Utilization of cow urine waste for the manufacture of urine as a form of environmentally friendly dairy farming business

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Abstract. Bio urine is a liquid organic fertilizer that comes from processing livestock waste. Bio urine is very useful and valuable. Processing of urin e waste into Bio urine is one of the steps to overcome the problem of environmental pollution caused by the livestock sector. This study aims to determine the quality of Bio urine derived from local microorganisms (MOL) of animal, vegetable and liquid organic fertilizers which were seen from microbiological elements and Fe levels, so that they can be used as environmentally friendly organic fertilizers. Animal mole is made from rumen contents, molasses and water, then fermented aerobically for 14 days. Indigenous microorganism (IMO) from nabati is made from tomato waste, brown sugar, rice washing water, coconut water and fermented with the same aerobic system for 14 days. The research method used a randomized block design with 5 treatments, namely A+: Cow urine + EM4, A -: Cow urine only, B: Cow urine + 100% animal MOL, C: Cow urine + 100% vegetable MOL, D: Cow urine animal MOL 50%+ 100% vegetable MOL Cow Urine, each treatment was repeated 4 times. Parameters observed included pH, total microbial and Fe content. The results showed that the treatment had no significant effect on pH, total colonies and Fe levels, with the results of the study that cow urine added animal MOL, vegetable MOL and the combination gave a pH value of 8.43-9.98, total microbial log 72.36-80.333 and Fe content 0.0002-0.0007 ppm. The results showed that cow urine with the addition of Animal MOL, Vegetable MOL and the combination of the two did not give significantly different effects on P (phosphorus) content, N (Nitrogen) content, and K (Calcium) content.

1. Introduction
Cow farm waste includes solid waste and cow urine which are generally just thrown away and cause environmental pollution. Cow urine can be used as a basic ingredient for making Bio urine for liquid organic fertilizer so that livestock waste does not cause problems in the community such as environmental pollution and poor air and water quality.

Organic fertilizer is the result of decomposition of organic materials, either dry plants or waste that is overhauled by microbes which are very important to increase the efficiency of liquid organic fertilizer derived from livestock urine. [1] stated that water pollution is a serious environmental problem, especially caused by dairy cattle and the most important thing is their urine. The results of [2] showed that livestock produces CH₄ emissions of 166 x 10⁶ kg C/year and livestock produces 85% of environmental pollution.

Utilization of cow urine has not been as optimal as the utilization of its feces. Urine that can be used as Bio urine for liquid organic fertilizer has good nutrient content and is needed by plants. The urine processing can be aerobic and anaerobic and for this study using aerobic (using air). A cow can
produce 5 liters of urine per day. Bio urine derived from cow urine is produced by means of a fermentation process from cow urine by adding indigenous microorganisms (IMO) both of animal origin, namely rumen contents and vegetable. IMO in this research uses tomato waste which will help the process during fermentation to produce Bio urine as a liquid organic fertilizer to fertilize plants. Urine contains about 1% more Nitrogen compared to solid feces of only 0.4%. The phosphorus content of cow urine is about 0.5% higher than solid manure which is 0.2% and the potassium content of SP urine is 1.5% and higher than 0.1% solid manure.

The main sources in the process of making Bio urine are carbohydrates such as rice washing water, used rice and others. Glucose such as brown sugar, coconut water, liquid sugar and others. Sources of bacteria are rumen contents, tomato waste, papaya, vegetables and others. Making Bio urine with the addition of IMO is done to replace the function of EM4 which is already available in the market. IMO can come from animals and plants. The IMO content of the rumen can be used as compost as much as 3% of the total material. Meanwhile, vegetable derived from tomato waste meets the standards as liquid organic fertilizer.

The benefits of organic fertilizers include fertilizing plants to maintain nutrients in the soil, to reduce the impact of organic waste in the environment, to help revitalize soil productivity, to improve fertilizer quality. According to the use of organic fertilizers will maintain soil fertility and friability, improve soil productivity both physically, chemically and biologically. The advantage of liquid organic fertilizer is to minimize losses to the environment, where cow dung is very useful for grasslands to maintain soil fertility and is environmentally friendly. Therefore, this study aims to determine the quality of Bio urine derived from local microorganisms (MOL) of animal, vegetable and liquid organic fertilizers.

2. Materials and methods

This research was conducted in January – March 2020 at the Waste Treatment Laboratory of the Department of IPTP, Faculty of Animal Science, IPB, and Saraswati Indogenetic Bogor. The research method used a randomized block design with 5 treatments, namely A+: Cow urine + AM4, A-: Cow urine only, B: Cow urine + 100% animal MOL, C: Cow urine + 100% vegetable MOL, D: Cow urine animal MOL 50%+ 100% vegetable MOL Cow Urine, each treatment was repeated 4 times. Parameters observed included pH, total microbial and Fe content. This study used the urine of Friesian Holstein dairy cows from the Field Farm of the Faculty of Animal Science, IPB University. Other IMO ingredients derived from animal and vegetable sources include rumen contents, tomato waste, molasses, coconut water, rice washing water, and EM4 which are already circulating in the market. Materials for Testing Nitrogen contents, Phosphorus contents, and Potassium contents.

2.1. Vegetable IMO Manufacturing

The working procedure in this research begins with the manufacture of animals and herb IMO. Animal mole is made from the contents of the rumen which is added with molasses and given the addition of water. Meanwhile, the manufacture of vegetable IMO is made from mashed tomato waste mixed with brown sugar then added with rice washing water and coconut water, each IMO is fermented for 14 days with an aerobic system. After the fermentation process, Bio urine was made using control (A) control treatment, animal IMO (B), vegetable IMO (C), and a combination of animal and vegetable IMO (D). Procedure of [10].

