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GROWTH POTENTIAL OF *Lactuca sativa* Linn. AND *Brassica oleracea* Alboglabra Group PLANTS IN HYDROPONIC SYSTEMS IN SUPPORT FOOD SECURITY

Erwin Junaidi Lubis
Department of Agrotechnology, Faculty of Agriculture,
Darwan Ali University, Sampit, Indonesia
Email: lubiserwinjunaidi@gmail.com

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Abstrak

Indonesia's dependence on vegetables makes it the third largest consumer of Lactuca sativa Linn. and the sixth largest consumer of Brassica oleracea Alboglabra Group vegetables. The use of hydroponics will help farmers produce Lactuca sativa Linn. and Brassica oleracea Alboglabra Group vegetables in the largest possible quantities while utilising a small amount of land. In Indonesia, there is ample land space, but if vegetables are grown using hydroponics, they will be healthier because they are grown using good organic methods. In this study, the potential use of small and not too large land areas can produce high and sufficient quantities of Lactuca sativa Linn. and Brassica oleracea Alboglabra Group vegetables for utilisation and resale to the vegetable market. To increase the diversification of products based on Lactuca sativa Linn. and Brassica oleracea Alboglabra Group vegetables, it is necessary to complement this with studies on economic use, support, the use of organic fertilizers, and supporting policies.

INTRODUCTION

Lactuca sativa Linn. is a vegetable plant commonly grown in temperate to tropical climates. *Lactuca sativa* Linn. is used in salads, soups and sandwiches, and can even be roasted. *Celtruce* is a type of vegetable plant produced from stems, which can be eaten raw or cooked (Saparinto, 2018).

Lactuca sativa Linn. plants are commonly grown as strong and fairly easy to manage plants, but they require relatively low temperatures to prevent flowering. The growth of *Lactuca sativa* Linn. is usually influenced by various factors, including

nutrient deficiencies, pests, diseases and bacteria that can kill *Lactuca sativa* Linn. (Setyaningrum & Saparinto, 2017).

Lactuca sativa Linn. is a vegetable plant rich in vitamins K, A, B and C, which are good for the body, and contains folate and iron. When grown in soil, *Lactuca sativa* Linn. has been cultivated for a long time, making it susceptible to contamination and the introduction of pathogens into the plant caused by bacteria, viruses, or other parasites such as E. coli and salmonella (Syawaluddin & Harahap, 2018).

Brassica oleracea Alboglabra Group plants are a type of vegetable belonging to the cabbage family (*Brassicaceae*), which are plants that have broad, flat, dark green leaves with thick, jointed stems (Amilah, 2020).

The nutritional content of *Brassica oleracea* Alboglabra Group plants is as follows: Calories 35.00 kcal.100 g^{-1}, Protein 3.0 g.100 g^{-1}, Fat 0.40 g.100 g^{-1}, Carbohydrates 6.80 g.100 g^{-1}, Fibre 1.20 g.100 g^{-1}, Calcium 230.00 mg.100 g^{-1}, Phosphorus 56.00 mg.100 g^{-1}, Iron 2.00 mg.100 g^{-1}, Vitamin A 135.00 RE, Vitamin B1 0.10 mg, Vitamin B2 0.13 mg, Vitamin B3 0.40 mg, Vitamin C 93.00 mg, carotene 3.1, niacin 2.6 mg, and Water 78.00 mg (Pracaya & Kartika, 2016 in Arizqi & Sitawati, 2018).

Hydroponic technology used as a growing medium for *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group plants is a solution to the decline in agricultural land area. Much of the land has been converted into highly practical and useful land, namely small plots of land that produce abundant yields, one example being hydroponic land.

One very simple use of hydroponics is a system that uses a wick system. This system operates without electricity because it does not use a pump for nutrient circulation. However, the use of a wick system in hydroponics is not ideal for plant growth because the nutrients cannot be absorbed properly by the plants. This is because the nutrients get stuck or filtered in the wick and do not reach the plant roots; only water can be absorbed.

