

Dosage and Frequency Test of Liquid Organic Fertilizer Banana Hump to Results and Growth of Cauliflower (*Brassica Oleraceae L.*)

Dyah Roeswitawati

Muhammadiyah University of Malang

Jl. Raya Tlogomas 246 Malang

*Corresponding author E-mail: dyroeswita@yahoo.com

Abstract

Increasing crop production through organic farming is a step to safeguard the environment from contaminating the use of chemicals. The application of organic farming is plant cultivation, one of which uses organic fertilizer. Organic fertilizers are fertilizers derived from organic materials in the form of plant residues and animal / human feces that have undergone a decomposition process so that they can be utilized by plants. Banana humps are one of the organic ingredients which contain microbial decomposers and hormones, so that it can be used as an ingredient in making organic fertilizer. The research was done on December 2014 till February 2015 at UMM experiment station. The research covers dose and application time of organic fertilizer liquid. Organic fertilizer made from banana hump mixed with rice water and molasses by comparison 5 kg : 25 liters : 1 liter then fermented for 3 weeks. Dose of organic fertilizer is 5 ml / plant ; 10 ml / plant, the frequency of giving organic fertilizer is once a week ; 2 weeks ; 3 weeks and 4 weeks. The results showed that there was an interaction between dose treatment and organic fertilizer application on the growth and yield of cauliflower so any changes of organic fertilizer dose will effect to application times and variable growth. Treatment combination dose organic fertilizer 5 ml/plant frequency 3 weeks or 7,5 ml/plant frequency 2 weeks are good treatment so recommended dosage and time of application.

Keywords: banana hump, liquid organic fertilizer, cauliflower

1. Introduction

Cauliflower plant is one of the most popular vegetables because it contains vitamins and minerals needed for the needs of the human body. This plant can grow in the highlands and produce flowers (Anonymous. 2015a). Organic fertilizer is a fertilizer derived from organic material, such as forage (straw, banana stems, and other forage) and animal feces (feces of goats, cows, chickens, rabbits, buffalo, etc.). The organic fertilizer liquid has several benefits such as to encourage and enhance the formation of chlorophyll of leaves and the formation of nodules on the plant Leguminosae thus improve plant photosynthesis and the absorption of nitrogen from the air, can increase the vigor of plants so that the plants become stronger and stronger, increase plant resistance to drought, weather stress and disease-causing pathogens (Suhastyo and Arum Asriyanti. 2011), stimulate the growth of branches of production, as well as increasing the formation of flowers and ovaries, as well as reduce the death of the leaves, flowers and fruit. These problems have been attempted forms of alternative technologies to reduce the use of inorganic fertilizer by utilizing the material or organic fertilizers (Anonymous. 2015b ; Gary Strobel, et al.,2004), such as liquid organic fertilizer banana hump (Maspariy, 2012) .

The research aimed to know the dose and time of giving of liquid organic fertilizer banana hump to growth and yield cauliflower (*Brassica oleracea L.*)

2. Method

The research was conducted in the experimental farm of Muhammadiyah University of Malang Tegalondo village in December 2014 until February 2015. Is a randomized factor factor experiment, factor 1 is the dose of liquid organic fertilizer and the second factor is the time of administration. The dose of liquid fertilizer is 5 ml/ plant (D1) and 7,5 ml/ plant (D2) and the time of administration is every weeks (A1) ; every two weeks (A2) ; every three weeks (A3) and every four weeks (A4).

The process of making liquid fertilizer banana hump

Liquid fertilizer banana hump made by mixing banana hump, rice water and molasses. The comparison is 5 kg of banana hump that have been cleaned first, 25 liters of rice water and 1 liter of molasses. All ingredients are mixed and placed on a plastic bucket, after all the ingredients are mixed and then fermented for 21 days. After the fermentation process or 21 days later the material is filtered, the dross is removed and the filtrate is used as liquid fertilizer.

