ISBN : 978-602-14917-9-9

NITROGEN LEVELS OF GOAT MANURE AND CHICKEN EXCRETA BIOCULTURE WITH ADDITION OF GRADUAL YOUNG COCONUT HUSK WASTE

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Abstract. Indonesia is an agricultural country where farming is the main occupation of its people. Therefore fertilizer becomes an indispensable item. At present, the majority of fertilizer used is met by chemical fertilizer. Long term application of chemical fertilizer and low content of micronutrients in common fertilizer causes quality degradation of the chemical, physical, and biological properties of the soil. Organic fertilizer is one of the strategic solutions to overcome these problems. Agricultural and livestock waste, including coconut husk, goat manure, and chicken excreta can be used as potential raw material for liquid organic fertilizer. The experiment was aimed to identify the best composition of coconut husk addition in liquid organic fertilizer. Various compositions of coconut husk used were 0; 0.65; 1.25; 2.5; and 5%. The analysis method was used One-Way Annova. Fermentation was carried out for one week in anaerobic conditions. Ammonium, nitrate, and nitrite levels of bioculture with the addition of 5% young coconut husk were significantly higher than other treatments, which obtained values 0.139; 0.705; and 0.523% respectively. The bioculture made has not met the quality of liquid fertilizer as in Standar Nasional Indonesia (SNI).

Keywords: liquid fertilizer, bioculture, goat manure, chicken excreta, coconut husk.

1. Introduction

Indonesia is one of the biggest agrarian countries in the world. Based on Badan Pusat Statistik [1], there are 24 million people living in Indonesia who work as farmers. The agriculture sector has strong relations with fertilizer applications, mainly chemical fertilizer. Many farmers choose to use chemical fertilizer because it can give rapid results and practical. Unfortunately, the long term use of chemical fertilizer causes the decrease of soil fertility, both in soil physic, chemical, and biological aspects.

The main solution to solve these problems are by applicated organic materials or use organic fertilizer. The organic fertilizer contains complete nutrients and biological content, although in relatively low concentration. Substitution of chemical fertilizer with organic fertilizer will not give high productivity in a short period, but in a long period will give higher productivity and recovery soil properties.

The use of agricultural waste is the best solution to supply organic material to the soil because it does not need too much cost. Goat manure is a waste of livestock which is often not utilized optimally. Goat manure has a hard and compact physic characteristic, and it causes the decomposition process is slow [2]. The solid goat manure has C-organic up to 41,5 % (dry weight) or 14,95 % (fresh weight) [3]; water content 31%; N 0,7%; P_2O_5 0,4%; K_2O 0,25%; CaO 0,4%; and C/N ratio 20-25. Beside goat manure, chicken excreta waste of commercial chicken is also a potential source to use as organic fertilizer. Poultry waste is a mix of solid and liquid material [4]. Chicken excreta is one of the best poultry waste which contains the highest N and P content than the other livestock. It contain water

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(57%); organic matter (29%); N (1,5%); P_2O_5 (1,5); K_2O (0,8%); CaO (4%); C/N ratio 9-11 [2] C-organic 32,6% (dry weight) or 14,02% (fresh weight) [3].

Livestock waste process to become fertilizer will be more effective if using nutrient dissolve method, generating liquid fertilizer. Liquid fertilizer has a high effectiveness than solid fertilizer. It is also more practical, not bulky, easy to make and displacement and the solid waste produced from this process can be used directly to soil as an organic matter too.

Combination of goat manure and chicken excreta to produce liquid organic fertilizer will have a high content of C, N and P, but lack in K [5]. Addition of young coconut husk waste equipt the K requirement in liquid organic fertilizer. Young coconut husk waste contain high K [6] also contain N, P, K amount 0,39; 0,07; 1,66 respectively [7]. Moreover, it is easy to soluble and available in large quantities in Indonesia.

Processing of bioculture with main raw material from goat manure, chicken excreta and young coconut husk is a strategic and simple way to increase soil fertility, which can be applied en mass. It will increase the economics of farmers too. This experiment was aimed to identify the best treatment of young coconut husk which can resulted highest nitrogen content in liquid organic fertilizer (bioculture) produced.

2. Methods

2.1 *Experimental Design*

This experiment was conducted in Politeknik Negeri Banyuwangi's laboratory. This experiment used Complete Randomized Design with three factors. There are five levels of coconut husk used : 0; 0.65; 1.25; 2.5; 5 % compared to goat manure and chicken excreta and one week fermentation time with three replications. The composition formula used in this experiment referred to the research by Priyadi [5]. The ratio of goat manure and chicken excreta used was 1 : 3.

