International Journal of Life Science and Agriculture Research

ISSN (Print): 2833-2091, ISSN (Online): 2833-2105

Volume 02 Issue 07 July 2023

DOI: https://doi.org/10.55677/ijlsar/V02I07Y2023-04

Page No : 174-180

Growth Responses of Clove Seedlings (*Sizigium aromaticum* L) to Natural Auxin and Household Waste Media

Ety Rosa Setyawati[1], Tri Endar Suswatiningsih[2], Maharani Dwi Kusumayanti[3], Setyastuti Purwanti[4]

[1,2] Lecturer at the Yogyakarta STIPER Agricultural Institute, Indonesia

[3,4] Student at the Yogyakarta STIPER Agricultural Institute, Indonesia

ABSTRACT: Indonesia is the number 1 clove producing country in the world, in amount of 140,812 tons (The Ministry of Indonesian Agriculture, 2022). Cloves are commonly used as a flavor enhancer for food and drinks. Its warm and spicy sensation is quite popular among people, especially those who live in cold areas. In addition, cloves are also useful for aromatic mixture of cigarettes. In addition, cloves are also good for the health of the body because they are known contain phosphorus, iron, magnesium, calcium, potassium, zinc, sodium and vitamins. This study aims were to determine the optimum concentration of organic auxin and the effect of using household waste media on the growth of clove plant seedlings. This study used a factorial experimental method which was arranged in a Completely Randomized Design (CRD) consisting of two factors. The first factor was the dose of household waste consisting of L0 = no household waste (control/ only with 2.5 g NPK fertilizer); L1 = household waste 10%; L2 = household waste 20% and L3 = household waste 30%. The second factor was the type of organic auxins, which consist of A0 = without organic auxin; A1 = red onion organic auxin; A2 = tomato organic auxin; A3 = auxin organic mung bean sprouts. Each treatment was repeated 4 times, resulting in 64 experimental units. The results showed that there was no interaction between the dose of household waste and natural auxins on the growth of clove seedling. Household waste can replace NPK fertilizer starting from a dose of 10 g/plant. Kinds of natural auxin did not affect the growth of clove seedlings. The seedling cultivation is enough profitable.

KEYWORDS: Clove, organic auxin, household waste.

Published Online: 11 July 2023

Corresponding Author: Ety Rosa Setyawati

INTRODUCTION

Indonesia is the number 1 clove producing country in the world, the amount is 140,812 tons (The Ministry of Indonesian Agriculture, 2022). Clove is commonly used as a flavor enhancer for food and drinks. Its warm and spicy sensation is quite popular among people, especially those who live in cold areas. In addition, cloves are also useful for as a aromatic mixture of cigarettes. In addition, cloves are also good for the health of the body because they are known to contain phosphorus, a substance iron, magnesium, calcium, potassium, zinc, sodium and vitamins. Some of the benefits of cloves for the body are as follows: healthy for the heart, improves digestion, as an anti-oxidant, overcomes inflammation, overcomes pain due to toothache, prevents bad breath and body odor, controls blood sugar, boosts the body's immune system (Hadiwijaya, 1977). In addition, dried clove leaves can be used for vegetable pesticides. Cloves contain essential oil compounds (eugenol, caryophyllene, vanillin, fulfural, tannins, etc.). Eugenol is used in perfumes, flavourings, essential oils and in medicine (antiseptic and local analgesic) (Tulungungan, 2020).

To accelerate the growth of clove seedlings, it is necessary to give growth regulators from the auxin group. Auxin plays a role in the process of accelerating the growth of roots and stems, namely in cell division, cell elongation, inhibition of lateral shoots and preventing abscission of fruit (Noggle & Fritz, 1982; Harjadi, 2019).

Plant Growth Regulator (PGR). PGR is a non- nutritional organic compound that can encourage or inhibit plant growth at low concentrations. Natural PGR besides being environmentally friendly, easy to obtain, cheap and easy to apply. PGR which plays a role in accelerating the growth of stems and roots is auxin. The hormone auxin plays a role in cell elongation, cell division, differentiation of xylem and phloem tissues, root formation, apical dominance, tropism response and inhibits leaf drop.

