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Response of Growth of Bokchoy (*Brassica rapa* L.) to the Treatment of AB Mix Concentration and Spacing on Floating Raft Hydroponics

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Abstract:- This study aimed to : (1) to determine the interaction between AB mix concentration and spacing on the growth of bokchoy in the floating raft hydroponics, (2) to determine the AB mix concentration and spacing that gave the best growth for bokchoy on the floating raft hydroponic. Experiments were carried out using a split plot design with AB mix concentration as the main plot consisting of three levels, namely K_1 (10 ml l^{-1}), K_2 (12 ml l^{-1}), and K_3 (14 ml l^{-1}) and spacing as subplots consisting of three levels, namely J_1 (10 cm x 10 cm), J_2 (10 cm x 15 cm), and J_3 (10 cm x 20 cm). From these two factors, nine treatment units were obtained, each treatment unit was repeated three times in order to obtain 27 experimental units. The results showed that: (1) there was a significant interaction between AB mix concentration and spacing to root volume of 14 DAP (Day After Planting), and leaf area index at 21 and 28 DAP, (2) AB mix concentration treatment of 14 ml l^{-1} gave the highest average leaf area index with a value of 2.559.

Keywords:- *Floating Hydrophonic, Growth, Treatment.*

I. INTRODUCTION

Hydroponics is a plant cultivation technique innovation that can be carried out in areas with minimal agricultural land, especially in urban areas. The Floating Raft Hydroponic System (FRHS) is a simple hydroponic system and is easier to manage compared to other hydroponic systems (Karimah et al., 2019). The hydroponic system has a high initial investment cost so that many people have not been able to implement a hydroponic cultivation system.

The use of bokchoy as a hydroponic cultivation plant is expected to be a solution to be able to provide a relatively fast break-even point. The use of pokcoy was chosen because this plant has a shorter harvest time and has broad adaptability (Luta et al., 2019). However, the productivity of bokchoy in Indonesia is still uncertain, this is due to the not yet optimal use of hydroponic technology. Overcoming the low productivity of bokchoy can be overcome by using optimal spacing settings (Murtiawan et al., 2018). This is because the spacing will be related to the plant population which has an impact on the level of competition between plants.

Apart from the competition factor, the success rate of plant cultivation can be influenced by other factors, namely the nutrition provided. In hydroponic systems, nutrition is carried out only by using AB mix nutrients. The provision of AB mix nutrition will be able to meet the nutrient needs needed by plants so that the plants will grow well (Sukasana et al., 2019). Even so, the provision of nutrients that tend to be low or high can also affect the plant growth process. Based on the description above, it is necessary to further investigate bokchoy response through the application of several spacing and AB mix concentrations.

II. MATERIAL AND METHODS

The experiment was carried out in the hydroponic garden of CV Green Vest, Drajat Village, Kesambi District, Cirebon City with a height of 4 meters above sea level (asl). The trial period is from June to July 2020.

Experiments were carried out using a split plot design with AB mix concentration as the main plot consisting of three levels, namely K_1 (10 ml l^{-1}), K_2 (12 ml l^{-1}), and K_3 (14 ml l^{-1}) and spacing as subplots consisting of three levels, namely J_1 (10 cm x 10 cm), J_2 (10 cm x 15 cm), and J_3 (10 cm x 20 cm). From these two factors, nine treatment units were obtained, each treatment unit was repeated three times in order to obtain 27 experimental units.

The observations observed included plant height, number of leaves, root volume, and leaf area index. The collected data were analyzed by ANOVA and LSD test least significance was used to compare means at $p \leq 0.05$.

III. RESULT AND DISCCUSION

- *Plant height*

The results of statistical analysis showed that there was no significant interaction between AB mix concentration and spacing. However, the independent treatment of AB mix concentration showed a significant effect on plant height at the age of 14, 21, and 28 DAP (See Fig. 1).

