

## Optimizing The Use Of Mole From Fruit Waste In Household Waste Processing With Household Scale Composter Produce Liquid Compost

Syahrizal<sup>1</sup>, Wiwit Aditama<sup>2</sup>, Zulfikar<sup>3</sup>

<sup>1,2,3</sup>Department of Environmental Health Health Polytechnic of the Aceh Ministry of Health, Aceh, Indonesia.

Correspondent Address : Department of Environmental Health Health Polytechnic of the Aceh Ministry of Health, Aceh, Indonesia. Email : [widnad78@yahoo.co.id](mailto:widnad78@yahoo.co.id)

### Abstract

**Background and Purpose:** The amount of waste generated by residents of the city of Banda Aceh is 0.58 kg/person/day for a population of 242,943 people in Banda Aceh. The percentage of organic, paper and plastic waste produced by the city of Banda Aceh is 89.1%; 2.5%; 0.74%. The fruit juice business is growing because with a little capital it can generate a profit of 15% -30%. People are also increasingly liking juice, especially when it is sold at low prices. The negative consequence that arises is the amount of waste that is produced. While the final waste storage capacity in the city of Banda Aceh is increasingly limited, for this reason, innovative works are needed that can help in waste management. The aim of this study was to determine the use of MOL from fruit waste in household waste processing with a modified composter to produce liquid compost, with variations in MOL doses (60 ml, 70 ml, 80 ml) and time (7, 10, 14, 18, 22 days). **Materials and Methods:** The type of research conducted was a quasi-experimental research with a pre-post-test only research design with a control group design, using a completely randomized design (CRD). The location of the research was carried out at the Workshop on the Department of Environmental Health, Poltekkes, Ministry of Health, Aceh. **Results:** The use of MOL from fruit waste in household waste processing with composter modifications can produce liquid compost, with variations in MOL doses (60 ml, 70 ml, 80 ml) and time (7, 10, 14, 18, 22 days). The value of organic carbon content, nitrogen, phosphorus and C/N ratio on the 7th day, both on the 60 ml, 70 ml composter and 80 ml composter increased from 18 on the 7th day and on the 22nd day. **Conclusion:** fruit waste can be used as MOL in the processing of liquid compost from household waste.

Keywords ; Garbage, Compost, Fruit Waste

### Introduction

Garbage is a problem in big cities. This is because the largest sources of waste come from settlements and traditional markets. Market waste, such as vegetable markets, fruit markets, or fish markets, has a relatively uniform type. As much as 95% is organic waste. Waste originating from settlements is generally more diverse, but in general at least 75% consists of organic waste and the rest is inorganic. The average amount of waste generated by each person in various regions can vary. The waste generated in metropolitan cities, big cities, medium cities and small cities as a whole is 2.97 liters/person/day, 2.5 liters/person/day, 2.28 liters/person/day and 2.15 liters/person /day.<sup>1,2</sup>

The amount of waste generated by residents of the city of Banda Aceh is 0.58 kg/person/day with a population of 242943 people in Banda Aceh. The waste generated by the City of Banda Aceh consists of: Organic waste, plastic, paper, metal/glass, and other waste. The percentage of organic, paper and plastic waste generated by the city of Banda Aceh is 89.1%; 2.5%; 0.74 % .<sup>3</sup>

The fruit juice business is growing because with a little capital it can generate a profit of 15% -30%. People are also increasingly liking the juice let alone sold at low prices . Because of this, the sale of 500 juices in the city of Banda Aceh has grown rapidly, more than 200 carts of street juice in the city center and the main roads of the city of Banda Aceh. On average overnight spending fruit reaches 10-20 kg of fruit. All types of fruit juice produce waste. The negative impact that arises is the amount of waste generated. While the final waste storage capacity in the city of Banda Aceh is increasingly limited, for this reason, innovative works are needed that can help in waste management. According to RI Law Number 18 of 2008 concerning Waste Management, states that waste is the residue of human daily activities or from natural processes in solid form. Garbage is something that is not used, not used, not liked or something that is thrown away from human activities and does not happen by itself .<sup>4</sup>

The waste management paradigm used is collection, transport and disposal, and the mainstay of a city in solving its waste problem is destruction by landfilling at a TPA. The process of taking goods that still have value from waste to be reused is known as recycling. Processing waste with the 3R concept, namely reuse, reduce, recycle. It is a way to process waste from upstream in the sense of household waste. Applying the 3R concept is actually easy but requires awareness of the community itself<sup>5</sup>

