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Effectiveness of AB MIX and Patents to Increase Microgreen Ercis Plant Yields

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Abstract

Microgreens are young vegetables recognized for their robust flavor and high nutritional content, including beneficial antioxidants that promote health. Peas show great potential as a microgreen because they can be harvested multiple times. This study aims to evaluate the effects of AB mix nutrients and patented fertilizers on the growth and yield of microgreen plants. The research was conducted at the Laboratory of the Faculty of Agriculture, Riau Islamic University, over the course of one month in June 2024. This study used a completely randomized design with two factors: the provision of AB mix (100 ppm, 200 ppm, 300 ppm) and Patent (immune patent 1 + patent fertilizer 1, immune patent 2 + patent fertilizer 1, immune patent 1 + patent fertilizer 2). The parameters observed were Plant Height, Root Length, Economic Wet Weight. In terms of interaction, there was no significant effect but the main effect was significant on the parameters of height, root length, economic wet weight. The best treatment of AB mix at a concentration of 300 ppm and the best treatment of paten at a comparative dose of paten imun 1 + paten fertilizer 2.

Keywords: AB Mix Concentration, Microgreen, Patent, Peas

1. Introduction

Microgreens are defined as young plants harvested at an early stage of growth. These vegetables are renowned for their robust flavour, vibrant hues, and exceptional nutritional value. The optimal harvesting period for microgreens is generally between 7 and 14 days after planting (Allegretta et al., 2019). Despite being harvested at an early stage of growth, microgreens contain significant levels of vitamin C, minerals (specifically copper and zinc), and phytochemicals, including carotenoids and phenolic compounds that act as antioxidants in the human body (Zhang et al., 2021). As posited by Dagmar et al. (2010), the consumption of microgreens confers a superior nutritional profile compared to vegetables that have reached maturity.

The cultivation of microgreens can be developed with a variety of plant species (Nurlaili et al., 2023). One such example is that of pea plant microgreens. Cultivating microgreens represents maintaining and increasing the nutrients in cherished plants, particularly when consumed at an early growth stage. Peas, in particular, offer a range of benefits, including the presence of phenolic compounds (Pambudi et al., 2020). Dahl et al. (2012) further highlight the antioxidant properties of these compounds, which have been linked to cancer and inflammatory disease prevention.

The life cycle of microgreens is notably brief, necessitating the application of appropriate fertilizers and nutrients to enhance the yield of pea plants. Sufficient nutrition is crucial for microgreens to achieve high production levels (Rokhmah & Sapriliani, 2020). Abmix serves as a nutrient formulation designed to promote the optimal growth of microgreen plants. This formulation consists of a blend of mineral salts tailored to meet plants' macro and micronutrient requirements. Additionally, Abmix is fortified with biological materials, such as rhizomax, which can enhance the absorption capacity of nitrogen and phosphorus nutrients (Rokhmah & Sapriliani, 2020).

Patent Fertilizer, a pure organic fertilizer utilizing nanotechnology, has been tested and shown to increase production yields by 20% to 50%. It provides nutrients that plants readily absorb through their roots, stems, leaves, flowers, and fruits, independent of photosynthesis, while also stimulating plants to utilize nutrients based on their needs selectively. According to Jayanti et al. (2022), adopting organic fertilizers represents a viable strategy to minimize the reliance on inorganic fertilizers. This study aimed to evaluate the effectiveness of Abmix and Patent

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Fertilizer in enhancing yields in pea microgreen plants.

2. Material and Methods

This research was conducted in the Laboratory room on the 2nd floor of the Faculty of Agriculture, Riau Islamic University, Jalan Kaharudin Nasution No. 113, Air Dingin Village, Bukit Raya District, Pekanbaru. This research was conducted for 2 months, from April to May 2024. The materials used in this study were Taichung variety pea seeds, Abmix, patented fertilizer. While the tools used were try microgreens, measuring cups, analytical scales, rulers, cameras and stationery.

