ANTI – SMELL AND COMPOST POWDER (ASC)

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Abstract: Nowadays, the reuse of waste to make fertilizer has been less applied. The objectives of this study were to produce Anti-Smell and Compost powder (ASC) as well as compare the strength of the smell and compare the decomposition time. The main purpose of ASC powder was to eradicate the smells produced by waste and to help decrease the decomposition time for compost fertilizer. The composting process divided into three condition; waste mixed with ASC, waste mixed with Bokashi, and waste without any mixture. The researcher distributed a questionnaire to test the smell from 350 respondents in Kota Kinabalu Polytechnic (PKK) area comprising of the PKK residents. The results of the study showed that ASC powder successfully achieved the objective, which the ASC mixed waste produced less smell compared to the other two samples. 69% chose with waste ASC powder will reduce the smells. While, the composting time for waste with ASC powders is more rapidly decomposing compared to existing products where in the second week ASC interventions began to show signs of decomposition. In the other hand, the temperature of the ASC approximately to ground temperatures which is at 32°C and for the waste with ASC powder textures is medium and a bit hard after 3 weeks. In conclusion, the results show that ASC powder can reduce the smell rate and accelerate the decomposition process and make the waste as compost fertilizer.

***Keywords**: Anti-Smell and Compost (ASC); Bokashi; Decomposition; Powder Texture*

1. Introduction

Solid waste management and zero open disposal by 2020 in an integrated manner is not just a goal but an effort towards managing solid waste resulting from human activities and taking care of the polluted environment. Care of the environment is very important because it is an important asset to the well-being of human life. Therefore, the implementation of integrated solid waste management is very important considering that the waste disposal statistics increase every year where the Local Authority states that each individual dispose of 1 kilogram of solid waste every day. If all the waste produced by the entire population is collected during 1 month

only, it will fill about four Kuala Lumpur Towers. The amount of waste generated is expected to continue to increase along with the increase in the number of people and the uncontrolled disposal of waste by all of us (Augustine, 2022).

Solid waste is the most easily available waste material and most produced. This happens because of an increase in resources or the source of the solid waste. Among the causes that cause the increase in solid waste are population increases, socioeconomic and lifestyle of Malaysians, untimely garbage/waste collection, unsystematic waste management and unconcerned community attitude.

Nowadays, the reusing waste materials is disappearing in the current of modernization because some communities still use the conventional method which is open dumping method or known as open dumping where all the solid waste that has been collected from houses and buildings will be released or thrown away in an open garbage disposal area. As a result, the problem of solid waste management in our country is getting more complicated. Local Authorities (PBT) are facing problems in finding suitable areas to dispose of the increasing amount of waste. In addition, awareness of water quality that decreased at a rate of 0.9 percent in 1994 is an example of the effects of water pollution as a result of inconsistent solid waste management. To overcome this problem, the researcher made a study on how to overcome this kind of problem. ASC powder is a powder made from organic materials to get rid of foul odours by indirectly composting materials such as waste. In this study, this powder has properties to reduce the smell of garbage and produce organic matter. This is because the problem of garbage nowadays is increasing and it is complicated to dispose of it. Therefore, this study was conducted to see the effectiveness of this powder in carrying out its function as a garbage odour remover and composting waste materials into organic compost fertilizer.

The main objective of this study was to produce Anti-Smell and Compost (ASC) powder. In this study, the effectiveness of ASC powder is more focused on the composting and reduction of waste odor. From the assessment made, overall ASC powder is effective in reducing odors and compostable waste. ASC powder also uses low cost in the process of making the powder. This ASC powder is able to decompose waste into organic compost. Overall, with Anti-Smell and Compost Powder (ASC) it can reduce waste disposal and cleaning work can be reduced. In addition, it will also help streamline solid waste management from having too much waste.

In this study, the scope of the study are as follows:

- Using ASC powder and additional organic matter.
- Using materials such as waste.
- The study only examined the effectiveness of ASC powder on waste.
- Make a composting time test (time will be recorded to know the time used during the composting process).
- Data collection such as moisture content, Phosphorus, Magnesium, Calcium, texture and temperature.

