (1200 ppm)	10.33 b B	7.67 b A	9.00 a AB	9.00
N2 (1400 ppm)	7.33 a B	5.00 a A	10.33 b B	7.56
N3 (1600 ppm)	8.33 ab A	6.67 ab A	8.33 ab A	7.78
Average	8.58	6.42	9.25	
HSD 5%	N x M = 3.04			
		M= 1.42	N=1.03	

In table 4 the highest number of tubers was in the treatment of 50% Cocopeat growing media: 50% husk charcoal with a nutrient dose of 1200 ppm (N1M1) and 100% cocopeat growing medium with a nutrient dose of 1400 ppm the average yield was 10.33. Cocopeat media has micro pores that can inhibit large water movements causing high water availability. Rice husk charcoal media has good porosity for root development and has high water holding capacity (Simbolon, 2018). Nutrient solutions as a source of water and minerals are important for the growth and quality of hydroponic plant results. The element nitrogen (N) is



very influential in the formation of leaves. Stems and tillers so that when used in optimal amounts it will increase plant growth (Ruhnayat. 2007).

The results of Dayak onion bulbs using the hydroponic wick system, Dayak onion bulbs look fresh red, cleaner and hygienic, easy to clean and grow faster than conventional.

The results of analysis of variance in the treatment of growing media and nutrient treatment showed an interaction with the weight of Dayak onion roots. There was no significant effect of nutritional treatment on root weight at 10 WAP. There was no significant effect of planting media treatment on root weight at 10 WAP.

Table 5 – Average root weight (g) in AB nutrition, tuber mix and growing media using the hydroponic wick system

Nutrients (N)	Planting media (M)			Average
	M1 Cocopeat 50%: husk charcoal 50 %	M2 Husk charcoal 100%	M3 Cocopeat 100%	
N0 (1000 ppm)	24.33 a A	44.33 b B	25.00 a A	28.11
N1 (1200 ppm)	25.67 a A	24.33 a A	41.96 a B	30.11
N2 (1400 ppm)	37.67 a A	25.33 ab A	30.00 a A	22.00
N3 (1600 ppm)	27.00 a A	34.33 ab A	27.33 a A	24.11
Average	24.92	25.17	28.17	
HSD 5%	N X M = 17.29			

In table 5 the best combination treatment of root weight in the 1000 ppm nutrient treatment and 100% husk charcoal planting medium (N0M2) reached 44.33 grams. Each planting medium has advantages for growing Dayak onions using a hydroponic wick system. Cocopeat media has micro pores which are able to inhibit greater water movement resulting in higher water availability (Istomo and Valentino, 2012). Rice husk charcoal media has good porosity for root development and has high water holding capacity (Simbolon, 2018). Supriyanto and Fiona (2010) in their research results also stated that in general the addition of rice husk charcoal could promote more effective development of the roots of the Jabon seedlings which were tested on sub soil media.

## CONCLUSION

Based on the results of the study it can be concluded that:

- There was an interaction between the treatment of AB mix tuber nutritional doses and the composition of the planting media on the growth and yield of Dayak onions on leaf area, number of tubers and root weight. There was no interaction on the number of leaves, tuber fresh weight and tuber dry weight;
- Treatment of the best planting media composition on the growth and yield of Dayak onions on 50% cocopeat planting medium: 50% rice husk charcoal to the number of tubers. The best nutritional treatment of AB mixed tubers was at a dose of 1200 ppm for the number of tubers, the fresh weight of the tubers and the dry weight of the tubers.

Because in this study the harvest period was at the age of 10 MST or 2.5 months for further research it could be harvested at 3-4 months to see more optimal yield and tuber quality. Further research can be added to the analysis of active compounds in Dayak onions to see the content of Dayak onions using a hydroponic wick system.

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