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Analysis of Omega-3 Content in Different Cultivation Treatments of Purslane Plants (Portulaca oleracea)

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Abstract: Purslane is a wild plant that is beneficial for human health. The aim of this research was to analyze the omega-3 content in various purslane cultivation treatments. This research was carried out in October-November 2022 at Wayamiga Village, East Bacan District, South Halmahera Regency, North Maluku Province. The tools used in this research were a scales watering can, a digital camera, a roller meter, a hose, a ruler, a rope, a counter, a plastic bucket, a plastic bag, stationery, hoe. The materials are purslane seeds, chicken manure, cow manure, label paper, and water. Population and Sample. The population in this study was purslane plants (Portulaca oleracea). At the same time, the samples were 27 purslane plant samples planted in 27 seedbeds. Research Variables: 1) The independent variable is the treatment dose of manure. 2) The dependent variable is plant growth with the parameters observed, namely vegetative growth: a) plant height and b) number of branches. Results. The single factor of chicken manure fertilization had an effect on the variable content of plant height and stem diameter of purslane at 30 HST. The single factor: Different harvest times influence the number of branches, stem diameter, and crown diameter of purslane plants which are influenced by differences in harvest time with a harvest time of 45 HST as the best treatment. The interaction between manure fertilization and different harvest times affects the variables of plant height, number of branches, stem diameter, crown diameter, and fresh weight of purslane plants. The best combination is chicken manure and a harvest time of 45 HST. The different treatments in cultivating purslane plants affect the omega-3 content, namely the differences in harvest time and the interaction between manure and differences in harvest time with the best harvest time being 35 HST and the best combination of cow manure and first harvest time.

Keywords: Analysis of Omega-3; Content in Various; Cultivation Treatments; Purslane Plant

Introduction

Indonesia has various cultivated and wild plants that are beneficial to society in abundance. The use of cultivated plants is generally known to the public. On the other hand, the use of wild plants has not been maximized in the community. People generally consider wild plants to be weeds that live among cultivated plants. The use of wild plants for the community is usually passed down from previous generations in certain areas simply as food ingredients with minimal knowledge about the nutritional content of crocot plants. One of the wild plants that has been used as food by people in certain areas is the purslane (Portulaca oleracea) (Uddin et al., 2014).

Purslane (Portulaca oleracea) is a plant that can be consumed in cooking, some people consume purslane as an herbal medicine and some types because of the beauty of the flowers are used as garden elements (Y. Zhang et al., 2018). Other studies report purslane as a potential plant with better nutritional quality than other cultivated plants because it contains higher levels of omega-3 fatty acids, beta carotene, ascorbic acid, and linolenic acid. The ingredients mentioned are available in high quantities and have antioxidant properties, so they are good for maintaining body health. Purslane has

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been proven to have the potential to improve the health of the human body with its content of beta carotene, vitamin C, and folic acid (Winarno, 2008)

Purslane is reported to be an excellent source of alpha-linolenic acid and beta-carotene by nutrition experts (Abdullah & Kusumaningtyas, 2020). Alpha-linolenic acid is part of the omega-3 fatty acids which are beneficial for health and rich in benefits for the body, while beta carotene is a provitamin A which functions as an antioxidant in deactivating free radical attacks (Aygün & Topuz, 2021).

Omega-3 plays a role in human growth and development as a health-supporting nutrient that can increase the body's intelligence and immunity thereby preventing disease, as well as an antioxidant to prevent the growth of cancer cells (Amjad Khan et al., 2017). The omega-3 acid content in purslane is five times higher compared to spinach. Omega-3 fatty acids are essential fatty acids that are not synthesized by the body, so their fulfillment must be done through consuming foods that contain these components and purslane has been identified as the richest vegetable source of omega-3 fatty acids (Cacique et al., 2020).