This study used a Factorial Completely Randomized Design (CRD) consisting of two factors. The first factor was the provision of a comparison of patent fertilizer with four levels of treatment (without patent fertilizer, 1 g patent fertilizer + 1 ml immune patent, 2 g patent fertilizer + 1 ml immune patent, and 1 g patent fertilizer + 2 ml immune patent). The second factor was the concentration of AB Mix consisting of four levels of treatment (0 ppm, 100 ppm, 200 ppm and 300 ppm) obtained 16 treatment combinations with 3 replications, so there were 48 experimental units. Each experimental unit contained 120 grams of pea seeds. The data obtained were analyzed using the BNJ further test at a level of 5%.

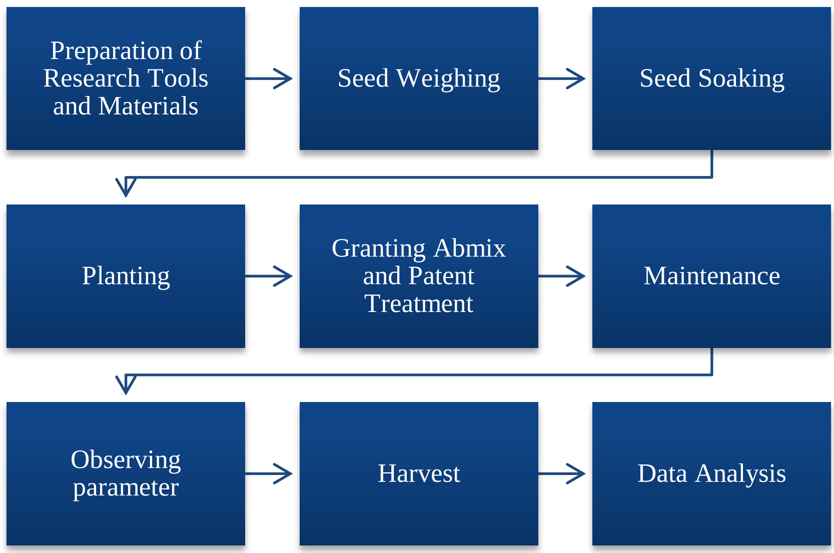

Figure 1. Research flow diagram

3. Results and Discussion

3.1. Plant Height

The data in Table 1 shows that the main effect of giving abmix nutrients is significant on the height of pea microgreen plants. The highest plant height was found in the 300 ppm concentration treatment with an average of 16.62, which was not significantly different from the 200 ppm treatment but significantly different from other treatments. While the treatment that produced the lowest plant height was 0 ppm with an average of 15.22, which was different from other treatments.

Table 1. Average Plant Height with AB Mix Nutrient Provision and Patent Fertilizer Comparison (cm)

AB mix	Patent Fertilizer				Average
	Without Patent Fertilizer	Patent Fertilizer 1 : Immune 1	Patent Fertilizer 2 : Immune 1	Patent Fertilizer 1 : Immune 2	
0 ppm	14,68	15,15	15,44	15,62	15,22 ± 0,53c
100 ppm	15,13	16,12	16,26	16,32	15,96 ± 0,56b
200 ppm	15,44	16,35	16,62	17,19	16,40 ± 0,92ab
300 pmm	15,70	16,45	16,88	17,46	16,62 ± 0,80a
Average	15,24 ± 0,76c	16,02 ± 0,63b	16,30 ± 0,69ab	16,65 ± 0,83a	
KK = 3,28		BNJ P & A = 0,58			

The numbers in the rows and columns followed by the same lower case letter show no significant difference according to the BNJ follow-up test at the 5% level.

The high microgreen pea in the 300 ppm concentration treatment was due to the abmix nutrients provided being able to meet the nutrient needs of microgreen pea. The abmix provided can provide the N nutrients needed for plant growth in forming vegetative plant organs such as leaves, stems and roots. The nitrogen content in abmix nutrients functions to form assimilates, especially carbohydrates and proteins and as a building block for chlorophyll needed in the photosynthesis process. Sufficient nitrogen elements in plants can facilitate the cell division process properly because the main role of nitrogen elements is to stimulate overall growth, especially stem growth so that it affects plant height growth (Yuliana et al., 2017). Abdillah and Ulpah (2024) added that providing nitrogen can help accelerate plant growth in plants effectively.

