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# Effectiveness Of Provisioning Local Microorganisms Bamboo Shoots (Dendrocalamus Asper) On The Quality Of Compost From Sugarcane Waste (Baggase)

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**ABSTRACT**
Garbage is still a severe problem for poor and developing countries. Population growth, as well as changes in public consumption, are the causes of the continued amount of waste. Efforts must be made to prevent the emergence of bagasse waste in the sugar industry and the community. Prevention can be done by utilizing bagasse waste as organic material in compost that is beneficial for plant growth with the addition of local microorganisms (MOL). Research with pure experiment posttest Only Control Group. This study aims to determine the effect of bamboo shoots' local microorganisms (MOL) on compost quality from bagasse waste. The number of samples was 10 with 3 times replication and 1 control. The sampling technique was done by random sampling. C/N Ratio for giving MOL 50 ml was 22.9, the C/N Ratio for giving MOL 100 ml was 22.5, the C/N ratio for giving MOL 150 ml was 20.2, and the C/N ratio for giving MOL was 25.9. There is an effect of giving a lot of MOL to the resulting C/N ratio (p = 0.005). The community needs to add innovations by processing bagasse waste into compost that can be used to reduce the amount of waste generation and apply it to plants.



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## INTRODUCTION

Rhizobium sp, Azospirillum sp, Azotobacter sp, Pseudomonas sp, and Bacillus sp. (Irianti and Suyanto, 2017). The main ingredients in the manufacture of Local Microorganisms (MOL) consist of several components: carbohydrates, glucose, and sources of microorganisms (Ismaya, 2014). These natural materials are a medium for living and developing microorganisms that can accelerate the destruction of organic materials (decomposers). Improper handling of waste will have a broad impact, not only on the environment but also on the economy and society (Madani, 2011). From initial observations on the handling of bagasse waste in sugar factories, generally, bagasse waste will be collected in one place in large quantities and used as fuel in subsequent production. Using bagasse waste as raw material for composting is an alternative to minimize the accumulation of waste. It has the potential to become a compost that can replace inorganic fertilizers.

Bagasse fiber is insoluble in water and consists mainly of cellulose, pentosan, and lignin. The decomposition process takes a long time if the bagasse is left alone. The composting process also requires the help of microorganisms to decompose the material and speed up the composting process. In this study, additional local microorganisms (MOL) consisted of bamboo shoots, brown sugar solution, and rice washing water. The addition of local microorganisms (MOL) in bamboo shoots can destroy organic matter in a short time. These microbes secrete enzymes that destroy lignin and cellulose. With the destruction of lignin and cellulose, the carbon content will decrease, and the nitrogen content will increase so that the C/N becomes low.

The composting process is a process in which organic matter undergoes biological decomposition, especially by microbes that utilize organic matter as an energy source, which can take place aerobically and anaerobically, which support each other under certain environmental conditions. This study aims to analyze the effectiveness of local microorganism (MOL) provision of bamboo shoots on the quality of compost from bagasse waste by physical examination and laboratory tests.

## METHODS

This research is an experimental research using Posttest Only Control Group Design. The examination of the C/N Ratio results was conducted at the Surabaya Industrial Baristand Testing and Calibration Laboratory. The object of this research is bagasse organic waste from the production waste in a sugar factory used as raw material for compost production Measurement of physical.

The test material in this study was bagasse waste mixed with other Local Microorganisms (MOL) from bamboo shoots, and the control group was bagasse waste without additional Local Microorganisms (MOL) from bamboo shoots.

There were 10 samples divided into 3 treatments with variations in volume addition (50 ml, 100 ml, and 150 ml) and 1 without treatment (control). The measurement of physical parameters in this study included temperature, humidity, and pH, which were conducted every three days. Observations were also made on odor and color parameters. Measurement of temperature using a thermometer, testing of humidity or water content using a wet basis, and measuring pH using a pH meter. Observation of the smell of compost was carried out using the sense of smell, and the color measurement of the material was carried out using the Munsell Soil Color Chart, with the Munsell color system consisting of three independent dimensions. Munsell determined the color spacing along these dimensions by taking measurements of the human visual response.

