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Techniques for Manufacture and Utilizing Liquid Organic Fertilizer (LOF) in Student Field Work Practices at the Gemilang Indah Tunas Utama Institute East Lombok

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Abstract: This article is based on a practical fieldwork report from students of the Environmental Sciences Studies Program, Faculty of Mathematics and Natural Sciences, Mataram University at the Gemilang Indah Tunas Utama Institute, East Lombok. Student field work practice is a form of effort to increase the relevance between the theory obtained in lecture classes and practical work experience in the field. So in this way, students apart from gaining increased competence in certain academic fields also gain work experience which can improve managerial qualities, both hard skills and soft skills. The program that students participate in in this field work practice is the manufacture and use of liquid organic fertilizer (LOF). The method used for this activity includes lectures, discussions and practice accompanied by supervisors from the Research Division, Gemilang Indah Utama Institute, East Lombok and guided by lecturers from the Environmental Science Study Program, Mataram University. LOF Manufacture requires ingredients such as fruit peels and rotten fruit, banana stems, egg shells, lamtoro leaves and many more, the contents of which were previously known. The results show that the performance achievements of practical students are considered very satisfactory. Performance assessed includes practical employer satisfaction, discipline, enthusiasm, thoroughness, ability to choose priorities, ability to collaborate, ability to work independently, ability to absorb new things, and analytical ability. After participating in practical field work, students truly master the theory and are trained in selecting quality materials, making liquid organic fertilizer, preparing plant planting media in the form of direct land or plant media in plastic bags, making vegetable pesticides and applying liquid organic fertilizer.

Key words: Botanical Pesticide, LOF, Manufacture And Application

Introduction

Indonesia is a country that has the potential to become an agricultural country because the land used as agricultural land is fertile land, besides that Indonesia is in a tropical climate so it gets sufficient sunlight and high rainfall intensity. When using rice fields, farmers usually plant several species of food crops according to the season, such as rice, corn, chilies and other types of vegetables. When caring

for plants, of course farmers fertilize to provide nutrients to the plants. There are several synthetic chemical fertilizers commonly used by farmers, namely Urea (Ammonium Urea), ZA (Zwavelzure Ammonium), SP36 (Superphosphate), KCl (Potassium Chloride), ZK (Zwavelzure Kali), NPK PHONSKA (nitrogen phosphate-potassium) and Dolomite (carbonate lime) and many other chemical fertilizers are often used (Andriyani *et al*., 2022).

Providing chemical fertilizers can indeed meet the nutrient needs of plants. Plants need macro nutrients and micro nutrients for their growth. The nutrients that are most needed are macro nutrients consisting of nitrogen (N), phosphorus (P), potassium (K), sulfur (S), calcium (Ca), and magnesium (Mg). Thus, fertilization using synthetic chemicals can indeed increase plant production. However, continuous use of synthetic chemical fertilizers can actually have a bad impact on soil quality, namely the condition of the soil becomes hard and damaged, the soil pH decreases, the soil becomes poorer in macro and micro nutrients, and not all fertilizer components can be absorbed by plants, no is easily degraded so that it becomes a toxic component in the soil and causes a reduction in microorganisms in the soil (Adetiya *et al*., 2017; Fauzan *et al*., 2021). This problem is what drives farmers to need new innovations in the use of environmentally friendly fertilizers, namely natural fertilizers that can reduce the use of synthetic fertilizers.

Organic fertilizer, as a type of natural fertilizer, whether from animals or plants or a combination of both, usually has biodegradable properties, so it is not permanently toxic after being applied in the field. Some organic fertilizers are in solid form and some are in liquid form. The use of solid organic fertilizer is usually used for direct fertilization without storage which requires quite a large space (Agustina *et al*., 2021; Iqlima & Rachmawati, 2023). For this reason, farmers generally prefer to choose liquid organic fertilizer for storage or fertilizer stock purposes before use. This is because storing liquid organic fertilizer does not require a large space, besides having a more complete nutritional content and being more ready to use because the content is partly the result of fermentation.