Omega-3 fatty acids are a type of unsaturated fatty acid with more than one double bond, where the first double bond is located on C atom number 3 if counted from the methyl group. These fatty acids are very important in the body's metabolic processes and cannot be synthesized or formed by the human body, so they must at least be present in the food consumed by humans. This is the reason nutritionists advise people to consume foods containing omega-3 fatty acids. Unsaturated fatty acids are sensitive to oxidation processes which can occur through inappropriate cooking and storage processes. Corrêa-Filho et al. (2019) reported that the amount of omega-3 fatty acids remained at a relatively consistent amount or experienced the lowest level of damage if cooking was done for a maximum of 20 minutes. Test results show that the cooking process for 20 minutes results in 10% damage to omega-3 fatty acids so if the cooking process does not exceed that time, the risk of damage to this compound in an ingredient is smaller. Omega-3 compounds have a positive role in body health, including compounds that can increase intelligence, increase body endurance, and as antioxidants that can prevent the growth of cancer cells. These chemical components which have good properties for the body are then used as a reference by several researchers by using purslane as a vegetable, a drink that can be consumed except by pregnant women, and even as an external medicine whose crushed results can be placed on the affected part (Gammone et al., 2019). By knowing the role of omega-3 in the development of purslane cultivation, we need a strategy to get superior purslane plants. The identification carried out includes environmental, morphological, and molecular aspects to obtain good characteristics of purslane plants that can be used as germplasm.

The aim is whether there is an influence of a single factor, differences in harvest time on the omega-3 content of purslane plants (Portulaca Oleracea). The benefit is to add information about the purslane plant which is rich in omega-3 as a food supplement for brain formation and understand how to process it appropriately and safely for health.

Method

Research Area Determination Method

This research uses an environmental design, namely a randomized block design (RAK) with a factorial treatment design consisting of two factors. The first factor is organic fertilizer treatment (P) which consists of 3 levels of treatment, namely treatment without fertilizer (P0), treatment with chicken manure (P1) with a fertilizer dose of 100 kg/200 m2, and treatment with cow manure (P2) with a fertilizer dose. 100 kg/200 m2. The second factor is harvest time (W) which consists of 3 levels, namely harvest time 35 HST (W1), harvest time 40 HST (W2), and harvest time 45 HST (W3).

The treatment combinations for this research will be obtained from 9 treatment combinations which will be repeated 3 times so that 27 experimental units (beds) will be obtained. The treatment combination can be seen in Table 1.

Table 1. Combination of research treatments.

Treatment	W1	W2	W3
P0	P0W1	P0W2	P0W3
P1	P1W1	P1W2	P1W3
P2	P2W1	P2W2	P2W3

Preparing Beds and Planting

The soil is hoe or processed then separated from the roots, leaves, rubbish, and grass then formed into a bed until it is ready for planting with a bed size of 1 m x 3 m. Seeds that have been germinated for 2 weeks after having 4-5 leaves are ensured to have the following criteria: a) Intact, meaning that they do not have defects or wounds, so they grow well., b) Healthy, meaning that the purslane plants are completely free from pests and diseases., c) Clean, means that it is free from dirt contaminated by foreign objects, grass remains or other seeds., d) Has good growth capacity., e) Fresh means that it is not wilted or wrinkled.

Planting is carried out by moving purslane plant seeds to beds that have been prepared and previously given organic fertilizer of 20 tons/ha with a planting distance of 50 cm x 50 cm. Watering and maintenance is carried out according to environmental conditions, if it is hot and the soil is dry then watering will be carried out

in the morning and evening. Weed control is carried out by manual removal and no herbicide spraying, as well as pest and disease attacks. Replanting can be done when the purslane plants (Portulaca oleraceae) are 1-15 days after planting if any of the purslane plants die.

The data collection technique in this research is an observation technique or observation of the research object. Through measurement activities, data collection is carried out when the plants are 10, 20, and 30 HST. The data collected as parameters and measured on the growth of purslane plants are: Vegetative Growth: (1) Plant height (cm) is measured from the base of the stem to the highest shoot.; (2) The number of secondary branches is counted from all branches that grow from the primary branches; (3) Stem diameter (cm) is observed on plants that It has been harvested by measuring the diameter at the center of the stem 4cm from the base of the stem using a caliper; (4) The crown diameter (cm) is observed by measuring the width of the largest crown; (5) The fresh weight of the purslane plant is weighed at harvest; (6) Root length was observed at harvest; (7) Observations were made only on omega 3. Harvest results were sent to the Makassar Unhas Laboratory (calibration and certification testing services).

All parts of the harvested plants are washed, and dried by drying in the sun or if there is continuous rainfall, they are dried using an electric oven, then packaged using a vacuum sealer and labeled with the identity of the treatment. Omega-3 testing was observed in all parts of the plant except the roots.