## RESULTS AND DISCUSSION

Table 1 shows the temperature of the compost fertilizer with the addition of 50 ml MOL at 29.3°C, 100 ml MOL at 29.6°C, and 150 ml MOL at 29.0°C. The control group obtained a result of 30.6°C, which is higher than the MOL treatments. The compost humidity was 49.6% for 50 ml MOL, 55.9% for 100 ml MOL, and 64.0% for 150 ml MOL. The control group had a humidity of 48%. The acidity level of the compost was 6.9 for 50 ml MOL, 7.6 for 100 ml MOL, and 7.6 for 150 ml MOL. The control group had a result of 6.5.

Table 2 shows that the smell or aroma of the compost with the addition of 50 ml, 100 ml, and 150 ml MOL began to become like soil on day 21 compared to the control, which had a more stable odor and an increase in pungent odor on day 15.

**Table 1**
**Temperature, Humidity And Activity Level in Compost Fertilizer**

| Replikasi | Treatment | | | |
|---|---|---|---|---|
| | Control | 50 ml | 100 ml | 150 ml |
| **Temperatur** | | | | |
| 1 | 30.6 | 29.8 | 29.7 | 29.8 |
| 2 | - | 29. | 29.5 | 28.6 |
| 3 | - | 28.6 | 29.8 | 28.5 |
| **Average** | **30.6** | **29.3** | **29.6** | **29.0** |
| **Humidity** | | | | |
| 1 | 48.0 | 49.2 | 55.6 | 62.7 |
| 2 | | 49.8 | 56.4 | 63.2 |
| 3 | | 49.9 | 55.8 | 66.2 |
| **Average** | **48.0** | **49.6** | **55.9** | **64.0** |
| **Acidity Level** | | | | |
| 1 | 6.5 | 6.2 | 7.5 | 7.7 |
| 2 | | 7.7 | 7.8 | 7.8 |
| 3 | | 7.0 | 7.6 | 7.5 |
| **Average** | **6.5** | **6.9** | **7.6** | **7.6** |

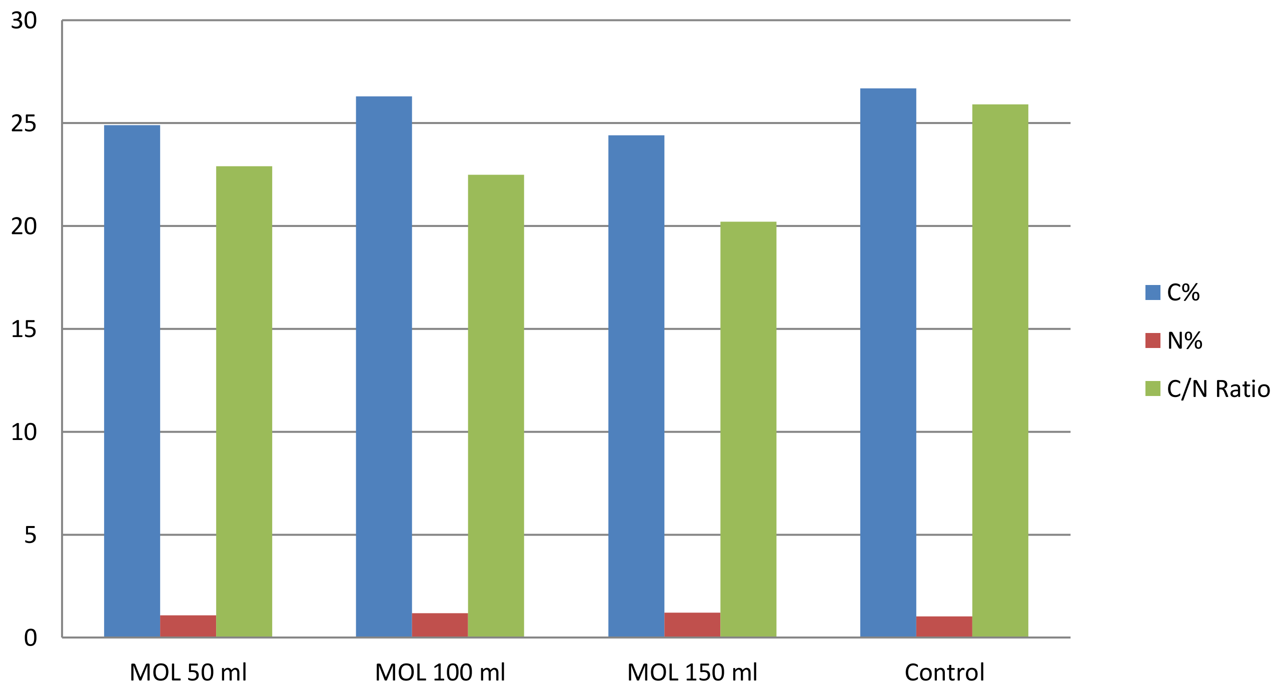
Graph 1 shows the average results for the C/N ratio obtained after going through laboratory tests for compost added with local microorganisms (MOL) with a volume of 50 ml, 100 ml, and 150 ml. The control showed a decrease and an increase in each treatment—the addition of MOL. The level of C (carbon) of compost fertilizer on the graph is given a blue indicator which gets the average result at the addition of 50 ml MOL of 24.9. With the addition of 100 ml MOL, the result is 26.3. With the addition of 150 ml MOL, the result is 24.4. At the same time, the control got the result of 26.7. The highest C (carbon) levels were obtained in compost with treatment as a control.

