

Improving The Quality Of Masters Of Bio-Activators In Golden Apple Snail With Addition Of Bamboo Shoot

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Abstract: Bamboo shoots are young shoots derived from bamboo plants. Bamboo shoots in Indonesia are mostly used by the community as vegetables because they taste good and economical and are easy to obtain but apart from that bamboo shoots can be used as an additional ingredient in making bioactivators. This study aims to improve the quality of the golden snail bioactivator by adding the best bamboo shoots with different techniques and fermentation time. This research uses a completely randomized design with 3 factors. The first treatment is snail mas bioactivator with the addition of bamboo shoots (b) consisting of 1 level, namely bamboo shoots as much as 5 kg (b1), per second treatment is the fermentation technique consisting of 2 levels namely anaerobic fermentation (f1), aerobic fermentation (f2), and the third treatment is the fermentation time period which consists of 3 levels, namely 1 week (w1), 2 weeks (w2), and 3 weeks (w3) which are repeated 2 replications. The observations included the chemical snail bioactivator chemical analysis test including pH, and the content of macro nutrients N, P and K and the bacterial content analysis test. The results showed that the best pH and K nutrient content in the snail bioactivator with the addition of bamboo shoots was on the bm2w3 treatment or the addition of bamboo shoots with aerobic fermentation techniques and fermentation time for 21 days, the best nutrient content of N and P at Bio snake bioactivator with the addition of bamboo shoots is the treatment of bm1w2 or the treatment of adding bamboo shoots with anaerobic fermentation techniques and the fermentation time for 2 weeks and the treatment of bm2w3 or the treatment of adding bamboo shoots with aerobic fermentation techniques and the fermentation time for 3 weeks is the most treatment. contains a lot of bacteria namely as many as 4 types of bacteria consisting of the bacteria *Pseudomonas fluorescens*, *Azotobacter* sp, *Azospirillum* and *Bacillus* sp

Keywords: golden apple snails, bamboo shoots, fermentation

1 INTRODUCTION

Inadequate management of organic waste causes a large number of problems such as environmental pollution, eutrophication, aesthetic damage to urban landscapes, greenhouse gas emissions and their impact on human health. Unwise and unscientific waste disposal does not only pose a major threat to the quality of the environment but also results in the loss of the economic value of waste. Because organic waste is an abundant collection of organic matter and valuable plant nutrients, agricultural recycling from this waste seems a promising alternative that allows the addition of value and use a lot [1]. Previous research has been carried out on the manufacture of MOL or bio-activators of fruit waste and banana weevil only produce one type of bacteria and the content of the nutrients is still very low, as well as after being applied to oil palm empty fruit bunches the compost is still very low. Furthermore, the making of cow rumen bio-activator applied to liquid organic fertilizer, rice straw waste, coconut fiber waste liquid fertilizer and corn waste also showed nutrient yield on bio-activator and liquid organic fertilizer is still low [2]. Then in the same year a bio-activator based on gold snail was made and the bacteria *Pseudomonas fluorescens* was produced, but the nutrient content was still low [3] but after being applied to shrimp shells to be composted it was able to increase nutrients in accordance with the Indonesian National Standard (SNI) No. 19-7030-2004 but for the standard of Regulation of the Minister of Agriculture (Permentan) Number 70 / Permentan / SR. 140/10/201 k the element content has been very high beyond the standard but the N and P content is still low [4].

In 2018, another research was carried out by trying to combine golden snails with banana weevil and fruit waste, which obtained 5 types of beneficial bakeries but still contained low nutrients [5]. So in this study the researchers tried to add bamboo shoots to the golden snail bioactivator in order to produce high quality both chemically and biologically.

This study aims to improve the quality of the golden snail bio-activator by adding the best bamboo shoots with different techniques and fermentation time

2 MATERIAL AND METHODS

This research was conducted from January 2019 to July 2019 in the pilot garden of the Samarinda State Polytechnic Agricultural Plant Plantation Study Program.

2.1 Instruments and Materials

Instruments employed in this research were 4 liter plastic jars, plastic drums with a capacity of 200 l water, scales, grinding machines, wooden fermentation tanks, stirrers, hoes, machetes, handsprayers, fansticks, gauges, scales, scales, stationery, filter cloth. The materials used in this study are: while the materials used are golden snails, cow urine, rice washing water (leri), coconut water, brown sugar, fruit waste, beef rumen, shrimp, banana weevil, and bamboo shoots.

