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## **Introduction of eco-enzyme to support organic farming in Indonesia**

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### **Abstract**

The development of organic farming is getting significant because the Indonesian people realize the hazards of consuming products with chemical substances. Organic farming product is chosen as it is healthy and fresh. In Indonesia the organic farming system is not well established. It does not support the food security since the cost production is high. It makes the organic products prices are expensive. Number of consumers of organic products in Indonesia is less than 5%. This paper aims to introduce eco-enzyme to enhance the sustainability of organic farming system in Indonesia. Eco-enzyme is a fermentation product from daily kitchen wastes such as fruits and vegetables. It is biodegradable and environmentally safe. Based on the literature study, eco-enzyme contains acids (lactate and acetic). These fermentation products are performing high antimicrobial activity that can inhibit the microbial growth. Therefore, it can be utilized as biopesticides. The investigation on some suspected active compounds is still under studied. Eco-enzyme is economically cheap and highly available. However, the benefits of eco-enzyme is only little known by Indonesian farmers. The target of this paper is to minimize the cost of organic farming system in Indonesia by introducing eco-enzyme as natural fertilizer and biopesticide to support the organic farming. By reducing the cost, it is expected that the sustainability of organic farming can be increased thus that it can support the food security. The outcome of introduction of eco-enzyme to Indonesian organic farming system can reduce the production cost and make the organic products affordable to the people.

**Keywords:** eco-enzyme; organic farming; biopesticides; natural fertilizer

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### **Introduction**

Agriculture today is finding itself in increasing difficulties. The environmental lobby complains about pollutions from pesticides, fertilizers, and other chemical substances added on

agriculture. People are worried about the chemical residues of modern farming to their diet and start to think about consuming healthier products. Organic farming and agriculture rose up to cope with the problems of current modern agriculture. Organic farming aims to be in harmony rather than in conflict with natural systems. This idea pervades all aspects of farm, from how pests are controlled through the treatment of livestock and the integration of the farm with the natural environment. Organic agriculture adopts an approach that minimizes the use of non renewable forms of energy. Chemical pesticides and artificial fertilizers are avoided to gain optimum nutritional value. In Indonesia, the organic agriculture increases by 10% per year. This phenomena show the increase of people interests in organic farming. Organic agriculture is expected to solve the health and environmental problems. The development of organic agriculture in Indonesia is gross, because basically Indonesia is an agricultural country. Most of the people depends their life a lot on agriculture. Some of agriculture areas are utilized as organic agriculture sites. The organic agriculture in Indonesia currently faces several problems. The production cost of organic agriculture is very high dealing with the pre-harvest and post-harvest treatment. This problem affects the sustainability of organic farming products in Indonesia. The organic products can be consumed only by upper class people due to its expensive prices. It makes the current organic agriculture system in Indonesia cannot support the food security. It cannot ensure the supply of foods to all the Indonesian people. The previous study from Bogor Agricultural University revealed that the main obstacle of Indonesian organic agriculture lies on the production cost. This paper aims to introduce eco-enzyme to enhance the sustainability of organic farming system in Indonesia. Eco-enzyme is a fermentation product from daily kitchen wastes such as fruits and vegetables. It is biodegradable and environmentally safe. Based on the literature study, eco-enzyme contains acids (lactate and acetic) (Symon and Buswell 1933). These fermentation products are performing high antimicrobial activity that can inhibit the microbial growth. So it can be utilized as biopesticides. The investigation on some suspected active compounds is still under progress. Eco-enzyme is economically cheap and highly available. But the benefits of eco-enzyme is only little known by Indonesian farmers. The target of this paper is to minimize the cost of organic farming system in Indonesia by introducing eco-enzyme as natural fertilizer and biopesticide to support the organic farming. By reducing the cost it is expected that the sustainability of organic farming can be increased so that it can support the food security. In conclusion the introduction of eco-enzyme to Indonesian organic farming system can reduce the production cost and make the organic products affordable to the people.