**Table 2 Changes in Smell and Color in Compost Fertilizer**

| Parameter | Treatment | Day | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |
| Smell | Control | + | + | + | + | ++ | ++ | ++ | ++ | ++ |
| | 50 ml | + | + | + | ++ | ++ | ++ | +++ | +++ | +++ |
| | 100 ml | + | + | ++ | ++ | ++ | ++ | +++ | +++ | +++ |
| | 150 ml | + | + | ++ | ++ | ++ | ++ | +++ | +++ | +++ |
| Color | Control | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR |
| | | Brownn | Brownn | Brownn | Brownn | Brownn | Brownn | Brownn | Brownn | Brownn |
| | 50 ml | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 10 YR |
| | | Brownn | Brownn | Brownn | Dark Brownn | Dark Brownn | Dark Brownn | Very Dark Brownn | Very Dark Brownn | Pale Brownn |
| | 100 ml | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 10 YR |
| | | Brownn | Brownn | Brownn | Dark Brownn | Dark Brownn | Dark Brownn | Very Dark Brownn | Very Dark Brownn | Pale Brownn |
| | 150 ml | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR | 7.5 YR |
| | | Brownn | Brownn | Dark Brownn | Dark Brownn | Very Dark Brownn | Very Dark Brownn | Very Dark Brownn | Very Dark Brownn | Very Dark Brownn |

Description : + = The Original
Smell ++ = Strong scent
+++ = Smell like earth

**Analysis of Laboratory Examination Chemical Parameters**
**C/N Ratio in Compost Fertilizer**




**Graph 1. Average C/N Ratio in Compost Fertilizer**

At the level of N (nitrogen), compost fertilizer was given a red indicator which got the average result of adding MOL with a volume of 50 ml to get the result of 1.08. With the addition of 100 ml MOL, the result is

1.17. With the addition of 150 ml MOL, the result is 1.21. At the same time, the control got the result of 1.03. The highest levels of N (nitrogen) were obtained in compost with the addition of 150 ml MOL.

The results of the average C/N ratio obtained by compost fertilizer on the graph are given a green indicator which gets the average result for adding 50 ml MOL of 22.9. With the addition of 100 ml of moles, the result is 22.5. With the addition of 150 ml MOL, the result is 20.2. At the same time, the control got a result of 25.9. C/N content The highest ratio was obtained in compost with treatment as a control.

Analysis of Anova Test Results on Compost Fertilizer didapatkan hasil bahwa ada perbedaan rata-rata C/N Ratio dalam pembuatan kompos dengan penambahan 50 ml, 100 ml dan 150 ml MOL (P=0.00), kemudian dilanjutkan dengan LSD (Least Significant Difference). Hasil Uji LSD adalah Illustrates that 150 ml of MOL to bagasse waste compost is better than the control and other volume additions. Besides being a supplier of nutrients, the role of local microorganisms (MOL) in compost also acts as a bioreactor component whose job is to maintain optimal plant growth processes. The function of a bioreactor is very complex; the functions that have been identified include supplying nutrients through the exudate mechanism, controlling microbes according to plant needs, and even controlling diseases that can attack plants.(Mentari, Yuanita and Roby, 2021)The ratio of carbon and nitrogen (C/N ratio) is critical to supply the nutrients needed by microorganisms during the composting process. Microorganisms need carbon as an energy source and nitrogen to form proteins. If carbon availability is excessive (C/N> 40), the amount of nitrogen is minimal, so it is a limiting factor for the growth of microorganisms. The decomposition process is hampered because excess carbon must be burned/disposed of by microorganisms in the form of CO2. The C/N ratio, which is quite large, also indicates that the material is difficult to decompose. The use of bamboo shoots MOL bio activator can destroy organic matter in a short time. These microbes secrete lignin and cellulose-degrading enzymes. With the destruction of lignin and cellulose, the carbon content will decrease, and the nitrogen content will increase so that C/N becomes small (Mentari, Yuanita and Roby, 2021).