The significances of the research are as follow:

- Identify ASC powder that can work to reduce the bad smell of garbage.
- Compost waste material to become organic fertilizer.
- Making it easier for local communities to dispose of their own garbage by composting waste materials.
- Produce a substance that removes the smell of garbage using ASC powder.
- Identifying whether ASC powder can be used as an ingredient composting.

2. Literature Review

Reuse of waste materials is one of the methods profitable savings due to its cost-effective materials, easier and safer to use. Today's technology requires a lot of materials new that can replace existing natural materials now.

2.1 Waste Disposal

Waste disposal, the collection, processing, and recycling or deposition of the waste materials of human society. Waste is classified by source and composition. Broadly speaking, waste materials are either liquid or solid in form, and their components may be either hazardous or inert in their effects on health and the environment. The term waste is typically applied to solid waste, sewage (wastewater), hazardous waste, and electronic waste (Brittanica, 2019).

2.2 Food Waste Disposal

Food Waste represents a large percentage of the waste steam for many industries such as restaurants, hospitals, nursing homes, food manufacturing and processing facilities, supermarkets, schools, prisons, hotels, Corporate Offices, Catering Halls, food courts and many other locations. There is growing pressure for removing the organic waste from landfills. For establishments that serve food there is an average of 1 pound of waste per meal served when both pre-sale and post-sale waste is considered. Below is a brief overview of some of the ways to address food waste. Of course, the solution for each industry and even each facility within the same industry will vary depending upon many factors (Kennedy, M. 2013).

2.3 Activated Charcoal

Charcoal is an odourless, tasteless, fine black powder, or black porous solid consisting of carbon, and any remaining ash, obtained by removing water and other volatile constituents from animal and vegetation substances. Charcoal has been used since the earliest times for a range of purposes, including art, medicine, and fuel (M. Abdollahi & A. Hosseini, 2014). Activated charcoal is a popular home remedy for several other ailments and it’s sometimes used for other household and cosmetic purposes. However, most of these purported benefits aren’t backed by science. Water filtration is one of the benefits used from activated Charcoal. Activated charcoal may help filter water by removing contaminants, suspended solids, and microorganisms like bacteria — all without affecting the water’s pH or taste (Petre, A., 2021).

2.4 Rice Husk

Rice husk is an organic waste and is produced in large quantities. It is a major by-product of the rice milling and agro-based biomass industry. Rice husk is a cellulose-based fiber and contains approximately 20% silica in amorphous form. In addition, it consists of 60–65% volatile matter, 10–15% fixed carbon, and 17–23% ash. It contains approximately 40% cellulose, 30% lignin group, and 20% silica. Rice husk can absorb water ranging from 5% to 16% of unit weights, and the unit weight of rice husk is 83–125 kg/m3 (Phonphuak, N. & Chindaprasirt, P., 2015).

2.5 Rice Bran

Rice bran is a rice processing by-product which accounts for tons of food waste per year, composed by numerous nutrients and bioactive substances that are able to reduce the risk of noncommunicable chronic diseases. Therefore, rice bran can be considered a good candidate as a sustainable functional ingredient (Ferreira, S. C & Fernandez, A. M., 2019).

Rice bran is used as a good source of proteins, oils, crude fibers, carbohydrates, energy, phenolic compounds, γ-oryzanols, and fatty acids (saturated fatty acids 16.59%– 21%; monounsaturated fatty acids, 39.82%–49.95%; and polyunsaturated fatty acids, 33.23%–38.57%). Fermented rice bran (FRB) can be prepared by dual fermentation using fungi and lactic acid bacteria for improvement of its functional properties (Md. Alauddin & Md. Zakir, 2019).

2.6 Bokashi

BOKASHI is a word in Japanese that has the same meaning as organic matter that is fermented by containing a group of active bacteria bokashi called Effective Microorganism and can be known as EM. According to EM expert Dr. Imamura, bokashi is one of the good materials to fertilize the soil. Under normal conditions, bacteria these exist together where each has its own function and depend on each other. EM has contained types of Microbes into 4 categories; 1. Photosynthetic Bacteria; 2. Lactic Acid Bacteria; 3. Actinomycetes; 4. Yeast (Yamada, K., 2000).