According to Gulo et al. (2024), growth increases cell size that can be calculated or measured qualitatively. The availability of maximum and balanced macro and micronutrients will cause the plant photosynthesis process to occur correctly, as well as plant growth and development. Nurlaili et al. (2023) stated that abmix contains macronutrients (N, P, K, Ca, Mg, and S) and micronutrients (B, Fe, Cu, Zn, Mn and Mo) that are readily soluble in water so that plants will easily absorb nutrients.

The data in Table 1 shows that the patent fertilizer ratio 1: immune 2 significantly affects the height of pea microgreen plants. The highest plant height was found in the patent fertilizer treatment 1: immune 2 with an average of 16.65 cm, which was not significantly different from the patent fertilizer treatment 2: immune 1 but significantly different from other treatments. While the treatment that produced the lowest plant height was without patent fertilizer, with an average of 15.24 cm which was different from other treatments.

(a) (b) (c)

Figure 2. Microgreen pea plants with Abmix and Patent; (a) Concentration of 100 ppm and patent fertilizer 1: immune 1, (b) Concentration of 200 ppm and patent fertilizer 2: immune 1 and (c) Concentration of 300 ppm and patent fertilizer 1: immune 2.

Comparison of patent fertilizer 1: Immune 2 gets maximum results because patent immunity provides plant immunity to pests and diseases, saving pesticide use by up to 80%. In addition, patent fertilizer is a fertilizer that uses nanotechnology to store nutrients in plant tissue and does not evaporate or disappear, where nutrients in patents are ready-to-eat food so that they can be absorbed directly through the roots, stems, leaves, flowers and fruits. Patent fertilizer functions as a catalyst that accelerates the distribution of nutrients in nature and plants as energy for growth, flowering and fruiting.

3.2. Economic Wet Weight

The data in Table 2 shows that the interaction of abmix nutrient treatment and the comparison of patented fertilizers significantly affected the economic wet weight.

Table 2. Average Plant Height with Abmix Nutrient Provision and Patent Fertilizer Comparison (cm)

AB mix	Patent Fertilizer				Average
	Without Patent Fertilizer	Patent Fertilizer 1: Immune 1	Without Patent Fertilizer	Patent Fertilizer 1: Immune 1	
0 ppm	89,41i	93,56h	94,71fgh	95,44fgh	93,28 ± 2,55d
100 ppm	93,99gh	97,19d-g	98,14c-f	99,73cd	97,26 ± 2,34c
200 ppm	94,30gh	98,55cde	99,15cd	103,63ab	98,91 ± 3,59b
300 pmm	95,03fgh	99,52cd	101,29bc	105,05a	100,22 ± 3,95a
Average	93,18 ± 2,44d	97,21 ± 2,46c	98,32 ± 2,79b	100,96 ± 4,02a	
KK = 1.16		BNJ P & A = 1.25		BNJ PA = 3.44	

The numbers in the rows and columns followed by the same lower-case letter show no significant difference according to the BNJ follow-up test at the 5% level.

The combination of abmix concentration treatment of 300 ppm and patented fertilizer 1: immune 2 significantly produced the highest economic wet weight with an average of 105.05 g which was not significantly different from the combination of abmix treatment 200 ppm and patented fertilizer 1: immune 2 but significantly different from other treatment combinations. The combination of treatment without abmix and without patented fertilizer produced the lowest economic wet weight with an average of 89.41 g, significantly different from other treatment combinations.

Patent is a pure organic fertilizer with nanotechnology. The results of agricultural expert research for approximately 13 years, some of which have been tested and proven to be able to increase production yields by 20 - 50%, provide nutrients for plants so that plants very easily absorb them through roots, stems, leaves, flowers and fruit without photosynthesis and stimulate plants to be able to sort out which nutrients and when they are needed, for example, nitrogen. Wahyuni and Romualdus (2020) stated that nitrogen rapidly increases the development of larger stems and stimulates overall plant growth, primarily stems, branches, and leaves. Besides that, it also plays an important role in forming green leaves, which are useful in photosynthesis. Phosphorus also plays a role in cell division and elongation. The availability of sufficient phosphorus can increase plant growth, one of which is the wet weight of the plant.