2.2 Bioculture Process

The livestock waste was soaked in three-litre of water in the 20-litre volume plastic bucket and leave it for a night. This process would make the solid goat manure become tender and easy destructed. Meanwhile, the coconut husk was destructed too and soaked in 2 litre of water during the overnight. Put in 250 ml molasses and 250 bioactivator into the bucket and stirred until homogenous. The solution was fermented for one week. Liquid fertilizer harvested by filtration method using filter cloth. The solution generated was sedimented, and then the sediment was discarded. The bioculture was saved in the bucket, and the sample for nitrogen content analysis was taken from the bioculture bucket. The nitrogen content was analyzed using the Kjeldahl method.

2.3 Data Analysis

Data were collected and analyzed using Analysis of Variance (ANOVA) and further tested used Tukey test 5%. Data represented in this paper obtained from the first-week data collection.

3. Results and Discussion

Based on the experiment was did, generated data about the nitrogen content of raw material used as follows :

Table 1. The nitrogen content of bioculture materials used

Material	Ammonium (NH_4)	Nitrate (NO_3^-)	Nitrite (NO_2^-)
Goat manure	1,926±0,025^b	6,973±0,097^b	5,276±0,378^b
Chicken excreta	3,185±0,123^c	11,640±0,410^c	8,636±0,327^c
Coconut husk	0,691±0,012^a	2,527±0,070^a	1,853±0,066^a
Average	1,934±1,065	7,951±3,615	5,255±2,904

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Table 1 showed a various number of ammonium, nitrate, and nitrite content generated from bioculture materials. The chicken excreta waste contained the highest value of ammonium, nitrate, and nitrite content, while the lowest nitrogen content was coconut husk. The solid goat manure contained higher nitrogen content than coconut husk but lower than chicken excreta. Based on this analysis, the combination of goat manure and chicken excreta would give a high nitrogen source of the nutrient. This result was in accordance with Sashanti [8], and other research [9] [5]. The amount of nitrate increased in line with the ammonium supply as a basic source for nitrification [10]. Addition of coconut husk has lowest nitrogen content but predicted supplied high K content. [11] Coconut husk in the form of ash was found to containe a large amount of K (26%), silica (SiO_2) and Cl (9%) and virtually no N.

The addition of coconut husk levels on ammonium content during one week of anaerobic fermentation resulted in data as in Table 2. The effect of P5 treatment resulted in the highest ammonium content of bioculture. The higher the level of coconut husk given, the ammonium content tends to increase. This is because the nitrogen source given to bioculture was more than the lower level.

Table 2. The effect of coconut husk levels on ammonium, nitrate, and nitrite content of bioculture

Coconut husk	Ammonium	Nitrate	Nitrite
P1 (0%)	0,154±0,004^{ab}	0,564±0,014^{ab}	0,418±0,010^{ab}
P2 (0,65%)	0,146±0,011^{a}	0,534±0,041^{a}	0,396±0,029^{a}
P3 (1,25%)	0,169±0,005^{b}	0,614±0,019^{b}	0,456±0,015^{b}
P4 (2,5%)	0,170±0,011^{b}	0,620±0,040^{b}	0,459±0,029^{b}
P5 (5%)	0,193±0,015^{c}	0,705±0,056^{c}	0,523±0,042^{c}
Average[1)]	0,167±0,019^{q}	0,607±0,069^{r}	0,451±0,051^{r}

Description :
Different superscript on the same column means significantly different (P<0,05)
[1)]Different superscript on the same row means significantly different (P<0,05)

The increased of ammonium caused by the higher level of coconut husk level application in line with the nitrate content of bioculture (Table 2). The P5 treatment resulted in highest nitrate and nitrite content. The nitrate and nitrite content tends to increase with the added level of coconut husk. Nitrate (NO_3^-) generated from nitrification process by Nitrosomonas which turn ammonium into NO_2^-, and then Nitrobacter which turn nitrite into nitrate. This form of nitrogen was common which can easily absorb by plant beside ammonium.

