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Application of Liquid Organic Fertilizer from River Moss and Seaweed to Increase the Growth of Mustard Soft Stem Plants

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Abstracts

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The 21st century development of plants in the agribusiness and agro-industry sectors, one form of agricultural agribusiness is mustard cultivation. However, in general, this cultivation still uses artificial chemical plants which have a negative impact if used continuously for plants, soil, and consumers. Seaweed besides being able to be consumed by the body, it can also be used as a liquid organic base. The content of seaweed in the form of calcium, manganese and potassium can actually increase plant growth. This study aims to determine the effect of liquid fertilizer applied by researchers on the growth of mustard plants. The method used is to make fertilizer made from seaweed and river moss. Giving liquid fertilizer to mustard plants with various percentages and measuring the height of mustard plants every 5 days for 25 days. The results showed that the application of organic fertilizer with seaweed as the base material could increase the growth of mustard plants. Seaweed-based fertilizers contain K_2O which can stimulate growth hormone growth. This is evidenced by the difference in plants given liquid fertilizer made from seaweed and river moss.

Keywords: Growth, Liquid Organic Fertilizer, Seaweed, Moss

1. Introduction

Agricultural development in the 21st century is more emphasized on agribusiness and agroindustry, one form of agribusiness is the cultivation of mustard plants. Mustard plants are vegetables that are important for the body because of the content they contain, and are able to support economic stability because the harvest period tends to be short. In Indonesia the mustard plant can grow well, this is because the mustard plant can live in the lowlands and highlands. Thus the need for mustard plants in Indonesia can be met without having to import from abroad [1]. Plant cultivation in Indonesia generally uses factory-made pesticide fertilizers because it has advantages, including the percentage of elements it has is very high so that with a small amount of application it can meet the needs of plants, and it is easy to obtain at any fertilizer store [2].

The development of modern agricultural systems in Indonesia with the use of pesticides and artificial fertilizers is very easy and practical. However, on the other hand, it results in environmental damage, namely decreasing soil fertility, decreasing soil pH and polluting water in the soil. For humans, consuming vegetables or fruit that contain pesticides and artificial (inorganic) fertilizers has the potential to cause cancer if the pesticide content continues to enter the body [3].

Nowadays people prefer plants that are treated with organic fertilizers. The reason is that these products are safer for consumption for the community [4]. Organic products have many advantages including: free of toxins and chemicals, producing higher quality products, safe for consumption, environmentally friendly, and organic products are in great demand by the market [5]. In addition, organic fertilizers also contain complete macro and micro nutrients, can improve soil structure so that the soil becomes loose, have high water retention, plants are more resistant to disease, increase beneficial soil microorganism activity, have a positive residual effect so that plants planted in the following season, still good growth and productivity [6] in [7].

Organic fertilizers have long been known among Indonesian farmers. In addition to providing macro and micro nutrients for plants, organic fertilizers also play a very important role in maintaining pH and soil fertility [8]. Organic fertilizers can be in the form of manure, compost, and liquid organic fertilizer. Liquid organic fertilizer is an extract of organic matter that has been dissolved. Liquid organic fertilizer can be applied through the leaves or referred to as folliar liquid fertilizer, which is given directly to the leaves of plants, so that the process of absorption of nutrients through the stomata is fast and directly absorbed. However, there are liquid organic fertilizers that are used directly on the soil. This fertilizer will be absorbed by the roots and the nutrients can be used by the soil [9]. Researchers used mustard plants, mustard greens are a type of vegetable plant that has high economic value after cabbage and broccoli. In addition, the mustard plant also contains minerals, vitamins, protein, and calories. Therefore, this plant has become a vegetable commodity that is quite popular in Indonesia [10].

Researchers make their own fertilizer products with two types of fertilizers that function as growth. Growth fertilizers are made using easily found ingredients such as rainwater, moss, cow's milk, seaweed and honey. This liquid organic fertilizer will be applied to mustard plants or plants that have soft stems (no cambium) by pouring it directly into the soil. This study aims to determine the effect of fertilizers made by researchers on mustard plants. The results of this study are expected to be able to provide accurate and useful information regarding the difference in the effect between fertilizers made by researchers and fertilizers that have been sold in the market on the growth of mustard plants, as well as knowing the type of fertilizer in which its application has the least negative impact on the environment.

2. Experiments Procedure

This research was conducted for approximately one month, namely in November 2019, starting from the manufacture of

fertilizers, preparation of planting media to harvest crops. The place of research was carried out in Mijen. Organic fertilizer (POC) A uses organic materials, namely moss, cow's milk, rainwater, and honey. POC (B) uses organic materials, namely seaweed, cow's milk, rainwater, and honey. The second factor is POC (B) with a concentration difference of 1:2 (50 ml: 100ml).

The research was carried out in several stages including;

(1) collection of organic matter for the manufacture of liquid organic fertilizer,
(2) preparation of planting media,
(3) preparation of mustard seeds,
(4) planting of seeds,
(5) fertilization,
(6) maintenance of mustard plants,
(7) harvesting of mustard greens begins at the age of 25-30 days,
(8) data collection and data analysis,
(9) report preparation.

The data obtained is the height of the mustard plant measured from the age of the plant 5 days to 25 days with measurements made every 5 days.

3. Result and Discussion

Table 1 results of the study of mustard plant height for 25 days.

