Jurnal Reaksi (Journal of Science and Technology)
Jurusan Teknik Kimia Politeknik Negeri Lhokseumawe
Vol. 21 No.02, December 2023 ISSN 1693-248X

THE EFFECT OF TEA DWAGES AND EM4 IN MANUFACTURING FERTILIZER FOR THE GROWTH OF CAYYEY CHILLI

Muhammad Jefri[1], Teuku Rihayat[1], , Fachraniah[1]
[1]Chemical Engineering Department, Lhokseumawe State Polytechnic, Jl. Banda Aceh-Medan Km. 280, Buketrata, Mosque Punteut, Blang Mangat, Lhokseumawe City, Aceh 24301, Indonesia
* E-mail: jefrimd63@gmail.com

ABSTRACT

Good quality organic fertilizer is useful for improving and maintaining soil fertility. In its application, this organic fertilizer is generally given through the soil but can also be given through the leaves. This research aims to determine the effect of tea dregs and the effect of the amount of EM4 on the growth of cayenne pepper, the results of stem height growth in cayenne pepper plants (Capsicum frutetences. L) by administration of EM4 and Tea Dregs with doses of 5;10;15;20;25 ml and Tea Dregs 50;100;150;200;250 and 250 grams have different characteristics, based on the statistical data it states the differences in dosages of the variables. 2, namely 10 ml/ 250 grams of tea dregs, dominates the growth of stem height in cayenne pepper plants.

Keywords: *Brown Sugar, Husk Charcoal,Cow Dung,The Dregs, EM4, Yellow Soil.*

1.1 INTRODUCTION

According to Rinsema (1993), good quality organic fertilizer is useful for improving and maintaining soil fertility. In its application, this organic fertilizer is generally given through the soil but can also be given through the leaves (Musnamar 2014). Another advantage of organic fertilizer is its ability to restore ecosystem balance, increase nutrient availability, stimulate plant root growth, act as a biological control agent and increase profits in farming. In Marpaung's research (2014), it was stated that the provision of solid and liquid organic fertilizer plays a very important role in plant growth. The dosage of organic fertilizer needs to be paid attention to. Machrodania Research (2015).

Organic fertilizer is fertilizer that comes from various natural fertilizer-making materials such as animal waste, animal body parts, plants, which are rich in minerals and are good for use as soil fertilizer. Based on its form, organic fertilizer is divided into solid and liquid. Liquid fertilizer is a solution that contains one or more soluble carriers of elements needed by plants. The advantage of liquid fertilizer is its ability to provide nutrients according to plant needs. Liquid fertilizer can also be applied more evenly and the concentration can be easily adjusted according to the plant's needs. Liquid organic fertilizer can come from either plant remains or animal waste, while solid organic fertilizer is fertilizer that is mostly or entirely filled with organic material originating from plant remains or animal waste in solid form. Liquid fertilizer will be able to overcome nutrient deficiencies more quickly, when compared to solid fertilizer. This is supported by its liquid form so that it is easily absorbed by soil and plants (Calvin, 2015).

Tea dregs which are usually thrown away and only become waste can be used as a mixture of planting media, because tea dregs contain various minerals such as organic carbon, copper (Cu) 20%, magnesium (Mg) 10% and calcium 13%. These contents can help plant growth. . Tea dregs also contain crude fiber, cellulose and lignin which can also be used by plants for growth (Nigrum, 2010).

Tea dregs as a planting medium mixture are useful for improving soil fertility. Apart from that, tea dregs can also be used as plant fertilizer and can stimulate the growth of roots, stems and leaves. This tea dregs is more

practical and more economical than other compost. Tea dregs have a high protein content reaching 27.42%. Other substances contained in tea dregs include caffeine 2.5-5.5%; theobromine 0.07-0.17%; and theophylline 0.002-0.013%, tannin 1.35% and crude fiber content of 23.01% (Wibowo, 2008).

Tea dregs contain antioxidant elements which are very effective in helping fight free radical damage to plant cells. Not only that, tea contains magnesium, zinc, fluoride, nitrogen, potassium, minerals, vitamins A, B1, B2, B6, B12, C, E and K to help maintain plant health. Before being sprinkled on the plants, the tea dregs are ground first to break down the leaves so that the nutrients contained come out more quickly (Adikasari, 2012).

