

The Effect of Hydroponic Nutrient Solution Treatments on the Vegetative Growth of Water Spinach (*Ipomoea aquatica*)

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Abstract

This study aims to determine the effect of applying AB Mix hydroponic nutrient solution on the vegetative growth of water spinach (*Ipomoea aquatica*). The method used was a simple experiment with two treatments: plants given AB Mix solution and control plants without nutrients, both grown using rockwool media in a static hydroponic system. The research was conducted from March to April 2025 in the yard of a house located in Bengkulu City. The observed parameters included plant height and the number of leaves on day 1 after planting (DAP) and day 16 DAP. The results showed that plants treated with AB Mix grew better than the control. The average plant height in the AB Mix treatment reached 16.85 cm, while the control only reached 14.55 cm. The number of leaves in the AB Mix group ranged from 8 to 10, while the control group only produced 4 to 7 leaves. These data indicate that the macro- and micronutrients contained in the AB Mix solution play an important role in supporting vegetative plant growth. The conclusion of this study is that the application of AB Mix nutrient solution significantly enhances the growth of water spinach compared to untreated plants, and its use is recommended for hydroponic cultivation at both household and commercial scales.

Keywords: Water spinach, hydroponics, AB Mix, vegetative growth, plant nutrition

Introduction

Agriculture is important for providing communities with food. As the population grows and farmland becomes scarce, it is important to use farming methods that save land and protect the environment (Delgado et al., 2023). One popular method is hydroponics—growing plants without soil, using water mixed with nutrients they need (Nuwansi et al., 2015). This method not only uses land more efficiently but can also increase crop yields by giving plants the nutrients they need (Rahmadhani et al., 2020).

Water spinach (*Ipomoea aquatica*) is a leafy vegetable highly favored by the community for its delicious taste and high nutritional content (Fevria et al., 2021). Water spinach is a fast-growing plant that is easy to cultivate, making it an ideal research subject in hydroponic systems (Yefrida et al., 2023). Studying the vegetative growth of water spinach in a hydroponic system provides an opportunity to evaluate the effects of various nutrient treatments and cultivation methods (Nurza, 2022).

In hydroponic systems, plant growth is strongly influenced by the composition and concentration of the nutrient solution. Studies show that balanced nutrient levels that match plant needs strongly support vegetative growth, including plant height, leaf number, and stem size (Gillespie et al., 2021; Mészáros et al., 2023). Inappropriate nutrient levels can disrupt leaf development and affect biomass accumulation, a crucial factor in agricultural yield (Rahmadhani et al., 2020; Greger & Dabrowska, 2010).

It is important to understand how the nutrients in hydroponic solutions affect all parts of plant growth, such as water spinach height and leaf number. Getting the right amount of nutrients helps avoid problems, like fewer leaves when the pH is not right (Gillespie et al., 2021; Kashem et al., 2008).

Hydroponic methods offer an environmentally friendly and efficient solution for plant cultivation. They are especially helpful in addressing challenges from population growth and the scarcity of agricultural land (Delgado et al., 2023). By understanding how nutrients influence growth, this study hopes to provide useful information for farmers, students, and the public interested in hydroponic cultivation (Anisa et al., 2023; Fahrur et al., 2024; Rahmadhani et al., 2020).

This study aims to examine the extent to which hydroponic solution nutrient treatments can influence the vegetative growth of water spinach (*Ipomoea aquatica*).

Research Method

This research was conducted in Bengkulu City from March to April 2025. The tools and materials used in this study included hydroponic trays, Impraboard covers, net pots, flannel wicks, rockwool, water spinach seeds, clean water, and AB Mix nutrients. This study used two treatment groups: a group receiving AB Mix nutrient treatment and a control group that did not. The use of hydroponic tools and materials aims to support optimal growth of water spinach in a hydroponic system.

The study observed plant height (in cm) and the number of water spinach leaves. The data collected were averaged to analyze vegetative growth and plant development.

Results and Discussion

Optimal plant growth depends on balanced nutrients that roots can easily absorb. In hydroponics, the nutrient solution is the main source of these nutrients. Water spinach (*Ipomoea aquatica*) is often grown hydroponically because it has a short harvest period and adapts to various media.

This study used a hydroponic system, with or without AB Mix nutrient solution, to observe effects on water spinach vegetative growth. Plant height and leaf number were the main indicators measured. The study aims to assess the extent to which the nutrient solution increases plant growth relative to the untreated control. Observation parameters are shown in the following table.