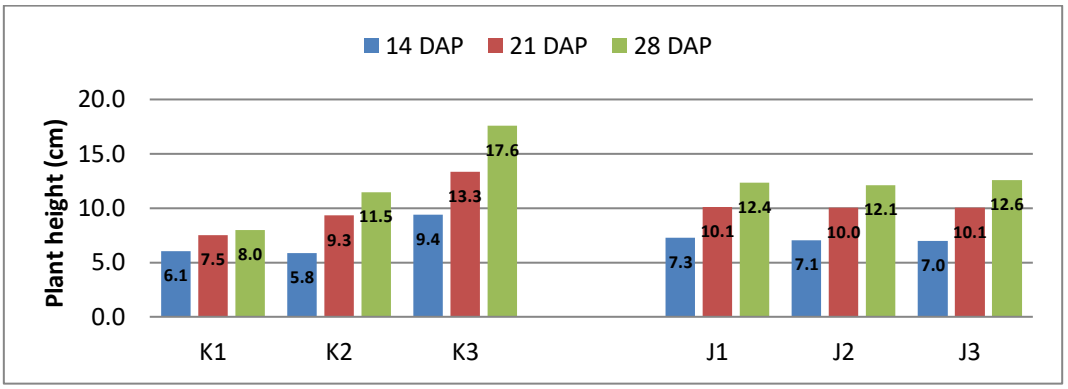

Fig 1. The effect of AB Mix concentration and spacing on plant height at 14, 21 and 28 DAP

This shows that AB mix nutrition will increase the height of the bokchoy plant along with the increase in the value of the concentration of nutrients given because the nutritional needs for vegetative growth can be met properly. In line with the opinion of Furoidah (2018), which states that, in hydroponic plant cultivation, giving a high concentration of solution will result in high plant growth as well.

In the treatment of spacing does not show a real effect on plant height, this is because plants can still minimize the impact of competition between plants, when plants are not in contact conditions, plants will get the same number of growth factors (Alfandi et al., 2017).

➢ *Number of leaves*

The results of statistical analysis showed that there was no significant interaction between AB mix concentration and spacing. However, the independent treatment of AB mix concentration showed a significant effect on the number of leaves aged 14, 21, and 28 DAP (See Fig 2).

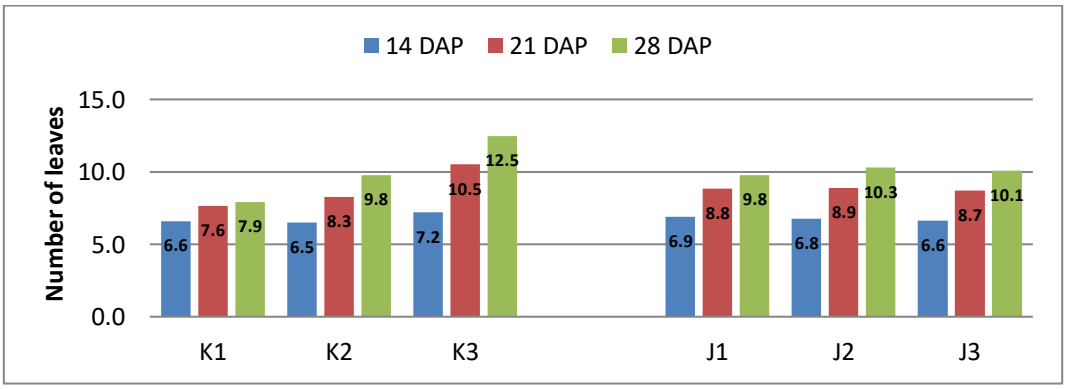

Fig 2. Effect of AB Mix concentration and spacing on the number of leaves aged 14, 21 and 28 DAP

This shows that increasing the concentration value tends to increase the content of a nutrient, especially the element N, when the plant is in the process of vegetative growth, the plant tends to need a large amount of nitrogen (Ria & Asmuliani, 2020).

➢ *Root volume*

The results of statistical analysis showed that there was a significant interaction effect between AB mix concentration and spacing on root volume aged 14 DAP (Fig 3).