EM4 treatment had a significant effect on observing plant height and number of leaves, but had no effect on observing stem diameter, leaf area, number of fruit, fruit weight and plant weight. EM4 can also increase soil fertility and improve the physical, biological and chemical properties of the soil. This does not have an effect on several observed variables because the microorganism content in EM4 is not yet sufficiently available so that the content provided is not completely absorbed by the plants.

The use of EM-4 is a technology that can be used in agricultural management efforts which can reduce negative impacts on the environment. EM-4 consists of a mixed culture of naturally living and beneficial microorganisms and can be applied as an inoculum to increase the diversity of soil and plant microorganisms. The role of soil microorganisms is to increase chemical transformations during the decomposition process, breaking down polysaccharides into carbon and water and stimulating the weathering of plant remains into smaller particles (Syafruddin and Safrizal, 2013).

Problem Formulation

Based on the background that has been described, the problem that is the focus of this research is as follows:

1. How does tea dregs affect the growth of cayenne pepper?
2. How does the amount of EM 4 affect the growth of cayenne pepper?

Research Objectives

Based on the problems that have been described, the objectives of this research are as follows:

1. To determine the effect of tea dregs on the growth of cayenne pepper
2. To determine the effect of the amount of EM 4 on the growth of cayenne pepper

Benefits of research

The benefit of this research is that solid manure is livestock manure in the form of solids, either uncomposted or composted, as a source of nutrients, especially nitrogen for plants and can improve the chemical, biological and physical properties of the soil. Composted manure from cow manure is highly recommended for all types of plants. . Not only is it useful for optimizing plant growth, using cow dung as fertilizer is also very environmentally friendly.

1.2IMPLEMENTATION METHODOLOGY

Research Place

This research was carried out by the Jl. Elak Workshop. Jeuleukat Blang Mangat. Lhokseumawe (near Brimop Company)

Tools and materials

Tools used

- Scales
- Hoe
- Scope
- Bag
- Bucket
- Wheelbarrow
- Polybag
- Cement spoon

Materials used

- Cow dung
- *Tea Dregs*
- *Effective Microorganisms* (EM4)
- Water
- Brown sugar

Fixed Variable

1. Yellow soil = 10 kg
2. Cow dung = 5 kg
3. Husk charcoal = 200 grams
4. Water = 2 liters

Dependent variable

1. Measurement of stem and leaf growth of cayenne pepper

1.2.5 Independent Variable

1. EM 4 (10 ml, 20 ml, 30 ml, 40 ml and 50 ml)
2. Tea dregs (50 grams, 100 grams, 150 grams, 200 grams, 250 grams)

Work Procedure for Making Fertilizer

1. Prepare yellow soil and weigh 5 kg
2. Then prepare 3 kg of cow dung then mix it with yellow soil
3. Then prepare 200 grams of husk charcoal and mix it
4. Add 10 ml of EM 4 into a bucket containing 2 liters of water and 100 grams of brown sugar then stir until dissolved (homogeneous)
5. Then add 50 grams of tea dregs and mix
6. Then pour the mixture into the ingredients, then stir until evenly mixed
7. If it is evenly distributed, put the material in a sack and store it in a place that is not exposed to the sun
8. Water every 7 days using water mixed with brown sugar to provide microorganisms in the fertilizer
9. Do it for up to 28 days

1.3 RESULTS AND DISCUSSION

Research Results

Table 1 of stem growth results for cayenne pepper plants weeks 1 to 5

No	Ampas Teh 50g	HST weeke 1 (cm)	HST weeke 2 (cm)	HST weeke 3 (cm)	HST weeke 4 (cm)	HST weeke 5 (cm)
1.	EM4 10ml	4,3	5,9	8,8	10,4	11,5
2.	EM4 20ml	3,6	5,5	9,5	10,9	11,6
3.	EM4 30ml	4	5,7	7,7	10,2	11,2
4.	EM4 40ml	4,8	6,6	7,5	9,9	10,9
5.	EM4 50ml	4,5	6	7,6	9,8	11,4

Describtion : Soil 5kg + *Tea Dregs* 50gram + EM4 10ml, Soil 5kg + *Tea Dregs* 50gram + EM4 20ml, Soil 5kg + *Tea Dregs* 50gram + EM4 30ml, Soil 5kg + *Tea Dregs* 50gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 50gram + EM4 50ml.

