ISSN No:-2456-2165

Acceleration of Sugarcane Waste Composting with Mol of Stale Rice

F.Silvi Dwi Mentari, Yuanita, Haryatie Sarie, Nur Hidayat, Riama Rita Manullang, Faradilla, Daryono, La Mudi, Zainal Abidin
Politeknik Pertanian Negeri Samarinda
Kampus Gunung Panjang Jl. Samratulangi Samarinda 75131

Abstract:- This study aims to produce compost that meets the requirements for use as organic fertilizer in a short time. The main raw material for this research is bagasse waste. The compost is made by mixing bagasse and local micro-organism bioactivators from stale rice which is first processed by combining the ingredients of stale rice, granulated sugar and coconut water and water for further fermentation to formMoL which is ready to be applied to the basic ingredients to be compost processed. The results showed that after 21 days of decomposition, compost made from bagasse had a nutrient content of 0.7% N, 2% P, 0.73% K, 15% water content, 28.35 C/N ratio, 34.54% Organic Matter and pH of 6.8 which indicates the compost is ripe and ready to use.

Keywords:- *Sugarcane Waste, MoL, Stale Rice, Compost.*

I. INTRODUCTION

In today's modern agriculture, the use of chemical fertilizers has begun to be suppressed, even almost abolished and replaced with organic fertilizers. This is because organic fertilizers do not leave chemical residues, one of the organic fertilizers is compost.

Currently the use of waste as raw material for compost is preferred. Waste is a material that is disposed of from a source of human activity or natural processes, and does not or does not yet have economic value and can even have negative and positive economic values. According to Santoso (2012) waste is said to have negative and positive values.

The impact that can be caused by waste is in the form of negative impacts such as disturbances to human health. Disturbances to humans can be caused by bacteria, viruses, nitrate compounds, several chemicals from industry and types of pesticides found in the food chain, as well as some metal contents such as mercury, lead and cadmium. Furthermore, waste has a negative impact on the disturbance of the balance of the ecosystem. Damage to plants and animals that live in waters is caused by eutrophication, namely water pollution caused by the emergence of excess nutrients into aquatic ecosystems.

There are also negative impacts in the form of disruption to aesthetics and objects. Disorders of comfort and aesthetics in the form of color, smell, and taste. Damage to objects caused by dissolved salts such as corrosive or rust, muddy water, causes a decrease in the quality of recreation and housing areas due to odor and eutrophication. Waste can also cause odor pollution, where organic waste has a pungent odor. This is due to the presence of nitrogen and ammonia compounds in this waste.

Therefore, organic waste must be placed in a special processing location. Another impact, waste causes excessive growth of aquatic organisms. If organic waste enters the waters in excess, it will result in the growth of aquatic microorganisms. This growth is due to the content of organic matter in this waste. Excessive growth can cause the waters to be covered by microorganisms and disrupt the life of living things in the water.

The positive impact of the waste is that it can be used as fertilizer. Organic waste can be used as fertilizer to fertilize the soil by turning it into compost. Compost contains organic substances that are beneficial to plants, such as nitrogen and carbon. Compost is cheaper than artificial fertilizers and more natural. Organic waste is easily decomposed. Organic waste is composed of organic compounds produced by plants and animals. This compound is easier to decompose than inorganic waste such as plastic. This decomposition occurs due to the activity of organisms in the soil such as worms and bacteria. Because it is easily decomposed, organic waste does not cause soil damage.

Sugarcane (*Saccharum officinarum*) is grown for sugar raw materials. This plant can only grow in tropical climates. This plant is a type of grass. The age of the plant from being planted until it can be harvested is approximately one year. In Indonesia, sugar cane is widely cultivated on the islands of Java and Sumatra. Bagasse is a solid waste product of the sugar factory milling station, produced in the amount of 32% of milled cane. Initially, bagasse was widely used by paper mills, but due to demands from paper quality and the availability of other, higher quality paper raw materials, paper mills began to rarely use it.

Sugarcane bagasse can also be considered as a companion product, because most of the bagasse is used directly by sugar mills as boiler fuel to produce energy for the process, which is around 10.2 million tons per year (97.4% of bagasse production). The rest (approximately 0.3 million tons per year) lies on the factory land so that it can cause air pollution, bad views and odors around the sugar factory. Bagasse contains water, sugar, fiber and microbes, which are stacked and undergo fermentation which produces heat. If the pile temperature reaches 94ºC, a spontaneous fire will occur (Sutrisno & Toharisman, 2009).

