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WASTE PLANT PRODUCTION FROM COFFEE THAT OBTAIN MANURE AND BIOURIN AS A FORAGE SOURCE FOR BALI CATTLE

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Abstract. Coffee is an important agricultural product which can be used as a feed source for Bali cattle. Consumer preference of organic coffee production need of organic fertilizer product, one of which is obtained from cattle manure that can produce circle of integration system production within coffee and livestock. The aim of this study was to study coffee production by providing compost and liquid fertilizer with various combinations. The method was used completely randomized design (CRD) consist of 3 treatment with 10 replications. C1: Coffee trees get RB 10 kg/tree/year compost combination + 4 liters of liquid fertilizer/tree /year; C2: Tree coffee gets a combination of local microorganism (M1) and compost 10 kg/tree /year + 4 liters of liquid fertilizer /tree/year; C3: Coffee trees get a combination of local microorganism (M2) and compost 10 kg/tree/year + 4 liters of liquid fertilizer/tree/year. Data shows the highest coffee production in C2 and the highest production of agricultural waste in C3. In conclusion the use of local microorganism M1 with a combination of liquid fertilizer produces the best coffee production.

1. Introduction

Coffee is an important commodity of plantations in Indonesia that has been exported. Increasing coffee productivity is an important thing to do to support this commodity export business. The problem faced in coffee production in Indonesia is the still low level of productivity and the quality of the coffee.

Coffee as one of the assets of Indonesian products that are well-known in the world today is widely cultivated produced organically. This is because consumers' demands for agricultural products are free or little use of chemical inputs and increased awareness of quality of life.

One effort to increase coffee productivity is by using organic fertilizers. By increasing the availability of organic nutrients given to the soil so that enzymatic oxidation occurs by microorganisms so that it is easily absorbed by plants [7]. One of Various fertilizers including organic fertilizer is manure. With the increase in coffee plant production, of course, it will increase waste as a by-product of coffee skin and leaves. The use of coffee plant waste as an alternative source of feed source for livestock can be an integration support business of coffee plant and cattle [5]. Whereas manure from livestock can be used as a source of organic fertilizer for coffee plants so as to create an integrated agricultural production system.

2. Material and Method

The research was conducted in Walung Amertha livestock group, Sanda village, Pupuan District, Tabanan Regency. The coffee plants used in this study were Robusta coffee plants aged 5 years. The design used was a completely randomized design (CRD) consisting of 3 treatments and 10 replications. The treatment given is:

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C1: Coffee trees get RB 10 kg / tree / year compost combination + 4 liters of liquid fertilizer / tree / year
C2: Coffee trees get a combination of malignant Mol compost 10 kg / tree / year + 4 liters of liquid fertilizer / tree / year
C3: Coffee trees get a combination of compost fruit Mol 10 kg / tree / year + 4 liters of liquid fertilizer / tree / year

The made of local micro organisms (MOL) was prepared in advance from local ingredients. M1 local microorganism was made from a mixture of stale rice with gamal leaves. Whereas M2 microorganisms are made using damaged fruit.

In making organic fertilizers RB, M1 and M2, it was done through a fermentation process using each of these decomposers for 14 days. Organic fertilizers are fermented with commercial decomposers namely Rummino Bacillus. For M1 and M2 organic fertilizers fermented with local microorganism decomposers (MOL) made by farmers. MG was MOL decomposer made from a mixture of gamal leaf extract and stale rice while MB was made from rotten fruit extracts and coconut water.

In making liquid organic biourine it was also done through fermentation with various types of decomposers . Making liquid organic fertilizer with MOL was done by adding 1 liter of decomposers to 1,000 liters of urine, then fermented for 7 days. For liquid fertilizer RB is made by fermented urine with RB and Azotobacter (AZBA) fermenters with a ratio of 1,000 liters of urine: 1 liter RB and 1 liter AZBA. The urine was fermented for 7 days and on the eighth day was rotated on a thinning ladder then packed. For applications on urine coffee plants are mixed with water with a ratio of 1: 1.

Coffee plants are nurtured at the end of the rainy season which is March. Before fertilizing, a circular hole along the canopy of 20 cm deep was made. Fertilizers were spread evenly along the circle and then buried with soil. Biourin fertilization was carried out through the roots 2 times, together with compost. The content of nutrients in compost and biourin can be seen in tables 1 and 2.