The limited availability of fertile top soil requires an alternative use of subsoil. The weakness of sub soil is less fertile soil due to lack of organic matter. Therefore, in the use of subsoil, it is necessary to add organic matter, including household waste. In addition, the presence of accumulated household waste will pollute the environment if it is not utilized.

Market waste, household waste as waste has always been a major problem, and this waste problem needs to be handled so that it becomes a valuable and useful material. Waste production from year to year is increasing. Indonesia produced around 21.88 million tons of waste in 2021 (The Indonesian Ministry of Life Environment and Forestry, 2022). Waste that is dominated by organic waste has high potential to be utilized into something more useful. One solution to this organic waste is to use it as organic fertilizer in the form of compost to increase plant growth and production and to support organic farming (Dahlianah, 2019). It was hoped can improve sub soil fertility.

The use of organic matter as fertilizer or compost can be an advantage in itself because it is easy to obtain and the price is cheap and can even be in the form of waste. The use of compost can increase soil fertility, because it improves the physical, chemical and biological properties of the soil (Harjowigeno, 2018).

MATERIALS AND METHODS

Place and Time of research

This research was carried out at the Education and Research Garden (KP2) Kalikuning Maguwoharjo, Sleman, Yogyakarta, Indonesia. Research was conducted in July – December 2022.

Tools and materials

The tools and materials used were hoes, polybags, sieves, clove seeds, oven, analytical scales, household waste, red onion, tomatoes, green bean sprouts and sub soil obtained at KP2 Maguwoharjo.

Research design

This study used a factorial experimental method which was arranged in a Completely Randomized Design (CRD) consisting of two factors. The first factor was the dose of household waste consisting of L0 = no household waste (control) only with 2.5 g NPK fertilizer; L1 = household waste 10%; L2 = household waste 20 %; L3 = household waste 30%. The second factor was the type of organic auxin, which consist of A0 = without organic auxin; A1 = red onion organic auxin; A2 = tomato organic auxin; A3 = mung bean sprouts organic auxin. So that there were 16 treatment combinations, repeated 4 times so that there were 64 experimental units.

Preparation of planting medium

The soil used was Regosol type sub soil which was previously sifted with a sieve so that it becomes fine grained and the soil was free from the remains of garbage and plant roots. Household waste was applied to the growing media before planting, according to the treatment dose.

Production of organic auxin

The organic auxin sources used were red onion, mung bean sprouts and tomatoes. Before use, these materials must be processed first into an extract. The way to make organic auxin was organic auxin ingredients (red onions, green bean sprouts or tomatoes) 1 kg was added to 1 liter of water and then was blended. After that the extract was filtered and applied by spraying it on the clove seedlings at the age of 1; 1.5; 2 and 2.5 months.

RESULTS AND DISCUSSION

Observation results after being analyzed with Anova and Duncan Multiple Range Test (DMRT) at a test level of 0.5% can be seen as follows.

Table.1 The effect of household waste on the growth of clove plant seedlings

Parameter	Waste Dosage (%)			
	No waste (NPK)	10	20	30
Plant height (cm)	10.85 p	8.22 q	7.88 q	7,10 q
Number of leaves (strands)	9.38 p	9.38 p	8.81 p	8.63 p
Stem diameter (mm)	0.13 p	0.16 p	0.14 p	0.16 p
Number of branches	0.50 p	0.94 p	0.88 p	1.13 p
Leaf wet weight (g)	3.92 p	3.47 p	3.42 p	3.49 p
Leaf dry weight (g)	1.21 p	1.14 p	1.06 p	1.06 p
Primary root length (cm)	20.69 p	22.74 p	21.31 p	19.72 p
Crown wet weight (g)	5.02 p	4.54 p	4.35 p	4.45 p
Crown dry weight (g)	1.69 p	1.58 p	1.50 p	1.54 p
Root dry weight (g)	0.40 p	0.44 p	0.41 p	0.37 p
Root wet weight (g)	1.22 p	1.39 p	1.20 p	1.14 p

Note: Numbers followed by the same letters in rows and columns show no significant difference according to Duncan's multiple range test (DMRT) at the 5% level.

ANOVA showed that the dose treatment of household waste only had a significant effect on plant height. The treatment without waste (NPK fertilizer) showed the highest seedling height compared to other treatments.