Organic fertilizer plays an important role in ensuring the sustainability of agricultural land use. Organic fertilizer can ensure soil fertility, increase the population of microorganisms, increase water absorption and retention capacity. Other advantages of liquid organic fertilizer when compared to solid organic fertilizer include being able to overcome nutrient deficiencies quickly, not causing problems in leaching nutrients, being able to provide nutrients quickly to plants and having a binding agent so that it can be directly absorbed by plants. POC also contains microorganisms, which are rarely found in solid and dry organic fertilizers (Amir *et al*., 2021; Hukma *et al*., 2022).

Several reports have mentioned the various benefits and uses of this POC, namely, among other things, it can encourage and increase the formation of leaf chlorophyll and the formation of root nodules in legume plants, thereby increasing the photosynthetic ability of plants and absorbing nitrogen from the air, increasing plant vigor so that plants become sturdy and strong. Plants are resistant to drought, weather stress and attacks by disease-causing pathogens, stimulate the growth of production branches, increase the formation of flowers and fruit ovaries, and reduce the fall of leaves, flowers and fruit ovaries (Agustina *et a*l., 2021; Suhadiyah *et al*., 2018).

Knowledge about various materials, both vegetable and animal, used to make liquid organic fertilizer is usually presented in lectures on campus. Likewise, the advantages over chemical fertilizers are usually discussed in class. Meanwhile, manufacturing and application practices are usually carried out in related companies outside the campus. For this reason, even though students have attended lectures on natural fertilizers, they still need to carry out practical work on natural fertilizers in the field. In this way, students gain more complete knowledge and more advanced skills regarding the manufacture and application of liquid organic fertilizer.

Methods

Time and place

Student field work practice has been carried out for four weeks, from 20 June to 20 2023 at the Gemilang Indah Tunas Utama (GITU) company, East Lombok.

Implementation of activities

The stages of student field practice activities wera carried out in accordance with the implementation schedule for making and applying liquid organic fertilizer which is currently being implemented at Gemilang Indah Tunas Utama, East Lombok. The stages and activity materials followed by practicum students can be seen in Table 1.

Table 1. Stages of student practical activities regarding the manufacture and application of liquid organic fertilizer in the Gemilang Indah Tunas Utama institute, East Lombok.

No.	Activities	Week:			
		1	2	3	4
1.	Introduction to the practical work environment	x			
2.	Research field orientation	x			
3.	Preparation and slicing of materials for making POC		x		
4.	Pre-harvest preparation of LOF before making new LOF		x		
5.	LOF harvesting		x	x	
6.	Preparation of planting media as material for research			x	
7.	Seeding and monitoring of plant growth			x	x
8.	Selection and planting of seedling as research material			x	x
9.	Watering and applying LOF to test plants in the greenhouse	x	x	x	x
10.	Preparation and completion of reports	x	x	x	x

The methods of carrying out practical fieldwork used include lectures, discussions, demonstrations and practice accompanied by supervisors from Gemilang Indah Tunas Utama, East Lombok and guided by lecturers from the Environmental Science Study Program, Mataram University.

Results and Discussion

Performance achievements

The performance achieved by student after completing practical field work was generally considered very satisfactory. Details of the performance assessed include practical employer satisfaction, discipline, enthusiasm, thoroughness, ability to choose priorities, ability to collaborate, ability to work independently, ability to absorb new things, and analytical ability.

Material and practical achievements

Selection and collection of materials for making liquid organic fertilizer

Gathering materials for making POC was not enough to do in one or two days. In this way, the collection of materials was carried out before the final harvest is carried out. This aims to speed up the creation of new POCs. The materials needed are domestic waste collected from local communities in the form of vegetables, fruit peels and rotten fruit, egg shells, and several other materials such as lamtoro leaves taken directly from trees, banana stems and coconut water. The ingredients for making LOF need to be mixed with EM4 from the start to speed up decomposition, as was the procedure previously carried out by Putri *et al*. (2022) and Warintan *et a*l. (2021). Material that is chopped into small pieces will overall expand the surface of the material which causes an expansion of the contact area for chemical reactions which ultimately can speed up the decomposition process, as previously reported by Warintan *et al*. (2021).

Once collected, the ingredients were then manually chopped into small pieces using a knife. Small pieces of this material were collected in different containers according to the type of material and each was weighed so that the content of the resulting LOF can be determined. In this research, the container used was a 1000 liter water tank. The ingredients that have been chopped before making LOF can be seen in Figure 1.

