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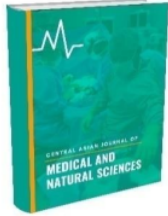
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EFFECT OF GIVING GAMAL LEAF LIQUID ORGANIC FERTILIZER (*Gliricidia septum*) ON CHLOROPHYLL LEVELS AND FRESH WEIGHT OF PAKCOY (*Brassica rapa* L) PLANTS IN TOMOHON CITY

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Sp. (ETS)

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Abstract: Tomohon City is one of the cities in the North Sulawesi Province. The Government of North Sulawesi has established, Tomohon City as a center for the production of vegetable crops including mustard plants or known as pakcoy vegetables (*Brassica rapa* L.). Pakcoy is a short-lived leaf vegetable plant and one genus with mustard has a high nutritional content such as beta-carotene, protein, vegetable fats, carbohydrates, fiber, Ca, Mg, Fe, sodium, vitamin A and vitamin C. Chlorophyll is a leaf green substance found in green plant parts, especially on leaves. One of the factors affecting the chlorophyll content in pakcoy leaves is the condition of the soil in this case the content of nutrients and nutrients in the soil. To meet the nutrient and nutrient content in the soil, namely by using organic fertilizers such as liquid organic fertilizer (POC) of gamal leaves. POC gamal leaves contain a lot of nutrients, especially N elements. Element N can affect the amount of chlorophyll levels in plants, and the fresh weight of pakcoy plants. This study aims to determine chlorophyll levels and wet weight in pakcoy plants after applying liquid organic fertilizer (POC) of gamal leaves. To find out the chlorophyll on pakcoy leaves, use the Portable Chlorophyll Meter SPAD-502 Plus tool while for wet weight using analytical scales. The highest chlorophyll content and fresh weight of pakcoy tend to be found in the P4 treatment (120 ml/l) POC of gamal leaves with a chlorophyll content value of 37.56 and fresh weight of 312.79 g while the lowest was found in the

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control treatment.

Key words: Pakcoy plant, POC gamal leaf, Chlorophyll, fresh weight

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INTRODUCTION

Tomohon City is one of the cities in the North Sulawesi Province. The Government of North Sulawesi has established, Tomohon City as a center for the production of vegetable crops including mustard plants or known as pakcoy vegetables (*Brassica rapa L.*). Pakcoy is a short-lived leaf vegetable crop and one genus with mustard has a high content of nutrients such as beta-carotene, protein, vegetable fats, carbohydrates, fiber, Ca, Mg, Fe, sodium, vitamin A and vitamin C. Pakcoy is one of the leaf vegetables that has high economic value. The plant can also grow in highlands and low dataran (Haryanto, et al, 2003). In Tomohon City, in general, the productivity of vegetable crops, especially pakcoy, is still very low. This can be caused by several factors, namely cultivation techniques carried out by farmers that have not been intensive, climatic factors and low soil fertility rates. Efforts that can be made to increase pakcoy production, one of which is by applying fertilizer. Fertilization is carried out in order to meet the needs of nutrients for plants, especially the element nitrogen (N) for vegetable crops so that it can provide high yields. Nitrogen is needed by plants whose leaves are taken like mustard pakcoy. Mustard pakcoy requires more nitrogen nutrients for its growth. Pakcoy vegetables contain a lot of fiber, vitamins A, B, B2, B6, and C, calcium, phosphorus, copper, magnesium, iron, and protein. Mustard pakcoy vegetables are useful for preventing heart disease, hypertension and cancer, helping for health such as the digestive system and preventing anemia in pregnant women (Tania et al., 2012). Nitrogen deficiency in plants causes the formation of chlorophyll to be disturbed so that it affects the process of photosynthesis. Chlorophyll deficiency causes yellowing of the leaves so that plant growth is slow, weak and stunted. The availability of nitrogen in the soil is influenced by the organic matter content of the soil (Wijanarko et al., 2012). Low organic matter affects the decrease in the soil's ability to store water and nutrients so that it is easy to leach. One of the plants that contains nitrogen elements is the gamal plant (*Gliricidia septum*) which is widely found in Tomohon City. Gamal plants are widely used as animal feed for ruminants. Apart from being animal feed, gamal plants are used as shade plants, regional plants, and as a buffer for cottages. The leaves of the gamal can be used as liquid organic fertilizer, because they contain various nutrients needed by plants including: nitrogen 3.15%, Phospat 0.22%, Potassium 2.65%, Calcium 1.5% and magnesium 0.41% (Oviyanti, et al, 2016). The increase in organic matter in the soil by using gamal leaf organic liquid fertilizer has proven benefits. According to Jeanne M Paulus et al, 2020 the application of liquid organic fertilizer (POC) of gamal leaves on sweet corn plants can increase plant height, number of leaves, cob length and cob weight. Furthermore, Putri Sumaryani, et al (2018) said that giving POC for gamal leaves increases the vegetative growth of tomato plants compared to control. The purpose of this study was to determine the effect of gamal leaf liquid organic fertilizer on chlorophyll levels and wet weight of pakcoy plants in Tomohon City.