The use of a pump hydroponic system is preferable because water and nutrients are distributed evenly to all plant roots without any residue or filtration. With this system, the nutrient solution provided can be absorbed well by the plant roots. Hydroponics is used for plants in low cultivation cycles and is very suitable for vegetables (Lingga, 2018 in Meriaty et al., 2021).

RESEARCH METHODS

Research Location

This research was conducted at the Hydroponic Experimental Garden, Darwan Ali University, Mentaya Baru Subdistrict, East Kotawaringin Regency. The water was analysed at the Agricultural Laboratory, Faculty of Agriculture, Darwan Ali University, Sampit. This research was conducted over a period of three months with three harvests from January 2025 to March 2025.

Research Design

This study used a completely randomised design (CRD) with Factor 1 treatment at Level 1, namely AB Mix with a dose of 1,000 ml, and Level 2 with a dose of 1,500 ml. Factor 2 at Level 1 was NPK 16.16.16 Liquid at a dose of 500 ml and Level 2 was NPK 16.16.16 Liquid at a dose of 1,000 ml.

Clean water with a tested soil acidity (pH) standard of 5.8. Plant Nutrition (PN) was applied once a week at a concentration of 20 litres of water. Treatment Level 1. This water analysis is conducted to maintain plant growth without accumulation of salts or acidic water (Lubis, 2025).

Observation Variables

Observations were conducted at the Hydroponic Experimental Field of Darwan Ali University in Sampit on the parameters of plant height (cm), root volume (ml), and fresh plant weight (g).

RESULTS AND DISCUSSION

Plant Height

The results of observations on plant height were obtained after conducting observations once a week. From the results of observations during the 3-month study period, the data in Table 1 was obtained as follows:

Table 1. Average Height of *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group Plants 3 Months After Application

Treatment	Plant Height (cm)											
	Month After Application											
	Week -											
	1	2	3	4	1	2	3	4	1	2	3	4
AB Mix (ml)	***Lactuca sativa* Linn.**											
1.000	4,6	5,2	5,9	6,3	7,7	7,9	8,1	8,4	8,7	9,2	9,5	9,8
1.500	4,5	5,2	5,9	6,3	7,8	7,9	8,1	8,6	8,8	9,4	9,5	9,8
NPK 16.16.16 (ml)	***Lactuca sativa* Linn.**											
500	4,4	4,8	5,8	6,3	7,8	8,2	8,6	9,1	9,4	9,7	9,8	10,1
1.000	4,5	5,0	5,6	6,4	7,9	8,2	8,8	9,3	9,5	9,7	9,9	10,1
AB Mix (ml)	***Brassica oleracea* Alboglabra Group**											
1.000	5,1	5,5	6,9	7,5	8,7	9,4	11,2	12,8	14,2	15,3	15,9	16,8
1.500	5,1	5,9	6,2	8,0	8,9	9,6	10,3	12,0	13,2	13,9	14,2	16,9
NPK 16.16.16 (ml)	***Brassica oleracea* Alboglabra Group**											
500	5,2	5,8	6,3	7,3	8,9	9,5	11,5	13,0	13,9	15,7	16,9	18,0
1.000	5,2	5,9	6,5	7,7	9,2	9,9	12,9	13,1	14,0	15,2	16,0	18,2

The results of the observations in Table 1 show that there are differences in plant height between *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group. In the analysis of *Lactuca sativa* Linn. plants with AB Mix nutrient application, the highest average was found in the 1,500 ml dose treatment, which was 9.9 cm, while the 1,000 ml dose had a plant height of 9.8 cm, which was not significantly different. Meanwhile, in the NPK 16.16.16 nutrient treatment, the highest average was 10.1 cm at a dose of 1,000 ml, while at a dose of 500 ml, the plant height was 10.1 cm, which was not significantly different.

In the analysis of *Brassica oleracea* Alboglabra Group plants with the application of AB Mix nutrients, the highest average was found in the 1,500 ml dose treatment,

namely 16.9 cm, while the 1,000 ml dose had a high plant yield of 16.7 cm, which was not significantly different. Meanwhile, in the NPK 16.16.16 nutrient treatment, the highest average was 18.2 cm at a dose of 1,000 ml, while at a dose of 500 ml, the plant height was 17.9 cm, which was not significantly different.