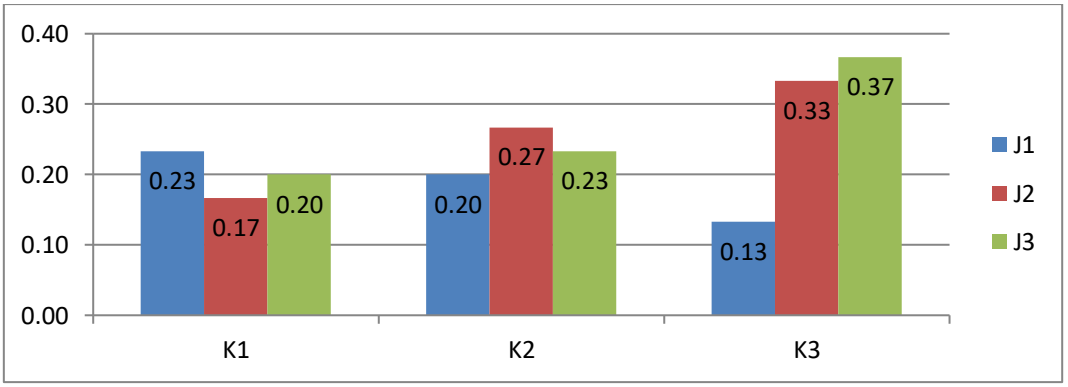

Figure 3. Effect of AB mix concentration and spacing on root volume of 14 DAP

This shows that the nutrients provided will have an impact on plant growth, roots are organs that play a role in the process of extracting water and nutrients needed in plant metabolism (Yama & Kartiko, 2020) so that root formation will be influenced by the levels of nutrients provided.

At the age of 21 and 28 DAP, there was no significant interaction between AB mix concentration and spacing. However, the independent treatment of AB mix concentration showed a significant effect on root volume (See Fig 4).

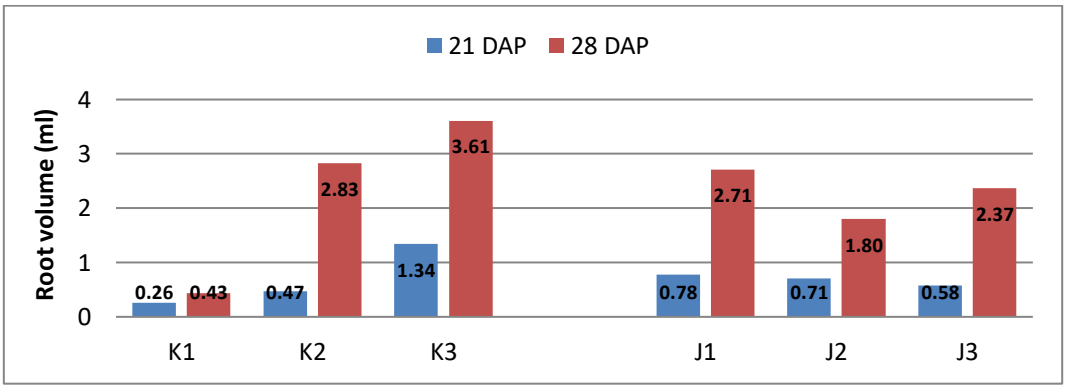

Figure 4. The effect of AB Mix concentration and spacing on root volume aged 21 and 28 DAP

This indicates that the provision of nutrients with relatively lower doses will cause a decrease in root volume due to inadequate root formation. When plants are deficient in N, Mg, K, and Ca, it will reduce root volume by 64-76% (Maia et al., 2014)

➢ *Leaf Area Index*

The results of statistical analysis showed that there was no significant interaction between AB mix concentration and spacing. However, the independent treatment of AB mix concentration showed a significant effect on the leaf area index at 14 DAP (See Fig 5).

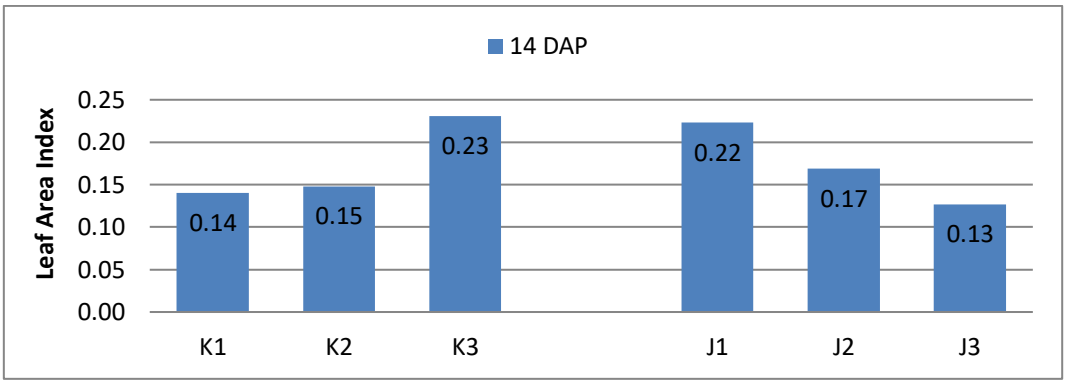

Figure 5. The effect of AB mix concentration and spacing on leaf area index 14 DAP.