RESEARCH METHODS

This study used the Complete Randomized Design (RAL) method which consists of 5 doses of gamal leaf liquid organic fertilizer, namely

P1 : 0 ml/liter of gamal leaf POC,

P2 : 40 ml/liter of POC gamal leaves,

P3 : 80 ml/liter of gamal leaf POC,

P4 : 120 ml/liter of gamal leaf POC,

P5 : 160 ml/liter of gamal leaves.

Each treatment was repeated 3 times so that 15 experimental units were obtained. Each experimental unit has 5 plants so that there are 75 pakcoy plants.

Place and time of research

This research was conducted in Tomohon City, Wawo Plantation, Matani Dua Village, Tomohon Tengah District, Tomohon City, North Sulawesi Province. Between the 3 months starting in March – May 2022.

Materials and Tools

The materials used in this study were soil, gamal leaves, EM4, molasses, rice washing water, coconut water, bran and clean water. While the tools used are a 60-liter plastic bucket, a rice sack made of synthetic and porous fibers measuring 50 kg, a dipper of 1 piece, a wooden stick measuring 50 cm, rubber gloves, a mask, a knife, analytical scales, a label, a Portable Chlorophyll Meter SPAD-502 Plus tool, writing stationery, chopping, pots and raffia ropes.

Work Procedure

Gamal Leaf Liquid Organic Fertilizer (POC) Manufacturing Procedure

First made a solution of molasses. Dissolve 1 kg of brown sugar in 1 liter of clean water into a saucepan, stirring until all parts of the sugar dissolve, then filtered and stored in a clean bottle, so as not to be swarmed with ants. The second is the creation of a gamal leaf POC. 10 kg of gamal leaves, 100 ml of EM4, 350 ml of molasses, 3 liters of water used for washing rice from the first laundry, 1 liter of coconut water, 7 liters of clean water.

- Put the chopped leaves that have been mixed with bran into the rice sack and press until solid, tie the ends of the sack with raffia rope.
- Make a substrate solution by mixing all the ingredients except gamal leaves, put in sacks containing gamal leaves. Put the load on the sack so that it does not float.
- Cover the bucket with a lid so that air does not get into the bucket.
- Keep the bucket in a shaded place and not exposed to direct sunlight for 14 days.
- Open the bucket cover, remove the sack containing the gamal leaves and separate them, the rest of this pulp can still be used for composting.
- Successful fermentation is characterized by the presence of white spots on the surface of the liquid. The liquid is brownish-yellow and smells like tape.

Pakcoy Plant Fertilization

Fertilizing pakcoy plants using gamal leaf liquid organic fertilizer that has been made. Pakcoy fertilization is carried out at a time when the plants are 7, 14, 21, 28 and 35 days after planting. Fertilization is carried out in the morning from 07.00 – 09.00 with the frequency of applying fertilizer once a week using liquid organic fertilizer gamal leaves according to the treatment dose. The method is shaken and stirred using a dipper.

The observed variables are:

1. The amount of chlorophyll. Measuring the amount of chlorophyll by using the Portable Chlorophyll Meter tool SPAD-502 Plus. How to measure the tool is placed Pinched) on the leaf blades at the tip of the leaf, the middle and base of the leaf. Then the results are summed and divided by three.
2. Wet weight, wet weight is obtained by weighing all parts of the plant including plant akat that has been cleaned first from the ground, by washing the roots with water until clean, weighing is carried out using analytical scales.

DATA ANALYSIS.

The data obtained will be analyzed statistically with fingerprint analysis and if there is a noticeable difference, it will be followed by the BNT test.

RESULTS AND DISCUSSION

Table 1. Total Chlorophyll Content of Pakcoy Plants Due to The Application of Gamal Leaf Liquid Organic Fertilizer

TREATMENT	DEUTERONOMY			TOTAL	AVERAGE TOTAL CHLOROPHYLL LEVELS
	1	2	3		
Control	32,35	30,47	33,96	96,78	32,26
P1	35,00	38,85	37,62	111,42	37,14
P2	35,66	39,47	37,54	112,67	37,56
P3	38,25	37,45	37,60	113,30	37,77
P4	36,95	39,70	36,10	112,75	37,58
P5	36,65	34,89	37,64	109,18	36,39

DISCUSSION

Table 1, shows that the highest total chlorophyll levels of pakcoy leaves were found in the treatment

Based on the data on the results of the chlorophyll content of pakcoy leaves after being given the treatment as in table 1, it can be seen that the chlorophyll content of pakcoy leaves for each different gamal leaf POC treatment has increased. The highest chlorophyll level was found in P4 peralquant (120 ml/l of gamal leaf POC liquid) which was 37.77. In total chlorophyll, the increase in POC administration of gamal leaves greatly affects the increase in chlorophyll. Gamal leaf liquid organic fertilizer in the P4 treatment has a high nitrogen element compared to other treatments. From Wijaya's research, (2000) which states that the addition of gamal leaf liquid organic fertilizer nitrogen to plants can increase and encourage the growth of organs related to photosynthesis. Leaves that get a supply of nitrogen will help leaves that have wider leaf blades with higher chlorophyll content, so that plants are able to produce high amounts of carbohydrates to support vegetative growth. The results of the same study were also stated by, Djumali and Nurnasari (2012) who showed that the dose of nitrogen fertilizer used can affect changes in plant physiology which includes leaf chlorophyll content, leaf specific weight, photosynthesis rate, light efficiency, reducing CO₂ and leaf maintenance respiration coefficient. Thus, a sufficient amount of liquid organic fertilizer of gamal leaves can increase the cadaverr chlorophyll on pakcoy leaves.