2.7 Distilled Water

Distilled water is steam from boiling water that is been cooled and returned to its liquid state. Some people claim distilled water is the purest water you can drink. All water, no matter if it comes from a natural spring, artesian well, or regular tap, may have trace but safe amounts of minerals, bacteria, pesticides, and other contaminants. Distilling rids water of all those impurities. It also removes more than 99.9% of the minerals dissolved in water. Distilled water is a type of purified water. Salts, minerals, and other organic materials are removed by collecting the steam from boiling water. Distilled water is safe to drink. But probably find it flat or bland. That is because it was stripped of important minerals like calcium, sodium, and magnesium that give tap water its familiar flavour. What was left is just hydrogen and oxygen and nothing else (Blades, N., 2020).

2.8 Lactic Acid

Lactic acid is an organic compound with the formula $CH_3CH(OH)COOH$. It is white and soluble in water in its solid form while liquid, visible colourless. It is produced naturally or synthetically. Position its hydroxyl group adjacent to the carboxyl group makes. This

acid is classified as an alpha-hydroxy acid (AHA). Its conjugate base form, for example lactate, plays a role in several biochemical processes.

Lactic acid fermentation, commonly referred to as lacto-fermentation, is one of the most common and easiest methods of home preservation. Lactic acid fermentation was a method used to preserve dairy products, vegetables, and meat for extended periods of time before the advent of refrigeration and modern canning practices and today is also utilized in industrial fermentation. Lactic acid bacteria such as Lactobacillus spp., lactococci, Streptococcus thermophilus, and leuconostocs are examples of lactic acid bacteria that have the ability to convert sugars into lactic acid. Lactic acid inhibits the growth of subsequent and potentially harmful bacteria of other species. It also creates favourable conditions for yeast activity, a property that is utilized in the production of wine and beer (Malo, P. M. & Urquhat, U. A., 2016).

Lactic fermentation is a bacterial process that takes place during the production of numerous food products. It provides the final products with characteristic aromas and textures and plays a crucial role in food safety and hygiene. Among the bacteria responsible for lactic fermentation are lactic acid bacteria, which display high morphological and physiological diversity. The term lactic acid bacteria emerged at the beginning of the twentieth century to describe a heterogeneous group of bacteria that are currently defined as spherical (cocci) or rod-shaped (bacilli), gram-positive, catalase-negative, immobile, nonsporulating, anaerobic, aerotolerant, and producers of lactic acid (the main metabolite generated during the fermentation of sugars by these bacteria) (Munoz, R. & Rivas B. D.L., 2011).

2.9 Coffee Grounds

Coffee is a popular beverage consumed all over the world. Coffee grounds have many practical uses around the home and garden and can even help spruce up the beauty routine. Soil does not contain the essential nutrients needed for optimal plant growth. Also, as plants grow, the plant absorb nutrients from the soil, ultimately leaving it depleted. Thus, most gardens need to be fertilized to ensure that plants have the nourishment they need to survive. Coffee grounds contain several key minerals for plant growth like nitrogen, calcium, potassium, iron, phosphorus, magnesium and chromium (McDonell, K., 2018).

There are so many benefits of coffee grounds as the source of the fertilizer of the garden, composting, repel insect and pests, remove fleas from the pet, neutralize odours, natural cleaning scrub and so on. Coffee grounds have become one of the main additives in the process the production of ASC powder where the chemical properties of this material have been used by researchers in this research. This is because coffee grounds that are able to absorb odours are able to reduce to a minimum the smell that results from waste that will compost researcher. Coffee grounds also have nutrients for which plants will help the growth of garden plants or ornamental plants at home.

3. Materials and Methods

ASC powder is a powder that is able to compose waste and at the same time remove unpleasant odours from waste materials such as domestic waste. ASC powder is made from organic ingredients and the others additives such as coffee and charcoal.

3.1 Introduction

The effectiveness of this study is to ensure whether the ASC powder using organic materials is able to remove odours and compost garbage. In addition, ASC powder is affected by several factors such as waste capacity, physical characteristics of waste, and physical characteristics of powder ASC itself. In order to ensure that this ASC powder can work well, it is necessary monitored and managed systematically from time to time. With this, use ASC powder can last longer while saving costs and even fostering students about awareness of recycling in everyday life and culture aspects of entrepreneurship through recyclable materials.

