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# THE EFFECT OF AB MIX NUTRIENT CONCENTRATION AND LIQUID ORGANIC FERTILIZER ON GROWTH AND YIELD OF PAKCOY (Brassica rapa L.) IN HYDROPONIC WICK SYSTEM

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**Abstract**

Pakcoy is a vegetable that is useful and popular with Indonesian people today. The demand for pak choy is increasing, but the problem of land conversion is causing productive land to decline. Hydroponics is one solution for cultivating pak choy. The growth and development of pak choy requires AB Mix and NASA POC nutrition. This research aims to determine the effect of AB Mix and NASA POC concentrations and to determine the interaction between the two. This research is a factorial experimental study with two factors arranged using a Completely Randomized Design. The first factor is the AB Mix concentration with three levels: 600 ppm, 900 ppm, and 1,200 ppm. Meanwhile, the second factor is NASA POC concentration with five levels: 0 ml/L, 3 ml/L, 5 ml/L, 7 ml/L, and 9 ml/L. The results of the study showed that there was an interaction between AB Mix concentration and NASA POC concentration, which had a significant effect on the parameters of plant height aged 30 HSPT, number of leaves, wet weight of the crown, and wet weight of the roots.
**Keywords**: AB Mix, hidroponik, konsentrasi, POC NASA

## INTRODUCTION

Vegetables are commodities that contribute to and realize the welfare of society. One of the vegetables that is currently in great demand by the Indonesian people is pakcoy, often referred to as spoon mustard. Pakcoy is a vegetable plant included in the Brassicaceae family originating from China which has good benefits for the health of the human body. (Setiawan, 2014). The demand for pakcoy continues to increase because it has good benefits for the body and pakcoy cultivation is also easy to do. There is a problem at this time, namely the lack of agricultural land due to land conversion, which causes limited productive land area. One of the efforts to increase pakcoy production is cultivation with hydroponic techniques. The wick system is one of the simplest hydroponic systems because it utilizes wick media as a nutrient connector for plants. The advantages of the wick system are low cost, easy and simple manufacture, and also does not require electricity and water pumps (Rustomo, et al., 2022).

One of the factors that can affect the growth and yield of hydroponic pakcoy plants is the availability of nutrients, such as nutrition. The usual nutrition given to hydroponic plants is AB Mix nutrition. AB Mix nutrition is a nutrient solution consisting of stock A nutrient solution containing macronutrients and stock B containing micronutrients; AB Mix is an inorganic fertilizer (Arianandaet al., 2020). Excessive use of inorganic fertilizers can trigger water pollution, which can lead to eutrophication, which triggers algae bloom. One of the efforts to reduce the use of inorganic fertilizers

or AB Mix can be done by applying liquid organic fertilizers such as NASA liquid organic fertilizer. NASA POC is a pure organic material in liquid form from livestock and poultry waste, natural and plant waste, and certain types of plants, NASA POC can be applied to all types of food, horticultural and annual crops, as well as for livestock/poultry and fish/shrimp. (Fatah and Tengku, 2022).

The addition of NASA liquid organic fertilizer in hydroponic pakcoy cultivation aims to support the availability of nutrients for the growth and yield of pakcoy plants. In addition, the provision of liquid organic fertilizers reduces the excessive use of inorganic fertilizers. Therefore, this study requires the right AB mix concentration and NASA POC concentration in pakcoy plants to increase pakcoy growth and production.

## METHOD

The research was conducted from November 2023 to December 2023 at the screen house in Sidoarjo. This research is a factorial experimental study with two factors arranged using a completely randomized design. The first factor is the concentration of AB Mix (A) with 3 levels: A1 = 600 ppm, A2 = 900 ppm, and A3 = 1,200 ppm. The second factor is the concentration of NASA POC (P) with five levels: 0 ml/L, 3 ml/L, P3 = 5 ml/L, P4 = 7 ml/L, and P5 = 9 ml/L. The parameters observed were plant height, number of leaves, leaf area, crown wet weight, and root wet weight. The tools used in this research are a pH meter, water container/bak, net pot, measuring cup, spray bottle, ruler, digital scale, and TDS meter. The materials used in the study were pakcoy seeds of Nauli F1 variety stamped Red Arrow, NASA liquid organic fertilizer, AB Mix nutrients, water, preboard, and rock wool planting media.