The process of making compost from bagasse takes place without the help of air or oxygen to the maximum so that this process coldly takes place and there are no temperature fluctuations that can slow down decomposition. The reversal in the composting process dissipates excessive heat, introduces fresh air into the pile of materials, evens out the weathering process in each part of the pile, distributes water evenly, and helps break down the material into small particles (Suyanto and Irianti, 2015). The higher the temperature approaching 40 in the decomposer room, the more influential the bacteria will be in breaking down waste. The decomposition process of organic matter and microorganisms is more optimal at a temperature of 30-400 C with a humidity level of 40-60%. That is, not too much water, but not too dry either. The moisture of organic matter makes decomposer microorganisms multiply rapidly, so the decomposition process becomes faster. The decomposition rate is also related to the pH of the organic matter. The initial pH should be around 6.5 – 8.5 so decomposers can develop properly (Wardoyo and Anwar, 2021). In the first week to the second week, thermophilic microbes grow rapidly in the pile of compost material. Thermophilic microbes live at temperatures of 45-60 oC and are tasked with consuming carbohydrates and proteins so that the compost material can be degraded quickly so that the peak temperature is reached. These microbes consist of Actinomycetes and fungi. Some of the Actinomycetes are able to break down cellulose and hemicellulose. Then the decomposition process begins to slow down. After the peak temperature has passed, starting in the third week the temperature of the pile of materials begins to decrease and the material decomposes more easily. In the fifth and sixth weeks are the cooling and ripening stages (Yuliani and Nugraheni, 2010)

Mature compost smells like earth and is blackish brown, formed due to the influence of stable organic matter. At the same time, the final form does not resemble the original form because it has been destroyed due to natural decomposition by microorganisms that live in the compost. The pungent smell at the peak of composting occurs because, during the process of reforming the material, it releases gas in the form of NH3+ (Ratnawati, 2019; Witasari, Sa'diyah and Hidayatulloh, 2021), While the smell is like soil because the composting process has entered the final phase of composting. This reaction includes an oxidation reaction which results in ammonia gas, water, and heat energy, causing the aroma in the treatment to be pungent.(Setiyo, 2007)

The results of color scoring showed that changes occurred on day 12 in the compost with the addition of Local Microorganisms (MOL) bamboo shoots, while the control did not show any color changes from the beginning to the end. Several treatments showed the same hue (7.5 YR) but had different values and chroma from the first to the last week. This is because the local microorganisms in the compost are utilized by microbes effectively. The difference in the color of the compost at the end of the observation indicates the maturity level of the compost. Compost is said to be ripe if it has a darker color change and an earthy smell. The compost's color change was due to the microbes in each treatment functioning well to decompose organic matter. A smaller value will indicate a darker color, and a more considerable chroma value will indicate a darker color, so if the value is more minor and more significant, the resulting color will be darker. The color change in the compost every week from green or the color of the raw material to blackish brown indicates that the compost is approaching maturity. The color observations from the four treatments showed that compost treatment with the addition of 150 ml of Local Microorganisms (MOL) was better than other treatments in color changes.

The C/N Ratio for each addition of Local Microorganisms (MOL) and control decreased and increased significantly. This is because the material undergoes a decomposition process. Organic C in the material is a food source for microorganisms, so the amount is reduced. In addition, organic C will also decompose into CO2 in the air. The total N in the material increased due to the decomposition process of the compost material by microorganisms that produced ammonia and nitrogen. Hence, the total N content of the compost increased. With decreasing organic C content and increasing total N content, the C/N ratio value will decrease.

## CONCLUSIONS

There is a difference in composting results using the addition of Local Microorganisms (MOL) for bamboo shoots which has a faster-composting process compared to composting without the addition of Local Microorganisms (MOL) for bamboo shoots with the results of the composting forming like soil on the 27th day.

Composting with the addition of Local Microorganisms (MOL) can be developed on a household scale and for medium-scale composting. Further research can develop advanced parameters in the form of compost nutrient content formed from the composting process using the addition of Local Microorganisms (MOL).

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