Figure 1. Ingredients for making LOF that have been chopped into small pieces

LOF creation

The process of making POC begins by mixing ingredients that have been chopped into small pieces with a certain weight according to needs or according to the formulation that has been determined for research. This formulation was prepared based on modified formulations from Putri *et al*. (2022) and Warintan *et al*. (2021). In this research, the mixture of ingredients used consisted of 25 kg of lamtoro leaves, 3 kg of banana tubers, 4 kg of rotten bananas, 1 kg of papaya fruit, 1/2 kg of egg shells and enough onion skins (Figure 2).

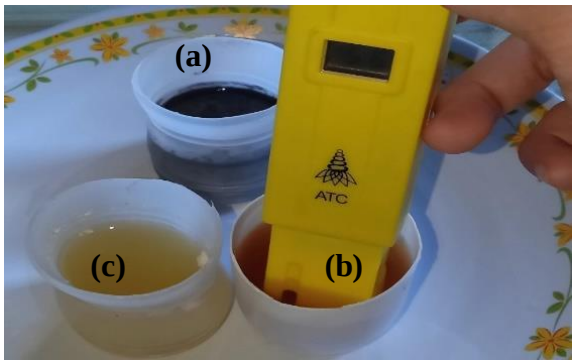
Figure 2. Mixing ingredients for making LOF

The addition of EM4 to the mixture of ingredients is conditional, because the mixture of ingredients already contains banana humps, which contain a lot of water and ingredients that can speed up decomposition. According to Putri *et al*. (2022), Warintan *et al*. (2021) and Iqlima *et al*. (2023), banana humps contain the growth regulator substances gibberellin and cytokinin and there are 7 microorganisms which are very useful for plants, namely Azospirilium, azobacter, bacillus, aeromonas, aspergillus, phosphate solubilizing microbes and cellulotic microbes. So, banana weevil is an optimal mixing ingredient in making LOF.

Harvesting liquid organic fertilizer (LOF)

Before harvesting fertilizer, you need to prepare the necessary tools such as a filter and a 30 liter jug. Harvesting is usually done from morning to evening to produce clear POC. LOF harvesting is carried out within 30 to 60 days from the start of manufacture. The color of LOF is determined by the length of harvesting time, that is, the longer the harvesting time, the clearer the results obtained. Harvesting time also causes differences in pH and TDS of LOF, although it is not significant. These results are similar to other POC results with different materials, as previously reported by Iqlima *et al*. (2023).

Three LOF samples with different colors, namely dark black, clear brown and clear yellow, are LOF samples produced at different times. The LOF from the first harvest is dark black, the second harvest is clear brown, and the last harvest is clear yellow (Figure 3).



a. LOF hasil panen pertama, hitam pekat
b. LOF hasil panen kedua, cokelat benin
c. LOF hasil panen terakhir, kuning

Figure 3. Differences in POC color according to variations in harvest time

Preparation of planting media for research

In accordance with the program of the Gemilang Tunas Indah Utama Institute, East Lombok, especially from the Research Division, to determine the quality of the LOF produced, LOF was applied to plants using a procedure modified from Sahadiah et al. (2018), Amir et al. (2021) and Adriyani et al. (2022). Planting media is prepared in two forms, namely soil in polyethylene bags and land directly in the field. For planting media contained in plastic bags, the size of the bag varied depending on the size or type of test plant. Meanwhile, the planting medium in the form of land directly on the land was made in the form of plots, the size of which varies according to the type of plant and treatment. The land used as planting media were made in the form of plots with shapes and sizes according to the type of plants and their treatment (Figure 4).

Figure 4. Fertilizing planting media

The plants used for LOF trials are usually vegetable plants such as eggplant, chilies and other plant types. In this fieldwork practice, the first plot was a medium fertilized with animal dung and planted with chilies, the second plot was fertilized using solid organic fertilizer (SOF) produced from the LOF harvest, planted with chilies and the third plot was not fertilized as control, that planted with chilies. Next, the growth of the chili plants was monitored and observed.

Selection and Planting of seedling

Seedling selection was carried out to produce seedlings of uniform age. In this field practical work, the seedlings used were an average of three weeks old. Groups of seedlings based on age uniformity can be seen in Figure 5.