In this case, both nutrients applied to *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group plants had high averages, because the higher the concentration of AB Mix and NPK 16.16.16 Liquid nutrients, the better the plant response to plant height. This aligns with the opinion of experts that the higher the nutrients provided to plants in appropriate doses and conditions, the better the growth will be. In line with the opinion of Aini & Nur (2018), the macro nutrient content, both primary and secondary, found in AB Mix nutrients and NPK 16.16.16 nutrients greatly influences the plant growth process, one of which is nitrogen (N) nutrients, which function to stimulate plant growth in the vegetative phase, namely in the roots, stems, and leaves of plants.

According to Susila (2006) in Ali et al. (2021), an increase in the concentration of nutrient application to the plant medium will be directly proportional to an increase in the plant process, namely in plant height growth. Meanwhile, according to Sutiyoso (2023); Hidayati et al. (2017); Ali et al. (2021) stated that the nutrient solution content in AB Mix is one of the important factors in producing the quality of hydroponic crops, so the application must be in accordance with the composition. The nutrients contained in AB Mix and NPK 16.16.16 are nutrients that are needed in large quantities by plants, so their concentrations are very high, namely the primary macro nutrients N, P, K, and the secondary macro nutrients Ca, Mg, and S. Micro nutrients generally have low concentrations, namely Fe, Mn, Zn, Cu, B, Mo, and Cl.

Root Volume

Observations on the root volume of *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group plants were conducted after the research observations were completed. From the results of the 3-month research observations, the data in Table 2 was obtained as follows:

Table 2. Average Root Volume of *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group 3 Months After Application

Treatment	**Root Volume (ml)**
AB Mix (ml)	***Lactuca sativa* Linn.**
1.000	11,36 a
1.500	12,19 b
NPK 16.16.16 (ml)	***Lactuca sativa* Linn.**
500	12,88 c
1.000	12,89 c
AB Mix (ml)	***Brassica oleracea* Alboglabra Group**
1.000	11,27 a
1.500	11,35 a
NPK 16.16.16 (ml)	***Brassica oleracea* Alboglabra Group**

500	13,23 d
1.000	13,53 d

Note: letters followed by numbers in the same row and column indicate differences that are not significantly different at the 5% level.

The research observations shown in Table 2 indicate that the treatments had a significant effect on nutrient application. In the application of AB Mix nutrients on *Lactuca sativa* Linn. plants, it can be seen that the application of nutrients given to the plants showed significant differences in root volume observations, both at doses of 1,000 ml and 1,500 ml. Meanwhile, in *Brassica oleracea* Alboglabra Group plants, root volume did not show significant differences, but root volume observations were heavier than those in the AB Mix nutrient treatment. The application of plant nutrients to *Brassica oleracea* Alboglabra Group plants showed a significant difference in nutrient treatment, but no significant difference in dosage between treatments. The AB Mix nutrient treatment showed the highest results at a dose of 1,500 ml, with a root volume weight of 11.35 ml, while the NPK 16.16.16 plant nutrient treatment at a dose of 1,000 ml resulted in the highest root volume weight of 13.35 ml.

This is thought to be because the plant roots have absorbed sufficient nutrients, allowing the plant to grow better and resulting in heavier roots due to the absorption of nutrients into the plant. According to Lubis (2025), roots are one of the main vegetative organs of plants that supply nutrients and other important materials for plant growth and development.

This is in line with the statement by Meriaty et al. (2021) that this is because more nutrients are absorbed due to the roots touching the water surface, allowing them to easily absorb nutrients in the water that has been fertilised.

This is in line with the research by Syawaludin & Harahap (2016) that rockwool is a growing medium used in hydroponic systems, but in this case it is adjusted to ensure that the rockwool reaches the water medium so that the plant roots can continue to absorb water and nutrients.