The data analysis technique used in this research to test the hypothesis is an analysis of variance (F test) at a significance level of 0.05. If it has a real effect then it will be continued with the least significant difference test (BNT) at the α level of 0.05.

Result and Discussion

Result

Plant height measurements were carried out every 10, 20 and 30 days by measuring from the base of the lower stem to the tip of the tallest leaf. Plant height is a variable that shows the vegetative growth activity of the plant. With an increase in plant height, the plant will experience cell division. Plant growth is influenced by several factors, such as the environment, physiological conditions, fertilizer and plant genetics.

Based on the analysis of purslane plant height, it shows that all treatments have unequal or significantly different effects on plant height. Testing of the treatment effect of the P factor and W factor on plant height was carried out using the Analysis of Variance (ANOVA) test with a factorial randomized block design with results BNT test is presented in Table 2.

Table 2. BNT Test Results for Plant Height Based on P Factor

Treatment	Average Plant Height (cm)		
	10 HST	20 HST	30 HST
	M±SD	M±SD	M±SD
P_0	4.0111 ^{b}	88.667^{b}	12.4111 b
P_1	4.8444 ^{a}	97.789^{a}	13.6111 a
P_2	4.6333 ^{a}	93.678^{a}	13.0111 a
BNT	0.044444444	0.048611111	0.055555556

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05

The results of the analysis in Table 2 show that the height of plants aged 10 HST based on the P factor obtained the highest average in treatment P_1 of 4.8444, while the lowest average in treatment P_0 was 4.0111. The results of the ANOVA test showed that there was a significant difference between treatment P_0 (without fertilizer) and treatment P_1 (chicken manure) as indicated by the different notations in the two treatments.

Based on plant height at 20 HST, the highest average P factor was obtained in treatment P_1, amounting to 9.7789, while the lowest average in treatment P_0 was 8.8667. The results of the ANOVA test showed that there was a significant difference between treatment P_0 (without fertilizer) and treatment P_1 (chicken manure) as indicated by the different notations in the two treatments.

At the age of 30 DAP, based on the P factor, the highest average was obtained in treatment P_1, which was 13.6111, while the lowest average in treatment P_0 was 12.4111. The BNT test results showed that there was a significant difference between treatment P_0 (without fertilizer) and treatment P_1 (chicken manure) as indicated by the different notations in the two treatments.

Meanwhile, the results of the BNT analysis of plant height at the age of 10 HST and 20 DAP on the W factor had no real effect and can be seen visually in the histogram in Figure 1 and had a real effect at the age of 30 HST. The results of the BNT test aged 30 DAP can be presented in Table 3.

Table 3. BNT Test Results for Plant Height Based on W Factor

Treatment	30 HST
	M±SD
W1	12.4889 a
W2	13.0444 ab
W3	13.5000 b
BNT	0,0555556

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05. Source: Processed Research Data (2023).

Based on the W factor, the highest average of plant height at 10 DAP was obtained in the W_3 treatment of 4.6222, while the lowest average in the W_1 treatment was 4.3667. The results of the BNT test showed that there was no significant difference between these treatments. Age 20 DAP based on the W factor, the highest average was in treatment W_3, amounting to 9.4689, while the lowest average in treatment W_1 was 9.1889. The BNT test results showed there was no significant difference between the treatments. Age 30 DAP based on the highest average W factor in treatment W_3 was 13.5000, while the lowest average in treatment W_1 was 12.4889. The results of the BNT test show that there is a significant difference between treatment W_1 and treatment W_3 as indicated by the different notations in the two treatments.

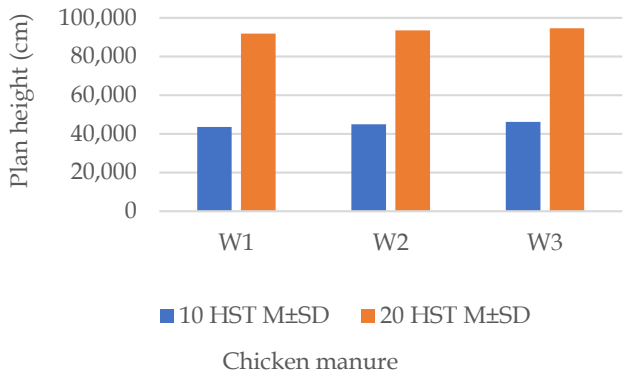

Figure 1. Histogram of average plant height at 10 and 20 DAP in post hoc tests using the BNT test