The activity of recycling waste in the context of making waste a resource is closely related to the composition of waste in Indonesia, of which around 71% is waste that can be used as compost. Looking at the characteristics of organic waste with a high water content (59.88%), a C/N ratio of 37.1 and a size range of about 2.5-7.5 cm, these are the characters or values suitable for the composting process 6-10. The results of a study on making municipal waste compost, namely household waste compost using "composters", help reduce the amount of waste generation at the source, reduce transportation costs for waste transportation and can extend the life of the landfill.<sup>5</sup> Utilization of fruit waste that is no longer used for the manufacture of liquid organic fertilizer with the help of Effective Microorganisms (EM-4), for the analysis of nitrogen is 2.80%, phosphorus is 1.16%.<sup>6</sup>

In this study, fruit waste left over from making juice will be used as local microorganisms (MOL) in processing organic waste. Compost can occur naturally in the open through natural processes for a long time. can reach tens of years. This process needs to be accelerated with compost, to help the decomposition process of organic matter into compost, decomposer materials are needed. Various kinds of decomposer materials are circulating in the market (EM4)<sup>7</sup>. However, the costs incurred are expensive. Basically, compost made from microorganisms is easy to produce yourself, because many useful microorganisms are found in nature around us. The process of making this compost can use MOL (Local Micro Organisms). MOL solution contains macro and micro nutrients and also contains bacteria which have the potential to decompose organic matter, stimulate growth and as agents to

control pests and plant diseases. The main advantage of using MOL is that it is cheap and even without costs by utilizing materials that are around<sup>8</sup>.

Processing waste into compost in urban areas requires a location for storing waste, of course this cannot be done in houses that are densely populated or there is no open land because in general the yard is on a concrete floor, for this you need a simple composter and easier composting results, namely with the results of liquid compost, several studies tested simple composters for household scale and obtained compost with good quality. The use of a composter is effective enough to be used in composting city waste. An alternative to making a simple household composter can be made by using used materials around the house.<sup>5</sup>

Research states that the reduced volume reaches 20% and also mentions the figure of 60% as the weight lost and leaves compost of 25% of the total weight of the organic part of the waste. The remainder that cannot be composted is 15%. Apart from the benefits of reducing the volume of waste, composting can also provide economic value to the community in accordance with the selling price of compost in each area<sup>5</sup>

This study aims to reduce the volume of waste by utilizing fruit waste and organic waste with a composter method that produces liquid compost which can be carried out at the household level.

## **Materials and Methods**

The type of research conducted was a quasi-experimental research with a pre-post-test only research design with a control group design, where the object of the study was divided into two treatment groups. The first group is referred to as the treatment group, namely the group that was given MOL of fruit waste. The second group is referred to as the control group, namely the group that was not given EM4 MOL and without MOL. With the Completely Randomized Design (CRD) method. The location of the research was carried out at the Workshop on the Department of Environmental Health, Poltekkes, Ministry of Health, Aceh. The object of research is fruit waste originating from the city of Banda Aceh. The research subject is organic waste.

The tools and materials used are a bucket (drum) used for composting containers, a pH meter is used to measure the pH of liquid fertilizer. Wooden racks, faucets, blenders are used for grinding fruit waste, scales, zinc plates as filters, buckets, plastic bottles. The filter is used to filter between the liquid and the composting dregs. Household organic waste, fruit waste. EM4 liquid (ready to use) as a bioactivator or bacteria for fermentation as a control. Rice washing water, sugar. Data obtained by recording the results of filtering and measuring treatment.