Table 1. Nutrient content of manure fertilizer from goat which fermented with many kind of decomposer

Variabel1)	Treatment			
	A	B	C	D
Dry Ingredient (%)	92,67	92,43	93,34	93,95
pH	8,1	4,5	7,8	7,9
KTK (cmol(+)/kg)	35,85	57,21	49,83	50,76
N total (%)	1,93	1,91	2,07	1,80
P_2O_5 (%)	1,20	0,99	1,14	1,13
K_2O (%)	3,51	2,39	4,39	3,23
C Organic (%)	45,35	41,48	41,63	36,98
C/N ratio	23	22	20	21

Description :
[1)] Nutrien obatined from laboratory analysis Balitanah Bogor
A : Goat Faeses without fermentation
B : goat feaces fermented with decomposer RB
C : goat faeces fermented with MOL A
D : goat faeces fermented with MOL B

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Table 2. Nutritions content of Goat urine fermented with different type of decomposer

Variabel)	Treatment			
	A	B	C	D
pH	7,45	7,48	7,49	7,47
DHL (mmhos/cm)	41,1	36,9	39,2	42,3
N total (%)	0,11	0,1	0,13	0,11
P Available (ppm)	65,69	56,37	70,19	64,72
K Available (ppm)	392,5	371,5	391,7	384,7
C Organic (%)	1,36	1,75	1,75	2,14
C/N ratio	12,36	17,5	13,46	19,45

Description :
[1)] Analyzed from soil laboratory of Udayana University
A : Goat Urine without fermentation
B : Goat Urine fermented with dekomposer RB and AZBA
C : Goat Urine fermented with MOL A
D : Goat Urine fermented with MOL B

Parameter observed: (1) Wet waste production, (2) Dry air waste production, (3) Dry matter waste production and (4) presentage of wet cofee bean production. The measurement of wet waste productions is done by weighing the total production of cofee plants reduced by the production of wet seeds/trees. To obtain the DW weight, it was carried out for testing on coffee skin samples (endocarp & epidermis) at 700 C for 24 hours. To get the weight of DM, it was carried out to test the sample with temperature 105-1100C for 9-12 hours [1].

The data obtained from the results of this study were analysed by analysis of variance with an error rate of 1-5%. If the variance test shows the effect of significant differences, then testing between the average of two treatments was carried out by multiple range tests from Duncan [4]. For data on the percentage of production of wet coffee beans analysed descriptively.

3. Result and Discusion

Cation exchange capacity value from faeces in treatment B is higest than the others treatment. Cation exchange capacity is the highest value of treatment B cation exchange capacity (CEC) compared to other treatments. CEC is the ability of the soil to exchange cations adsorbed on the surface of the colloidal soil with other cations present in the soil solution. A material with a high CEC has better quality because the ion binding power is higher. Soils with high organic matter content have higher CEC than those with less organic matter [9]. An increase in CEC can cause cations bound by soil colloids and organic soil colloids to be easily released and replaced with other cations so that they will be available for plant roots[8].

The average level of ready-made manure contains 0.5% N [4]. In quality, the N content in goat feces is in the range of 1.8-2.07%. The N content is higher than the nutrient of fresh goat manure without fermentation that is equal to 0.29-0.75% [11]. The availability of nutrients highly depends on the level of decomposition / mineralization of the material. The higher N content in the C stool is due to the more complete decomposition process. Nitrogen is a macro element that is needed in large quantities by plants, is also a limiting element that is heavy in a state of deficiency compared to other nutrients [2]. According Hanafiah [3], the element N is very closely correlated with the development of meristem tissue, so it is crucial to plant growth. The lack of N elements will affect the plants will grow stunted, the root system is limited, the leaves become dry or yellowish green and tend to fall out quickly [7].

Element N is also closely related to organic C contained in an ingredient that will be used as organic fertilizer. C / N ratio is the ratio of carbon content (C) with N content in a material.