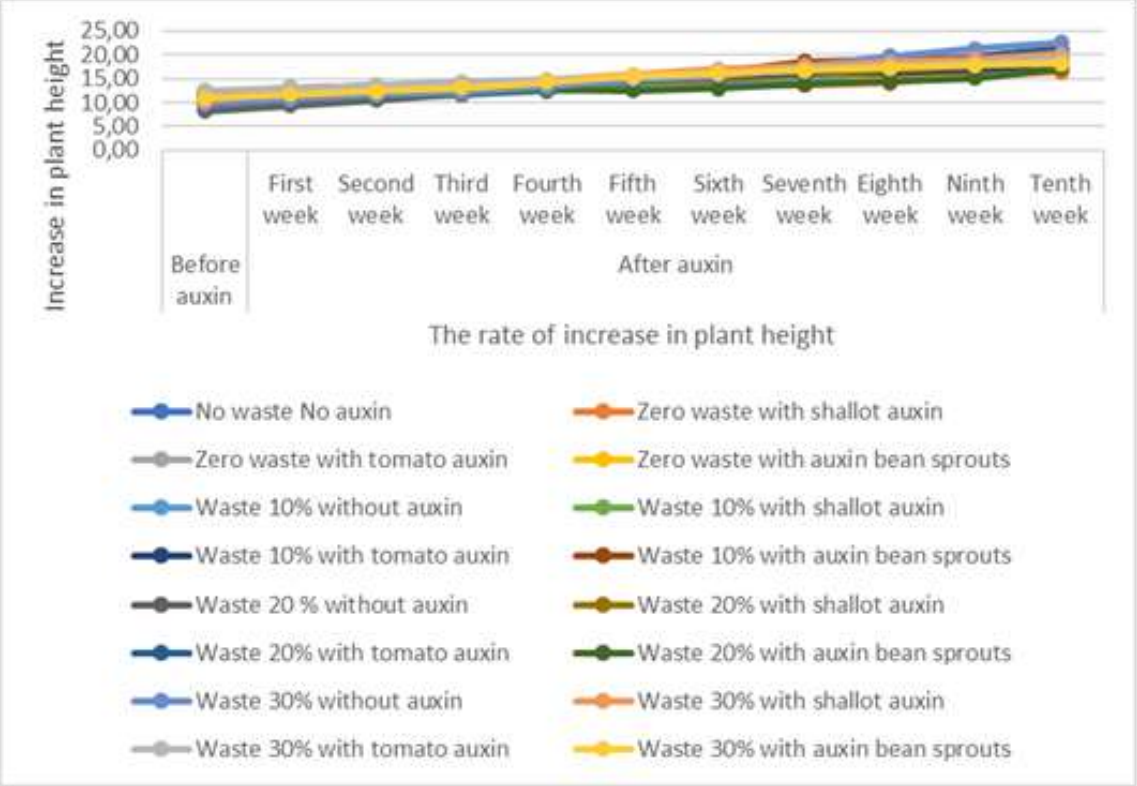

Figure 1. Response of clove seedling growth to natural auxins and waste doses.