Preparation and plot making



Soil treated with a depth of 30 cm and then made a plot with the size of 1 m x 1 m, the distance between plots 40 cm. Seedling is done on seedbag filled with mixture media of soil and pigeon pruner with ratio 1: 1, seed of cabbage planted by way of sprinkling on the surface of soil. Seeds that have been aged 28 days or have leaves 3 sheets planted with spacing of 30 cm x 30 cm

Application of liquid organic fertilizer banana hump

Application of liquid organic fertilizer banana hump in accordance with the treatment dosage, ie : D1 (5 ml / plant), D2 (7,5 ml / plant), granted in accordance with the treatment time is W1 (once a week), W2 (2 weeks), W3 (3 weeks) and W4 (4 weeks). Timing starts when the plant cauliflower was 14 days after planting

3. Results and Discussion

3.1. Results

3.1.1. Number of Leaves

There is interaction between treatment dosage and application time liquid fertilizer of banana hump to leaves number cauliflower, combinations dosage of 5 ml / plant applied every 4 weeks and the dosage of 7.5 ml / plant applied every two weeks to produce the number of cabbage leaves flowers most are 29 leaves per plant. The result of the amount of interest due cabbage leaf treatment dosage and application time of of liquid fertilizer banana hump is presented in Figure 1

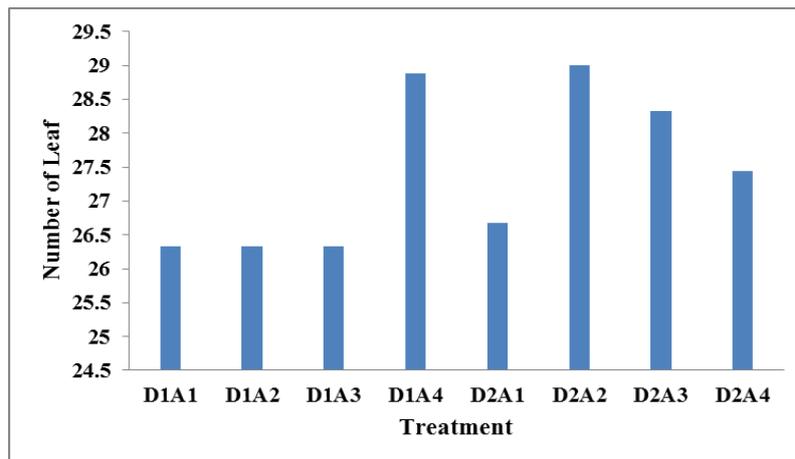


Figure 1: Average number of leaves due to dose treatment and when applying of banana liquid fertilizer hump

3.2. Plant Height

There is interaction between treatment dosage and application time of liquid fertilizer banana hump cabbage flowers on the plant height, the combination treatment dosage of 5 ml / plant applied once every 2 weeks as well as a dosage of 7.5 ml / plant applied every 2 weeks is a high-yielding crop good ie 62 cm - 63 cm. The result of the amount of interest due cabbage leaf treatment dosage and application time of of liquid fertilizer banana hump is presented in Figure 2

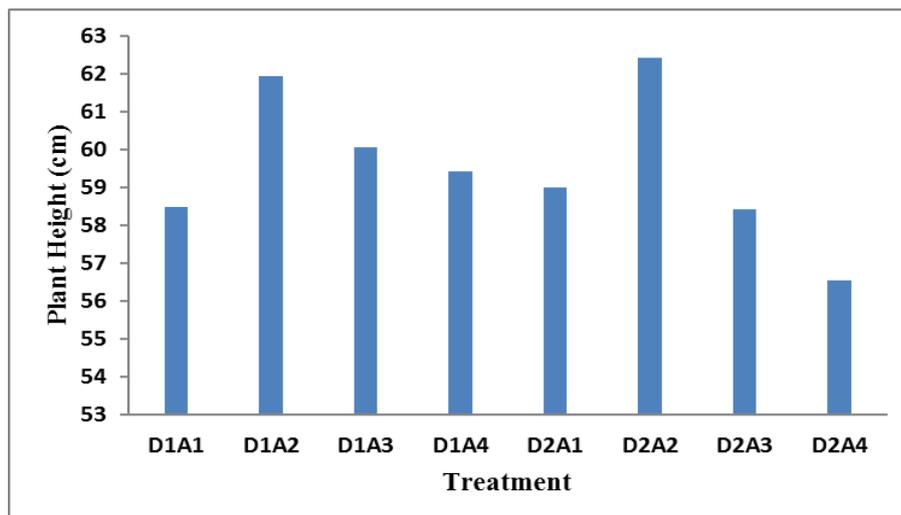


Figure 2: Average cauliflower plant height due to dose treatment and when applying of banana liquid fertilizer hump