Table 2 of stem growth results for cayenne pepper plants weeks 6 to 10

No	Ampas Teh 50g	HST Minggu 6 (cm)	HST Minggu 7 (cm)	HST Minggu 8 (cm)	HST Minggu 9 (cm)	HST Minggu 10 (cm)
1.	EM4 10ml	12,5	13,8	14,4	14,9	15,4
2.	EM4 20ml	12,8	13,4	14,6	15	15,8
3.	EM4 30ml	12,5	13,2	13,9	14,6	15,3
4.	EM4 40ml	11,9	12,6	13,6	14,2	14,8
5.	EM4 50ml	11,6	12,4	13,2	13,8	14,4

Describtion : Soil 5kg + *Tea Dregs* 50gram + EM4 10ml, Soil 5kg + *Tea Dregs* 50gram + EM4 20ml, Soil 5kg + *Tea Dregs* 50gram + EM4 30ml, Soil 5kg + *Tea Dregs* 50gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 50gram + EM4 50ml.

Table 3 of stem growth results for cayenne pepper plants weeks 1 to 5

No	Ampas Teh 100g	HST weeke 1 (cm)	HST weeke 2 (cm)	HST weeke 3 (cm)	HST weeke 4 (cm)	HST weeke5 (cm)
1.	EM4 10ml	4,6	6,2	9,2	10,6	11,7
2.	EM4 20ml	3,9	5,8	9,8	11,4	11,9
3.	EM4 30ml	4,7	5,9	7,6	9,4	11,5
4.	EM4 40ml	5,5	6,9	7,8	10,4	11,6
5.	EM4 50ml	4,8	6,6	7,9	9,9	11,6

Describtion : Soil 5kg + *Tea Dregs* 100gram + EM4 10ml, Soil 5kg + *Tea Dregs* 50gram + EM4 20ml, Soil 5kg + *Tea Dregs* 50gram + EM4 30ml, Soil 5kg + *Tea Dregs* 50gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 50gram + EM4 50ml.

Table 4 of stem growth results for cayenne pepper plants weeks 6 to 10

No	Ampas Teh 100g	HST weeke 6 (cm)	HST weeke 7 (cm)	HST weeke 8 (cm)	HST weeke 9 (cm)	HST weeke 10 (cm)
1.	EM4 10ml	12,7	13,9	14,8	15,4	15,8
2.	EM4 20ml	13,4	13,6	14,8	15,2	15,8
3.	EM4 30ml	12,8	13,4	14,5	14,8	15,3
4.	EM4 40ml	12,3	12,5	13,7	14,4	14,9
5.	EM4 50ml	11,8	12,8	13,6	13,9	14,9

Describtion : Soil 5kg + *Tea Dregs* 100gram + EM4 10ml, Soil 5kg + *Tea Dregs* 100gram + EM4 20ml, Soil 5kg + *Tea Dregs* 100gram + EM4 30ml, Soil 5kg + *Tea Dregs* 100gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 100gram + EM4 50ml.

Table 5 of stem growth results for cayenne pepper plants weeks 1 to 5

No	Ampas Teh 150g	HST weeke 1 (cm)	HST weeke 2 (cm)	HST weeke 3 (cm)	HST weeke 4 (cm)	HST weeke 5 (cm)
1.	EM4 10ml	4,9	6,4	9,3	10,5	11,8
2.	EM4 20ml	3,7	5,9	9,9	11,8	11,9
3.	EM4 30ml	4,8	5,6	7,7	9,6	11,8
4.	EM4 40ml	5,6	6,8	7,6	10,8	11,5
5.	EM4 50ml	4,5	6,8	7,5	9,5	11,6

Describtion : Soil 5kg + *Tea Dregs* 150gram + EM4 10ml, Soil 5kg + *Tea Dregs* 150gram + EM4 20ml, Soil 5kg + *Tea Dregs* 150gram + EM4 30ml, Soil 5kg + *Tea Dregs* 150gram+ EM4 40ml, Soil 5kg + *Tea Dregs 1*50gram + EM4 50ml.