### **Research procedure**

The stage for making MOL is that 5 kg of fruit waste is cut into small pieces, 5 liters of coconut water and 0.25 grams of sugar are added. All ingredients are put in a 2.5 liter bottle and then all ingredients are stirred until evenly mixed. Bottle caps and bottles are given holes so that air can enter, observed on the fifth day to check the smell so that the level of success is known, marked by the smell of fermentation. All ingredients are then fermented for 10 days. After 10 days in the filter. And MOL is ready to use

### Simple Composter stage

Place the filter holder in the bucket, then the filter. Hole in the bucket at the bottom, about 1-2 cm from the bottom of the bucket, to install a faucet as a hole for draining leachate resulting from the composting process. Filter made of plastic sheet using solder or heated nails (will serve as a perforated filter) Attach a faucet or hose to the hole. Made as many as 5 pieces

The composting stage is placing the composter in a rack or high place

Cut small waste, around 1 – 2 cm. Prepare 10 kg of organic waste and divide by five so that for one treatment with 2 kg of waste. Enter MOL with details

P1 was 60 ml MOL, P2 was 70 ml MOL, P3 was 80 ml MOL, P+ was without MOL (control -), P- was given EM4 (positive control). Enter the comparison of water with waste (2 waste : 1 water) (2 kg of waste with 1 liter of water), stir well. Close the composter tightly. Take the results from the faucet at 7, 10, 14, 18, 22 days. Check the CNP content. The data obtained were analyzed descriptively

### Results

ResultsThe research aims to use liquid compost from the use of MOL from fruit waste in household waste processing with a household scale composter with indicators of organic carbon, nitrogen, phosphorus and C/N ratio examination results:

Table 1. Liquid compost from the use of moles of fruit waste in household waste processing with a household scale composter

Moles Dosage	Content	Day				The 22nd
		7th	10th	14th	18th	
60 ml	Organic Carbon	19,8	19,40	19,73	20,3	20,05
	Nitrogen	3,5	3,73	3,79	4,2	3,85
	phosphorus	14,3	14,08	14,32	14,8	14,55
	C/N Ratio	18	18,56	18,86	18,3	18,15
70 ml	Organic Carbon	25,6	25,74	26,17	27,6	26,6
	Nitrogen	7,8	8,27	8,41	8,3	8,55
	phosphorus	19,5	19,31	19,63	20,4	19,95
	C/N Ratio	22	21,77	22,14	22	22,5
80 ml	Organic Carbon	27,8	27,05	27,50	28,1	27,95
	Nitrogen	9,2	9,10	9,25	9,6	9,4
	phosphorus	22,8	22,50	22,88	22,7	22,25
	C/N Ratio	25	24,68	25,09	25	25,5
Negative control	Organic Carbon	39,6	39,29	39,95	41,6	40,6
	Nitrogen	0,74	0,86	0,88	0,9	0,89
	phosphorus	7,2	7,21	7,50	7,4	7,45
	C/N Ratio	30	29,03	29,52	29	29
Positive Control (EM4)	Organic Carbon	20,7	20,13	20,46	20,9	20,8
	Nitrogen	2,2	2,27	2,31	2,2	2,15
	phosphorus	9,3	9,48	9,64	9,3	9,8

C/N Ratio	15	15,48	15.74	14	14.5
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In Table 1. The results of the study show the use of liquid compost from the use of MOL from fruit waste in household waste processing with a household scale composter with indicators of organic carbon, nitrogen, phosphorus and C/N ratios showing variations in percentage. The detailed results of the content examination are in the following image:

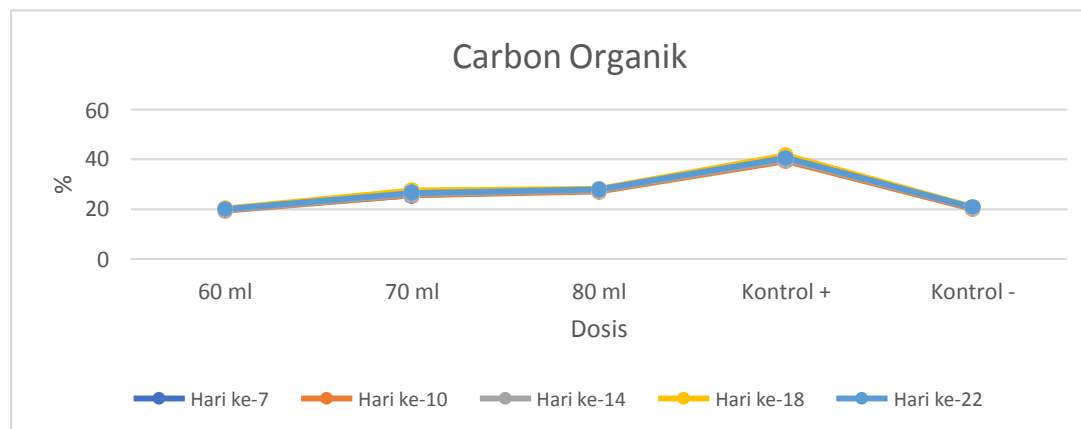


Figure 1. Organic carbon content of liquid compost from the use of moles of fruit waste in household waste processing using a household scale composter