2.2. Experimental Design

The design of this study used a randomized block design with 4 treatments and 5 replications. The research method used a randomized block design with 5 treatments, namely A+: Cow urine + EM4, A-: Cow urine only, B: Cow urine + 100% animal MOL, C: Cow urine + 100% vegetable MOL, D: Cow urine animal MOL 50%+ 100% vegetable MOL Cow Urine, each treatment was repeated 4 times. If
the treatment has a significant effect, Duncan’s further test will be carried out[11]. Data analysis using SPSS software. Observed Parameters Variables observed were Nitrogen Content, Phosphorus Level, and Potassium Level. The test was carried out according to BSN standards and was carried out in a KAN accredited laboratory, namely PT Saraswati Indogenetic Bogor.

3. Results and discussion
3.1. Nutrient Assessment for Nitrogen Content
The content of nitrogen in Bio urine with various treatments added by animal and vegetable MOL is presented in table 1.

| Treatment                  | Nitrogen (mg/L) |
|----------------------------|-----------------|
| A (Control)                | 257.82 ± 21.55  |
| B (Animal IMO)             | 260.03 ± 15.86  |
| C (Vegetable IMO)          | 249.51 ± 9.09   |
| D (Animal and Vegetable IMO)| 253.62 ± 5.48   |

The results of this study showed that the nitrogen content of dairy cattle urine was not significantly different among treatments where the results ranged from 249.51 mg/L ± 9.09 to 260.03 mg/L ± 15.86. Giving Bio urine to plants will increase crop yields such as lettuce crop 42.59% [12]; rice plants [13]; cherry tomatoes with high N during 6 days of fermentation at a dose of 240 – 360 ml/plant[14]; increase cauliflower quality with the application of 100g N ha-1[15]. High N will increase the vegetative character[16]. D (Animal and Vegetable IMO) 253.62 ± 5.48.

High nitrogen concentrations will result in a large enough nitrite accumulation[17]. Nitrogen function is for the growth of shoots, stems, and leaves. These nutrients are needed by plants, each element has its advantages.[18] green plants in the rainy season are a source of N2O emissions from intensive grazing systems. These emissions are also influenced by the type of food and land. The application of nitrogen which is abundant in grazing systems as an interaction between urine, manure, and fertilizer N. manure and urine significantly increases the emission period of N2O and urine will increase twofold [19]. Urea contained in urine is a good source of nitrogen for plants to accelerate the formation of compost or organic fertilizer. This urine will be influenced by plants and environmental temperature [20].

3.2. Nutrient Assessment for Phosphorus Content

| Treatment                  | Phosphorus (mg/L) |
|----------------------------|-------------------|
| A (Control)                | 156.67 ± 2.49     |
| B (Animal IMO)             | 136.75 ± 31.52    |
| C (Vegetable IMO)          | 130.94 ± 4.11     |
| D (Animal and Vegetable IMO)| 138.97 ± 19.18    |

The results showed that the phosphorus levels of dairy cow urine were not significantly different which is indicated by the results ranged from 130.94 mg/L ± 4.11 to 156.67 mg/L ± 2.49 Nutrients that are needed by plants include phosphorus which functions to stimulate the growth of roots, fruits, and seeds. A good dose in making IMO is 3% for yeast and rumen contents [21]. This Bio urine is also very good as a shallot fertilizer [22].

Organic fertilizers have many advantages compared to inorganic fertilizers, namely having more complete nutrients, both macronutrients and micronutrients containing organic acids, enzymes,
hormones that are not found in artificial fertilizers[23],[24];[25] the benefits of Bio urine are substances that stimulate plant root growth in seeds, as organic leaf fertilizer mixed with organic pesticides that can open curly leaves due to thrip attacks.

3.3. **Nutrient Assessment for Potassium Content**

| Threatment                      | Potassium (mg/L) |
|--------------------------------|------------------|
| A (Control)                    | 7.78 ± 0.30      |
| B (Animal IMO)                 | 7.46 ± 0.39      |
| C (Vegetable IMO)              | 7.63 ± 0.24      |
| D (Animal and Vegetable IMO)   | 7.24 ± 0.43      |

The results showed that the potassium levels of dairy cow urine were not significantly different indicated by the results ranged from 7.24 mg/L ± 0.43 to 7.78 mg/L ± 0.30. According to [26] in terms of physical liquid organic fertilizer, is more typical than solid fertilizer. This is supported by the nutrients contained in urine, one of which is potassium which serves to increase plant resistance to pests and diseases. Environmental conditions greatly affect the fermentation process carried out. The functions of N, P, and K are closely related in supporting photosynthetic processes and photosynthetic production produced, as well as increasing plant growth through the mechanism of converting NPK nutrients into organic compounds or energy is called metabolism, nutrients cannot be replaced with other nutrients so that the nutrients Plants can fulfill a life cycle [27].

4. **Conclusion**

Based on the results of this study, it can be concluded that nitrogen levels, phosphorus levels, and potassium levels do not affect Bio urine as influenced by either from animal MOL or vegetable MOL or a combination of both. So, Bio urine derived from animals and plants and their combination can be used as liquid organic fertilizer for plants or vegetables as a form of utilizing environmentally friendly livestock waste.

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