Table 6 of stem growth results for cayenne pepper plants weeks 6 to 10

No	Ampas Teh 150g	HST weeke 6 (cm)	HST weeke 7 (cm)	HST weeke 8 (cm)	HST weeke 9 (cm)	HST weeke 10 (cm)
1.	EM4 10ml	12,8	13,4	14,4	15,6	15,8
2.	EM4 20ml	13,2	13,6	14,2	15,5	15,9
3.	EM4 30ml	12,8	13,6	14,7	14,6	15,6
4.	EM4 40ml	12,5	12,8	13,9	14,6	14,8
5.	EM4 50ml	11,7	12,4	13,7	13,5	15,2

Describtion : Soil 5kg + *Tea Dregs* 150gram + EM4 10ml, Soil 5kg + *Tea Dregs* 150gram + EM4 20ml, Soil 5kg + *Tea Dregs* 150gram + EM4 30ml, Soil 5kg + *Tea Dregs* 150gram+ EM4 40ml, Soil 5kg + *Tea Dregs 1*50gram + EM4 50ml.

Table 7 of stem growth results for cayenne pepper plants weeks 1 to 5

No	Ampas Teh 200 g	HST weeke 1 (cm)	HST weeke 2 (cm)	HST week 3 (cm)	HST weeke 4 (cm)	HST weeke 5 (cm)
1.	EM4 10ml	4,7	6,3	9,3	10,7	11,8
2.	EM4 20ml	3,6	5,9	9,5	11,5	11,7
3.	EM4 30ml	4,8	5,5	7,4	9,2	10,8
4.	EM4 40ml	5,6	6,8	7,7	10,5	10,6
5.	EM4 50ml	4,5	6,7	7,9	9,8	11,6

Describtion : Soil 5kg + *Tea Dregs* 200gram + EM4 10ml, Soil 5kg + *Tea Dregs* 200gram + EM4 20ml, Soil 5kg + *Tea Dregs* 200gram + EM4 30ml, Soil 5kg + *Tea Dregs* 200gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 200gram + EM4 50ml.

Table 8 of stem growth results for cayenne pepper plants weeks 6 to 10

No	Ampas Teh 200g	HST weeke 6 (cm)	HST weeke 7 (cm)	HST weeke 8 (cm)	HST weeke 9 (cm)	HST weeke 10 (cm)
1.	EM4 10ml	12,9	13,6	14,6	15,7	15,9
2.	EM4 20ml	13,3	13,5	14,5	15,8	16,2
3.	EM4 30ml	12,4	13,7	14,2	14,7	15,7
4.	EM4 40ml	12,6	12,7	13,6	14,5	14,9
5.	EM4 50ml	11,4	12,5	13,8	14,8	15,4

Describtion : Soil 5kg + *Tea Dregs* 200gram + EM4 10ml, Soil 5kg + *Tea Dregs* 200gram + EM4 20ml, Soil 5kg + *Tea Dregs* 200gram + EM4 30ml, Soil 5kg + *Tea Dregs* 200gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 200gram + EM4 50ml

Table 9 of stem growth results for cayenne pepper plants weeks 1 to 5

No	Ampas Teh 250g	HST Weeke 1 (cm)	HST weeke 2 (cm)	HST Weeke 3 (cm)	HST weeke 4 (cm)	HST Weeke5 (cm)
1.	EM4 10ml	4,9	6,6	9,5	10,3	10,8
2.	EM4 20ml	3,5	5,7	9,6	10,2	11,2
3.	EM4 30ml	4,6	5,6	7,5	9,3	10,5
4.	EM4 40ml	5,7	6,9	7,6	10,5	10,8
5.	EM4 50ml	4,7	6,4	8,2	9,9	11,2

Describtion : Soil 5kg + *Tea Dregs* 250gram + EM4 10ml, Soil 5kg + *Tea Dregs* 250gram + EM4 20ml, Soil 5kg + *Tea Dregs* 250gram + EM4 30ml, Soil 5kg + *Tea Dregs* 250gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 250gram + EM4 50ml.

