Study of bioremediation techniques as a process for making organic cosmetics plants fertilizers

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Abstract. Bioremediation is one technique to reduce environmental pollution and renew soil with the help of microorganisms and plants. The process carried out includes detoxification of toxic chemicals by cleaning the environment naturally and economically. This study aims to identify waste recycling, modification of ecology-based farming systems, and test traditional plants as a source of bioremediation. Then, bacteria and bioremediation results will be used as liquid fertilizer. Liquid fertilizers are processed through bioremediation techniques, then reused as nutrients for organic cosmetics plants. The research method is carried out qualitatively and its application is in a polluted environment. The research findings state that there is a positive impact on reducing environmental pollution, especially in reducing the volume of waste and the smell of garbage. Meanwhile, the success of bioremediation in liquid fertilizer depends on the Hydrogen (H2) cycle. In addition to H2, there are carbon (C), sulfur (S), and nitrogen (N) during the bioremediation process which encourages the bioremediation of liquid organic fertilizer to be able to fertilize the plant source of organic cosmetics. Thus, cosmetics can be said to be organic as a whole.

1. Introduction
Bioremediation is one technique to reduce environmental pollution and renew soil with the help of microorganisms and plants. The process carried out includes detoxification of toxic chemicals by cleaning the environment naturally and economically. Bioremediation is an environmental technology that utilizes the metabolism of microorganisms to eliminate pollution, with relatively low costs, through technical assistance that is quite easy, and very high to be accepted by the community [1].

In principle, the bioremediation technique will break down pollutants, so that it effectively reduces soil pollution. However, the bioremediation technique depends on weather and climate, because this technique uses environmental parameters such as climate change, soil temperature, humidity, number of root exudates, increase in ambient air, atmospheric concentration, acclimation rainfall patterns, and adaptation [2].

Previous studies Martínez-Alcántara et al. mentions that applying liquid fertilizer is not only based on fertility problems and obstacles that interfere with soil as a planting medium for certain plants [3]. Understanding, misuse, and inaccuracy in choosing fertilizers will have consequences on the health and pollution of the surrounding environment [4]. In organic systems, soil management involves the use of pruned or milled cover crops, animal manure, compost and the application of organic fertilizers that increase soil organic matter (SOM) while providing stable release of nutrients to plants when organic matter touches plant roots [5]. The composting process can increase the biological decomposition of
organic matter associated with the microbial activity [6]. The use of large amounts of chemical fertilizers to ensure high yields in China has caused serious agricultural ecological and environmental problems [7,8].

2. Methods
This research is qualitative research with the results of the feasibility analysis of liquid organic fertilizer on cosmetics plants. This study uses two stages of data collection, the first is conducting interviews with experts in making organic liquid fertilizer with the purpose of exploration, and obtaining an understanding of organic liquid fertilizer, the second is testing the feasibility of organic fertilizers in plants based on cosmetics. This research took place at the Muttawakil, Ciganjur, Jagakarsa organic liquid fertilizer manufacturing centers. Starting from January to March 2019. Implementation of the use of liquid organic fertilizer on cosmetics plants will be carried out in the PKK toga park around Malakasari Village.

3. Results and discussions
3.1. Bioremediation technique
In soil bioremediation, this study uses two techniques, the first technique is inoculation (planting) on microorganisms and developing microorganisms to carry out the biotransformation process and then returning the contaminated soil to healthy soil that can be reused in the process of planting plants and plant nurseries (Figure 1).

![Figure 1. Soil bioremediation technique through inoculation.](image-url)

In microbiological research, bacteria will colonize liquid cultures, allowing aggregation and inducing inoculation. The aggregation in grafting will shape and change the culture phenotype [9]. Some results of the study show, when cells are inoculated in fresh culture media, the cell will enter a pause phase. During this phase, cells adjust to fresh media through protein synthesis and prepare themselves for growth [10,11]. In this study, inoculation in the soil will change the bad bacteria that damage the soil and encourage decay and foul odor, becoming a land that is ready to be replanted, besides bioremediation with this technique, can reduce unpleasant odor due to the accumulation of garbage in the soil.

The phase-in inoculation has a varied length of time, depending on the level of cells inoculated, and the population of the inoculum [12]. Growth will run fast, during the process of increasing the number of the exponential growth of cells that have been able to adapt to the new environment [13]. After this process is complete, the growth will slow down again until it reaches the stage of division and defense of population stability [14].

The assumption of inoculation on the soil can restore soil conditions and the surrounding environment because, in the bacteria that carry out the process, it will reduce the number of inoculated...
populations so that it can eliminate all residues from the initial inoculum phenotypic state. These assumptions corroborate the results of studies that indicate a change in the condition of soil fertility, as well as a decrease in odor in the environment studied.

In addition to the inoculation process, bioremediation in this study was tried to use techniques for using plants such as lemongrass, dan welingi. The bioremediation process using plants will be illustrated in Figure 2.

![Figure 2. Bioremediation by utilizing plants.](image)

Bioremediation by utilizing plants can be called phytoremediation, which is defined as the incorporation of plants and microbial communities with the aim of degradation, eliminating, changing, or killing toxic compounds in the soil, as well as sediments. Phytoremediation can be used in contaminated groundwater and wastewater in wetlands. The use of this plant encourages plant bacteria (rhizosphere or endophytes) to bioremediate organic compounds in an environmentally and economically friendly manner [14].

Technically, bioremediation using plants according to the results of the study was stated to be more effective. The selection of the right bioremediation technique will be able to reduce the concentration of pollutants in harmless conditions. The main thing to consider when conducting bioremediation is to look at the principles, advantages, limitations, and prospects of the bioremediation [15].

3.2. All seed organic cosmetics plants

Organic cosmetics are made from compositions that are bred in organic standards. This means that plants used as cosmetic raw materials are not sprayed with pesticides and do not use other chemical fertilizers. Organic products are safe from a variety of chemicals that can cause side effects such as allergic reactions. The advantage of using this type of cosmetics is the high level of absorption in the body and friendly environment. However, the disadvantage is that the positive effects of this product require a significant amount of usage time rather than high chemical cosmetic products, and expire faster.

A product can attach a 100% organic label if the entire ingredients have been tested organically or meet the organic standards of the National Organic Standardization Board. These materials can come from flora, fauna, minerals and including by-products. In the process of planting organic cosmetics plants, the effects obtained from the soil bioremediation process and liquid bioremediation fertilizers show the acceleration of plants when planted. In addition, because starting from the planting process is organic, the cosmetics produced from the results of this planting can be said to be 100% organic products.

4. Conclusion

The bioremediation technique used in this study has significant values and benefits for the surrounding environment, especially in the research area. The positive impact of this technique is to reduce the odor from the surrounding environment because one of the ingredients for making liquid fertilizer is waste derived from organic waste. In addition, when liquid fertilizer is tried on cosmetic plants, the soil used for planting is fertile, thereby reducing the risk of planting failure in planting cosmetics.
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