3.3. Leaf Area (cm² / Plant)

There is interaction between treatment dosage and application time of liquid fertilizer on banana hump cabbage flower plant leaf area, the combination treatment dosage of 5 ml / plant applied every 3 weeks showed the highest leaf area cauliflowers then ddikuti treatment as well as a dosage of 7.5 ml / plants applied every other week. Results cabbage leaf area of interest as a result of the treatment dosage and application time of of liquid fertilizer banana hump is presented in Figure 3

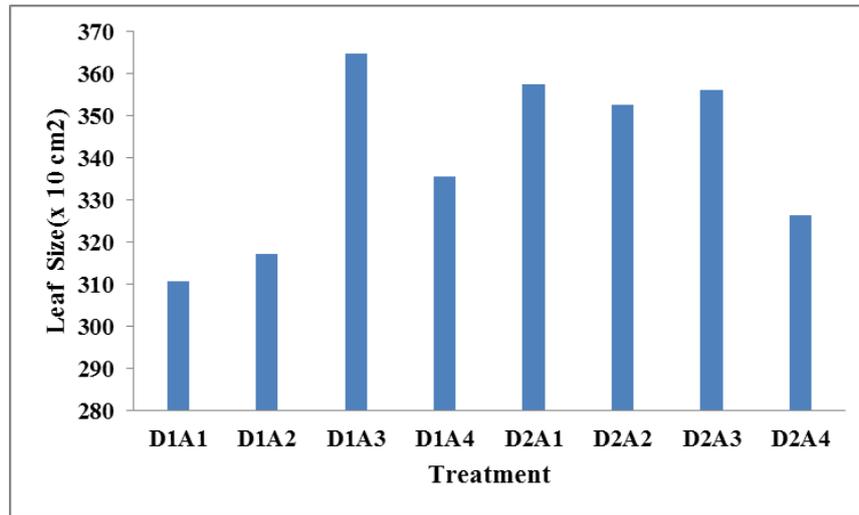


Figure 3: Average cauliflower leaf area due to dose treatment and when applying of banana liquid fertilizer hump

3.2. Weight of Flowers

There is interaction between treatment dosage and application time of of liquid fertilizer banana hump against the weight of flowers cauliflower, combination dosage of 7.5 ml / plant applied once every 2 weeks is a combination of the best treatment for produce heavy interest cauliflower per plant was the largest of more than 250 grams per plant. Results cauliflower flowers weight due to dosage and application time of of liquid fertilizer banana hump is presented in Figure 4.

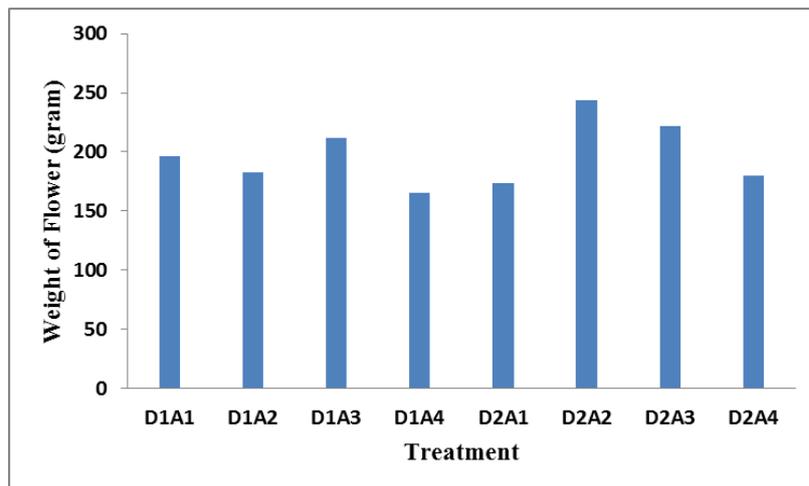


Figure 4: Average weight of cauliflower flowers due to dose treatment and when applying of banana liquid fertilizer hump