Table 10 of stem growth results for cayenne pepper plants weeks 6 to 10

No	Ampas Teh 250g	HST weeke 6 (cm)	HST weeke 7 (cm)	HST weeke 8 (cm)	HST weeke 9 (cm)	HST weeke 10 (cm)
1.	EM4 10ml	13,1	13,4	14,3	15,4	15,8
2.	EM4 20ml	13,4	13,6	14,7	15,3	16,1
3.	EM4 30ml	12,5	13,6	14,3	14,6	15,8
4.	EM4 40ml	12,5	12,9	13,7	14,4	14,8
5.	EM4 50ml	12,8	12,4	13,4	13,7	15,6

Describtion : Soil 5kg + *Tea Dregs* 250gram + EM4 10ml, Soil 5kg + *Tea Dregs* 250gram + EM4 20ml, Soil 5kg + *Tea Dregs* 250gram + EM4 30ml, Soil 5kg + *Tea Dregs* 250gram+ EM4 40ml, Soil 5kg + *Tea Dregs* 250gram + EM4 50ml.

1.4 Discussion

In research on making solid organic fertilizer using basic ingredients from cow dung, husk charcoal, yellow soil and brown sugar, which are varied with different fermented ingredients including:

1. Using fermented ingredients with tea dregs
2. Using fermented ingredients with EM 4

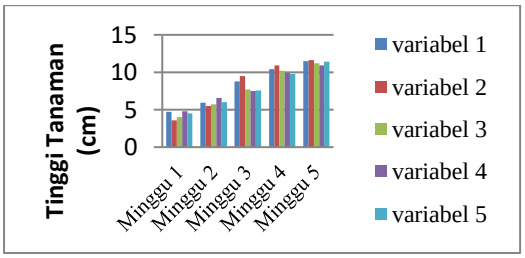
Composting is carried out using fermented material EM4, Tea Dregs and mixing all the raw materials with a material composition based on research variables. The material is then doused with EM4 which has been mixed with water so that the material becomes moist and stored closed

Composting is carried out for 4 weeks and also watering EM4 by mixing with water once a week, when watering it should not be done too

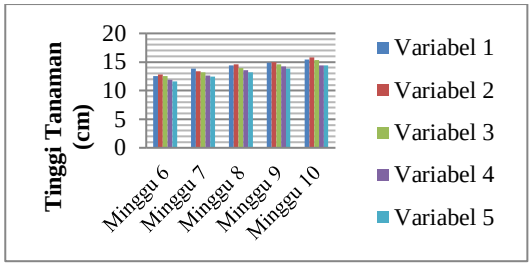
much, just moisten the soil with fertilizer. After completing the composting stage for 4 weeks, the researcher will try/examine the effect of Em4 and tea dregs on the growth of cayenne pepper plants, therefore the research will carry out sowing in 6x7 cm polybags using core seeds SKPB No.040/Pd/DYA/4.2015

At the seeding stage, researchers varied the cayenne pepper seeds with different variable fertilizers, therefore each seeding was carried out in 5 polybags with the same variables in order to prevent death or failure to grow. This means that researchers tested the growth of cayenne pepper on 5 different variables. After the chili seeds have been sown in polybags, they must be placed in a closed place to avoid rain and midday sun, and watering will also be carried out twice a day every morning.

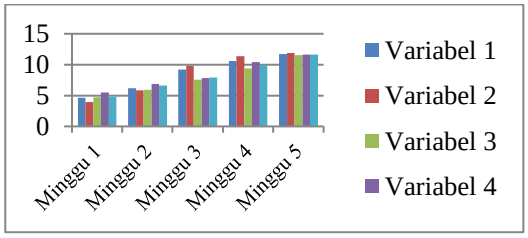
The growth rate of cayenne pepper plants is measured every 1 week at intervals of 1, 2, 3, to 15 weeks after planting the cayenne peppers.



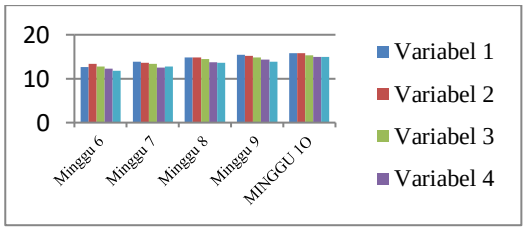
Graph 1 Growth process of chili plants for each variable from Weeke 1 to Week 5