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organic matter can be given directly to the soil if it meets the requirements especially the C / N ratio is not more than 15. The ratio of C / N in the treatment faeces A, B, C and D shows a relatively higher number. Organic material which has a high C content indicates that the decomposition process by bacteria is still not perfect, so it is necessary to reduce the organic C by increasing the length of composting time. Organic matter which has the same C / N ratio as the soil allows the material to be absorbed by plants. A C / N ratio that is too high will result in N being not available to meet crop requirements ([10]. Conversely, if the C / N ratio is too low then too much ammonia is produced so that it can poison the bacteria.

Table. 3 Cofee plant production which is fertilized with Biourine

Variable1)	treatment (g/tree)		
	C1	C2	C3
Wet coffe bean production	9775 [a]	10012,5[a]	9661,7[a]
Dry air cofee bean production	3670,51[b]	4015,01[a]	3502,37[b]
Wet waste production	4871,86[ab]	4603,75[b]	5713,49[a]
Pulp/mesocarp	3840,60[b]	3466,33[b]	4251,15[a]
hull/endocarp	1031,26[a]	1037,42[a]	1462,34[a]
Dry weight waste production	1082,16[a]	1033,83[a]	1142,24[a]
Pulp/mesocarp	612,96[a]	553,23[a]	678,48[a]
hull/endocarp	469,20[a]	480,60[a]	463,76[a]
Dry matter waste production	941,80[ab]	900.46[b]	993.40[a]
Pulp/mesocarp	538,00[a]	500,57 [a]	516,48[a]
hull/endocarp	403,80[a]	339,89 [a]	476,93[a]

Description :

[1)] Values with different letters in the same line show real differences

C1 : The coffee tree gets a 10 kg RB compost / tree / year + 4 liters of liquid fertilizer / tree / year

C2 : Coffee trees get a combination of malignant compost Mol 10 kg / tree / year + 4 liters of liquid / tree / year fertilizer

C3 : Coffee trees get a combination of compost 10 Mol fruit kg / tree / year + 4 liters of liquid fertilizer / tree / year

In line with the production of wet coffee beans, the highest production of wet coffee beans was also found in the C2 treatment that is equal to 5,408.75 grams / tree not significantly higher (P> 0.05) each with C1. Compared with C3 treatment C.99 treatment 36.99% was significantly higher (P <0.05). For the weight of the sun-dried coffee beans, only one treatment, ie C2, was significantly higher than the other treatments, while the other treatments were not significantly different. However, for the oven dry weight for all treatments there was no significant difference with the highest value still in the C2 treatment.

For the production of waste produced, the highest is in the C3 treatment that is equal to 5,713.49 grams / tree or 17.28 and 24.11% not significantly higher (P> 0.05) compared to the C1 and C2 treatments. From the wet weight obtained the highest dry weight of the sun is also highest in C3 which is not significantly different. Judging from the oven dry weight the ratio between all treatments was not significantly different from the highest weight still in the U6 treatment.

From these data, the average wet weight composition between seeds and waste in bio-urine alone was 54%: 46%, while for the administration of a combination of solid fertilizer and bio-urine was 48.42%: 51.58%. In quality, the water content between the two treatments shows that coffee that gets bio-urine fertilizer has a lower water content of 60.77% while that which gets a combination of solid and liquid fertilizer is 62.01%. The higher water content in coffee

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production that gets a combination fertilizer treatment is probably due to more water being absorbed by plants. The addition of solid organic fertilizer that has the ability to bind water causes the availability of water around the roots of coffee plants to increase. This is in line with the opinion of Sylvia et al [6] which states that the application of organic fertilizer indirectly makes it easy for the soil to absorb water. Besides the addition of bio-urine also causes the amount of available water to increase. This causes more and more water that can be absorbed by plant roots so that more can be stored especially in the fruit. The role of water as a solvent of nutrients in the soil causes plants to easily take these nutrients for growth and production. This causes the production of wet coffee cofee in the treatment that gets higher solid and liquid organic fertilizer.

4. Conclusion

The most waste production is produced by the C3 treatment by giving a combination of Molecular compost fertilizer 10 kg / tree / year + 4 liters of liquid fertilizer/tree /year, while the best grain coffee production is produced by C2 treatment that is by treating the combination of malignant Molecular compost 10 kg / tree / year + 4 liters of liquid fertilizer /tree /year.

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