## **Materials and Methods**

The main ingredients to make ecoenzyme are kitchen waste, brown sugar, and water according to ratio 3:1:10. Kitchen waste that ecoenzyme need come from fruits and vegetables. These kitchen waste are cut into small pieces, brown sugar is punched into powder, and mixed with water in a plastic container that can be tightly sealed. The bottle should be shook to make sure all the ingredients hydrated and soluble. Make sure to open the cap every two weeks to release the gas of carbondioxide and methane. What is the experiment? Is method just making the eco-enzyme? What is other steps after making the eco-enzyme e.g. results of using and results that prove the use of eco-enzyme that it is really work?

## **Results and Discussion**

Fermentation refers to the activity of bacteria and fungi. These microbes break complex compounds, like sugars, into simple substances, such as carbon dioxide and alcohol. One of the common types of fermentation used in the making of ecoenzyme is methane – is this been really measured here in this experiment? fermentation. The fermentation involved mixed

culture. The culture can be gained through the raw materials such as kitchen wastes. The literature in this field was summarized some years ago by Mcbeth and Scales??not appear in the references and what year? and by Stephenson ?? not appear in the references? revealed that moist organic materials, when allowed to decompose under restricted oxygen, yields hydrogen, carbon dioxide, methane, and a variety of organic acids. Two kinds of product yielded from the fermentation which are methane and carbon dioxide. The data of Symon and Buswell shows 3.5 l of methane was formed over a period of 100 days with regular circulation of hydrogen and carbondioxide through a culture of 2 l total volume.

During the fermentation process, methane gas, hydrogen, carbon dioxide, and organic acids either volatile or non volatile are yielded. The acids contain acetate acids, lactate acids, and butyrate acids. The volatile acids which are intermediates in the decomposition of higher compounds must not exceed a predetermined value, usually 2000 to 3000 ppm. If the volatile acids value is allowed to rise above 2000 ppm (as acetic) gas formation drops off, the quantity of acids increases rapidly, and all the fermentation cease. Even though some acids can be found as product, reference which explains details completely about any acid which is formed rarely and far from enlightening.

There are several organic compounds existed in the plant such as carbohydrate, fat, wax, tannin, lignin, and protein. Carbohydrate consists of carbon, oxygen, and hydrogen. Carbohydrate varies from a simple sugar such as sucrose to a complex molecule such as cellulose. Fats and oils are simple glyceride of fatty acids like butyrate, stearate, oleate and etc. The addition of organic materials on the soil will yield a series of chemical reaction and complex decomposition result. Sugar, starch, and protein simply can be soluble in water and available as abundant energy source. Protein can be decomposed and resulted into the formation of amide and amino acids. The decomposition rate depends on the soil organisms. Most of the nitrogen from decomposition is utilized as body forming compounds and the rests will be utilized to form humus.

Organic materials can be benefited for supporting the growth of microorganisms and other soil organisms. During the decomposition process some organic acids, sulfuric compounds, methane, and carbon dioxide will be produced.

The plastic containers or bottles must be thoroughly dried before used as the fermentation media. The contamination of fatty materials is avoided because it can cause high pressure during the fermentation process. The pressure can destruct the bottle and may cause explosion. Fibrous materials such as paper, shredded cornstalks will form a tough mat at the top of the fermentation vessel. The objection to this mat is, again, that it favors the accumulation of large amounts of acid.

The whole text here is not results and discussion. It is just the introduction and elaboration of what is eco-enzymes and what is does to the soil or benefit to plant!!!

What is the results in form of scientific? Is this just a review of using eco-enzyme?

## **Conclusion**

Ecoenzyme can support agriculture in Indonesia. It is used as natural fertilizer and biopesticide. The ingredients to make ecoenzyme are kitchen wastes. Brown sugar is carbohydrate source which consists of carbon, oxygen, and hydrogen when it decomposed. Fat is not used because it can slow down the decomposition process of others. Meanwhile, protein from vegetables will be decomposed to yield nitrogen which is utilized to fertile the soil. Organic materials can be

benefited for supporting the growth of microorganisms and other soil organisms. During the decomposition process some organic acids, sulfuric compounds, methane, and carbon dioxide will be produced. But there is no results at all support your conclusion. There is just the review article of what is eco-enzymes

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