Gamal leaf liquid organic fertilizer contains high nitrogen and can increase nitrogen in the soil so that it can affect the increase in the number of leaves in plants (Rahmina, et al 2017). According to Harahap, et al (2015) nitrogen elements can increase photosynthesis and the results can be accumulated on all parts of the plant for growth, including for leaf formation. In addition, the more nitrogenous elements

contained in the growing medium, the more chlorophyll is formed for the photosynthesis process, causing more nutrients available for plant growth.

Based on the results of the study on the chlorophyll content of pakcoy leaves after applying liquid organic fertilizer gamal leaves, the lowest chlorophyll content of pakcoy leaves, namely in the control treatment of 32.26, means that the fertilizer that greatly affects the increase in chlorophyll is in the liquid organic fertilizer of gamal leaves. The decreasing composition of gamal leaf liquid organic fertilizer can affect the nutrient content in pakcoy growing media. According to Rahmina et al (2017) the adequacy of nutrients for plant growth is very influential. Sufficient nutrients for plant growth can make plants grow optimally. Nutrients that can support the growth of pakcoy plants to grow well one of them is macro nutrients, namely nitrogen, phosphorus and potassium (NPK) where this element is needed in large quantities, this macro element is found in organic liquid fertilizer gamal leaves.

According to Sutedjo (2010), the element N functions to increase plant growth, nourish chlorophyll, increase protein levels in plants, improve the quality of plants that produce leaves. The availability of sufficient nitrogen and in a balanced state with other elements can promote the vegetative growth of plants. The content of P element is a material that forms the cell nucleus and the development of meristematic tissue so that it affects the formation of leaf ovules and expands the size of the leaves. The content of K elements contained in gamal leaf organic liquid fertilizer also has very high criteria. The element K is an activator of a large number of enzymes that are important for photosynthesis and respiration in plants.

Table 2. Fresh weight of Pakcoy Plant Due to Application of Gamal Leaf Liquid Organic Fertilizer

TREATMENT	DEUTERONOMY			TOTAL	Pokcay Plant Fresh Weights (g)
	1	2	3		
Control	156,70	150,96	158,80	466,46	155,48
P1	253,70	247,87	254,40	755,97	251,99
P2	270,67	281,14	273,62	825,43	275,14
P3	288,63	291,24	296,75	876,62	292,21
P4	301,74	316,22	320,40	938,36	312,79
P5	301,42	307,27	310,47	919,16	306,39

DISCUSSION

The fresh weight of pakcoy at harvest (age 35 hst), with the application of liquid organic fertilizer gamal leaves has a positive influence on the vegetative growth of pakcoy plants. N nutrients contained in gamal leaf organic liquid fertilizer affect the fresh weight of pakcoy. The control treatment differed markedly at 35 hst of fresh weight of pakcoy plants, but all treatments of gamal leaf liquid organic fertilizer increased pakcoy yield at 35 hst. The use of 40 ml / l gamal leaf POC increased the lower yield compared to if giving 120 ml / l gamal leaf POC. This is related to the additional N nutrient levels contained by the gamal leaf POC. The release of N from the POC of gamal leaves is still ongoing for a longer time (Hartati et al., 2015). This shows that the availability of N is still sufficient for N needs for pakcoy plants. Available nitrogen is absorbed by plants for plant metabolic processes such as photosynthesis. With the increase in chlorophyll levels in pakcoy plants due to the administration of POC gamal leaves can increase the growth and fresh weight of pakcoy plants. The fresh weight of the plant is influenced by chlorophyll levels to carry out the process of photosynthesis. The results of the Bangun (2016) study using solid organic matter resulted in a pakcoy weight of 103.33 g with 1 dose of NPK (2 g of planting) combined with 40 mg of humic acid, it turned out that the results were lower when compared to the administration of POC of gamal leaves 120 ml / l. This shows that the use of gamal leaf POC is better than the use of solid organic fertilizer, because the POC

nutrients of gamal leaves are more quickly available so that they are more quickly absorbed by plants (Pranata, 2004).

CONCLUSION

The application of liquid organic pupuk of gamal leaves has the effect of increasing chlorophyll levels and fresh weight of pakcoy plants. The highest chlorophyll content and fresh weight were found in the treatment of applying liquid organic fertilizer (POC) of gamal leaves at the level of 120 ml / l and the lowest was found in the control treatment with a level of 0 ml / l POC of gamal leaves.

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