Ana (2020) stated that the wet weight of a plant states the composition of nutrients in plant tissue by including water content, where 70% of the wet weight of living plants consists of water as a component and weight adder.

3.3. Root Length

The data in Table 3 shows that the main effect of providing abmix nutrients is significant on the length of pea microgreen roots. The highest root length was found in the 300-ppm concentration treatment with an average of 5.97 cm, which was not significantly different from the 200 ppm concentration treatment but significantly different from other treatments. Meanwhile, the treatment that produced the lowest root length was without abmix, with an average of 4.03 cm.

Table 3. Average Root Length with AB Mix Nutrient Provision and Patent Fertilizer Comparison (cm)

AB mix	Patent Fertilizer				Average
	Without Patent Fertilizer	Patent Fertilizer 1 : Immune 1	Without Patent Fertilizer	Patent Fertilizer 1 : Immune 1	Without Patent Fertilizer
0 ppm	3.51	4.13	4.23	4.25	4.03 ± 0,52c
100 ppm	4.11	5.00	5.35	5.73	5.05 ± 0,73b
200 ppm	4.45	5.22	5.90	6.43	5.50 ± 0,98ab
300 pmm	4.56	5.36	6.30	7.65	5.97 ± 1,38a
Average	4,16 ± 0,61c	4,93 ± 0,71b	5,45 ± 0,93ab	6.02 ± 1,45a	
KK = 12.13			BNJ P & A = 0.69		

The numbers in the rows and columns followed by the same lowercase letter show no significant difference according to the BNJ follow-up test at the 5% level.

Abmix nutrients have a complete and balanced content of available nutrients with sufficient amounts to meet the needs of pea microgreens. Suarsana et al. (2020) stated that abmix nutrients contain macro and micronutrients in amounts according to plant needs, are stable and dissolve quickly in water so plant roots readily absorb them.

Plants mostly absorb nutrients through their roots. The roots' nutrients must be absorbed in the same amount or greater than the plant requires to produce biomass. Providing sufficient P nutrients will make the plant roots grow longer, so nutrient absorption by the roots can be more optimal. According to Nurdiansyah (2020), a broad and deep root system will obtain nutrients according to what is needed for plant growth. Nitrogen in plants is needed for vegetative growth, and photosynthesis results are used for root and leaf growth to increase plant weight.

Sutedjo (2010) stated that the accuracy of the dose largely determines root development. The administration of fertilizer or concentration given, the more precise the dose given, determines the growth and development of the plant. The nature of good soil media will increase the distribution, elongation, and compactness of plant roots, allowing them to use nutrient absorption to form high assimilation and stimulate better root growth and development.

The data in Table 4 shows that the comparison of patent fertilizer 1: immune 2 significantly affects the length of pea microgreens' roots. The longest root length was found in the patent fertilizer treatment 1: immune 2 with an average of 6.02 cm, which was not significantly different from the patent fertilizer treatment 2: immune 1 but significantly different from other treatments. Meanwhile, the treatment that produced the lowest average root length was without patent fertilizer, with an average of 4.16 cm.

The elements contained in patent fertilizer stimulate the overall vegetative growth of plants, especially the growth of roots, stems and leaves. Patents play a role in helping accelerate the formation of green leaf substances (chlorophyll), which are very important for the process of photosynthesis. Plant roots function to accelerate the process of releasing elements from soil minerals. The longer and more root hairs, the greater the ability of plants to absorb and convert elements into elements that are available to plants.

Roots are organs that absorb water and nutrients, so contact between water or nutrients and the surface of root hair cells is an essential part of the absorption process. The role of roots in plant growth is to provide nutrients and water needed in plant metabolism (Sudirman et al., 2022).

4. Conclusion

The best treatment in administering patent fertilizer is with a ratio of 1 gram of patent fertilizer + 2 ml of patent immunity, while in administering AB Mix the best treatment is at a concentration of 300 ppm in increasing the growth and yield of microgreen pea plants.

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