Fresh Weight of Plants

Observations on the fresh weight of *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group plants were conducted after the research observations were completed. From the results of the 3-month research observations, the data in Table 3 was obtained as follows:

Table 3. Average Fresh Weight of *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group Plants 3 Months After Application

Treatment	**Fresh Weight of Plants (g)**
AB Mix (ml)	***Lactuca sativa* Linn.**
1.000	47,55 a
1.500	48,10 a
NPK 16.16.16 (ml)	***Lactuca sativa* Linn.**
500	48,15 a
1.000	48,57 a
AB Mix	***Brassica oleracea* Alboglabra Group**

(ml)	
1.000	55,12 b
1.500	55,28 b
NPK 16.16.16 (ml)	***Brassica oleracea* Alboglabra Group**
500	56,16 c
1.000	58,54 d

Note: letters followed by numbers in the same row and column indicate differences that are not significantly different at the 5% level.

In the research observations shown in Table 3, it can be seen that the AB Mix nutrient treatment on *Lactuca sativa* Linn. plants with a concentration of 1,000 ml produced a fresh plant weight of 47.55 g.plant^{-1}, but this was not significantly different from the 1,500 ml concentration, which produced a plant weight of 48.10 g.plant^{-1}. This is also the case with the NPK 16.16.16 nutrient treatment at a concentration of 500 ml, which produced a fresh plant weight of 48.15 g.plant^{-1} and was not significantly different from the concentration of 1,500 ml, which produced a fresh plant weight of 48.57 g.plant^{-1}.

This observation was conducted on the fresh weight of *Brassica oleracea* Alboglabra Group plants, where the application of AB Mix nutrients at a concentration of 1,000 ml resulted in 55.12 g of plants, but there was no significant difference with a concentration of 1,500 ml, which resulted in a plant weight of 55.28 g. This indicates that the application of AB Mix nutrients on *Brassica oleracea* Alboglabra Group plants did not result in a significant increase, as both lower and higher nutrient applications did not alter the fresh weight of the plants.

The application of NPK 16.16.16 nutrients to *Brassica oleracea* Alboglabra Group plants at a concentration of 500 ml resulted in a fresh plant weight of 56.16 g.plant^{-1}. This was significantly different from the 1,000 ml concentration, which produced a fresh plant weight of 58.54 g.plant^{-1}, and was significantly different from the AB Mix nutrient treatment applied.

This is thought to be because the number of leaves on *Lactuca sativa* Linn. and *Brassica oleracea* Alboglabra Group plants can affect the fresh weight of the plants in addition to nutrient absorption in the plant roots, which will tend to increase. This is in line with the opinion of Kinasihati (2019) in Oviyanti (2016) and Lubis et al. (2023) that the increase in fresh weight of the plant is due to an increase in plant height, so that the number of leaves on the plant will increase, and this increase is due to the cycle of the plant's vegetative process.

According to Chaerunnisa et al. (2018) in Lumbanraja (2019), nutrient absorption by plants through hydroponics, where the roots absorb nutrients through water, will result in the absorption of both water and nutrients. This is inseparable from the root cycle, which actively absorbs nutrients directly without evaporation and nutrient disposal.

CONCLUSION

In this study, it was concluded that:

1. The effect of providing nutrients at concentrations appropriate to plant needs, including AB Mix nutrients and NPK 16.16.16 nutrients, has an impact on plant height, root volume and fresh plant weight.

2. This effect is better for supporting the supply of vegetables, which is needed to improve the application of NPK 16.16.16 nutrients that are essential for supporting food security.
3. NPK 16.16.16 nutrient concentration administered in liquid form at a concentration of 1,000 ml is better for the vegetative growth process of plants.

BIBLIOGRAPHY

Aini, N., & Nur, A. (2018). Teknologi Budidaya Tanaman Sayuran Secara Hidroponik. *UB Press*. ISBN 978-602-432-519-0.

Ali, K., Sumampow, D. M. F. & Paulus, J. M. (2021). Respons Tanaman Kailan (*Brassica oleracea* var. Albglabra) pada Berbagai Konsentrasi AB Mix dengan Sistem Hidroponik Sumbu (Wick System). *J. Agri-SosioEkonomi*, Vol. 17(3): 1023-1030.