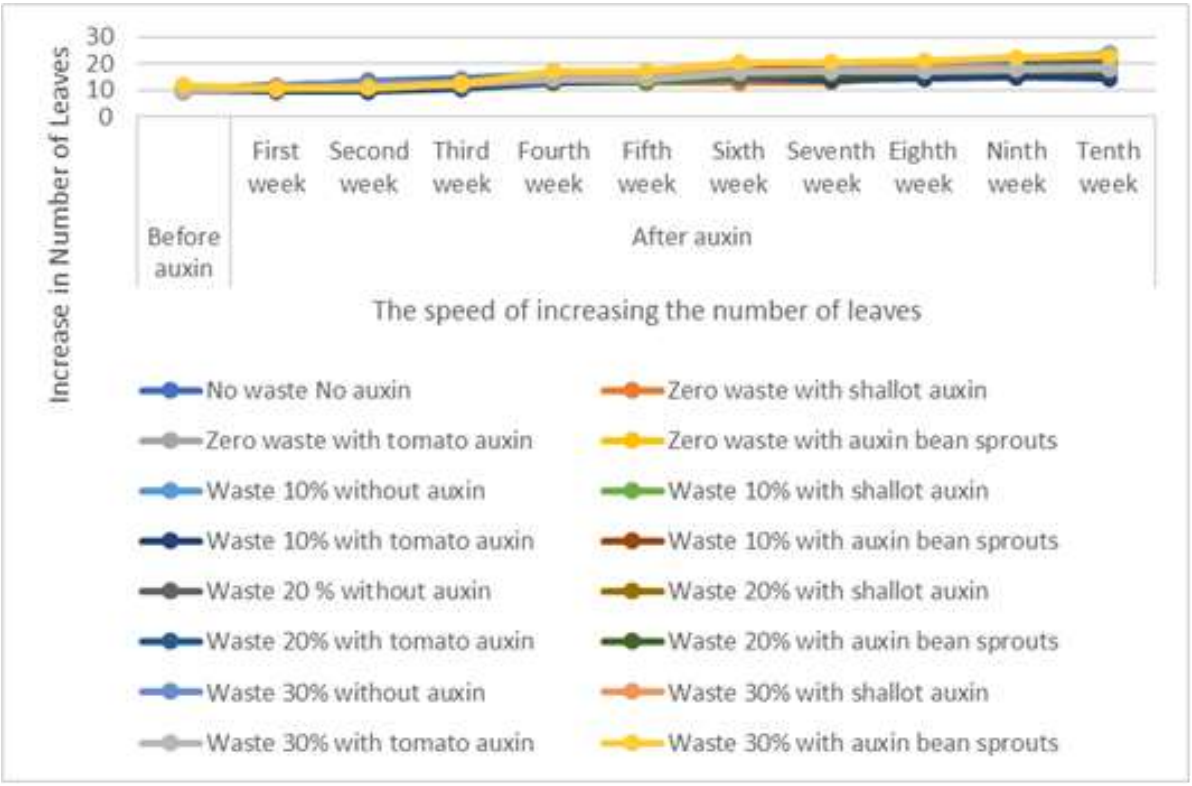

Figure 2. Increase in the number of clove seedling leaves due to treatment of various natural auxins and weekly household doses.

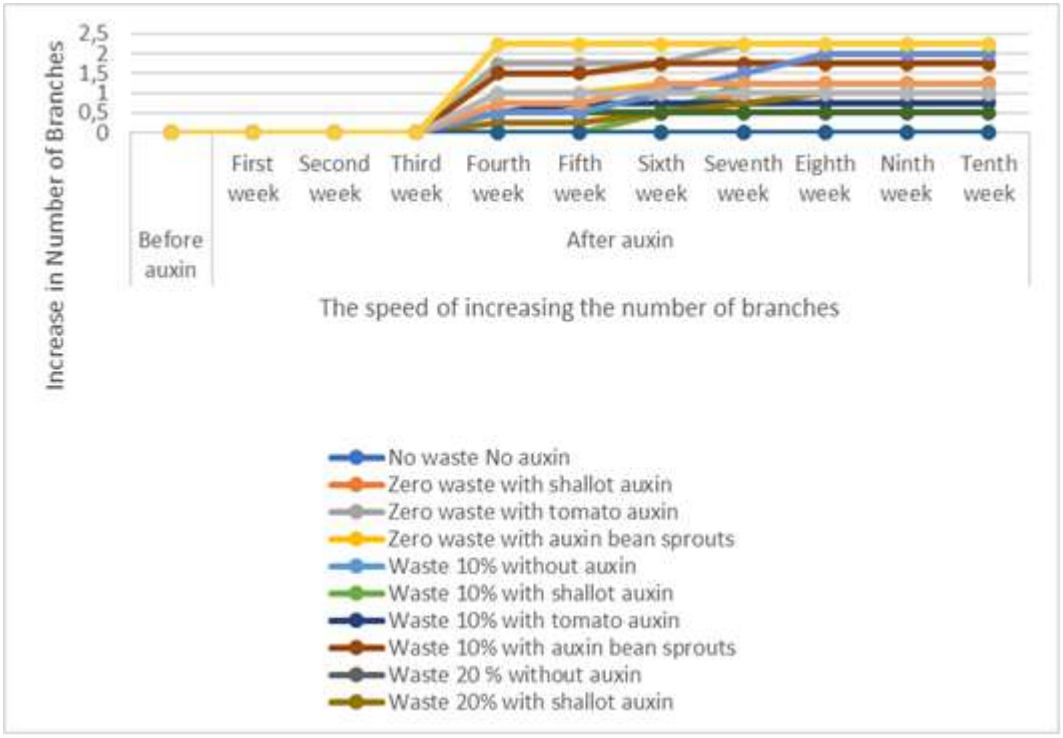

Figure 3. Response of the increase in the number of clove seedling branches to natural auxins and waste doses.