This is reinforced by the statement of Akakusuma et al (2011), that bagasse is the residue of sap extraction, generally constituting 31-34% of sugarcane. Its composition is 50% consisting of 47% fibrous parts and 3% residual sugar and other dissolved solids. The bagasse produced is generally burned in a boiler as a steam generator to drive sugar factory machines and other processing needs. Bagasse or commonly called bagasse, is a by-product of the sugarcane juice extraction process. From one factory, bagasse is produced around 35-40% of the weight of milled sugarcane.

Based on data from the Indonesian Sugar Plantation Research Center (P3GI), bagasse produced is 32% of the weight of milled sugarcane. As much as 60% of the bagasse is used by sugar factories as fuel, raw material for paper, raw material for the brake lining industry, mushroom industry and others. It is estimated that as much as 40% of the bagasse remains untapped.

Rahimah et al (2015) stated that bagasse is a waste material that is usually disposed of in open dumping without further processing, which will cause environmental disturbances and an unpleasant odor. Based on this, it is necessary to apply a technology to deal with this waste, namely by using solid waste recycling technology to become useful-value compost products. Composting is considered a sustainable technology because it aims at environmental conservation, human safety and provides economic value.

Utilization of bagasse waste as a raw material for composting is an alternative to minimize aesthetic pollution. Bagasse, commonly called bagase, is a waste produced from the process of milking or extracting sugarcane stalks. One extraction process produces bagasse of about ± 35 - 40% of the weight of the whole milled sugar cane.

Based on the observations of researchers, although there are no sugar factories in the Samarinda area, there are many sugarcane juice traders who produce a lot of waste in the form of bagasse.Utilization of bagasse as organic material has the potential to become compost which can replace anorganic fertilizers and is beneficial for plant growth. Developments in agriculture and the agricultural industry in Indonesia often lead to an increase in plant residues, most of which are side products containing lignocellulose (Hendritomo, 2011).

According to Wahono (2017) bagasse contains 3.82% ash, 22.09% lignin, 37.65% cellulose, 1.81% juice, 27.97% pentose and 3.01% SiO_2. Bagasse waste has an organic matter content of about 90%, has a nutrient content of 0.30% N, 0.02% P2O5, 0.14% K2O, 0.06% Ca, and 0.04% Mg (Research and Development Agency PT. Mataram White Sugar, 2002). Bagasse fiber is insoluble in water and consists mostly of cellulose, pentosan and lignin. If bagasse is left alone, the decomposition process takes a very long time. The composting process also requires the help of microorganisms to decompose materials and speed up the composting process.

Composting is a countermeasure as well as can be beneficial for the next life cycle. With the help of an activator, composting time can be shortened, reducing costs, eliminating odor problems and producing good quality compost that meets the requirements for use as organic fertilizer. In its use, compost also does not leave chemical residues so that it is one of the supporters of organic farming. The use of several microbes including Azotobacter, Trichoderma, Aspergillus, Pseudomonas and other local microorganisms (MoL) will produce compost that is richer in nutrients (N, P and K) so that it can affect plant productivity.

According to Jumriani (2018),Local Microorganisms (MoL) is solution resulting from the fermentation made from the basis of a variety of resources locally available. MoL solution contains micro and macro nutrients and also contains bacteria that potential as a decomposer of organic matter, growth stimulant and as an agent controlling pests and plant diseases, so MoL can be used either as decomposers of biological fertilizers and as organic pesticides or as a fungicide.

Bioactivators are fermented products made from organic materials found in the environment such as bamboo shoots, rice washing water, brown sugar. The content of bacteria in the bioactivator can be used as a starter for the manufacture of organic fertilizers, compost, biological fertilizers, and even organic pesticides. The characteristics of MoL that are ready to use are through the smell that the liquid will smell like tape.

Another easy-to-obtain microorganism material comes from household waste which is produced almost every day, namely stale rice. Stale rice can be used to fertilize plants because it contains nutrients 0.7% N, 0.4% P_2O_5, 0.25% K_2O, 62% moisture content, 21% organic matter, 0.4% CaO and C/N ratio 20-25 (Lingga, 1991).