3.2.1. Fresh Weight of Cauliflower Plants

There is interaction between treatment dosage and application time of of liquid fertilizer on banana hump total wet weight of cabbage plants flower, the combination dosage of 7.5 ml / plant applied once every 2 weeks is a high yield a good crop of 500 grams per plant. The results of the total wet weight kobis interest due to dosage and application time of of liquid fertilizer banana hump is presented in Figure 5.

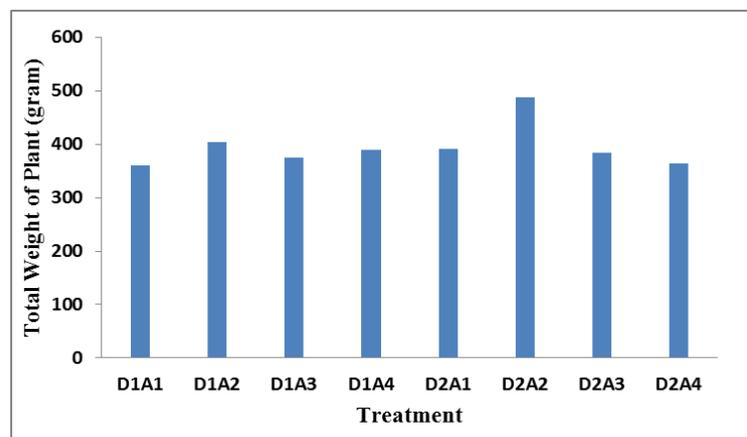


Figure 5: Average total weight of the cauliflower plant due to dose treatment and when applying of banana liquid fertilizer hump

3.2.2. Diameter Flowers

There is interaction between treatment dosage and application time of of liquid fertilizer to flower diameter banana hump cauliflower, combination dosage of 7.5 ml / plant applied every 2 to produce diameter of the largest cauliflower flower crop is 25 cm. Results cauliflower flower diameter due to the dosage and application time of of liquid fertilizer banana hump is presented in Figure 6.

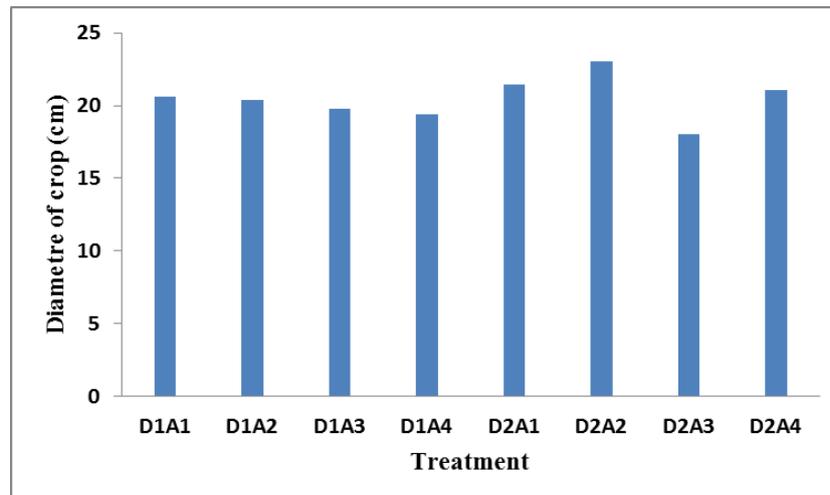


Figure 6: Average diameter of cauliflower flowers due to dose treatment and when applying of banana liquid fertilizer hump