Table 4. BNT Test Results for Plant Height Based on P*W interactions

Treatment	Plan Height		
	10 HST	20 HST	30 HST
	M±SD	M±SD	M±SD
P0W1	3.9200 a	9.0667 ab	11.8700 a
P0W2	4.0000 ab	8.5700 a	12.6333 a
P0W3	4.1000 ab	8.9667 ab	12.7333 a
P1W1	4.6667 abc	9.6000 bc	13.1000 b
P1W2	4.8333 bc	9.9000 c	13.3333 b
P1W3	5.0333 c	9.8367 b	14.4000 c
P2W1	4.5000 b	8.9000 a	12.5000 a
P2W2	4.6667 abc	9.6000 bc	13.1667 b
P2W3	4.7333 bc	9.6033 bc	13.3667 b
BNT	0,0555556	0,0611111	01.00

Note: The average number followed by the same letter means that the level is not significantly different
BNT α 0.05.

Plant height at 10 DAP based on the P*W factor obtained the highest average in the P_1W_3 treatment of 5.0333, while the lowest average in the P0W1 treatment was 3.9200. The BNT test results showed that there was no significant difference between the treatments. Plant height at 20 DAP based on the P*W factor obtained the highest average in the P1W2 treatment of 9.9000, while the lowest average in the P0W2 treatment was 8.5700. The results of the ANOVA test showed that there were no significant differences between the treatments. Plant height at 30 HST based on the P*W factor obtained the highest average in the P1W3 treatment of 14,4000, while the lowest average in the P_0W_1 treatment was 11,8700. The BNT test results showed there were no significant differences between these treatments.

The Effect of Treatment on the Number of Branches

Testing of the treatment effect of the P factor and W factor on the number of branches was carried out using the Analysis of Variance (ANOVA) test showing that the P factor had no effect on the number of branches of the purslane plant with the results of the BNT Test presented in the histogram in Figure 2.

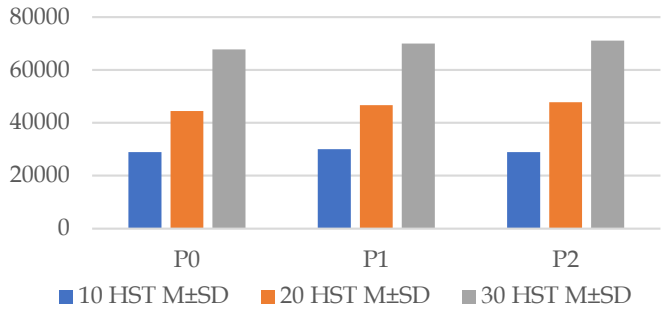

Figure 2. Histogram of the BNT test for the average number of branches aged 10 DAP, 20 DAP, 30 DAP based on the P Factor.

The number of branches aged 10 DAP based on the P factor obtained the highest average in treatment P_1 of 3.0000, while the lowest average in treatment P_0 was 2.8889. The BNT test results showed that there were no significant differences between the treatments. The number of branches aged 20 DAP based on the P factor obtained the highest average in treatment P_2 of 4.7778, while the lowest average in treatment P_0 was 4.4444. The BNT test results showed that there were no significant differences between the treatments. The number of branches aged 30 DAP based on the P factor obtained the highest average in treatment P_2 of 7.1111, while the lowest average in treatment P_0 was 6.7778. The BNT test results showed that there were no significant differences between the treatments.

Meanwhile, testing the effect of the treatment of the W factor on the number of branches was carried out using the Analysis of Variance (ANOVA) test, showing that the W factor had an influence on the number of branches of the purslane plant at 10 DAP and 30 DAP. The BNT test results are presented in Table 5.