Table 1. Average plant height and number of leaves in AB Mix treatment and control on the vegetative growth of water spinach plants

Plant	Average Plant Height (cm)				Average Number of Leaves (leaves)			
	AB Mix Treatment		Control (without AB Mix)		AB Mix Treatment		Control (without AB Mix)	
	1 HST	16 HST	1 HST	16 HST	1 HST	16 HST	1 HST	16 HST
1	7.05	10.6	9.5	14	2	10	2	6.5
2	5.5	9	7.25	12	2	6.5	1.5	6.5
3	11.1	16.85	5.75	8.25	2	8	2	5
4	9.25	14.75	9.55	14.55	2	7.5	2	7
5	10.25	15	5.5	9	2	8.5	2	5.5
6	8.8	13.8	6.55	10.1	2	10	2	6.5
7	8.25	13.25	6.5	10	2	8.5	2	9
8	6.5	9	9	13.75	2	8.5	2	5
9	8.3	12.55	6.4	8.3	2	8.5	1.5	4.5

The results showed that applying AB Mix nutrient solution significantly improved the vegetative growth of water spinach (*Ipomoea aquatica*). Both plant height and leaf number were generally higher with the AB Mix treatment than with the control. This suggests nutrients in AB Mix play a key role in promoting plant growth, especially during the early to mid vegetative phase (Yuliani et al., 2022).

For the plant height parameter, the average plant height with AB Mix treatment at 1 DAP ranged from 5.5 cm to 11.1 cm. Meanwhile, at 16 DAP, plant height increased significantly to 9-16.85 cm (Figure 1). This increase indicates that during the growth period, plants efficiently utilized nutrients from AB Mix to accelerate stem and leaf formation (Wijaya et al., 2021).

In contrast, control plants not given the AB Mix solution showed slower growth. At 1 DAP, their height ranged from 5.5 cm to 9.55 cm. By 16 DAP, height ranged from 8.25 cm to 14.55 cm. Although there was an increase, the averages were still lower than those of AB Mix-treated plants. This shows the growing medium has nutrient limitations without an extra solution (Putra & Lestari, 2023).



Figure 1. Observation of water spinach plants 16 DAP (days after planting) A. Without treatment (Control), B. AB Mix treatment

The increase in leaf number also showed a similar trend. Plants given AB Mix on average produced 2 leaves at 1 DAP and increased to 10 leaves at 16 DAP, especially in Plant No. 6. Other plants also showed a consistent increase, although in some plants the number of leaves was relatively lower, but still higher than the control (Nugroho & Sari, 2024). Meanwhile, in the control treatment, the number of leaves at 1 DAP averaged 1 to 2, and at 16 DAP, it increased to 3 to 7. This limited increase in leaf number reflects deficiencies in essential nutrients, such as nitrogen, phosphorus, and potassium, which are required for leaf cell division and elongation (Indriani et al., 2020).

The AB Mix treatment consistently outperformed the control in both plant height and leaf number. For example, Plant No. 3 in AB Mix reached 16.85 cm and 8 leaves at 16 DAP, whereas the control reached only 8.25 cm and 5 leaves. This shows that AB Mix consistently accelerates and enhances growth (Pratama et al., 2021). AB Mix's success is due to its complete, balanced nutrients. Nitrogen aids leaf formation, phosphorus supports roots, and potassium strengthens stems and regulates water (Dewi & Kurniawan, 2022). These elements are insufficient in the control treatment, so growth is slower.

This significant difference also shows the importance of nutrient management in hydroponic systems. Without an artificial nutrient supply such as AB Mix, plants depend solely on the limited water and growing media, which generally cannot fully meet their physiological needs (Wulandari & Setiawan, 2023). Overall, the data in Table 1 support the preliminary assumption that hydroponic nutrient solution treatment has a real impact on the vegetative growth of water spinach. Plant height and leaf number are the main indicators of growth success, and the AB Mix treatment has consistently yielded better results than control plants without additional nutrients (Siregar et al., 2022).

Conclusion

Based on the research results, the application of AB Mix hydroponic nutrient solution significantly affects the vegetative growth of water spinach. Plants given the AB Mix treatment showed greater increases in plant height and leaf number compared to control plants. The average height of water spinach in the AB Mix treatment reached 16.85 cm at 16 days after planting (DAP), exceeding the control, which reached only 14.55 cm. In addition, the number of water spinach leaves in the AB Mix treatment was higher, namely 8–10, while the control produced only 4–7. This proves that the complete and balanced nutrition in AB Mix supports the development of the plant's vegetative organs. Therefore, the use of AB Mix solution in hydroponic systems has been proven effective and is recommended to improve the growth of water spinach at both household and commercial scales.

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