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Administration Response of Milkfish Rinsed Water on The Growth and Production of Celery (*Apium graveolens* L.)

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Abstract

This study aimed to determine growth and production responses of celery (*Apium graveolens* L.) after the administration of milkfish rinsed water. This study was perfomed in the Experimental Land, Faculty of Agriculture, Cokroaminoto University, Palopo on June – August, 2022. Experimental method used in this study was a completely randomized design, containing six treatments and four replications (24 experimental units). Treatments in this study contained several milkfish rinsed water administration doses, namely P0 = without rinsed water administration (control), P1 = 250 ml/polybag, P2 = 300 ml/polybag, P3 = 350 ml/polybag, P4 = 400 ml/polybag, and P5 = 450 ml/polybag. The results showed that the milkfish rinsed water administration significantly affect plant height, number of leaves, and number of buds, but obtaining no significant effect on wet weight. The best treatment was found in the P3 treatment with average plant height of 25.30 cm, 149.75 leaves, 6.75 buds, and 59.33 g wet weight

Keywords: celery, growth, milkfish, rinsed, water, production

A. Introduction

Celery is an important vegetable with export value. This plant is the second important spice after lettuce based on its popularity and value. This plant has also long been known in Indonesia with various advantages. Besides a cooking spice, celery can also heal various sickness, such as fever, flu, liver and lymph problems. The chemical contents of celery have several activities as antimicrobial, antihypertensive, antioxidant, antidandruff, antidepressant, and anti-inflammation agents (Arzi, Hemanti, Karampour, Nazari, & Baniahmad, 2014).

The celery prospect in Indonesia, either in domestic or foreign markets as an export commodity, faces a problem in its cultivation as celery cultivation is included in a small-scaled

cultivation category as side cultivation plant. Based on the Bureau of Statistics on the vegetable plant survey in Indonesia in 2017, harvesting and production land data of celery plants were absent. This condition was also similarly reported by the Research and Development Program for Horticulture Activities in Indonesia (Puslitbang) (BPS, 2017).

Celery can grow well, if supported with good cultivation condition. All conditions that affect its growth factor will determine the cultivation success. These factors are soil, climate, pests, and diseases. Above these factors, a proper cultivation technique also needs further attention (Yunus, 2018). The celery cultivation can be performed both in wide land and narrow land such as a pot or a polybag (Dalimunthe and Lestari, 2019). Intensive maintenance, proper conditions for growth, and appropriate fertilization are ways to improve celery production quality (Yunus, 2018). The liquid fishery wastes contain proteins and lipids that expose high nitrate and ammonia level. According to the General Directorate of Aquaculture (2015), fish waste can be utilized as an organic fertilizer ingredient. A fish waste that can be utilized comes from milkfish. Milkfish contains proteins and lipids, which can be utilized as organic liquid fertilizer to optimize growth and development of celeries. Commonly, fish rinsed water contains various nutrients, such as N (nitrogen), P (phosphorus), and K (potassium), which become the important components of organic fertilizers to regulate the plant growth.

The objective of this study was to determine the administration response of milkfish rinsed water on the growth and production of celery plants, and identify the best rinsed water concentration for growth and production of celery plant improvemen.

B. Methology

This study was carried out in the Experimental Land, Faculty of Agriculture, Cokroaminoto University, Palopo, Jl. Lamaranginang, Batupasi Village, Wara Utara Sub-district, Palopo City. The study was performed on June – August, 2022.

The experimental method used was a completely randomized design, containing six treatments and four treatments. Hence, there are 24 experimental units in this study. The treatments were composed of: P0 = control (without rinsed water administration), P1 = 250 ml/polybag milkfish rinsed water, P2 = 300 ml/polybag milkfish rinsed water, P3 = 350 ml/polybag milkfish rinsed water, P4 = 400 ml/polybag milkfish rinsed water, and P5 = 450 ml/polybag milkfish rinsed water. The observational data were analyzed using an analysis of variance. If there was a significant different, the data were continuously analyzed with the Honestly Significantly Different (HSD) at 5% level.

Planting was performed after the sown seedlings were 1 month old or produced 3-4 leaves. Seedlings were carefully transferred to the treatment polybags filled with soil containing the soil media. The planted seedlings had to be in a similar size and healthy. Seedlings were sufficiently watered every morning or afternoon to sustain the soil humidity. Also, soil was also maintained not too wet and not too dry.

The milkfish rinsed water was produced by chopping the milkfish and cutting it into two parts. This condition was proposed to simplify the rinsed water collection. Water at 7 L was poured in a container with milkfish. The rinsed water was then collected after the first and second time of rinsing. The milkfish used was 1 kg weight in a fresh condition. After the rinsed water was ready, the rinsed water was kept in a bucket. For the last step, the milkfish rinsed water was applied to the celeries after two-week planting.