Table. 2 Effect of household waste on the growth of clove plant seeds

Parameter	Auxin			
	No auxin	Red onion	Tomato	Bean sprouts
Plant height (cm)	7.79a	8.31 a	9.43 a	9.06a
Number of leaves (strands)	8.94 a	7.50a	9.25a	10.50a
Stem diameter(mm)	0.16a	0.14a	0.13a	0.16a
Number of branches	0.94a	0.75a	0.38a	1.38 a
Leaf wet weight (g)	3.48 a	3.48 a	3.55 a	3.79a
Leaf dry weight (g)	1.09a	1.08a	1.10 a	1.21 a
Primary root length(cm)	21.96a	21.78 a	18.76 a	21.96a
Header wet weight (g)	4.42 a	4.43 a	4.53 a	4.98a
Canopy dry weight (g)	1.51 a	1.53 a	1.58 a	1.69 a
Root dry weight (g)	0.40a	0.41a	0.39a	0.42a
Root wet weight (g)	1.25a	1.25a	1.17 a	1.28 a

Note: Numbers followed by the same letters in rows and columns show no significant difference according to Duncan's multiple range test (DMRT) at the 5% level.

The results of ANOVA showed that there was no interaction between the various natural auxin treatments and the doses of household waste on all observed clove seedling growth parameters. This means that each treatment does not work together or have its own effect on growth.

The results of the analysis showed that only on plant height did the dose of household waste have an effect. Without household waste showed the highest plant height compared to other the treatments. On other parameters, namely number of leaves, number of branches, fresh and dry weight of leaves, stem diameter, root length, fresh and dry weight of roots did not show a significant difference between the use of 2.5 g NPK (16-16-16) fertilizer/plant (control) and the application of household waste. This shows

that household waste can replace the use of chemical fertilizers. At a waste dose of 10 g/plant, it has been able enough to replace 2.5 g of NPK chemical fertilizer. This is because organic matter can have a good effect on the physical, chemical and biological properties of the soil. This was also supported by soil analysis prior to treatment, namely soil pH of 7.28 which is neutral for clove seedlings. The total soil N content was 0.098% and P2O5 0.225 % and soil water content was 1.45 % which indicated poor soil nutrients for the growth of clove seedlings (soil analysis data is attached). So within 3 months the soil has been repaired by this household waste.

According to Harjowigeno (1987) and Atmojo (2003) the role of organic matter in increasing soil fertility has a long-lasting effect although it is complex. Allegedly with a longer time in this study the effect of household waste can be real. This is apparently in this research within 3 months, it turns out that there has been a positive effect from the waste. For the future it is necessary to extend the research time, especially for clove seedlings, which have a period of 2 years. It was different for vegetable plants that were around 3 months old, the 250 g/polybag treatment gave the highest plant height and the highest fresh weight of mustard greens *(Brassica juncea L.)* (Dahlianah, 2019). Provision of household waste compost to red onion *(Allium cepa L.)* 100 g/polybag for the best production, namely tuber fresh weight and tuber dry weight (Mabel and Tuhuteru, 2020).

According to research by Antunes *et al* (2022) to obtain an efficient substrate for lettuce plants using a mixture of waste that is 125 days old. Research by Pellejero *et al* (2022) showed that the compost residue of shallots had no effect on the 60-day sample of pumpkin plants, but had an effect on the first 15 days. According to Rachid *et al* (2022), the phytotoxicity test shows that the safety of compost as a soil conditioner is related to the application dose and the type of plant. It was concluded that the physicochemical and phytotoxicity parameter tests showed that the compost obtained could be used as organic fertilizer because it contains organic matter and mineral elements.