Figure 5. Selection of seedlings according to their age

Using a uniform seed age can make research easier, especially at the observation or data collection stage, and the resulting data is generally more valid (Amir *et al*., 2021; Adetiya *et al*. (2017). After the planting medium prepared, two to three days after applying manure and solid organic fertilizer, three week old chili seedlings were then planted in each plot. After that, do watering using water first. Three days later, LOF was then given with the dilution (concentration) formula explained in the discussion regarding LOF application.

Monitoring the growth of seedlings in the planting medium

Monitoring the growth of seedlings was carried out especially on shallot seedlings which had been grown for three weeks on planting media in plastic bags. In this research, two days after sowing the seeds, the shallots began to appear to germinate and further growth measurements could be carried out (Figure 6).

Figure 6. Shallot seeds begin to germinate after 2 days in the planting medium in a plastic bag

Making of botanical pesticides

Organic pesticides that come from plants are called botanical pesticides. The active anti-pest ingredients of botanical pesticides come from plants, which are efficacious in controlling pest populations and plant diseases. The use of botanical pesticides is generally effective and selective in controlling certain pests (only killing or suppressing pest populations but not destroying natural enemies and not disturbing the growth of host plants), but is also economic and environmentally friendly (Suripto *et al*., 2017; Sutriadi *et al*., 2019).

The materials used in making this vegetable pesticide are quite simple and easy to find in the surrounding environment. One of the ingredients used is serikaya leaves with a size of 1kg, then ground or blended finely and mixed with water. The containers used can be used bottles or water tanks and jerry cans. Next, leave the mixture for 2

days and can be applied to plants that are attacked by pests.

In selecting plants as sources of botanical pesticides, apart from being based on their toxicity to target pests, they also need to be based on their pesticidal selectivity. According to Suripto et al. (2017; 2020), ingredients for making vegetable pesticides need to be selected from plants whose active anti-pest content is selective, that is, very toxic to the target pest but not toxic or very low in toxicity to the natural enemies of the pest.

The use of botanical pesticides is very compatible with an integrated pest control program. Selection of plants as sources of botanical pesticides, apart from being based on the type of pest, also pays attention to the type of host plant for the pest to be controlled. According to Suripto et al. (2021), water extract of jayanti leaves (Sesbania sesban) has been proven to be selective for controlling golden snails as pests of rice plants, namely effectively reducing the population of golden snails as target pests but not killing tilapia fish and carp as non-target organisms. They also reported that dregs from jayanti leaf extract can be used as a green fertilizer mixture which has also been proven to increase the growth of rice plants.

Jayanti leaf extract has also been reported to be able to control cabbage pests, namely effectively preventing oviposition of Plutella xylostela on cabbage plants but not killing its natural enemy, namely Diadegma semiclausum (Suripto *et al*., 2020; 2022).

LOF application

LOF is applied by watering the plant media. Watering is carried out every week with different formulas depending on plant needs and species, with procedures modified from Hukma *et al*. (2022). For example, in a greenhouse it takes 10 liters of water to watering the plants, so the LOF formula is 0.5:10, namely 500 mL of LOF diluted in 10 liters of water. The LOF formula for land planted with hardwood trees is usually twice the value of the formula for herbaceous plants. For woody trees, the LOF formula is 1:20 or 1 liter of LOF diluted in 20 liters of water. The application of LOF for woody plants on planting media in the form of land can be seen in Figure 7.

In applying LOF, the dose given depends on the size or age of the plant and the shape or area of the plant land.

Figure 7. Application of LOF on woody plantations

Conclusion

After completing practical field work at the Gemilang Indah Tunas Utama Institute, East Lombok, students gain knowledge and skills regarding making and applying LOF for various types of media and plants. This knowledge and skills include selecting, collecting and processing materials for making LOF, preparing planting media, making vegetable pesticides, making formulas or concentrations of LOF solutions to apply LOF to various types of plants and land areas.

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References

Adetiya, N., Hutapea. S. dan Suswati, 2017, Pertumbuhan dan produksi tanaman cabai merah (*Capsium annum* L.) bermikoriza dengan aplikasi biochar dan pupuk kimia, *Jurnal Agroteknologi dan Ilmu Pertanian*, 1(2):11-17.