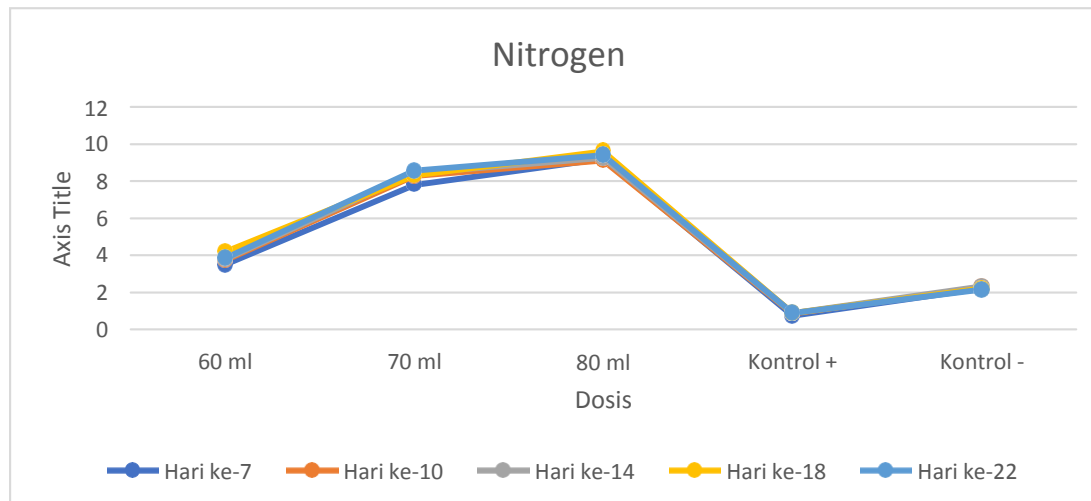


Figure 2. Nitrogen Content of Liquid Compost from the Use of Moles of Fruit Waste in Household Waste Management with a Household-Scale Composter

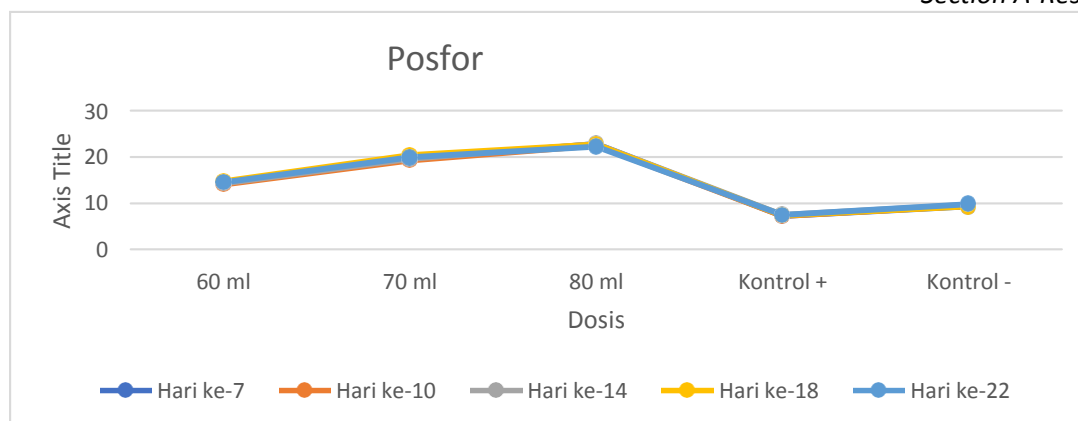


Figure 3. Phosphorous Content of Liquid Compost from the Use of Moles of Fruit Waste in Household Waste Management with a Household-Scale Composter