Stale rice is used as a medium for growth and development of microorganisms. The use of MoL rice in plants does not damage the environment and is also harmless to humans and animals. MoL of stale rice with a concentration of 300 grams of stale rice is good for use as an activator for making compost with a treatment dose of 200 ml MoL of stale rice (Harizena, 2012). Fungus on stale rice is a thermophilic flora that can appear within 5 to 10 days to act as a decomposer of organic matter into colloidal liquid containing iron, calcium and nitrogen which eventually becomes fertilizer. Saraswati & Sumarno (2008) Useful microbes (effective microorganism) are components of natural habitats that have an important function in supporting environmentally friendly agriculture through the processes of decomposition of organic matter, mineralization of organic compounds, nutrient fixation, nutrient solvents, nitrification and denitrification.

The objectives of this research are:

- Knowing the nutrient content of compost processed from bagasse
- Utilizing sugarcane bagasse into a product in the form of good quality compost that is useful for the community

This research is expected to provide benefits:

- The results of this study are expected to minimize bagasse waste by utilizing bagasse as compost with the help of stale rice MoL bioactivator.

- Providing information to the general public that bagasse waste can be used as raw material for making compost.
- This is a positive step to anticipate the scarcity of fertilizers, the high price of fertilizers and to avoid fake fertilizers.
- Through composting, it is hoped that it will create new jobs.

II. RESEARCH METHODOLOGY

A. Time and Place

The time of this research was 3 months, starting from December to February 2018, including the activities of preparing materials and tools, making stale rice MoL, carrying out composting, testing compost nutrients and preparing reports.

This research was conducted on Kapas street no.62 Samarinda and nutrient testing was carried out at the Soil Laboratory of Politani Samarinda.

B. Materials and Equipment

Some of the tools needed in making MoL include a bucket with a lid with a capacity of 10 liters, a plastic hose with a diameter of 0.5 cm and a length of 2 meters (as a link between the bucket and the used mineral water bottles), bottles of mineral water with a capacity of 1.5 liters, filters, buckets, blender / pounder. The main ingredients used are 1 kg of stale rice overgrown with orange mushrooms, 5 tablespoons of granulated sugar, 1 liter of coconut water and 4 liters of water.

The equipment used to make compost includes machetes, shovels, thermometers, pH meters, plastic sheeting, composting tubs while the materials used are bagasse and bran and MoL of stale rice which are ready to be applied.

C. Research Procedures

➢ *Production of stale rice MoL bioactivator*

- Prepare a casserole that has been overgrown with orange (orange) mushrooms.
- Make a hole in the bucket lid with a diameter of 0.5 cm, then insert the hose through the hole. The edge of the hose on the bottle cap is covered in a circle using plasticine to ensure there are no air gaps.
- Make a hole in the lid of a used mineral water bottle with a diameter of 0.5 cm, then insert the hose through the hole. The edge of the hose on the bottle cap is covered in a circle using plasticine to ensure there are no air gaps.
- Fill a used mineral water bottle with half of the water. Make sure the end of the hose is submerged in water. This bottle is then referred to as an indicator bottle. Indicator bottles are made to drain air bubbles resulting from the fermentation process.
- Prepare a bucket then add 4 liters of water, then add sugar and stir until dissolved.
- Add coconut water. According to Budiyanto (2002) coconut water is a good medium for the growth of microorganisms during the fermentation process because coconut water contains 7.27% carbohydrates; 0.29% protein; some minerals include 312 mg L-1 potassium; 30 mg L-1 magnesium; 0.1 mg L-1 iron; 37 mg L-1 phosphorus; 24 mg L-1 sulfur; and 183 mg L-1 chlorine.
- Put stale rice into the solution then stir the mixture until smooth, then filter.The filtered liquid is put into a bucket, then tightly closed with a lid that has been connected with a plastic hose to the indicator bottle. Leave it for 7-10 days and avoid direct sunlight. The indicator for the success of making MoL is a liquid that smells like tape, does not smell bad, there are air bubbles in the indicator bottle as a sign of microbial activity in the fermentation process.
- MoL is ready to be used as a starter, decomposer.