Observation was started on 2 WAP (weeks after planting), then continued once in two weeks to determine the treatment effect, based on the observational characteristics in celeries. Celeries were harvested after reaching 63 WAP in polybag. The observational parameters were plant height (cm), number of leaves (leaves), number of buds, and weight wet (g).

C. Result and Discussion

Plant Height

Based on the analysis of variance, milkfish rinsed water administration treatments obtained a significant difference on celery height parameter. The average height of celeries after administered with milkfish rinsed water until 63 WAP can be shown below in Table 1.

Table 1. Celery height after milkfish rinsed water application

Treatment	Average plant height (cm) on -th week (WAP)				
	7	21	35	49	63
P0	4.58[a]	6.75 [a]	8.80 [a]	12.53 [a]	20.38 [a]
P1	5.28 [a]	8.00 [a]	10.93 [abc]	16.95 [ab]	25.08 [a]
P2	5.03 [a]	8.00 [a]	10.80 [abc]	16.08 [ab]	21.48 [a]
P3	4.85 [a]	8.63 [a]	11.95 [bc]	20.48 [b]	25.30 [a]
P4	5.23 [a]	8.88 [a]	11.98 [bc]	18.65 [b]	24.85 [a]
P5	5.40 [a]	9.50 [b]	13.28 [bc]	16.35 [ab]	23.13 [a]

Note: Numbers followed by similar letter in the same column show no significant different based on HSD test at 5% level.

From the table above, the average plant height of celeries was significantly different on 35 and 49 WAP. The highest average height on 63 WAP was obtained by the P3 treatment (350 ml rinsed water) at 25.30 cm, while the lowest average height was obtained by the P0 treatment (control) without rinsed water administration at 20.38 cm.

Number of Leaves

Based on the analysis of variance, the administration of milkfish rinsed water could significantly affect the number of leaves in celeries. The average number of leaves in celeries after the rinsed water administration until 63 WAP is shown in Table 2.

Table 2. Number of leaves in celeries after milkfish rinsed water administration

Treatment	Average number of leaves (leaves) on -th week (WAP)				
	7	21	35	49	63
P0	3.00 [a]	5.25 [a]	9.50 [a]	44.25 [a]	70.50 [a]
P1	3.25 [a]	7.00 [abc]	14.25 [ab]	58.50 [ab]	96.50 [ab]
P2	3.00 [a]	6.00 [abc]	11.75 [a]	55.00 [ab]	98.50 [ab]
P3	3.25 [a]	8.25 [bc]	21.00 [bc]	94.00 [c]	149.75 [c]
P4	3.25 [a]	10.00 [cd]	19.50 [bc]	64.00 [ab]	131.75 [bc]
P5	3.50 [a]	11.50 [d]	22.50 [c]	74.50 [bc]	129.50 [bc]

Note: Numbers followed by similar letter in the same column show no significant different based on HSD test at 5% level.

The table above shows that the average number of leaves in celeries obtained a significant different on 21, 34, 49, and 63 WAP. On the 63 WAP, the average number of leaves in the P3 treatment was 149.75, as significantly different from the P0, P1, and P2 treatments, but insignificantly different from the P4 and P5 treatments.

Number of Buds

Based on the analysis of variance, the administration of milkfish rinsed water could significantly affect the number of buds in celeries. The average number of buds in celeries after the rinsed water administration until 63 WAP is shown in Table 3.

Table 3. Number of buds in celeries after milkfish rinsed water administration

Treatment	Average number of buds on -th week (WAP)		
	35	49	63
P0	1.00 [a]	2.25 [a]	3.25 [a]
P1	1.50 [a]	3.75 [ab]	4.75 [ab]
P2	1.25 [ab]	3.75 [ab]	5.25 [ab]
P3	3.00 [c]	5.75 [c]	6.75 [b]
P4	2.00 [abc]	4.25 [bc]	6.00 [b]
P5	2.75 [bc]	4.25 [bc]	5.50 [ab]

Note: Numbers followed by similar letter in the same column show no significant different based on HSD test at 5% level.

Based on the table above, the average number of buds in celeries shows a significant different on 35, 49, and 63 WAP. The P3 treatment was significantly different from the P4 and P5 treatments, but insignificantly different from the P0, P1, and P2 treatments on all observational period. The highest number of buds produced was obtained from the P3 treatment (350 ml rinsed water) at 7.50 buds, while the lowest number of buds was obtained from the P0 treatment (control) without rinsed water administration at 3.25 buds.