Amilah, S. (2020). Penggunaan Berbagai Media Tanam Terhadap Pertumbuhan dan Perkembangan Brokoli (*Brassica oleracea* Italica) dan Baby Kailan (*Brassica oleracea* Alboglabra baley). *Jurnal Wahana*, 59(2): 10-16.

Arizqi, Z. R., & Sitawati. (2018). Efisiensi Penggunaan Pupuk Kandang Sapi dengan Aplikasi *Plant Growth Promoting Rhizobacteria* (PGPR) terhadap Pertumbuhan dan Hasil Tanaman Kailan (*Brassica oleracea* Var. Alboglabra). *Jurnal Produksi Tanaman*, Vol. 6(8): 1992-1999.

Chaerunnisa, S. S., Suryanto, A., & Sugito, Y. (2018). Pengaruh PGPR (*Plant Growth Promoting Rhizobacteria*) dan Dosis Pupuk Urea pada Tanaman Kailan (*Brassica oleracea* var. Alboglabra). *Jurnal Produksi Tanaman*, Vol 6(8): 1952-1959.

Hidayati, N., Pienyani, R., Fitriadi, Y., Nanang, H. (2017). Kajian Penggunaan Nutrisi Anorganik Terhadap Pertumbuhan Kangkung (*Ipomea reptanus* L.) Hdroponik Sistem Wick. *Jurnal Daun*, Vol. 4(2): 75-81.

Kinasihati, E. (2019). Studi Kebutuhan Nitrogen Tanaman Salada. Universitas Jember.

Lingga, P. (2018). Hdroponik Bercocok Tanam Tanpa Tanah. *Penebar Swadaya*, Jakarta.

Lubis, E. J. (2025). Effect of Liquid Organic Applications of *Ananas comosus* (L.) Merr. and *Citrullus solocynthys* (L.) Schrad. on Soil Fertility in Latosol Soil and Growth and Yield of *Vigna unguiculata* ssp. Sesquipedalis Plants. *Loka: Journal of Environmental Sciences*. 251- 260.

Lubis, E. J., Rauf, A. & Sarifuddin. (2023). Effectiveness of Fertilization Techniques on Growth Two Varieties of Palm Oil Seeds (Elaeis guineensis Jacq.) in Main Nursery. *Journal of Social Research*, Vol. 2(8): 2759-2772.

Lumbanraja, G. (2019). Pengaruh Pemberian *Plant Growth Promoting Rhizobacteria* (PGPR) dan Pupuk Organik Cair (POC) terhadap Pertumbuhan dan Hasil Tanaman Sawi (*Brassica juncea* L.). *Universitas Brawijaya*, Malang.

Meriaty, Sihaloho, A. & Pratiwi, K.D. (2021). Pertumbuhan dan Hasil Tanaman Salada (*Lactuca sativa* L.) Akibat Jenis Media Tanam Hidroponik dan Konsentrasi Nutrisi AB Mix. *J. Agroprimatech*, Vol. 4(2): 75-84.

Oviyanti, F. (2016). Pengaruh Pemberian Pupuk Cair Daun *Gliricidia sepium* (Jacq) Kunth ex Walp terhadap Penambahan Tanaman Sawi (*Brassica juncea* L.). UIN Raden Fatah, Palembang.

Pracaya & Kartika, J. K. (2016). Bertanam 8 Sayuran Organik. Jakarta ID: *Penebar Swadaya*. 162 Hal.

Saparinto, C. (2018). Gown Your Own Vegetables-Panduan Praktis Menanam Sayuran Konsumsi Populer di Pekarangan. Yogyakarta. 180 hal.
Setyaningrum, H. D. & Saparinto, C. (2017). Panen Sayur Secara Rutin di Lahan Sempit. *Penebar Swadaya*, Jakarta.
Sutiyoso. (2023). Meramu Pupuk Hidroponik. *Penebar Swadaya*, Jakarta.
Syawaluddin, W. & Harahap, I.S. (2018). Pengaruh Perbandingan Jenis Larutan Hidroponik dan Media Tanam terhadap Pertumbuhan serta Hasil Produksi Tanaman Sawi (*Brassica juncea* L.) Drif Irrigation System. *Jurnal Agrohita*, Vol. 1(1): 38-53.