➢ *Making Compost*

The manufacture of compost from bagasse includes the following steps:

- The raw material in the form of bagasse is chopped with a machete until it is smooth (± 1 cm).
- Raw materials that have been chopped and mixed with stale rice MoL bioactivator until evenly distributed with a water content of ± 60% (characterized by the material feeling wet when squeezed but water does not drip) are put into the composting box. The material is then tightly covered with a tarpaulin.
- During the decomposition process, the temperature is maintained by regular reversal.
- Observation of the color, smell and texture of the compost during the composting process takes place and the observation ends when the compost has matured marked with black compost color, smells like earthy smell, crumb texture, normal temperature (same as room temperature), and volume shrinks to one third.

D. Data Processing

Data processing in the form of reports on the results of observations on composting including visual observation of compost, as well as results of laboratory analysis including nutrient content of Nitrogen, Phosphorus, Potassium, water content, C/N ratio, organic matter and pH contained in bagasse compost processed with MoL rice stale.

III. RESULTS AND DISCUSSION

A. Results

Composting is done for 21 days. Mature compost is characterized by odorless, blackish color, temperature returns to normal, crumb structure (crumbles when crushed). The final result and duration of composting are highly dependent on the material to be composted. Material properties that influence include: nutrient content and C/N ratio, particle size, aeration, porosity, humidity, temperature and pH (Isroi, 2008).

The pH condition on day 1 was 5.5 and continued to increase slowly to 6.8 on day 21. The initial temperature in the composting process was 28^0C, the highest temperature increase was on the 10th and 11th days of 35^0C and slowly decreased again. On the 15th day the temperature had become 26^0C but the bagasse which was processed into compost had not completely crumbled. The temperature remained stable (26^{0}C) until the 21st day and from visual observations the bagasse which was originally white had turned into crumbs and had a blackish color.

The results of the analysis of bagasse-based compost showed the value of the nutrient content of 0.7% N, 2% P, 0.73% K, 15% water content, 28.35 C/N ratio, 34.54% Organic Matter and pH of 6.8 indicating that the compost is ripe and ready to use.

If you look at the nutrient content obtained from the manufacture of bagasse compost, the addition of other materials (for example, livestock manure) in the context of supplying organic matter should be done to supplement the nutrient content that does not meet compost quality standards while still helping to make use of the existing waste.

B. Discussion

In the process of composting bagasse with stale rice MoL as bioactivator it takes 21 days. The addition of MoL from stale rice makes the decomposition process rate faster because the bioactivator contains decomposer microorganisms or bacteria whose job is to decompose compost material. In accordance with the opinion of Indriani (2015), if the compost contains a lot of decomposer microorganisms, the rate of reduction in the thickness of the compost is faster because a lot of material decomposes, thereby reducing the thickness of the compost and a more advanced strategy is to utilize organisms that can speed up the composting process.

Composting is carried out for 21 days and visually the maturity of the compost can be seen, among others, from:

➢ *Smell*

The smell of compost is one of the criteria marked maturity of compost with an earthy smell (Wahyudin, 2018). At the beginning of composting it smells bad. This is thought to inhibit aeration resulting in an anaerobic process that produces an unpleasant odor. Anaerobic processes will produce compounds that smell unpleasant, such as organic acids, ammonia, and H_2S. Aeration can be increased by turning over the compost heap. Compost that smells bad indicates that the quality of the compost is not good, while compost that smells of soil indicates that the compost is of good quality and is really mature. In accordance with the opinion of Djuarnani & Setiawan (2012), that the characteristics of ripe bokashi are the loss of unpleasant odors.

➢ *Color*

The color of mature compost is black. Based on observations in research on making bagasse compost using stale rice MoL, visually the bagasse which was initially white in color has turned into crumbs and has a blackish color. The color change from dark brown at the beginning of composting to black at the end of composting is caused by decomposition of organic matter by the activity of various microorganisms. The aerobic decomposition process is indicated by the change in color to black (Sutanto, 2012). In accordance with the opinion of Djuarnani & Setiawan (2012), that the characteristics of ripe bokashi are dark brown to blackish in color. In accordance with the statement of Novitamala et al (2015), shape and color are one of the compost maturity criteria, with marked characteristics of dark brown to black like soil.

➢ *Temperature*

High and low temperatures are a factor that greatly influences the success of composting. An increase in temperature generally occurs since the beginning of composting. This increase can vary from 27-50ºC. Furthermore, it is close to the initial temperature of composting which is an indication that the compost is ripe. The temperature increases at the start of composting (≥ 30°C) and will remain high for a certain time. this indicates a very active decomposition/decomposition of organic matter. The microbes in the compost using oxygen will decompose organic matter into CO_2, water vapor and heat. After most of the material has decomposed, the temperature will gradually decrease. At that time compost maturation occurs, namely the formation of humus clay complex.