Table 5. BNT Test Results on the average number of branches based on the W factor

Treatment	10 HST	30 HST
	M±SD	M±SD
W1	2.6667 [a]	6.3333 [a]
W2	2.6667 [a]	7.1111 [b]
W3	3.4444 [b]	7.4444 [b]
BNT	0,04861	0,05486

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05. Source: Processed Research Data (2023)

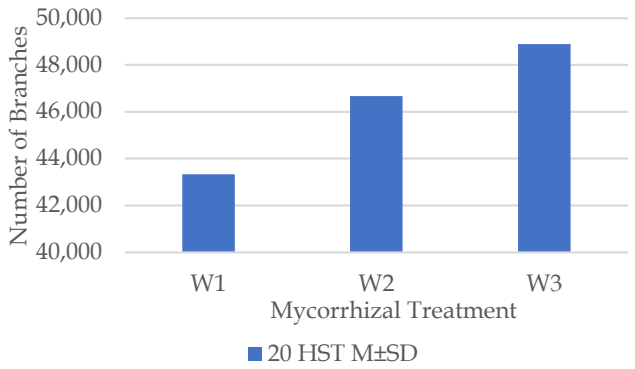

Figure 3. Histogram of the number of branches at 20 DAP in the follow-up test (post hoc) using the BNT test

The number of branches aged 10 DAP based on the W factor obtained the highest average in the W_3 treatment of 3.4444, while the lowest average in the W_1 treatment was 2.6667. The results of the ANOVA test show that there is a significant difference between treatment W_1 and treatment W_3 as indicated by the different notations in the two treatments. The number of branches aged 20 DAP based on the W factor obtained the highest average in the W3 treatment of 4.8889, while the lowest average in the W1 treatment was 4.3333. The results of the ANOVA test showed that there were no significant differences between the treatments. The number of branches aged 30 DAP based on the W factor obtained the highest average in the W_3 treatment of 7.4444, while the lowest average in the W_1 treatment was 6.3333. The results of the BNT test show that there is a significant difference between treatment W_1 and treatment W_3 as indicated by the different notations in the two treatments.

Meanwhile, the interaction of the number of branches P * W is presented in Table 6. The number of branches aged 10 DAP based on the P*W factor obtained the highest average in the P_2W_3 treatment of 3.6667, while the lowest average in the P_2W_2 treatment was 2.3333. The BNT test results showed that there were no significant differences between the treatments. The number of branches aged 20 DAP based on the P*W factor obtained the highest average in the P_2W_3 treatment of 5.0000 while the lowest average in the P_0W_2 treatment was 4.6667. The results of the ANOVA test showed that there were no significant differences between the treatments. The number of branches aged 30 DAP based on the P*W factor obtained the highest average in the P_2W_3 treatment of 7.6667, while the lowest average was in the P0W1 treatment of 6.3333. The results of the ANOVA test showed that there were no significant differences between the treatments.

Table 6. BNT test results on a number of branches based on P*W interaction.

Treatment	Number of Branches	
	10 HST	30 DAP
	M±SD	M±SD
P0W1	2.6667 a	6.3333 a
P0W2	3.00 AM	6.6667 ab
P0W3	3.00 AM	7.3333 ab
P1W1	2.6667 a	6.3333 a
P1W2	2.6667 a	7.3333 ab
P1W3	3.6667 b	7.3333 ab
P2W1	2.6667 a	6.3333 a
P2W2	2.3333 a	7.3333 ab
P2W3	3.6667 b	7.6667 b
BNT	0,0611111	01.36

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05. Source: Processed Research Data (2023).

The Effect of Treatment on Post-Harvest Results

Testing the effect of treatment of the P factor on post-harvest results including stem diameter, crown diameter, root length, fresh weight, and dry weight was carried out using the Analysis of Variance (ANOVA) test showing that there was a significant effect on stem diameter Table 7 while crown diameter, length roots, fresh weight, and dry weight have no significant effect on the BNT test results which can be seen in Figure 3.

Table 7. BNT Test Results on Harvest Results Based on P Factor

Treatment	Bar Diameter
	M±SD
P0	1.0555 [b]
P1	0.9000 [a]
P2	0.9500 [ab]
BNT α 0,05	00.12

Note: The average number followed by the same letter means that it is not significantly different at the BNT α level of 0.05

Stem diameter based on the P factor obtained the highest average in treatment P_0 of 1.0555, while the lowest average in treatment P_1 was 0.9000. The BNT test results showed that there were no significant differences between the treatments. The crown diameter based on the P factor obtained the highest average in treatment P_2 of 2.0444, while the lowest average in treatment P_0 was

1.9944. The BNT test results showed that there were no significant differences between the treatments. Root length based on the P factor obtained the highest average in treatment P_1 of 6.0556, while the lowest average in treatment P_0 was 5.6833. The BNT test results showed that there were no significant differences between the treatments.