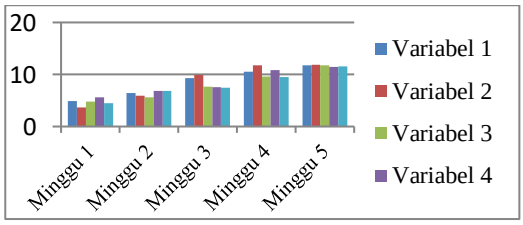
Graph 2 Growth process of chili plants for each variable from Weeke 6 to Week 10



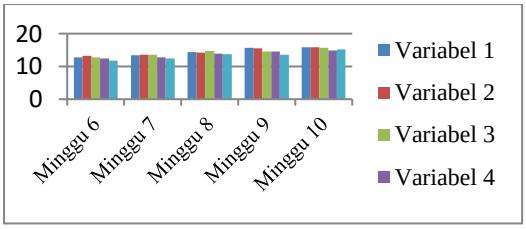
Graph 3 Growth process of chili plants for each variable from Week 1 to Weeke 5



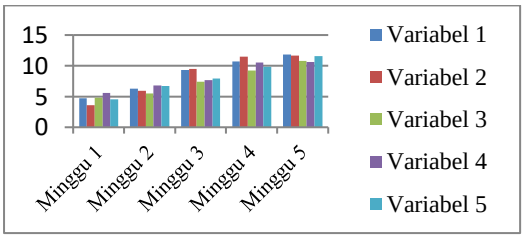
Graph 4 Growth process of chili plants for each variable from Weeke 6 to Week 10



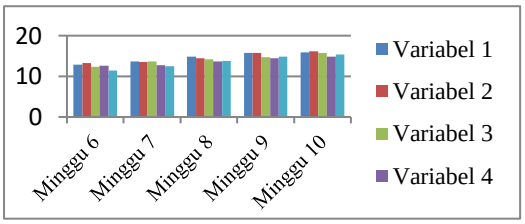
Graph 5 Growth process of chili plants for each variable from Week 1 to Weeke 5



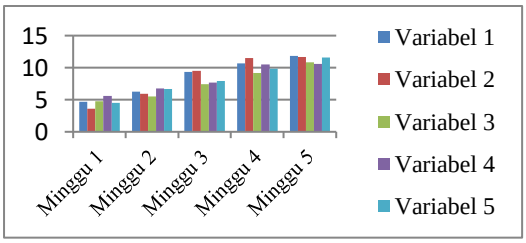
Graph 6 Growth process of chili plants for each variable from Week 6 to Weeke 10



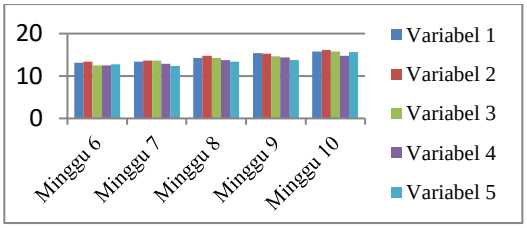
Graph 7 Growth process of chili plants for each variable from Weeke 1 to Week



Graph 7 Growth process of chili plants for each variable from Weeke 6 to Week 10



Graph 8 Growth process of chili plants for each variable from Weeke 1 to Week 5



Graph 9 Growth process of chili plants for each variable from Weeke 6 to Week 10

The growth rate of cayenne pepper plants (Capsicum Frutencens L) was measured every 1 week at intervals of 1, 2, 3, 4 to 10 weeks after planting the cayenne peppers. Plant growth is measured by measuring the height of the plant from the top of the ground to the top of the highest leaf

1.5 Conclusion

Conclusion

1. The results of the influence of tea dregs on this measurement show that a dose of 10 ml/ 250 grams is superior in the growth of cayenne pepper stems.
2. The results of the effect of EM4 on this measurement show that a dose of 25 ml/ 250 grams is superior in the growth of cayenne pepper leaves

Suggestions

1. The research I did is very good for stem growth. In the future, other starters besides tea dregs and EM4 can be used to increase the fruit of cayenne pepper plants.

2. In the future, if you use the EM4 fermentation method and tea dregs, make changes to the application of fertilizer for ornamental plants to other plants such as

cayenne pepper, cassava, rice and corn to increase their content.

BIBLIOGRAPHY

[1] A. Abdullah, H. M. Ali, and J. A. Syamsu. Status of sustainability of adoption of livestock waste processing technology as organic fertilizer. Pulpit Journal, 31. 1 (2015): 11-20.