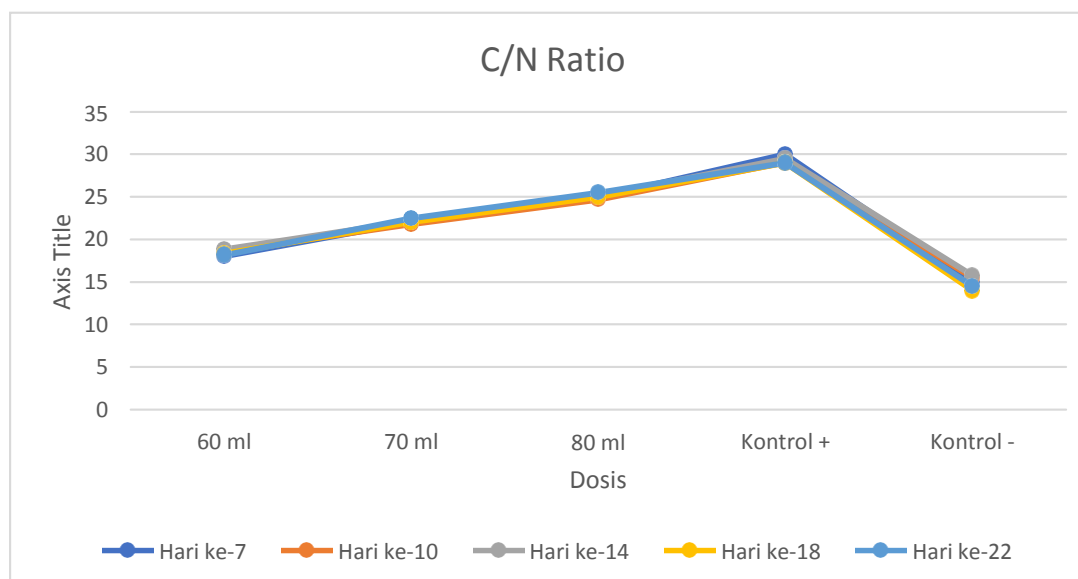


Figure 4. Content of C/N Ratio of Liquid Compost from the Use of Moles of Fruit Waste in Household Waste Management with a Household-Scale Composter

## Discussion

The C/N ratio is also an important factor in evaluating the ongoing composting process. The results of the analysis of the C/N ratio during the composting process, are presented in which it can be seen that the value of the C/N ratio on the 7th day, both at the composter dose of 60 ml, 70 ml and at the composter dose of 80 ml increased from 18 on the 7th day and

became 18.15 on day 22. Likewise with the content of organic carbon, nitrogen and phosphorus.

This is because the types of organic waste studied are the same and the composting process takes place on the same day. The C/N ratio value of 18.5 indicates that the organic waste studied is in the optimal C/N ratio range. In general, it can be seen that the nutrient content of composters with larger doses is higher than those with low doses, the nutrient content is relatively the same as the nutrient content of similar municipal waste composts.

Thus, based on the temperature parameters, the C/N ratio in general it can be said that the composter used to compost household waste can function properly. However, the temperature parameter is still not optimal, so it is necessary to make a composter that has a larger volume so that the heat insulation process occurs. The composting process takes 22 days and there is relatively no difference between the treatments with and without reversal.

Variation A has a C/N ratio value that is almost close to the minimum value compost standard based on SNI 19-7030-2004. But overall, the value of the C/N ratio is still there below the value of the C/N ratio of commercial compost on the market. This is due to the availability of carbon limited in composting material, so not enough energy to fix free nitrogen. Nitrogen will released in the form of ammonia and low quality compost. A good C/N score would be close to the C/N value of the soil, which is 12. At this value is the best condition that will affect efficiency of utilization of nutrients found in fertilizers by plants<sup>9</sup>

The long factor for compost maturity which takes 22 days is also supported by other factors such as: On the 22nd day the smell of compost already resembles the smell of earth. The color of the compost on the 22nd day is blackish brown. The structure of the compost has been biologically destroyed. The structure of the compost in the composter which is mixed is more destroyed (better) than that without stirring<sup>10</sup>.

### **Conclusion :**

The use of MOL from fruit waste in household waste processing with a modified composter can produce liquid compost, with variations in MOL doses (60 ml, 70 ml, 80 ml) and time (7, 10, 14, 18, 22 days). The value of organic carbon content, nitrogen, phosphorus and C/N ratio on the 7th day, both in the composter dose of 60 ml, 70 ml and in the composter dose of 80 ml increased from 18 on the 7th day and on the 22nd day.

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