Fresh weight based on the P factor obtained the highest average in treatment P_0 of 9.4000, while the lowest average in treatment P_2 was 9.2389. The BNT test results showed that there were no significant differences between the treatments. Dry weight based on the P factor obtained the highest average in treatment P_2 of 4.0000, while the lowest average in treatment P_0 was 3.7222. The BNT test results showed that there were no significant differences between the treatments.

Testing of the treatment effect of the W factor on post-harvest results including stem diameter, crown diameter, root length, fresh weight, and dry weight was carried out using the Analysis of Variance (ANOVA) test, showing that there was a real influence on the crown diameter of the W factor, presented in Table 8. Meanwhile, stem diameter, root length, fresh weight, and dry weight have no significant effect on the BNT test results, which can be seen in Figure 3.

Table 8. Results of variation in average crown diameter

Treatment	Header Diameter
	M±SD
W1	2.1222 [b]
W2	1.9222 [a]
W3	1.9888 [a]
BNT α 0,05	00.13

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05.

The crown diameter based on the W factor obtained the highest average in treatment W_1 of 2.1222, while the lowest average in treatment W_2 was 1.9222. The results of the ANOVA test show that there is a significant difference between treatment W_1 and treatments W_2 and W_3 as indicated by the different notations in the two treatments.

The stem diameter based on the W factor obtained the highest average in the W_1 treatment of 9833, while the lowest average in the W_2 treatment was 9555. The BNT test results showed that there was no significant difference between the treatments. Root length based on the W factor obtained the highest average in treatment W_3 of 6.0000, while the lowest average in treatment W_2 was 5.6833. The results of the ANOVA test showed that there were no significant differences between the treatments.

Fresh weight based on the W factor obtained the highest average in the W_3 treatment of 9.4944, while the lowest average in the W_2 treatment was 9.1667. The results of the ANOVA test showed that there were no significant differences between the treatments. Dry weight based on the W factor obtained the highest average in treatment W_2 of 3.8889, while the lowest average in treatment W_1 was 3.7778. The BNT test results showed that there were no significant differences between the treatments. Testing the interaction effect of the W and P factors on post-harvest results including stem diameter, crown diameter, root length, fresh weight, and dry weight was carried out using the Analysis of Variance (ANOVA) test, showing that there was a significant influence on crown diameter while stem diameter, and fresh weight, while root length and dry weight have no significant effect on the BNT test results, which can be seen in Table 9.

Table 9. BNT Test Results on Harvest Results based on P*W interactions

Treatment	Bar Diameter	Header Diameter	Root Length	Fresh Weight	Dry Weight
	M±SD	M±SD	M±SD	M±SD	M±SD
P0W1	1.1167 b	2.1333 b	5.8333 a	9.2000 ab	3.5000 a
P0W2	1.0667 ab	1.9500 ab	5.3800 a	9.3333 ab	3.8333 a
P0W3	0.9833 ab	1.9000 ab	5.8333 a	9.6667 ab	3.8333 a
P1W1	0.8833 a	2.0666 a	5.8333 a	9.1667 ab	4.00 AM
P1W2	0.8700 a	1.8700 a	6.1667 a	9.0667 ab	3.8333 a
P1W3	0.9500 ab	2.0500 b	6.1667 a	9.9333 ab	3.8333 a
P2W1	0.9500 ab	2.1666 c	6.00 AM	9.7333 ab	3.8333 a
P2W2	0.9333 ab	1.9500 a	5.5000 a	9.1000 ab	4.00 AM
P2W3	0.9667ab	2.0166 a	6.00 AM	8.8800 a	4.1667 a
BNT	00.21	00.17	01.09	0,06736111	0,05625

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05.

The bar diameter based on the P*W factor obtained the highest average in the P_0W_1 treatment of 1.1167, while the lowest average in the P_1W_2 treatment was 0.8700. The BNT test results showed that there were no significant differences between the treatments. The crown diameter based on the P*W factor obtained the

highest average in the P_2W_1 treatment of 2.1666, while the lowest average in the P_1W_2 treatment was 1.8700. The results of the ANOVA test showed that there were no significant differences between the treatments. Root length based on the P*W factor obtained the highest average in the P_1W_3 treatment of 6.1667, while the lowest average in the P_0W_2 treatment was 5.3800. The results of the ANOVA test showed that there were no significant differences between the treatments.