[2] A. Ratriyanto, SD Widyawati, WPS Suprayogi, S. Prastowo and N. Widyas. Making organic fertilizer from livestock manure to increase agricultural production. *Journal Semar* , 8.1 (2019):9 – 13.

[3] Anonymous. 2000. Organic Agriculture. *Department of Agriculture of the Republic of Indonesia: Jakarta*

[4] Anonymous. 2001. Guidelines for the Integrated Dry Land Participation Development Program (P3TLK). *At the Bimas High Rectorate: Jakarta*

[5] Djuarni, N. 2005. *A Quick Way to Make Compost* . Agromedia Pustaka, Jakarta. Higa, T. and Wididana. 1994. Effective Microorganism Technology. Kopkar

[6] D. Nenobesi, W. Mella, and P. Soetedjo. Utilization of livestock manure compost solid waste in increasing the environmental carrying capacity and biomass of green bean plants (*Vigna radiata* L.). *Food Journal* , 26. 1 (2017): 43 –56..

[7] E. Sutrisno and IB Priyambada. Making solid compost from cow dung waste using the fermentation method using the Starbio bioactivator in Ujung - Ujung Village, Pabelan District, Semarang Regency. *Journal of Pasopathy* , 1 . 2 (2019) : 77-79.

[8] Fagi, AM and Las, I. 2007. Equipping farmers with advanced technology based on local wisdom in the era of a sustainable green revolution. In: Kasryno, F, Pasandaran, E, and Fagi, AM (Eds). Turning the Tide Reaps Farmers' Independence. Indonesian Rice Foundation. Jakarta

[9] Hardjowigeno, Sarwono. 2003. Soil Science . *Publisher Akademika Pressindo: Jakarta*

[10] Hapsoh1*, Wardati1, Gusmawartati1, AYP 1Program. 2018. Testing the Combination of Compost Raw Materials and Several Decomposers on Compost Quality

[11] L. Trivana, AY Pradhana and AP Manambangtua. Optimization of composting time for manure from goat manure and coconut fiber dust with *EM4 bioactivator. Journal of Environmental Science and Technology*, 9. 1 (2017): 16-24.

[12] Mulyatun. Renewable energy sources and organic fertilizer from cow dung waste, *Dimas Journal* , 16.1 (2016): 191-214.

[13] Mulyatun. Renewable energy sources and organic fertilizer from cow dung waste, *Dimas Journal* , 16.1 (2016): 191-214.

[14] NA Fitriyanto, S. Triatmojo1, A. Pertiwiningrum1, Y. Erwanto1, MZ Abidin1, E. Baliarti, and YY Suranindyah. 2015. Counseling and assistance in processing beef cattle livestock waste in the Sido Mulyo livestock farmer group, Pulosari Hamlet, Jumoyo Village, Salam District, Magelang Regency. *Indonesian Journal of Community Engagement*, 01. 01 (2015): 79-95.

[15] Nisa, K. 2016. Producing compost & Local Micro Organisms (MOL). Bibit Publisher, Jakarta, 130 h.

[16] Prabeli. 2002. Growing Organic Vegetables in Gardens, Pots and Polybags. *Spreader Self-Help: Jakarta*

[17] Sukamta, MA Shomad and A. Wisnujati. Management of Cattle Waste into Commercial Organic Fertilizer in Kalipucang Hamlet, Bangunjiwo, Bantul, Yogyakarta. *Independent Journal* . 5.1 (2017) : 1-10.

[18] Sutanto, Rachman.2002. Organic Agriculture, Towards Alternative and Sustainable Agriculture. *Kanisius Publisher: Yogyakarta*

[19] SP Nugraha and FN Amini. Utilization of Cow Manure into Organic Fertilizer. *Journal of Innovation and Entrepreneurship* , 2. 3 (2013): 193-197.

[20] Winarso, Sugeng. 2005. Soil Fertility, Basics of Soil Health and Quality. *Publisher Gava Media: Yogyakarta*

[21] Wididana, GN 1994. Application of Effective Microorganisms (EM) and Bokashi on Natural Farming. Kyusei Nature Farming Bulletin 03 (2): 47-54.