This shows that when plants with spacing tend to be dense, light tends to be maximally utilized, further high density will cause light penetration into plants (Njuguna et al., 2017).

At the age of 21 and 28 DAP, the results of statistical analysis showed that there was a significant interaction between AB mix concentration and spacing on leaf area index (See Fig 6 and Fig 7).

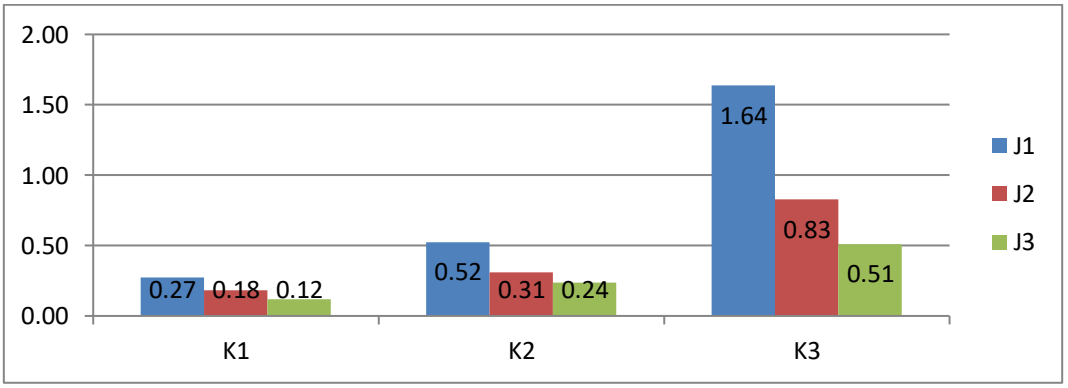

Figure 6. The effect of AB mix concentration and spacing on leaf area index 21 DAP.

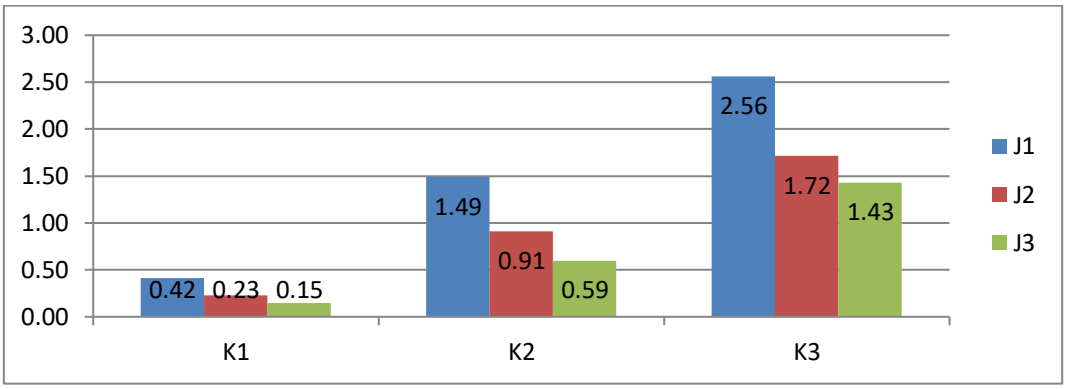

Figure 7. The effect of AB mix concentration and spacing on leaf area index 28 DAP.

This shows that different concentrations of AB mix will give different levels of N. When the nutrients that are given are sufficient and very high, then some will be used for leaf formation which has an impact on increasing plant leaf area (Lakitan, 2011).

At the denser the spacing, the higher the tendency of the light to be absorbed. When light capturing runs optimally, plant growth will be better (Wibowo, 2008).

IV. CONCLUSION

There was a significant interaction effect between treatment AB mix concentration with spacing on root volume of 14 DAP, and leaf area index 21 and 28 DAP. The treatment of AB mix concentration and spacing that gave the highest average leaf area index was 2.559 at a concentration of 14 ml l^{-1} and spacing of 10 cm x 10 cm.

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