Wet Weight

Based on the analysis of variance, the administration of milkfish rinsed water had no significant difference on the wet weight of celery. The average wet weight of celery after the milkfish rinsed water administrations is shown in Figure 1.

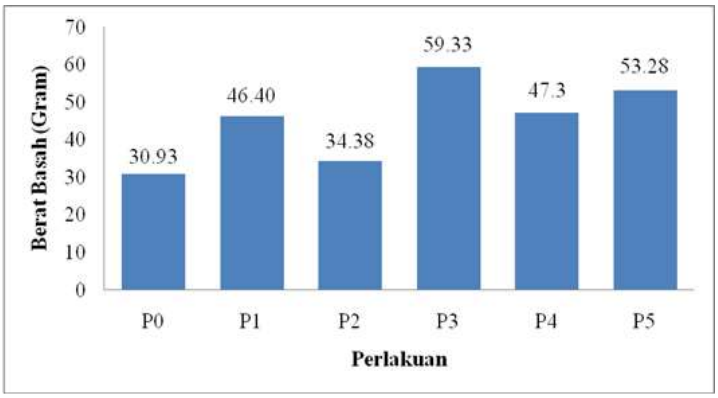

Figure 1. Average wet weight of celery plants after milkfish rinsed water administration

From the figure above, the first highest average wet weight of celery was found in the P3 treatment (350 ml milkfish rinsed water) at 59.33 g, while the second highest wet weight was found in the P5 treatment (450 ml milkfish rinsed water) at 53.28 g, the third highest wet weight was the P4 treatment (400 ml milkfish rinsed water) at 47.3 g, the fourth highest wet weight was the P1 treatment (250 ml milkfish rinsed water) at 46.40 g, and the lowest wet weight was found in the P0 (control) treatment without milkfish rinsed water administration at 30.93 g.

2. Discussions

Based on the study results in celery height, the P3 treatment obtained the highest value by administering 350 ml/polybag milkfish rinsed water at 25.30 cm, compared to other treatments, while the lowest value was obtained from the P0 treatment at 20.38 cm. This condition was thought as the administration of milkfish rinsed water supplied nutrients, such as N, P, and K, that were required by celeries.

In addition, General Directorate of Aquaculture (2015) explained that the addition of N and P matters could improve growth, in this case plant height. Besides nitrogen matter, plant height growth can be affected by phosphorus (P), zinc (Zn), and manganese (Mn). Ca nutrient is required by plants for cell elongation, cell division, upward growth of plants, and bud formation. Iron (Fe) is important for chlorophyll formation in leaves required for photosynthesis, which can continuously be used as a food for plants to grow and develop. Magnesium (Mg) is functioned for assisting the phosphate transportation pathway in plants and accelerating the fruit formation. Manganese (Mn) is functioned in photolysis process (water degradation) to form energy that can be used by plants for metabolisms, such as absorption, transpiration, cell division, flowering, and fruit formation (Nurul, 2012).

The P3 treatment produced the highest number of leaves at 149.75, while the lowest number of leaves was obtained from the P0 treatment at 70.50. According to the Swamp Land Agriculture Research Center (2015), nitrogen has roles in plant vegetative growth, plant coloration, and organ-initiator for photosynthesis. Plants applied with the fish rinsed water showed a positive impact due to abundant calcium (Ca), iron (Fe), nitrogen (N), magnesium (Mg), and manganese (Mn) contents that can promote plant length growth, number of leaves, and fruit formation (Anik, 2012).

Based on the analysis of variance for number of buds in celery, the P3 treatment had the highest number of buds at an average of 6.75, while the lowest number of buds was found in the P0 treatment at an average of 3.25. This condition was caused by the nitrogen content in milkfish rinsed water. Nitrogen is a main nutrient for plant growth to promote the plant vegetative growth, improve protein content in leaf-producing plants, following Patti, P.S., E. Kaya, & C. Silahooy (2013).

The wet weight parameter presents the highest value in the P3 treatment at an average of 59.33 g, while the lowest value was obtained from the P0 treatment at an average of 30.93 g. This condition indicates that a wider root distribution coverage will cause a better nutrient absorption as widening the nutrient absorption area and provide optimal plant parameters. According to Mutyarny (2014), the plant wet weight mainly fluctuates, depending on the plant humidity level.

D. Conclusion

Based on the study results, administration of milkfish rinsed water could significantly affect plant height, number of leaves, and number of buds, but showing no significant different on plant height observation and wet weight. The best milkfish rinsed water administration was found in the P3 treatment, which produced 25.30 cm height, 149.75 leaves, 6.75 buds, and 59.33 g wet weight

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