The implementation of this research begins with sowing pakcoy seeds using Rockwool planting media with a seeding duration of two weeks. The next step was to move the pakcoy seedlings to the container/axis system with pakcoy that showed characteristics of having four leaves. Pakcoy seedlings are placed in a net pot and then placed on a preboard. Next is the making and giving of AB Mix, making AB Mix by dissolving each nutrient stock A and stock B first, then put in the tub according to the treatment, AB Mix nutrition is given every week at regular intervals. Next is the manufacture and administration of NASA POC. NASA POC, according to the treatment, is included in each 1 liter of water. Then, the application of NASA POC is done by spraying on the leaves of pakcoy until wet. NASA POC was given three days after transplanting (HSPT) once a week until week 5 with a total of 4 sprays.

Furthermore, pakcoy maintenance includes controlling pests and diseases che,cking the concentration of nutrient solutions, checking pH, and checking EC. The next step is harvesting, which is done at the age of 30 HSPT. Data from the observations of each treatment were analyzed statistically using analysis of variance (ANOVA). If there is a significantly different effect, further analysis is carried out with the Honest Real Difference Test (BNJ) at the 5% level.

## RESULTS AND DISCUSSION

### Plant Height

Table 1. shows that there is a real interaction in plant height at the age of 30 HSPT. Table 1. Shows the highest results in the treatment of AB Mix nutrient concentration of 1,200 ppm with POC 7 ml / L with the result of 19.44 cm. Not significantly different from the combination treatment of AB Mix nutrient concentration 600 ppm + POC concentration 5 ml/L (18.89 cm), AB Mix nutrient concentration 900 ppm + POC concentration 0 ml/L (18.89 cm), AB Mix nutrient concentration 900 ppm + POC concentration 5 ml/L (18.67 cm), AB Mix nutrient concentration 900 ppm + POC concentration 7 ml/L (18.67 cm), AB Mix nutrient concentration 900 ppm + POC concentration 9 ml/L (18.44 cm). The average result in the control treatment of 19.33 cm is almost the same as the average result of the highest combination treatment.

Table 1

Average Plant Height (cm) of Pakcoy Treated with a Combination of AB Mix Nutrient Concentration and POC at Age 30 HSPT

| Treatment | POC Concentration | | | | |
|---|---|---|---|---|---|
| | 0 ml/L | 3 ml/L | 5 ml/L | 7 ml/L | 9 ml/L |
| Control | 19,33 | | | | |
| Concentration AB Mix Nutrition | | | | | |
| 600 ppm | 18,22 ab | 17,67 a | 18,89 bc | 18,33 ab | 17,89 ab |
| 900 ppm | 18,89 bc | 18,22 ab | 18,67 ABC | 18,67 ABC | 18,44 ABC |
| 1.200 ppm | 17,61 a | 18,00 ab | 18,33 ab | 19,44 c | 17,72 a |
| BNJ 5% | 1,09 | | | | |

Description: Numbers followed by the same letter indicate that the average results are not significantly different in the 5% BNJ test

According to research Ismail et al. (2023) stated that the combined treatment of AB Mix nutrition with POC gave the best results on the height of mustard plants. The combination of AB Mix nutrient treatment with POC concentration is one of the factors for growth and yield in pakcoy plants because it has the availability of macro and micronutrients such as N, P, K. This is in line with the opinion of the researchers Rosdiana (2015) states that the combination of liquid organic fertilizer and AB Mix nutrition can increase the growth of pakcoy plants in the vegetative phase because the content of N and P can help in the photosynthesis process so that the formation of plants becomes optimal. It is also supported by the opinion of Subandi et al. (2015), which states that to spur cell division in meristem tissues in stems and leaves, division requires nitrogen and phosphorus elements and Zn so that it can affect plant height growth.

**Number of Leaves**

Table 2. shows that there is no effect of the combined treatment of AB Mix nutrient concentration with POC concentration on the number of leaves at the age of 30 HSPT.

Table 2

Average Number of Leaves (strands) of Pakcoy Treatment of Combination of AB Mix Nutrient Concentration with POC concentration at Age 30 HSPT

| Treatment | 30 HSPT |
|---|---|
| Control | 10,22 |
| AB Mix Nutrient Concentration | |
| 600 ppm | 11,76 |
| 900 ppm | 11,62 |
| 1.200 ppm | 11,98 |
| BNJ 5% | unreal |
| POC Concentration | |
| 0 ml/L | 11,96 |
| 3 ml/L | 11,52 |
| 5 ml/L | 11,67 |
| 7 ml/L | 12,04 |
| 9 ml/L | 11,74 |
| BNJ 5% | unreal |

Description: unreal

The availability of nutrients for a plant is one of the important factors to support the growth and yield of pakcoy plants. However, if the available nutrients are excessive, it will cause poisoning for plants. According to Enrawan (2019), the balance of nutrients in the solution needs to be considered to prevent stress and poisoning in plants due to ion competition. Excess fertilizer in the form of liquid organic fertilizer will cause ammonia and nitrate pollution, causing solution pollution caused by excessive chemical compounds in the solution. It is also supported by the opinion of Wiguna (2011), who states that high fertilizer doses can cause plants to become stressed and physiological processes are disrupted so that plants experience poisoning and unstable growth.