2.2 Experimental Design

This experiment is a factorial research consisting of 3 factors, carried out using a Completely Randomized Design. The first factor is the addition of bamboo shoots (b) consisting of 1 level, i.e.

b = addition of 5 kg of bamboo shoots

The second factor is the fermentation method (m) which consists of 2 levels, namely:

m1 = anaerobic fermentation

m2 = aerobic fermentation

The third factor is the time / time of fermentation (w) which consists of 2 levels, namely:

w1 = 1 week

w2 = 2 weeks

w3 = 3 weeks

Each study was repeated 2 replications so that there were 12 experimental units

2.3 Research procedure

Ingredients that need to be prepared for the manufacture of bioactivators include: 5 kg gold snail, 2 l beef rumen, 5 kg banana weevil, 5 kg fruit waste, 3 l cow urine, 2 l rice washing water, 1 l coconut water, 5 l and 125 g of shrimp paste 125 and 2.5 kg of brown sugar, 5 kg of bamboo shoots at each treatment level. How to make: Brown sugar crushed until smooth then mashed golden snail until finely ground, banana weevil and bamboo shoots chopped until smooth. Furthermore, mixing all materials for making bio-activator in accordance with the treatment then stirring evenly, for the treatment of plastic drum aerobics where the bio-activator is closed and given a plastic hose which is connected with a 1500 ml bottled bottle filled with 500 ml of plain water while for anaerobic treatment the plastic drum is tightly closed without air. The aerobic treatment is stirred twice a day while for the anaerobic treatment it is left tightly closed in accordance with the length of the fermentation treatment. Analyzes nutrient content in all ready bio-activators and identifies bacterial content in all bio-activators for all treatments. Observation of chemical properties that exist in the snail bio-activator in the form of nutrient content and observing the types of bacteria found in the snail bio-activator by adding bamboo shoots.

2.4 Data analysis

Data obtained from observations and results of laboratory tests are tested using tests. Data obtained from each treatment, then analyzed by analysis of variance using the F test at 5% and 1% significance level. If the interaction effect on the F test is real or very real, then the analysis continues with Duncan's Multiple Range Test (DMRT) at the 5% level.

3 RESULTS AND DISCUSSION

3.1 Chemical Properties

1. pH

The results of the analysis of variance on the three treatment factors differed significantly on the average pH of the snail bio-activator by adding bamboo shoots. The results of the average interaction (b x m x w) pH values are listed in Table 1.

Table 1. Mean of interaction between bio-activator factors, fermentation method factors and fermentation time factors on pH values

Treatment	Mean	mean + DMRT	Group
bm ₂ w ₂	4,010	4,018	a
bm ₂ w ₁	4,180	4,189	b
bm ₁ w ₁	4,190	4,199	c
bm ₁ w ₂	4,680	4,689	d
bm ₁ w ₃	6,640	6,649	e
bm ₂ w ₃	6,690	6,720	f

Note: Mean followed by the same letter indicated a non significant difference ($\alpha = 5\%$) using DMRT test

Based on the results of the DMRT test at a level of 5% the treatment that provides the best pH value is the treatment that has the largest average value of bm₂w₃ (interaction between the addition of bamboo shoots in a container with an air hose (aerob) with a fermentation time of 3 weeks).

The interaction of the golden snail bio-activator with the addition of bamboo shoots and fermentation techniques

and fermentation time were significantly different from the average pH value. If you pay attention in making aerobic bamboo shoot bioactivators with fermentation time for 3 weeks, it is shown the combination treatment of bm₂w₃ with the highest average value of 6,720 This is due to bamboo shoots added to gold snail bioactivators with aerobic fermentation techniques and fermentation time for 3 week can interact well, where the aerobic fermentation technique is a fermentation technique that requires oxygen. The results of this study are in line with research [6] which states that the pH content tends to be higher in aerobic fermentation in the manufacture of liquid fertilizer from market waste. Fermentation is a process carried out by both aerobic and anaerobic microorganisms that are able to change or transform complex chemical compounds into simpler ones. It aims to accelerate the absorption of nutrients in plants. The principle of this fermentation is that organic matter is destroyed by microbes in a certain range of temperatures and conditions.

The best pH value for this bm₂w₃ combination is higher than the pH value in bio-activator research [3] and research [7].

2. N Content

The results of the analysis of variance on the three treatment factors differed significantly on the average N content in the bio-activator. The average yield of interactions (b x m x w) N content is shown in Table 2.