Fresh weight based on the P*W factor obtained the highest average in the P_1W_3 treatment of 9.9333, while the lowest average in the P_2W_3 treatment was 8.8800. The results of the ANOVA test showed that there were no significant differences between the treatments. Dry weight based on the P*W factor obtained the highest average in the P_2W_3 treatment of 4.1667, while the lowest average in the P_0W_1 treatment was 3.5000. The results of the ANOVA test showed that there were no significant differences between the treatments.

The Effect of Treatment on Post-Harvest Results of Omega-3

Purslane (Portulaca oleracea) is an annual herbaceous plant that can live forever in tropical soil, characterized by fleshy purplish green stems and fleshy leaves with blunt leaf tips. The flowers grow at the ends of the stems in groups and are yellow. The seeds are small, almost a millimeter or less, have a grainy surface, are reddish brown when immature, and turn black when ripe. Testing of the treatment effect of factor P and factor W, on omega-3 was carried out using the Analysis of Variance (ANOVA) test with a factorial randomized block design with the results of the BNT test presented in Table 10.

Table 10. BNT Test Results for Omega-3 Based on P Factor

Treatment	Omega-3 M±SD
P0	1.6944 a
P1	1.6611 a
P2	1.7055 a
BNT	0.05

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05.

Omega-3 results based on the P factor obtained the highest average in treatment P_2 of 17055, while the lowest average in treatment P_0 was 1.6944. The results of the BNT test show that there is a significant difference between treatments P_0 and P_1 and treatment P_2 as indicated by the different notations in the two treatments.

Omega-3 results based on the W factor obtained the highest average in treatment W_1 of 2.1222, while the lowest average in treatment W_2 was 0.9500. The BNT test results show that there are significant differences between treatments W_1, W_2, and W_3 as indicated by the different notations in the two treatments.

Table 11. BNT Test Results for Omega-3 Based on W Factor

Treatment	Omega-3 M±SD
W1	2.1222 b
W2	0.9500 a
W3	1.9500 a
BNT	0.05

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05. Source: Processed Research Data (2023)

Table 12. BNT Test Results for Omega-3 Based on P*W Factor

Treatment	Omega-3 M±SD
P0W1	2.1333 ef
P0W2	1.0500 b
P0W3	1.9000 c
P1W1	2.0667 de
P1W2	0.8667 a
P1W3	2.0500 d
P2W1	2.1667 f
P2W2	0.9333 a
P2W3	2.0166 d
BNT α 0,05	0.08

Note: The average number followed by the same letter means that it is not significantly different at the BNT level of 0.05.

Omega-3 results based on the P*W factor obtained the highest average in the P_2W_1 treatment of 2.1666, while the lowest average in the P_2W_2 treatment was 0.9333. The test results show that there are significant differences between treatments as indicated by the different notations in the two treatments.

Discussion

The Effect of Treatment on Plant Height

Plant height is a plant growth variable that is easily observed as a parameter to determine the influence of the environment or the effect of treatment on plants (Monton et al., 2019). The increase in plant height indicates the vegetative growth activity of a plant. Based on the results of plant height variation, there were significant differences between treatments. Venugopalan et al. (2021) applied fertilizer can improve soil chemical properties, pH, and soil organic C. Furthermore, according to Q.-W. Zhang et al. (2018). Providing soil amendments affects field capacity and plant growth including plant height, wet weight, dry weight of plants, and number of leaves. Organic materials can improve the properties of regosol soil which has porosity, so that the soil can

maintain the availability of moisture for fertilizer nutrient uptake. Observation of plant height is carried out to determine the rate of plant growth. The results of the average height of the purslane plants can be seen in Tables 1, 2, and 3. Based on Tables 1, 2, and 3, significant plant height growth rate patterns were found in the 4th week (30 DAP) based on the P, W, and P*W treatments which are shown in different notations for the three treatments. Data on average plant height is available in treatments using fertilizer because it can provide additional availability of macro and micronutrients that can be absorbed well (Y. Zhang et al., 2018). Apart from fertilizer factors, plant growth at the age of 30 days after planting is also influenced by environmental factors such as temperature, air humidity, sunlight, and soil conditions which can influence plant growth (Estiasih et al., 2022).