**Leaf Area**

Table 3. shows a real interaction in the pakcoy leaf area. The combined treatment of AB Mix nutrient concentration of 1,200 ppm with POC 9 ml/L showed the highest average result of 22.70 cm2 but was not significantly different from the treatment of AB Mix nutrient concentration of 600 ppm + POC concentration of 7 ml/L and the treatment of AB Mix nutrient concentration of 1,200 ppm +

POC concentration of 7 ml/L with consecutive results of 20.24 cm2 and 19.68 cm2. The highest average result of the pakcoy leaf area was 0.21% higher than the average result of the control treatment.

Table 3

Average Leaf Area of Pakcoy Based on the Treatment of Combination of AB Mix Nutrient Concentration and POC at Harvest Age 30 HSPT

| | Leaf Area ($cm^2$) | | | | |
|---|---|---|---|---|---|
| Treatment | POC Concentration | | | | |
| | 0 ml/L | 3 ml/L | 5 ml/L | 7 ml/L | 9 ml/L |
| Control | 22,51 | | | | |
| AB Mix Nutrient Concentration | | | | | |
| 600 ppm | 19,10 ab | 19,34 ab | 17,71 ab | 20,24 abc | 17,26 a |
| 900 ppm | 18,91 ab | 18,68 ab | 18,69 ab | 20,88 b | 18,69 ab |
| 1.200 ppm | 17,14 a | 17,77 ab | 18,46 ab | 19,68 ABC | 22,70 c |
| BNJ 5% | 3,17 | | | | |

Description: Numbers followed by the same letter indicate that the average results are not significantly different in the 5% BNJ test.

Accordance with the research of Napitupulu et al. (2023), which states that there is an interaction between AB Mix nutrition and liquid organic fertilizer in the pakcoy leaf area. The more nutrients available, that they can help accelerate the growth and development of pakcoy. AB Mix nutrition has complete macro and micronutrients to support leaf area in pakcoy plants, and NASA POC has nutrients such as N, P, and K, where these elements are needed during the vegetative period to accelerate plant growth and development. It is in accordance with the opinion of Puspitasari et al. (2023) that the provision of sufficient N and P elements can help convert carbohydrates produced in the photosynthesis process into protein so that it will help increase the width, length, and number of leaves.

**Crown Wet Weight**

Table 4. shows a real interaction on the wet weight of the pakcoy crown. The combined treatment of AB Mix nutrient concentration of 1,200 ppm with a POC concentration of 9 ml/L had the highest result of 21.87 g. It was not significantly different from the others, except for the treatment of AB Mix nutrient concentration of 900 ppm + POC concentration of 0 ml/L (12.33 g) and the treatment of AB Mix nutrient concentration of 900 ppm + POC concentration of 9 ml/L (11.60 g). The highest average result of pakcoy crown wet weight was 5.47% higher than the average result of the control treatment.

Table 4

Average Wet Weight of Pakcoy Canopy Based on the Treatment of Combination of AB Mix Nutrient Concentration and POC at Harvest Age 30 HSPT

| | Crown Wet Weight (g) | | | | |
|---|---|---|---|---|---|
| Treatment | POC Concentration | | | | |
| | 0 ml/L | 3 ml/L | 5 ml/L | 7 ml/L | 9 ml/L |
| Control | 16,40 | | | | |
| AB Mix Nutrient Concentration | | | | | |
| 600 ppm | 17,03 ab | 16,73 ab | 19,37 ab | 19,90 ab | 15,30 ab |
| 900 ppm | 12,33 a | 19,93 ab | 21,63 b | 15,07 ab | 11,60 a |
| 1.200 ppm | 13,97 ab | 17,00 ab | 14,70 ab | 15,50 ab | 21,87 b |
| BNJ 5% | 9,00 | | | | |

Description: Numbers followed by the same letter indicate that the average results are not significantly different in the 5% BNJ test.