Table 2. Mean of interaction between bio-activator factors, fermentation method factors and fermentation time factors on N content

Treatment	Mean	mean + DMRT	Group
bm ₁ w ₁	0,196	0,197	a
bm ₂ w ₃	0,204	0,205	b
bm ₂ w ₁	0,213	0,214	c
bm ₂ w ₂	0,221	0,222	d
bm ₁ w ₃	0,249	0,251	e
bm ₁ w ₂	0,314	0,316	f

Note: Mean followed by the same letter indicated a non significant difference ($\alpha = 5\%$) using DMRT test

Based on the results of the DMRT test at a level of 5% the treatment that gives the best N content is the treatment that has the largest average value, b₂m₁w₂ (interaction between adding bamboo shoots in a tightly closed container (anaerobic) with a fermentation time of 2 weeks). The N content is more different from the pH content this is in line with research [8] which states that the N content will increase under acidic pH conditions. The interaction of the golden snail bio-activator with the addition of bamboo shoots and fermentation techniques as well as the length of fermentation was significantly different from the average nutrient content of N. If we pay attention to the making of anaerobic bamboo shoot bioactivator with fermentation time for 2 weeks, it was shown that the combination treatment of bm₂w₃ with the highest average value which is 0.316. This is due to the fact that bamboo shoots added to the snail bio-activator by anaerobic fermentation techniques and fermentation time for 2 weeks can interact well, where the

anaerobic fermentation technique is a fermentation technique that does not require oxygen. This opinion is consistent with the results of the study [9] which states that the optimal fermentation time is 14 days with a yield of 3.745% nitrogen on the use of molasses as much as 50 ml. The results of this study differ from studies [6] which state that the content of N nutrients tends to be higher in aerobic fermentation in the manufacture of liquid fertilizer from market waste. The increase in the total N-value is due to an overhaul of organic material by nitrifying bacteria that convert ammonia to nitrate at the end of the composting process [10]. While the decrease in the total N-value can be caused by temperature and pH, where high temperatures and alkaline pH can cause loss of nitrogen gas as NH₃ and alkaline pH causes nitrogen levels to decrease [11]. The best N content in the treatment of this bm1w2 combination is higher than the N value in bio-activator research studies [2] and [12].

3. P₂O₅ content

The results of the analysis of variance on the three treatment factors were significantly different in the average content of P₂O₅ on the bioactivator. The average yield of interactions (b x m x w) N content is shown in Table 3.

Table 3. Mean of interaction between bio-activator factors, fermentation method factors and fermentation time factors on P₂O₅ content

Treatment	mean	mean + DMRT	Group
bm1w3	0,011	0,013	a
bm2w3	0,012	0,014	b
bm1w1	0,022	0,024	c
bm2w1	0,023	0,025	d
bm2w2	0,221	0,223	e
bm1w2	0,314	0,325	f

Note: Mean followed by the same letter indicated a non-significant difference ($\alpha = 5\%$) using DMRT test

Based on the results of the DMRT test at a level of 5% the treatment that provides the best P content is the treatment that has the largest average value of b2m1w2 (interaction between adding bamboo shoots in a tightly closed container (anaerobic) with a fermentation time of 2 weeks). The interaction of the golden snail bio-activator with the addition of bamboo shoots and fermentation techniques as well as the fermentation time were significantly different to the average nutrient content of P. If you pay attention in making anaerobic bamboo shoot bio-activator with the fermentation time for 2 weeks it was shown the combination treatment of bm1w2 with the highest average value which is 0.325. This is due to the fact that bamboo shoots added to the snail bio-activator by anaerobic fermentation techniques and fermentation time for 2 weeks can interact properly. The results of this study are in line with research [6] which states that the content of P nutrients tends to be higher in anaerobic fermentation in the manufacture of liquid fertilizer from market waste. Fermentation is the anaerobic oxidation process of carbohydrates producing alcohol and acids. Sugar if fermented will produce ethanol, lactic acid, butyric acid, acetone, and hydrogen [13], whereas according to [7], the fermentation process decomposes the physical form of solids

and liberates a number of important elements in the form of complex compounds or compounds. simple compound into a fermentation solution. The high content of P nutrients in the bm1w2 combination treatment is proportional to the nutrient content of N, this is in accordance with Yuli's opinion [14] which states that the high content of phosphorus is also influenced by the high nitrogen content, the higher the nitrogen contained, the multiplication of microorganisms that overhaul the phosphorus will increase, so the phosphorus content will increase.