The Effect of Treatment on the Number of Branches

The effect of the interaction between treatment factors, namely the number of branches per plant on the height of the purslane plant during the growth period is presented in Tables 4, 5, and 6. The number of branches per plant has an effect on the height of the purslane plant at the age of 10 DAP and 30 DAP. Meanwhile, the P and P*W factors showed that there were no significant differences between the treatments. Purslane plants grown using fertilizer quickly grow taller than purslane plants planted without using fertilizer (Yuniastri et al., 2020). This may be related to additional materials given to soil or plants to improve soil fertility and increase plant growth. Providing appropriate fertilizer can increase the number of branches on plants, especially if the soil is less fertile or contains less nutrients (Sirivibulkovit et al., 2018). However, the number of branches growing on a plant is also influenced by other factors, such as genetics, plant type, and the environment where the plant grows (Zargoosh et al., 2019).

The number of branches in plants is influenced by plant hormones called cytokinin. Cytokinin are responsible for promoting branch growth in plants. Providing appropriate fertilizer can increase the levels of nutrients available to plants, including nutrients that play a role in cytokinin production. In this case, applying fertilizer can help increase cytokinin production and promote branch growth in plants (Chung et al., 2020)

However, giving too much fertilizer can also cause plants to grow unhealthy and unbalanced. Excessive fertilizer application can cause plant poisoning and can cause the plant to grow too many branches with small, unhealthy leaves. Apart from that, excessive application of fertilizer can also cause environmental damage, such as water and soil pollution (Hapsari et al., 2018).

Therefore, it is important to provide fertilizer in the right amount and according to the plant's needs. In this case, it is important to carry out a soil analysis first to determine the right type and amount of fertilizer for the plants to be planted (B. Zhang et al., 2019). In addition, it is also important to pay attention to environmental factors such as light, temperature, humidity, and water to ensure optimal and healthy plant growth.

The Effect of Treatment on Post-Harvest Results

Testing the effect of treatment from the P factor and W factor on post-harvest results included stem diameter, crown diameter, root length, fresh weight and dry weight and the results showed that there were no significant differences between these treatments. Plant treatment can influence post-harvest results. harvest, both quality and quantity. Among them is that selecting the right plant variety can influence post-harvest results (Hidayati et al., 2019). Plant varieties that are resistant to pest and disease attacks or have good fruit quality can produce better harvests. Fertilizing, watering, and storing the harvest properly can extend its shelf life. This can affect the quality and quantity of crops sold on the market (Feduraev et al., 2019). Each plant has different needs depending on the type and environmental conditions where the plant grows. Therefore, it is important to know the needs of the plant and carry out treatment correctly and on time to get optimal harvest results (Anugrah et al., 2019).

The Effect of Treatment on Post-Harvest Results of Omega-3

In Tables 10, 11, and 12, the results of the ANOVA test on Omega-3 based on factors P, W, and P*W show that there are significant differences between each treatment. This can refer to the average value which is significantly different between the three groups, where providing appropriate fertilizer containing the nutrients needed by plants can increase the omega-3 content in crop yields (Murtaza et al., 2020). Apart from that, proper light intensity regulation is also needed to influence plant production and the omega-3 content of the harvest. Plants that get enough sunlight tend to produce seeds with higher omega-3 content.

It should be understood that each plant has different needs depending on the type and environmental conditions where the plant grows. Therefore, it is important to know the needs of these plants and carry out treatment correctly and on time to get harvests with optimal omega-3 content.

Conclusion

Based on the research results, it was concluded that: (1) The single factor of manure fertilization that influences the content can be seen from the height of the purslane plant at the age of 30 DAP and the diameter of the purslane stem which is influenced by manure fertilization with chicken manure as the best treatment; (2) The single factor of different harvest times influences

the number of branches, stem diameter and crown diameter of purslane plants which are influenced by differences in harvest time with harvest time of 45 DAP as the best treatment; (3) The interaction between manure fertilization and different harvest times can be seen from plant height, number of branches, stem diameter, crown diameter and fresh weight of purslane plants which are influenced by the interaction of manure fertilization and different harvest times with the best combination being manure chickens and harvest time 45 DAP; (4) Different treatments in the cultivation of purslane plants affect the omega-3 content, that is the difference in harvest time and the interaction between manure and the difference in harvest time with the best harvest time being 35 DAP and the best combination of cow manure and first harvest time.

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