Likewise the treatment of organic auxin did not affect all the observed parameters. This is also suspected because the relatively short research time, on 3 months, seems to be insufficient for the research period of clove nurseries that are 1 to 2 year old. Therefore, it should take a longer research time. The application of natural auxin to oil palm seedlings in the pre-nursery had no significant effect on all observational parameters (Setyawati, Kristalisasi and Purba, 2021). Coffee seedlings were also not significantly affected (Irlando, Fitriani and Podesta, 2020), as well as mangosteen seeds *(Garcinia mangostana L)* administration of green bean and tomato sprout extracts had no significant effect on all parameters until 14 MST (Karyanto et al, 2022). Application of shallots to binahong plants *(Anredera cordifolia L.)* increased root dry weight (Manurung et al, 2020), increased yield and growth of pakcoy plants (*Brassica chinensis L.)* (Manurung Idham and Nuraeni, 2021). The application of shallots to melon seeds *(Cucumis melo L.)* soaked for 24 hours had an effect on increasing the fresh and dry weight of plants (Yunindranova, Budihastuti and Purnomo, 2017). In addition, shallot extract made using a juicer is more effective than using a blender. Perhaps because in this study the blender extraction method was used so it was less effective.

The application of natural auxin had no significant effect on plant height. thought to be caused by the application of auxin doses that were too low so that the auxin concentration had no significant effect. In accordance with the opinion (Campbell *et al*, 2013). Auxin moves only from the bud to the base, not the other way around. This unidirectional auxin transport is called polar transport. Polar transport has nothing to do with gravity, because auxin moves upwards, requiring energy. Auxin has an effect only in a certain concentration range. In this study it is suggested to increase concentration. It is recommended to use natural auxin concentrations of more than 750 ppm (Irlando, Fitriani and Podesta, 2020).

Auxin types also had no significant effect on stem diameter. This can be caused by genetic and environmental factors. The growth of stem diameter is in line with the development of shoot height. According to Sitompul and Guritno (1995) growth is a process in plant life that results in changes in plant size. Growth at the tip of the plant will tend to result in an increase in length (plant height) while lateral growth will result in sideways growth (stem diameter).

The treatment given had no significant effect because the application of natural growth regulators was carried out at the relatively young age of clove plants. This causes the absorption of nutrients to be limited, so that secondary root growth has not been formed and functions to absorb hormones and other nutrients. The results of research by Rugayah *et al.* (2020) showed that the application of 100 g/l tomato extract was carried out 8 weeks after planting and secondary roots began to form, indicating a significant direct response to the treatment given.

Cost Analysis Production

Worth or nope something farming according to Saeri (2018), got is known from efficiency use cost and total comparison between costs incurred with generated receipts. A number of condition main in appropriateness farming must notice things following such as: R/C > 1 or Acceptance (Rp) > BEP price (Rp). More continued Sutrisno (2013) mentions an analysis economy business too determined with calculating Cost of Goods Production with objective between For determine price sell from commodity produced. Base price high production indicate exists inefficiency in do effort. Cost and price analysis tree production nursery clove with utilize auxin complete organic and market waste presented in Table 4.

Table. 4. Analysis Cost and Cost of Cost produce Nursery Clove with Utilize Auxin Organic and Household Waste.

No.	Description	Amount (IDR)	%
1	Fixed costs		
	Land lease	300.000	
	Tool depreciation	1.000	
	Total Fixed Costs	**301.000**	**28,34**
2	Variable Costs		
	Polybag	25.000	
	Shadding	70.000	
	Early seeds	175.000	
	Market waste planting media	180.000	
	Organic auxin ingredients	54.000	
	Inorganic Fertilizer	84.000	
	Botanical pesticides	23.000	
	Labour	150.000	
	Total variable costs	**761.000**	**71,66**
3	Total cost	1.062.000	
4	Number of seeds produced	70	
	Cost of goods sold	**15.171**	

CONCLUSİONS

Based on the research results obtained, there was no interaction between the dose of household waste and the type of natural auxin on the growth of clove seedlings. Household waste can replace NPK fertilizer starting from a dose of 10 g/plant. Kinds of natural auxin did not affect the growth of clove beets. The seedling cultivation is enough profitable.