4. K₂O content

Potassium is used by microorganisms in the substrate as a catalyst during the fermentation process in the presence of bacteria and its activity will greatly influence the increase in potassium content [15]. The results of the analysis of variance on the three treatment factors differed significantly on the average K₂O content in the bioactivator. The average yield of interactions (b x m x w) K₂O content is shown in Table 4.

Table 4. Mean of interaction between bio-activator factors, fermentation method factors and fermentation time factors on K₂O content

Treatment	Mean	mean + DMRT	Group
bm1w1	0,050	0,061	a
bm2w1	0,050	0,061	a
bm1w2	0,060	0,071	b
bm2w2	0,060	0,072	b
bm1w3	0,510	0,522	c
bm2w3	0,510	0,526	d

Note: Mean followed by the same letter indicated a non-significant difference ($\alpha = 5\%$) using DMRT test

Based on the results of the DMRT test at the level of 5% the treatment that gives the best K₂O content is the treatment that has the largest average value of bm2w3 (interaction between the addition of bamboo shoots in a container with an air hose (aerob) with a fermentation time of 3 weeks).

The results of this study are in line with research [6] which states that the content of K nutrients tends to be higher in anaerobic fermentation in the manufacture of liquid fertilizer from market wastes. The high K content in the bm2w3 combination treatment is thought to be caused by the formation of organic acids during the aerobic fermentation process and causes higher solubility of nutrients such as K.

3.2 Identification of Bacteria.

The quality of bio-activators or MOL is also determined by the content of useful microorganisms contained therein. According to [16] states that the bio-activator solution or MOL contains micro and macro nutrients and also contains bacteria that have the potential to remodel organic matter, stimulate growth, and as a pest control agent and plant diseases, so that MOL can be used both as decomposers, biological fertilizers and as organic pesticides, especially as fungicides. The results of bacterial identification in the two bio-activator treatments can be seen in the following Table 5:

Table 5. Bacterial identification results for all treatments

No	Treatment	Types of Microorganisms
1	bm1w1	Clostridium, sp
2	bm2w1	Clostridium, sp

3	bm1w2	Bacillus, sp dan Enterobacter sp
4	bm2w2	Bacillus, sp dan Enterobacter sp
5	bm1w3	Bacillus, sp dan Enterobacter sp
6	bm2w3	Bacillus sp, Clostridium, sp dan Enterobacter sp Pseudomonas fluorescens, Azotobacter sp, Azospirillum dan Bacillus sp

Source: Plant Clinical Laboratory, Lambung Mangkurat University, Banjarbaru and UPTD. East Kalimantan Health Service Laboratory. 2019.

In accordance with opinion [17] which states that the bacterium *Pseudomonas fluorescens* is an aerobic bacterium that can grow well at temperatures of 27 - 37 C. *Bacillus* bacteria are also included aerobic bacteria in accordance with opinion [18] which states that *Bacillus*, is a bacterium with gram-positive character of bacilli positive endospores are round or oval in shape and are aerobic to facultative anaerobic. *Azotobacter* bacteria including aerobic bacteria stated by [19] suggested that the genus *Azotobacter* is characterized by stem-shaped cells, gram-negative, obligate aerobic and has a cell size that is longer than other prokaryotes with cell diameters of 2-4 µm or more. Microorganisms contained in liquid fertilizer (MOL) include *Azotobacter* sp. which acts as a nitrogen-fixing [20] *Azotobacter* is an N₂-inhibiting bacterium that is able to produce gibberellins, cytokinin, and indole acetic acid growth promoting substances, so that their utilization can stimulate root growth [21].

4 CONCLUSION

1. The best pH and K nutrient content in the snail bioactivator with the addition of bamboo shoots is the treatment of bm2w3 or the treatment of adding bamboo shoots with aerobic fermentation techniques and fermentation time for 3 weeks
2. The best nutrient content of N and P in the snail bioactivator with the addition of bamboo shoots is the treatment of bm1w2 or the treatment of adding bamboo shoots with anaerobic fermentation techniques and fermentation time for 2 weeks
3. The treatment of bm2w3 or the treatment of adding bamboo shoots with aerobic fermentation techniques and fermentation time for 3 weeks is the most bacterial treatment that is as many as 4 types of bacteria consisting of *Pseudomonas fluorescens*, *Azotobacter* sp, *Azospirillum* and *Bacillus* sp.

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