Accordance with the research of Aullia et al. (2023), which states that there is an interaction effect of turi leaf POC and AB Mix nutrition on the wet weight of lettuce plants. Wet weight is caused by the fulfillment of the nutrients needed and the length of irradiation, so it helps the growth and development of pakcoy. In addition, wet weight is also related to the amount of water contained in the plant. In accordance with the opinion of Anjeliza (2014), which states that fresh weight is related to the amount of water contained in the plant, the use of water in plants is for the photosynthesis process so that food reserves stored in the leaves will increase. There is an increase in plant fresh weight. Nitrogen nutrients contained in the combination of AB Mix nutrition with POC have a role in increasing the wet weight of plants. Accordance with the opinion of Agustin and Mari (2019), which states that nitrogen elements can increase the wet weight of plants because nitrogen nutrients play a role in the formation of carbohydrates, proteins, and starch.

**Root wet Weight**

Table 5. shows that there is a real interaction between the wet weight of pakcoy roots. The combined treatment of AB Mix nutrient concentration of 1,200 ppm and POC 9 ml/L was the highest result of 6.60 g and not significantly different from the other treatments, except for the treatment of AB Mix nutrient concentration of 900 ppm + POC concentration of 9 ml/L (4.53 g), AB Mix nutrient concentration of 1,200 ppm + POC concentration of 0 ml/L (4.27 g), AB Mix nutrient concentration of 600 ppm + 0 ml/L (4.03 g), and AB Mix nutrient concentration of 900 ppm + POC concentration of

900 ppm + POC concentration of 3 ml/L (4.00 g). The highest average result of pakcoy root wet weight was 4.1% higher than the average result of the control treatment.

Table 5

Average Wet Weight of Pakcoy Roots Based on the Treatment of Combination of AB Mix Nutrient Concentration and POC at Harvest Age 30 HSPT

| | Root Wet Weight (g) | | | | |
|---|---|---|---|---|---|
| Treatment | POC Concentration | | | | |
| | 0 ml/L | 3 ml/L | 5 ml/L | 7 ml/L | 9 ml/L |
| Control | 2,5 | | | | |
| AB Mix Nutrient Contrentation | | | | | |
| 600 ppm | 4,03 a | 5,10 abc | 4,87 abc | 5,07 abc | 4,60 abc |
| 900 ppm | 5,37 abc | 4,00 a | 5,27 abc | 5,30 abc | 4,53 ab |
| 1.200 ppm | 4,27 ab | 5,43 abc | 5,10 abc | 6,13 bc | 6,60 c |
| BNJ 5% | 2,14 | | | | |

Description: Numbers followed by the same letter indicate that the average results are not significantly different in the 5% BNJ test.

In accordance with the research of Muladi et al. (2022) which states that the combination treatment of POC Intanpari with AB Mix nutrition gives the highest effect and results on the fresh weight of pakcoy plant roots. The more the availability of nutrients consisting of AB Mix nutrition and POC, the more nutrients will be absorbed by pakcoy roots. According to Mutryarny et al. (2014) stated that root length, the number of growing roots, and root hairs affect the absorption field area. The wider the absorption field, the more water and nutrients will be absorbed, so that it will affect the wet weight of the plant.

## CONCLUSION

This research shows that the combination of AB Mix nutrient concentration treatment with NASA POC concentration has a significant interaction on several plant growth parameters. At 30 days after planting (HSPT), this combination had a significant effect on plant height, number of leaves, shoot wet weight and root wet weight. This shows that using AB Mix and POC NASA together can increase overall plant growth, especially in terms of increasing plant height and increasing wet mass in the crown and roots. However, the research results also showed that the combination of AB Mix nutrient concentration treatment with NASA POC concentration did not have a significant effect on the number of leaves. This may be caused by other factors that influence leaf development that are not

directly related to the combination of nutrients provided. Therefore, although there are clear benefits from using AB Mix and POC NASA on several growth parameters, further research is needed to understand more deeply the other factors that influence leaf number and how this combination can be modified to optimize all aspects of plant growth.

## REFERENCE

Agustin, S dan Mari. A. Wahyuningrum .2019. Pengaruh Konsentrasi POC Limbah Kulit Jeruk Peras Terhadap Pertumbuhan dan Produksi Tanaman Sawi Hijau (Brassica Juncia L.) *Jurnal Ilmiah Respati*, 10 (2): 136 – 145.

Anjeliza, R. Y. 2014. *Pertumbuhan dan Produksi Tanaman Sawi Hijau Pada Berbagai Desain Hidroponik*. Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam, Fakultas Pertanian Universitas Hasanuddin. Makassar.