REFERENCES

1. Indonesian Ministry of Agriculture (Kementan). 2022. National clove production (tonnes) (2017-2021). https://databoks.katadata.co.id. Uploaded June 25, 2022 at 20.02 WIB.
2. Hadiwijaya, T. 1977. Cloves. Yasaguna. Jakarta.
3. Tulungungan, FR 2020. A book on North Sulawesi's smart clove farming in the 4.0 era and society 5.0. Deepublish. 100 p.
4. Noggle, GR and GJ Fritz. 1987. Introductory plant physiology. Prentice Hall International Inc. Engelwood Cliffs, NJ USA.
5. Dahlianah, I. (2019). Response of Growth and Production of Mustard Plants (Brassica juncea L.) to Giving Household Garbage Compost. Chlorophyll. 15 (2): 69-73.
6. Hardjowiigeno, S. 1987. Soil science. PT. Mediyatama Mighty Means. Jakarta. Atmojo, AW 2003. The role of organic matter on soil fertility and management efforts. Inaugural Speech of Professor of Soil Fertility Science, Faperta, UNS. Surakarta.
7. Mabel, JM and S. Tuhuteru. 2020. Utilization of Household Waste as Compost for Shallot Plants (Allium cepa L.). Agritrop. 18(1):51-59.
8. Antunes, LFS, DG Silva, MAA Leal and MEF Correia, 2022. Effect of Substrate consisting of Organic Waste Processed by Diplopod on Lettuce Seed Production. International Journal of Recycling of Organic Waste in Agriculture. 11(1):1-13.
9. Pellejero, G., J. Menendez, J. Palacios, G. Askkar, FJG Navaro, JMT Gonzalez, JLC Vozmediano, RJ Bellesta. 2022. Effects of Agronomic Applications of Organic Waste on the Production of Chayote Pumpkins. International Journal of Recycling of Organic Waste in Agriculture. 11(1):143-151.
10. Rachid, S., FMA Ahmad, M. Kanane, A. Hammoum. 2022. Agricultural Valization of Compost Produced by Recycling Organic Waste. International Journal of Recycling of Organic Waste in Agriculture. 12(2):209-219.
11. Setyawati, ER, EN Crystallization and Ancient PA. 2021. Utilization of Empty Oil Palm Bunches and Organic Auxin Types for the Growth of Oil Palm Seedlings in Pre-Nursery. Agro Agricultural Journal. 23(2):327-333.
12. Irlando, M., Fitriani, D., & Podesta, F. (2020). The Effect of Natural Auxin on the Growth of Cuttings of Robusta Coffee (Coffea canephora L). Agriculture, 14 (2). https://doi.org/10.36085/agrotek.v14i2.1034.
13. Karyanto, A., S Pramono, Rugayah and ND Fauzan. 2022. The Effect of Toat Sprout Extract and Biological Liquid Fertilizer

on the Growth of Mangosteen (Garcinia mangostana L.) Seedlings. Journal of Agrotropics. 21(2):107-114.

14. Manurung, GCT., Y. Hasanah, C. Hanum and L. Mawarni. 2020. The Role of a Combination of Bamboo Shoot Extract and Shallots as a Natural Growth Regulatory Substance on the Growth of Binahong (Anredera cordifolia Stennis) in Medan. International Conference on Agriculture, Environment and Food Security (AEFS) 2019 IOP Conf. Series: Earth and Environmental Sciences. Issuance of IOPs.
15. Manurung, EF, Idham and Nuraeni. 2021. The Effect of Giving Shallot Extract on the Growth and Yield of Pakcoy (Brassica chinensis L.). eJ. Agrotekbis. 9(5)1204-1210.
16. Yunindanova, MB, M. Th.S Budihastuti and D. Purnomo. 2017. Analysis of endogenous shallot auxin and its effect on germination and growth of organically cultivated melon (Cucumis melo). Publishing IOP Conf. Series : Earth and Environmental Sciences Campbell, Neil A., Reece, B Jane., Mitchell G. Lawrence. 2003. Biology Fifth Edition Volume 2. Translator: Wasmen manalu. Jakarta: Erlangga.
17. Sitompul, SM and B. Guritno. 1995. Plant Growth Analysis. Gadjah Mada Press University. Yogyakarta.
18. Rugayah, Suherni, D., Ginting, YC, and Karyanto, A. 2020. Effect of shallot and tomato extract concentrations on the growth of mangosteen seedling (Garcinia mangostana L.). Honor National Seminar.