1. Effect of liquid organic fertilizer on mustard plant growth

The results of measuring the height of the mustard plant based on the research we have done show that there are differences in species treatment of the mustard plant. The results of the study can be shown in table 1 where the growth of plants that were given POC B fertilizer was higher than that of mustard plants that were given POC A fertilizer. This indicates that the use of seaweed as fertilizer is very beneficial for plants. Seaweed has good prospects for organic fertilizers because of its richness in micro-nutrients and especially growth regulators. The growth regulators it contains include auxin, cytokinin, gibberyl, abscisic acid and ethylene. ZPT can not only increase production, but also increase plant resistance to drought and insect attacks and improve soil elements (Basmal, 2009).

Table 1. recapitulation of research results on the effect of type and concentration of liquid organic fertilizer on mustard plant growth

Faktor perlakuan	Tinggi Tanaman				
	5HST	10 HST	15 HST	20 HST	25 HST
Perlakuan Jenis					
POC (A)	2 cm	2.5 cm	5 cm	8 cm	12 cm
POC (B)	3 cm	6 cm	10 cm	13 cm	17 cm
Perlakuan Konsentrasi					
POC B1	3 cm	6 cm	10 cm	13 cm	17 cm
POC B2	3 cm	7 cm	12 cm	15 cm	20 cm

Seaweed has compounds that can regulate the growth of plants. In addition, there are other elements in the POC B that we make, namely the use of cow's milk which contains many compounds such as sodium, potassium, phosphorus, calcium, and magnesium which if the milk is stale, these compounds will be wasted. Though plants also need these compounds for growth. In terms of quality, the nutrient content in cow's milk is no more than other inorganic fertilizers. However, it can be increased by adding other ingredients that contain macro nutrients [3].

2. Effect of POC B concentration on mustard plant growth

This research was conducted by treating the volume concentration of cow's milk in POC B with a ratio of 50 ml: 100 ml (1: 2). The initial hypothesis of this study was that the addition of milk could give a significant difference in plant height to mustard plants. Based on the research that we have done, there is a difference in plant height growth in mustard greens, however, it is not too significant. The addition of the volume of milk will increase the percentage of the compounds contained in it. The difference in

plant height with a ratio of 1: 2 showed a difference in plant height of 2-3 cm with an increase of 3-4 cm every five days.

The addition of volume concentration of cow's milk with POC B2 fertilizer caused the growth of mustard plants to increase in plant height, although the increase was not too significant. Cow's milk contains growth compounds that can work optimally when combined with organic ingredients that contain high growth-promoting hormones. This growth-promoting hormone is intended to stimulate plant growth so that plants can grow, flower, and bear fruit faster, more, or bigger.

The hormone content in seaweed, namely auxin, gibberellins, and cytokinins is high enough so that this type of liquid fertilizer can increase plant growth. Each type of seaweed contains elements of different compounds so that the hormones contained are also different [11]. Identified the presence of auxin content of 16 species of marine algae in Chinese waters. The result was found that auxin compounds were present in all marine algae he observed with a large concentration distribution, namely 0.001 – 0.11 ppm wet weight. The lowest auxin concentration was found in brown algae while the highest was in red algae. In addition, differences in HPT content in seaweed are also influenced by several seasonal factors and the development phase of seaweed [12] in [13].

The technique used in making this seaweed organic liquid fertilizer can affect the level of hormone content contained. Physical extraction technique by crushing seaweed and then filtering the liquid extract, the HPT content obtained by composting in general also has a higher value. Each hormone has a different function. Auxins function as plant physiology, gibberellins function to influence peak dormancy, cambium growth, geotropism, abscission, and parthenocarpy, effectively increase fruit set, stimulate growth between nodes so that plants are not stunted [14]. While cytokinins play a very important role in cell division resulting in plant growth responses, fruit growth, and sprout germination [15].

Seaweed does not only contain growth-promoting hormones, in seaweed there are also macro and micro nutrients. Seaweed contains macro minerals such as calcium, manganese, and potassium as well as micro minerals such as zinc, iron, cobalt, molybdate, and boron from the sea [16]. Total nutrients for seaweed liquid fertilizer include; N, P2O5, K2O have low values. Likewise with the micro elements. The percentage of macronutrients contained in seaweed organic liquid fertilizer is N of 0.004%, P2O5 of 0.003%, and K2O of 0.015% (rounding) [13].

4. Conclusion

Liquid organic fertilizer that we have made by crushing and filtering techniques to obtain results from extraction. Based on the research that we have carried out and discussed the results, it can be concluded that the use of organic fertilizer from seaweed produces plants that are taller than plants that are given liquid organic fertilizer from moss. Seaweed liquid organic fertilizer contains growth-promoting hormones (auxin, gibberellins, and cytokinins) which is higher than liquid organic fertilizer for mosses.

The second research is to distinguish the volume concentration of cow's milk which is one of the ingredients in the mixture of liquid organic fertilizer on seaweed. The difference in volume causes the nutrient content in seaweed to increase because of milk which also contains macro nutrients that work optimally when there are supporting materials to increase these macro nutrients. The volume of cow's milk with a ratio of 1: 2 shows that when there is more cow's milk, it also affects the height of the mustard plant. Although the increase in plant height was not too significant, it was enough to make a difference in the growth of mustard plants.

Liquid organic fertilizer that we make has advantages and disadvantages that complement each other. The advantages of this fertilizer product are that it uses all organic materials, is friendly to the environment, and the dregs from the extraction can be used as solid fertilizer. The

drawback of this fertilizer product is the smell that is still stinging. Therefore, for the development of this fertilizer, it can be added with other ingredients that can remove odors and increase their use.

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