3.2 The Materials

There are the materials that can be used and composted in this study are like domestic waste (fruits, vegetables, meat, fish, cheese, eggs, bread, tea bags, wilted flowers, tissues and other foods) and industrial waste (oil). The materials that used of ASC powder production are rice bran, paddy husk, charcoal, coffee ground, white rice, brown sugar and distilled water.

ASC powder is dry ingredients that have carbon elements, for example rice/wheat bran, rice/wheat husks that are ground and then mixed with EM (microbes), molasses, water and some other ingredients and fermented for a certain period before drying. When it is ready, these dry ingredients are finally full of microbes.
In addition to being used in compost, this ASC Powder can also be used to treat/remove the smell of animal excrement, put in regular compost, can improve soil conditions (provide additional microbes in the soil), can also be used as additional feed for chickens/ducks.

3.3 The Method

This method is made on ASC powder that will be made until deep research implementation process. The methods of producing ASC Compost of cycle are as follow:

- Collection of ingredients to make ASC powder.
- Production of Acid Lactic Process.
- Production of ASC powder within 1 week.
- Collection of waste such as food waste.
- Mixing ASC Powder and Food Scraps.
- The sealing process is done within 3-5 week.
- Production of organic fertilizers.

Figure 1. Acid Lactic Production Process.

Figure 2. Production of ASC Process.

Figure 3. Mixing ASC Powder and Food Scraps

4. Results

The results of the analysis in Figure 4 show waste with ASC powder recorded a high which is 69% of respondents felt that ASC powder with waste produced less odor followed by no mixing material which recorded 33% of respondents felt that no waste was mixed with the odor but not as strong as such as waste with Bokashi powder. The waste with Bokashi powder recorded a percentage of only 3%. This is due to the waste with Bokashi powder that produces a very strong odor compared to the absorbed waste material and waste with ASC powder.

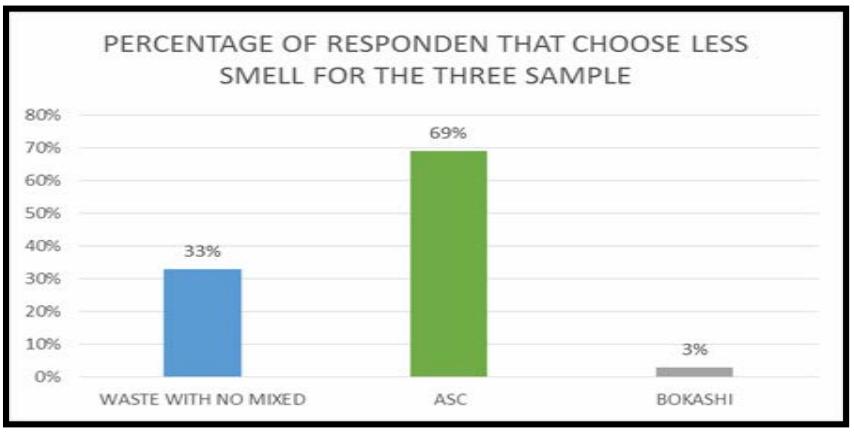

Figure 4. Percentage of respondent that choose less smell for three sample.

Table 1 show the temperature test and pH value of the three of waste without mixture, waste mixed with Bokashi and waste mixed with ASC. Temperature analysis was taken 3 times to compare the soil temperature with the three waste materials. Meanwhile, the pH value is taken to see the acidity and alkalinity of the three waste materials. The pH value test shows that the level of alkalinity of both waste materials, that is no mixture with Bokashi mixture, shows a higher level of alkalinity compared to the waste material with ASC which shows a neutral value (7). The pH value of waste with ASC powder is 7 which is neutral. While, the pH value of waste mixed with Bokashi powder and waste with no mix is 8 which is alkaline.

After 5 weeks, the temperature of waste with ASC powder is 32°C which is approximately soil temperatures. While, the temperature of waste mixed with Bokashi powder is 31.6°C and the temperature of waste with no mix is 31°C.

Table 1. Temperature Test and pH Value

About	Week	Waste Without Mixture	Waste Mixed with Bokashi	Waste Mixed With ASC
Temperature (°C)	Week 2	30.4	30.9	31.6
	Week 3	30.5	31.0	31.8
	Week 5	31.0	31.6	32
pH Value	Week 5	8.0	8.0	7.0

As a result of the tests that have been done by MARDI, the waste mixed with ASC has lost moisture which is 63.3g/100g or more than 60% loss humidity. According to studies that have been conducted on shrinkage tests moisture, waste material mixed with compost fertilizer takes

4-5 months to achieve 60% moisture reduction. However, waste materials mixed with ASC more than 60% moisture reduction in just 5 weeks.