Arianandа., T. Nopsagiarti., dan Mashadi. 2020. Pengaruh Pemberian Berbagai Konsentrasi Larutan Nutrisi Ab Mix Terhadap Pertumbuhan Dan Produksi Selada (Lactuca Sativa L.) Hidroponik Sistem Floating. *Jurnal Green Swarnadwipa*, 9 (2): 185-195

Aullia, D., Nikmah., L. Bachrun. 2023. Pengaruh Kombinasi Nutrisi AB Mix dan Pupuk Organik Cair Daun Turi Terhadap Pertumbuhan dan Hasil Tanaman Selada (Lactuca sativa L.) Pada Hidroponik Sistem Sumbu. *Jurnal Agrisia*, 15 (2): 8 - 20

Enrawan. 2019. *Aplikasi Nutrisi AB Mix dan Pupuk Organik Cair Pada Tanaman Pakcoy (Brassica rapa L) Secara Hidroponik Dengan Wick System*. Universitas Islam Riau. Pekanbaru.

Fatah dan T. E. Sabli. 2022. Aplikasi Kompos Kiambang dan POC NASA terhadap Pertumbuhan serta Hasil Tanaman Okra Merah (Abelmoschus esculentus L. Moench). *Jurnal Agroteknologi Agribisnis dan Akuakultur*, 2 (2): 45-57

Ismail, F. S., Sunawan., dan Djuhari. 2023. Pengaruh Substitusi Pupuk Organik Cair Pada Nutrisi Ab Mix Terhadap Pertumbuhan Dan Hasil Caisim (Brassica Juncea L.) Dengan Sistem Hidroponik Nft (Nutrient Film Technique). *Agronisma*, 11 (2): 35 - 45

Muladi, H., Dewi Ratna Nurhayati., Siswadi. 2022. Uji Konsentrasi Pupuk Organik Cair dan AB Mix Terhadap Pertumbuhan Pakcoy (Brassica Rapa L.) Metode Hidroponik Wick. *Jurnal Inovasi Pertanian*, 24 (2): 9-16

Mutryarny, E., Edriani., dan S. U. Lestari (2014). Pemanfaatan Urine Kelinci untuk Meningkatkan Pertumbuhan dan Produksi Tanaman Sawi (*Brassica Juncea* L.) Varietas Tosakan. *Jurnal Ilmiah Pertanian, 11*(2), 23-34.

Napitupulu, B. S., U. C. J. Simatupang., dan M. L. Sipayung. 2023. Pengaruh Pupuk AB Mix dan Pupuk Organik Cair terhadap Pertumbuhan dan Produksi Tanaman Sawi Pakcoy (Brassicachinensis L.) dengan Teknik Hidroponik. *Agrotekma*, 7 (2): 1- 6

Puspitasari, E., Jayaputra., I. W. Sutresna. 2023. Pengaruh Konsentrasi Pupuk Organik Cair Nasa Terhadap Pertumbuhan Dan Hasil Tanaman Pakcoy (Brassica chinensis L.). *Jurnal Agrokomplek*, 2 (1): 116 - 121.

Rosdiana. 2015. Pertumbuhan Tanaman Pakcoy Setelah Pemberian Pupuk Urin Kelinci. *Jurnal Matematika, Sains, dan Teknologi*, *16*(1), 1-9.

Rustomo, B. Y., D. F. Iskandar., Fernando., F. W. Sinambela., K. Christine., K. Varlet., M. B. K. Digjaya., S. D. P. Beda., V. Salvathea., B. T. Sundoro. 2022. Penyuluhan Penggunaan Teknik Hidroponik Wick System dengan Media Botol Plastik Bekas sebagai Media Cocok Tanam di Desa Ngawu, Playen, Gunung Kidul. *Jurnal Atma Inovasia* (JAI), 2 (3): 339 -343

Setiawan, 2014. *Pengaruh Dosis Vermikompos Terhadap Pertumbuhan Pakcoy (Brassica chinensis L)*. Skripsi. Universitas Lampung. Lampung.

Subandi, M., N. P. Salam dan B. Frasetya .2015. Pengaruh Berbagai Nilai EC (*Electrical Conductivity*) terhadap Pertumbuhan dan Hasil Bayam (*Amaranthus* Sp.) pada Hidroponik Sistem Rakit Apung (*Floating Hydroponics System*). *Jurnal Istek, 9*(2), 136-152.

Wiguna, J. 2011. *Pengaruh Konsentrasi Pupuk Organik Cair Urine Kelinci dan Macam Pengajiran Terhadap Pertumbuhan dan Hasil Tanaman Mentimun (Cucumis sativus L.).* Fakultas Pertanian Universitas Winaya Mukti.