➢ *pH*

According to Indriani (2012), a good pH in compost is between 6.5 – 7.5 (neutral). In this study the range of pH during the composting process fluctuated, namely at the beginning of 5.5 and 6.8 at the end of the observation. Composting that lasts for days affects changes in the pH of organic matter. The initial pH of organic fertilizers starts off slightly acidic due to the formation of simple organic acids, then the pH increases during further incubation due to the decomposition of proteins and the release of ammonia.

➢ *Structure*

Compost that has matured is crumbly in nature, will feel soft when crushed, when it is kneaded it will crumble easily and there will be a decrease in the volume/weight of the compost as the compost matures. According to Murbanono (2013), mature compost will shrink. This is caused by the destruction of the material which used to be hard to become like soil, when it is squeezed it will be crushed so that shrinkage occurs and shrinkage can also be caused by compound substances that are lost and evaporate into the air.

➢ *Organic matter content and C/N ratio of compost*

The presence of a fairly high organic matter content in compost when applied to soil can more easily be observed for its benefits in changing the physical properties of the soil, including: a stimulant for soil granulation, improving soil structure to make it more crumbly, reducing soil plasticity and cohesion, increasing soil water holding capacity so that drainage is not excessive, soil moisture and temperature becomes stable, affects soil color to brown to black, neutralizes the destructive power of raindrops, inhibits erosion, and reduces leaching (leaching). Apart from that, the role of organic matter in changing soil biological properties is to increase diversity and increase the population of soil organisms that can live in the soil (soil macrobes and microbes).

The ratio of carbon and nitrogen (C/N ratio) is very important to supply the nutrients needed by microorganisms during the composting process. Carbon is needed by microorganisms as an energy source and nitrogen to form proteins. If the availability of carbon is excessive (C/N> 40) the amount of nitrogen is very limited so that it is a limiting factor for the growth of microorganisms. The decomposition process is hampered because excess carbon must be burned/disposed by microorganisms in the form of CO_2. The C/N ratio which is quite large also indicates that the material is difficult to decompose. The use of stale rice MoL bioactivator has the ability to 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 (Indriani, 2015).

Compost maturity test is carried out with a compost laboratory test. One of the compost maturity criteria is the C/N ratio. According to Sofian (2014), an analysis of the chemical properties of compost with a C/N ratio value below 30 is still safe for plants. Thus, the compost from this study, which has a C/N ratio of 28.35, is still suitable for fertilizing agricultural and plantation crops.

➢ *Compost nutrients*

The results of the analysis of compost made from bagasse showed that the nutrient content was 0.7% N, 2% P, and 0.73% K. According to Djuarnani and Setiawan (2012), element N is a nutrient in the soil which plays a very important role in plant growth. The behavior of nitrogen in the soil is difficult to predict because the transformation is very complex, more than 98% of N in the soil is not available to plants because it accumulates in organic matter or is entangled in clay minerals. Therefore, organic matter that has been transformed into fertilizer can help provide N for plants. . The supply of N elements through fertilization is preferred for plants because it is the most abundant element lost from the land after it is harvested. Element P in the soil, the classification is divided into organic P and inorganic P. The availability of organic P is less compared to inorganic P. Organic phosphorus comes from organic materials such as leaves which have undergone deorganization and released P ions so that they will enter the soil. Examples of organic P include phospholipids, succinic acid phytin, and inositol phosphate. While inorganic P in the soil is related to compounds that are difficult to dissolve in water such as Al, Fe, Mn, Ca. Organic materials are one of the determining factors for the availability of P nutrients through weathering, the results of which are easily absorbed by plants. Weathering involves microorganisms such as bacteria. As for the element K, plants can naturally obtain potassium from the soil, residues of organic matter and irrigation water. However, in general intake from nature is not always sufficient for optimal growth and yield. Thus there is no need for additional intake from the outside for the plant because it contains low potassium elements.

Compared to factory-made fertilizers, bagasse compost provides a much smaller value of the elements N, P and K. However, it is not just the addition of nutrients to improve chemical properties that is of concern, but in the long term it can also improve the physical and biological properties of the soil.