Agustina. R., Mulyani. HRA., dan Farida. N., 2021, Manfaat Penggunaan Pupuk Organik Cair (POC) Pada Pertumbuhan Bunga Aglonema, Seminar Nasional dan Pengabdian Kepada Masyarakat (SNPPM-3). Universitas Muhammadiah Metro. ISBN 978-623-90328-7-6. Pp185-189.

Amir. N., Paridawati. I., dan Mulya. S. A., 2021, Respon pertumbuhan dan produksi tanaman bawang merah (*Allium ascalonicum* L) dengan pemberian pupuk organik cair dan pupuk kalium, *Jurnal Agroteknologi dan Ilmu Pertanian*, 16 (1):6-11.

Andriyani. D., Juliansyah. H., Puteh. A., dan Anwar. K., 2022, Minimalisasi biaya produksi usaha tani melalui pemanfaatan limbah buah-buahan sebagai pupuk organik cair, *Jurnal Malikussaleh Mengabdi*. 1(2):60-67.

Fauzan. N. D., Maulana. A., An-najjah. I. S., Rachman. F., dan Octalyani. E., 2021, Penggunaan pupuk organik cair sebagai pengganti pupuk kimia di Desa Sidomulyo, Kecamatan Air Naningan, *Jurnal Of Community Services, Abdi Insani*. 2(2):23-26.

Hukma, A.U., Yuliana, M. dan Teristiandi, N., 2022. Pengaruh pupuk organik cair (POC) buah belimbing wuluh (*Averrhoa bilimbi* L.) terhadap pertumbuhan sawi hijau, *Ekotonia (Jurnal Penelitian Biologi, Botani, Zoologi dan Mikrobiologi)*, 7(2): 105-111.

Iqlima, S. dan Rachmawati, D., 2023, Pengaruh larutan hara dan pupuk organik cair urin kelinci terhadap pertumbuhan pakcoy (Brassica rapa L) pada teknik hidroponik, *Bioscientist (Jurnal Ilmiah Biologi*), 11(2): 1186-1194.

Putri, M.Y., Hidayat, R., Sofiyanti, M. dan Pratama, R.W., 2022, Pembuatan pupuk organik fermentasi berbahan dasar kotoran burung puyuh, *Jurnal Pusat Inovasi Masyarakat*, 4(2): 69-74.

Suhadiyah. S., Muhtadin dan Lestari. D., 2018, Pemanfaatan pupuk organik cair (POC) pada budidaya tanaman kol bunga *Brassica oleraceae* var. botrytis L. subvar. Cauliflora DC. *Jurnal Biologi Makassar*, 3(1):35-47.

Suripto, Ahyadi, H. and Rahayu, N. R., 2022, Anti-ovipositor power of jayanti plant (Sesbania sesban) for integrated control of cabbag pest (Plutella xylostella), *J. Biologi Tropis*, 22(3):972-980.

Suripto, Gunawan, E.R., Tresnani, G. and Jupri, A. , 2021. Anti mollusk-selectivity of jalanti plants (Sesbania sesban) for the control of the golden snail, a pest of paddy *J. Biologi Tropis*, 21(3): 897-906.

Suripto, Sukiman and Gunawan, E.R., 2017, Insecticidal selectivity of jayanti plants (*Sesbania sesban*) for integrated control of diamondback moth (*Plutella xylostella*), *Asian Journal of Agriculture*, 1(2):80-84.

Suripto, Tresnani, G. and Gunawan, E.R., 2020. Mode of action anti serangga dari tanaman jayanti (Sesbania sesban L. Merr.)(MAGNOLIOPSIDA:Fabaceae), *J. Biologi Tropis*, 20(2): 194-102.

Sutriyadi, M.T., Harsanti, E.S., Wahyuni, S. dan Wihardjaka, A., 2019, Pestisida nabati: Prospek pengendali hama ramah lingkungan, *Jurnal Sumberdaya Lahan*, 13(2): 89-101.

Warintan, S.E., Purwaningsih, P., Novianti dan Tethool, A., 2021, Pupuk organik cair berbahan dasar limbah ternak untuk tanaman sayuran, *Jurnal Pengabdian kepada Masyarakat DINAMISIA*, 5(6):1465-1471.