Nitrogen was the main nutrient involved in protein forming and nucleic acid [12]. Plant with sufficient nitrogen will have better vegetative growth such as the number of leaf and leaf area, plant height, chlorophyll quantity [13] and plant diameter while plant with lack of nitrogen will show inhibited growth, stunted and failure to form seed or grain [13]. Overall the P5 treatment of bioculture gave the highest source of nitrogen. But the result of N content in first week bioculture hasn't met the quality of liquid fertilizer as in Minimum Technical Requirements issued by Minister of Agriculture in 2011. The N content must reach 3-6 %, while in this reserach the total N content was below 3%. This was expected that the closing of the bucked was not tight enough, so the nitrogen in oxygen (ammonia form) cannot enter equally in the pile so the oxygen content was limited. This was caused ammonia cannot transform in to nitrate and lost in NH_3 form [14].

3. Conclusions

ISBN : 978-602-14917-9-9

The best treatment of coconut husk level was 5% addition to bioculture solution. This treatment resulted in highest ammonium, nitrate, and nitrite content which are important to plant growth and development**.**

Refference

[1] Badan Pusat Statistik 2018 Hasil Survey Pertanian Antar Sensus (SUTAS) 2018 Badan Pusat Statistik. Jakata ISBN 978-602-438-255-1.

[2] Hartatik W, and L R Widowati 2006 Pupuk Organik dan Pupuk Hayati Balai Besar Penelitian dan Pengembangan Sumberdaya Lahan Pertanian. Bogor

[3] Moral R, M Caselles, M D P Murcia, A. P. Espinosa, B Rufete, dan C Paredes. 2004. Characterisation of the Organic Matter Pool in Manures. *Elsevier Bioresource Technology* **96:** 153

[4] Yuwanta T 2004 *Dasar Ternak Unggas*. Yogyakarta : Penerbit Kanisius.

[5] Priyadi, D.A. 2015. Pengaruh Penambahan Ekskreta Ayam terhadap Kadar C-organik, N, P, dan K Biokultur Feses Kambing dengan Fermentasi Aerob dan Anaerob. *Skripsi Fakultas Peternakan Universitas Gadjah Mada.* Yogyakata.

[6] Sabri, Y. 2017. Pengaruh Pemberian Pupuk Organik Cair dari Sabut Kelapa dan Bokashi Cair dari Kotoran Ayam terhadap Pertumbuhan Tanaman Sawi Caisim (*Brassica juncea* L.). *Jurnal Pertanian Faperta UMSB* **1**. ISSN 2527-3663.

[7] Kurniawan E Z, Ginting P, and P. Nurjanah. 2017. Pemanfaatan Urine Kambing pada Pembuatan Pupuk Organik Cair terhadap Kualitas Unsur Hara Makro (NPK) Proceeding Seminar Nasional Sains dan Teknlogi Fakultas Teknik Universitas Muhamadiyah Jakarta, 1-2 November.

[8] Sashanti, K.H.S.J. 2013. Pengaruh Penggunaan Abu Vulkanik Terhadap Kualitas Biokultur Feses Kambing dan Domba. *Skripsi Fakultas Peternakan Universitas Gadjah Mada.* Yogyakarta.

[9] Balai Pengkajian Teknologi Pertanian Bali 2013 Membuat Pupuk Cair Bermutu dari Limbah Kambing. *Warta Penelitian dan Pengembangan Pertanian* **30** 7.

[10] Sholikah, M. H., Suyono, dan P. R. Wikandari. 2013. Efektivitas Kandungan Unsur Hara N pada Pupuk Kandang Hasil Fermentasi Kotoran Ayam Terhadap Pertumbuhan Tanaman Terung *(Solanum melongena L.)* UNESA *J.Chem*. 2 : 135.

[11] Bonneau X, I haryanto, and T Karsiwan. 2010. Coconut Husk Ash as A Fertilizer For Coconut Palms on Peat. *Expl. Agric*. 46 (3) : 401 – 414.

[12] Griffiths, A.J.F., S.R. Wessler, S.B. Carroll, dan J. Doebley. 2012. Introduction to Genetic Analysis 10th Edition. W.H. Freeman and Company. *New York*. Amerika.

[13] Istanti, A. 2017. Pengaruh Nitrogen dan Molibdenum terhadap Aktivitas Enzim Asimilasi Nitrogen, Pertumbuhan Dan Hasil Pada Tanaman Padi Hitam. *Tesis*. Fakultas Pertanian. Universitas Jember.

[14] Purwati A D, 2017. Uji Kandungan N dan Pupuk Organik Cair Kombinasi Batang Pisang dan Sabut Kelapa dengan Penambahan Kotoran Ayam sebagai Bioaktivator. *Skripsi*. Program Studi Pendidikan Biologi Fakultas Keguruan dan Ilmu Pendidikan Universitas Muhamadiyah Surakarta.