IV. CONCLUSION

- The decomposition process of bagasse as a basic ingredient of compost is accelerated by the addition of stale rice MoL bioactivator. Composting lasts 21 days.
- The resulting compost is ripe and ready to use. The results of laboratory analysis of the sample compost made from bagasse in this study contained nutrients 0.7% N, 2% P, 0.73% K, 15% water content, 28.35 C/N ratio, 34.54% Organic Matter and pH of 6.8. In order to shorten composting activities to help overcome waste problems in urban areas, especially bagasse, it is highly recommended to use stale rice MoL bioactivator which is very easy to process.
- Stale rice MoL is a solution fermented from stale rice, white sugar and coconut water which contains micro and macro nutrients and also contains bacteria that have the potential to break down organic matter.
- The addition of other materials (such as livestock manure) in the context of supplying organic matter should be done to supplement the nutrient content that does not meet the compost quality standards while still helping to make use of the existing waste.

REFERENCES

[1.] Akasuma N., Septu, M. Raiza. 2011. Making Bio-Ethanol from Sugarcane Bagasse with Variations in Hydrolysis Time, Yeast Weight, and Yeast Type. Sriwijaya University Palembang.

[2.] Research and Development Agency PT. Mataram White Sugar. 2002. Results of Bagage, Blotong, and Ash Analysis. Lampung : PT. Mataram White Sugar.

[3.] Djuarnani, N, and Setiawan, K.B.S. 2012. Quick Ways to Make Compost. Jakarta: Agromedia Pustaka.

[4.] Harizena, I. N. D. 2012. The Influence of Type and Dosage of MoL on the Quality of Household Waste Compost. Thesis. Concentration of Soil and Environmental Science, Department of Agroecotechnology, Faculty of Agriculture, Udayana University, Denpasar in Analysis of the Quality of Compost from Paddy Field Waste with MoL as a decomposer. E-Journal of Tropical Agrotechnology ISSN : 2301-6515 Vol 2 No.4 October 2013.

[5.] Hendritomo, HI. 2011. Mushroom consumption has medicinal properties. Jogjakarta : Publisher Andi.

[6.] Indriani, Y.H. 2015. Making Compost Quickly. Jakarta: Independent Spreader.

[7.] Jumriani. K. 2018. The Effect of MoL Against Growth and ProductionLand Kale Plant (*Ipomeareptans* Poir). Education JournalAgricultural Technology Vol 3.

[8.] Murbanono, L, H, S. 2013. Making Compost. Jakarta: Independent Spreader.

[9.] Novitamala, CB, B.Suwerda, I. Werdaningsi.

[10.] 2015. Effectiveness of Various Bio-Slurry as Compost SeasoningAgainst Formation Time and Compost Quality in Dusun Gadingharjo, Donotirto, Kretek, Bantul. Environmental health journal Vol 7, No 2, Pages 51-58
[11.] Rahima, M. Mardhiansyah, D. Yoza. 2015. Utilization of Compost Made from Sugarcane Bagasse (*saccharum* sp.) With Trichoderma spp Bioactivator. As a growing medium for *Acacia crassicarpa* seedlings. Jom Faperta Vol. 2 No. 1 February 2015.
[12.] Santoso. 2012. Utilization of Waste as an Industrial Material. Jakarta : Canisus.
[13.] Saraswati, R and Sumarno. 2008. Utilization of Soil Fertilizing Microbes as Components of Agricultural Technology. Journal of Food Crops Science and Technology, 3(1) :41- 58.
[14.] Sofian. 2014. Success in Making Compost from Garbage. Jakarta: PT Agromedia Pustaka.
[15.] Sutanto, R. 2012. Application of Organic Agriculture. Yogyakarta: Kanisius.
[16.] Sutrisno and A. Toharisman. 2009. Summary of Company Figures for the 2008 Mill Year (Inpress). P3GI. Pasuruan-East Java.
[17.] Wahono, T. 2017. Bagasse Fiber Analysis. http://eprints.undip.ac.id/58354/4/BAB_II.pdf. accessed on 9 February 2021.
[18.] Wahyudin. 2018. Garbage Composting Organic Household Uses Weevil Local Microorganisms Bananas As Bioactivator. Journal environmental health, Vol 1, No 1.