Table 2 show the texture of waste in three weeks while the Figure 5 show the changes of the texture in three weeks. The texture was tested through two physical forms, namely the colour and toughness of the three samples waste. The changing of the waste with no mixture are decomposition begins and the colour of the waste become brownish orange within three weeks. The texture was rough material. For the waste mixed with Bokashi, decomposition is taking place and the colour of the waste becomes blackish brown and coarse texture. The waste mixed with ASC show the fast decomposition and the waste materials begin to become compost and the colour was dark brown. The texture is medium texture but a bit rough.

Table 2. The Texture of Waste in 3 weeks

About	Waste Without Mixture	Waste Mixed with Bokashi	Waste Mixed With ASC
Colour	Brownish Orange	Blackish Brown	Dark Brown
Moisture	Very Clay	Clay	Less Clay
Types of Texture	Coarsely and Clay Textured	Coarsely Textured	Medium Texture but a bit Rough

Figure 5. The Texture of Waste in 3 Weeks.

5. Discussion

For ASC powder, odour effectiveness tests were conducted throughout this process. This product has been tested by sprinkling it on waste material and leaving it for a long time a few days before doing the questionnaire to collect data. The test was done according to the responses from the respondents who answered the questionnaire which has been distributed. Next, the researcher has also done this study and the result was that almost all respondents said that this ASC powder is lacking gives off an unpleasant odour compared to the ready-made product is on the market.

In addition, composting tests are carried out by making observations every day and data are taken on the temperature and texture changes of the waste material with ASC powder. Organic fertilizer will be produced when it returns to the soil temperature of 32°C. By that, the temperature of waste material with ASC powder is close to 32°C and can be organic fertilizers.

As for the texture, organic fertilizers have a fragile texture and rattled. Based on the research carried out, the texture of the waste material mixed with ASC powder is almost similar to the texture of organic fertilizer normal. In terms of colour, the waste material has turned brown and in terms of toughness, the waste material is clay due to the presence of water from the waste material which is taken which makes the waste material still slightly moist. For the moisture test, waste material mixed with ASC has reached the percentage a decrease in humidity of 63.3% which is the study that has been done previously a waste material that has been mixed with compost it takes 4-5 months to reach a 60% shrinkage percentage. But ASC mixed waste only takes 5 weeks, material the waste has reached more than 60% reduction humidity.

6. Conclusion

The main objective of this study is to produce Anti-Smell powder and Compost (ASC). The collection of data and information about this powder is through a questionnaire distributed to the people of Kota Kinabalu Polytechnic. An odour effectiveness study was conducted to prove that ASC powder is effective and helps in reducing the smell of garbage. In this study, the effectiveness of ASC powder is more focused on composting and waste odour reduction. From the assessment made, overall ASC powder is effective in reducing odours and substances waste can be composted. ASC powder also uses low cost in the powder manufacturing process. In addition, the required workforce in the manufacturing process of this product is a total of four people. This ASC powder capable of decomposing waste materials into organic fertilizers.

The collection of data and information on this through a questionnaire distributed to the residents of Kota Kinabalu Polytechnic. In this study, the effectiveness of ASC powders is more focused on composting and reducing waste. From the assessment, overall ASC powder is effective in reducing smell and waste can be compost. Overall, with the presence of Anti- Smell and Compost powder (ASC) it can reduce waste disposal and reduced cleaning works.

Currently the Anti-Smell and Compost (ASC) Powder in process to get the certification scheme drawn up by Malaysian Department of Agriculture, formerly known as Good Practice Scheme of Malaysia (SALM) to recognize farms or factory that practice Malaysian Good Agricultural Practice (myGAP). For future development, we plan to do more researches and studies on the composition of ASC Fertilizer in terms of mineral content to refine the advantages and benefits to the community. We also plan to install the sensors in the dustbin to acquire direction information. The sampling methods will be improved or upgraded using ARDUINO where temperature and humidity sensor are placed. The recording data of temperature and humidity will be sending the data to a cloud server for research purpose.

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