4. Discussion

According to the result showed that there is interaction between dosage and frequency liquid organic fertilizer banana hump to growth and result cauliflower. Dosage liquid organic fertilizer 5 ml/plant with frequency 3 weeks time and 7,5 ml/plant with frequency 2 weeks time are good treatment. Liquid organic fertilizer has several benefits such as to encourage and enhance the formation of chlorophyll of leaves and the formation of nodules on the plant Leguminosae thus improve plant photosynthesis and the absorption of nitrogen from the air, can increase the vigor of plants so that the plants become stronger and increase plant resistance to drought, weather stress and disease-causing pathogens, stimulate the growth of branches production, as well as increasing the formation of flowers and ovaries, as well as will reduce the death of the leaves, flowers and fruit (Anonymous, 2015). Quality liquid manure can predicated of the ratio between the amount of carbon and nitrogen (C / N ratio). The amount of carbon and nitrogen, if ratio of C/N high, meaningful constituents of liquid fertilizer has not decomposed completely. If the materials of C / N ratio is high, will break down or decompose much longer than the feedstock C / N is low. Liquid fertilizer quality is considered good if it has a C / N ratio between 12 - 15. The nutrient content in liquid fertilizer depend to the type of materials used and the organic material. Liquid organic fertilizer can improve nutrient total. Increasing of N-total on the ground due to the provision of nitrogen derived from organic compounds and produce organic acids (Sholah, 2014)

Part of banana plants from the roots to the leaves have many benefits, especially that many people are consumed fruit. Other parts of banana plants, namely the heart, stem, fruit skins, and the hump is rarely used and thrown away into the waste bananas. Banana hump contains many microbes decomposing organic matter (Maspariy, 2012). According to some literature that banana hump containing plant growth regulator Gibberellin and cytokines. In addition, the banana hump containing many microorganisms which are very useful for the plant, namely: Azospirillum, Azotobacter, Bacillus, Aeromonas, Aspergillus, microbes and microbial selulolitik phosphate solvent. Local microorganism in banana hump could be used for decomposer or accelerate the composting process (Shani, et al., 2010). Local microorganisms is a microorganism that is made of natural materials as a medium for the development of useful microorganisms to accelerate the destruction of organic materials (decomposition). In addition, it also can serve as additional nutrients for the plants, which are developed from microorganisms that are in place.

In addition using microorganism for rice cultivation is to fertilizer functioning, as well as pest control agents. Microorganism decomposer has solution a dual role in the cultivation of organic rice farming, which is as organic fertilizer and as organic pesticides, especially as fungicides (Santosa, E. 2008). Preparation of microorganism decomposer have to go through a fermentation process using coconut water or sugar. Long fermentation process materials microorganism decomposer approximately 10-15 days (Rahmi,A. and Jumiati. 2007)

Anonymous 2015c : factors that affect microbial growth and is a source of natural microorganism included : moisture, aeration, temperature, energy source (organic matter), acidity (pH) and the addition of inorganic material. Source natural microorganism also determine the number of microbes that grow as the source of microorganism as raw material providers that would be bacteria grown (Suhastyo, 2011). Humidity according to the bacterial growth is between 60-80%. Aeration aims to provide good conditions for microbial growth, which is to supply gas O₂ and CO₂ that determines the type of microbes that grow aerobically or anaerobically. The temperature of the growth of bacteria is in the range of 15-45oC, while in mesophyll temperature (25-35oC) growth at most.

The degree of acidity (pH) optimum for bacteria growth between 6.5-7.5. The role of soil microbes to plants, namely:

- Increasing the content of some nutrients in the soil.
- Increasing the availability of nutrients in the soil.
- Improving the efficiency of nutrient absorption.
- Pressing microbial soil borne pathogens through interaction competition.
- Producing growth regulators to enhance the development of the root system of plants.

Increase the activity of beneficial soil microbial heterotrophic through the application of organic matter.

Fertilization is important factor to plant growth and development. Shortage of fertilizer on crops can cause poor plant growth in vegetative and generative phase so as to cause a decline in crop production or the end result. The improver time of fertilization to plants can

lead to deficient or excess plant growth and yield that was not optimal. Therefore, it is necessary concentration proper and appropriate frequency in order to obtain maximum results. Basically liquid fertilizer can be done in two ways: by directly to the ground and sprayed onto the leaves. Advantages fertilizing through leaf absorption of nutrient elements of fertilizer more efficiently compared with fertilization through the soil. Fertilization liquid fertilizer through the soil is running away (leaching) by water. According to Rahmi,A. and Jumiati (2007) research that the liquid organic fertilizer is also a practical gift, because this fertilizer can be applied together with the use of pesticides. Liquid organic fertilizer has advantages such as: easy to make, cheap, no residual effects for the environment as well as plants, can also used to pests control on the leaves (biocontrol) like caterpillars on vegetable crops. According to (Gary Strobel et.al., 2004) superiority of organic fertilizer such as compost is due to the activity of microorganisms and the formation of organic acids in the decomposition process, so that the solubility of the elements N, P, K, and Ca becomes higher and available to plants.

5. Conclusion

The results showed that there was an interaction between dose treatment and organic fertilizer application on the growth and yield of cauliflower so any changes of organic fertilizer dose will effect to application times and variable growth. Treatment combination dose organic fertilizer 5 ml/plant frequency 3 weeks or 7,5 ml/plant frequency 2 weeks are good treatment so recommended dosage and time of application

Acknowledgments

This research was carried out on funds from the Muhammadiyah University of Malang, for this reason, the authors say many thanks for the facilities that have been given, so that the research can run smoothly

References

- [1] Andoko, A. 2002. *Budidaya Padi secara Organik*. Penebar Swadaya. Jakarta, 96 Halaman.
- [2] Anonymous. 2015a. *Kumpulan Informasi Tentang Pertanian Kehutanan Peternakan dan Perikanan*. (online). From <http://www.info-penyuluh.blogspot.co.id> (Accessed on 2 Agustus 2015).
- [3] Anonymous. 2015b. *Recycle Work Compost : A Program of San Mateo County* (online) From <http://www.recyclework.com>. (Accessed on 5 Agustus 2015).
- [4] Anonymous. 2015c. *Jenis dan Macam Pupuk*. (online). Pusat Info Pertanian From <http://www.agroteknologi.web.id> (Accessed on 5 Agustus 2015).
- [5] Gary Strobel, Bryn Daisy, Uvidelio Castillo, and James Harper. 2004. *Natural Product from Endophytic Microorganism*. American Chemical Society and American Society of Pharmacognosy. *Journal of Natural Product* (online). From <http://pub.acs.org/pdf> (Accessed on 3 Oktober 2016).
- [6] Maspari, 2012. *Apa Kehebatan MOL Bonggol Pisang*. <http://www.gerbangpertanian.com> (accessed on 15 July 2014)
- [7] Rahmi,A. dan Jumiati. 2007. *Pengaruh Konsentrasi dan Penyemprotan Pupuk Organik Cair Super ACI Terhadap Pertumbuhan dan Hasil Jagung Manis*. *Fak. Pertanian UNTAG 1945 Samarinda. Agritrop* 26 (3) : 105 – 109. (online), From <http://unud.ac.id/pdf> (Accessed on 30 Oktober 2016).
- [8] Santosa, E. 2008. *Peranan Mikroorganisme Lokal dalam Budidaya Tanaman Padi Metode SRI (System of rice Intensification)*. Workshop Nasional SRI Dir. Jen. Penegloalaan Lahan dan Air, Deptan. Jakarta.
- [9] Shani, E.H., Ben-Gera, S. Shleizer-Burko, Y. Burko, D. Weiss, N. Ori. 2010. *Cytokinin Regulates Compound Leaf Development in Tomato*. *The Plant Cell* (22) : 3206-3217.
- [10] Sholah, A.A. 2014. *Pengertian dan Manfaat Mikroorganisme Lokal*, (online) From <http://www.caragampang.com> (Accessed on 2 Agustus 2016).
Metode SRI. Tesis Pasca Sarjana. IPB. Bogor.
- [11] Suhastyo dan Arum Asriyanti. 2011. *Studi Mikrobiologi dan Sifat Kimia Mikroorganisme Lokal (MOL) yang Digunakan Pada Budidaya Padi*