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Preface

This book covers key areas of agriculture and veterinary science. The contributions by the authors include colonization, leaf litter, nutrient parameter, anti-nutrient parameter, interaction, growth, g*ranulocyte macrophage colony stimulating factor, peripheral blood mononuclear cells, PCR method, Cloning, carnivorous fish, animal health and production specialists, economic livestock, general practitioners, oral history interviews, pets, pseudo-sciences, veterinary art, veterinary history, veterinary industry, veterinary science and, veterinary trade, caseinates, milk protein concentrate, Micellar casein concentrate, whey protein concentrate and isolate, functional properties, sensory quality, biourin, mycorrhiza, result and nutrition value, anaemia, Alterations, Hematology, Electrolyte, murciano,, meat quality, babesiosis, epidemiology. This book contains various materials suitable for students, researchers and academicians in the field of agriculture and veterinary science.*

Chapter 7
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Study on the Effect of Biourine and Mycorrhizal Arbuscular Fungi towards Result and Value of Forage Nutrition *Hymenachne amplexicaulis* (Rudge) Nees) on the of Ex-Coal Mine Land: An Advanced Study

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ABSTRACT

The purpose of this study is to find, obtain and prove that, the administration of biourine and the fungi of mycorrhiza arbuskula (FMA) is able to improve the fertility of ex-coal mine land, so that it gives an influence on the results and nutritional value of forage feed. This experiment used a completely randomized design with 4 treatments and 5 replications. The treatment consists of: 1) concentration of 0% biourine + FMA 20 g/pot, 2) concentration of 15% biourine + FMA 20 g/pot, 3) concentration of 30% biourine+ FMA 20 g/pot and 4) concentration of 45% biourine + FMA 20 g/pot. Variables observed were the results of dry matter, crude protein, dry matter digestibility, organic digestibility by In-Vitro and percentage of root infections by mycorrhizae. This results of the analysis of variance showed that the treatment had a very significant effect ($P<0.01$) on all observed variables. The treatment of 45% biourin + FMA 20 g/pot produced the highest value, followed by the treatment of 30% biourine + FMA 20 g/pot, 15% biourine + FMA 20 g/pot and the treatment of 0% biourine + FMA 20 g/pot. The conclusion of this study was that the treatment concentration of 45% biourine + FMA 20 g/pot was the best of all the observed variables.

Keywords: Biourin; mycorrhiza; result and nutrition value; hymenachne amplexicaulis; land.

1. INTRODUCTION

Hymenachne amplexicaulis (Rudge) Ness), is a natural resource that has high biological value, it has the potential to support the availability of forage for ruminants based on local resources [1]. Land for forage planting is increasingly reduced, because fertile land is generally for food crops, plantations and various non-agricultural needs [2]. This ex-coal mine land area in Jambi province is getting wider, due to the higher mining activities. Hundreds or even thousands of hectares have been turned into unproductive land, due to physical structure damage and degradation of soil nutrients. According to Kuyper TW et al. [3] roots of most plant species, including the roots of almost all major crops, are colonized by arbuscular mycorrhizal fungi. This relationship, which dates from the times plants conquered the land, is a beneficial nutritional symbiosis to better understand the ecology of arbuscular mycorrhizal (AM) symbiosis, They need to measure functional traits of individual fungal under field conditions. The efficiency of AM fungi in locating nutrient-rich patches in soil space is one of their central traits in this symbiotic relationship [4]. Raising land into productive land needs to be done. The use of biourin and mycorrhizae as biotechnology agents to increase the productivity of ex-coal mine land is an alternative that needs to be done. This study aims to find, obtain and prove the effect of biourin and mycorrhizae on result and the value of forage nutrition in ex-coal mine land.

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2. MATERIALS AND METHODS

2.1 Place and Time

The study was conducted in Kotabaru City-District, Jambi for 5 (five) months. Analysis of forage dry material in the laboratory of the Faculty of Animal Husbandry is at the University of Jambi, and analysis of the nutritional value in the Ruminant Nutrition Laboratory of the Faculty of Animal Husbandry, Andalas University.

2.2 Material and Equipment

As a planting medium used of ex-coal mine land of 5 kg / pot each, kumpai grass, fungi of mycorrhiza arbuscular of multiple spore types (*Glomus sp, Acaulospora sp and Scutellospora sp,.),* and biourine. The equipment used is: tillage equipment, lawn mowers, rule, sprinklers, plastic bags, scales, and equipment for analyzing the value of forage nutrition.

2.3 Research Methods

The experiment used a completely randomized design (CRD), with four treatments and five replications. The treatment consists of: 1) concentration of 0% biourine+ FMA 20 g/pot, 2) concentration of 15% biourine+ FMA 20 g/pot, 3) concentration of 30% biourine+ FMA 20 g/pot, and 4) concentration of 45% biourine+ FMA 20 g/pot.

2.4 Observed Variables

Variables observed were the results of forage dry matter, crude protein, dry matter digestibility, organic matter digestibility and percentage of root infections by mycorrhiza.

2.5 Research Implementation

Before the grass is planted, first take the soil for planting media in a composite manner from a depth of 0-20 cm. The soil is air dried and cleaned from plant roots and other materials that are not needed. Provision of fungi of mycorrhiza arbuscular as a treatment based on the results of Syafria [1] research, which is 20 g/pot. As for the biourin, the aeration results are used for 6 hours and fermented for 21 days. Two weeks before planting, a polybag is prepared and filled with 5 kg pot of soil. Giving mycorrhizae is when planting grass, by inserting an inoculum into each planting hole, while biourine is given when the grass is two weeks after planting.

2.6 Data Processing

Statistical data processing in a completely randomized design, variance analysis is used to determine the effect of treatment on the observed variables. The results of the analysis of the variance show a real effect, followed by the DNMRT Test.

3. RESULTS AND DISCUSSION

3.1 Results of Forage Dry Matter

The results of the analysis of variance in the first and second cutting periods showed that the treatment had an effect ($P < 0.01$) on the results of dry matter. The results of the forage dry matter are shown in Table 1.

The results of forage dry matter for the first and second cutting periods at 45% biourine + FMA 20 g/pot showed the highest results ($P < 0.05$) compared to other treatments. The average result of dry matter in the second cutting period for all treatments is higher than the first cut. Treatments of 45% biourine + FMA 20 g / pot resulted in better plant growth and development compared to other

treatments, both in the first and second cutting periods. This is caused, because mycorrhizae need organic fertilizer as a source of nutrition and energy, and oxygen consumption increases, so plants are better able to absorb mineral salts and supply of hydrogen ions that can be exchanged. Beinroth [5] states that mycorrhiza can increase the absorption of nutrients and water from the soil, which allows plants to produce new cells and hormones to increase plant growth, improve soil aggregate so that the mass flow process goes better. In the same climatic conditions, soil fertility is more influential on plant growth and development [6,7]. The results of Syafria's research [1] giving FMA and organic fertilizer (compost, cow dung) in Ultisol soil can also increase the result of dry matter of forage.

Table 1. Effect of biourine with the fungi of mycorrhizaearbuscular on the result of forage dry matter

Treatment	Cutting period (g/pot)	
	First	Second
Concentration of 0% biourine+ FMA 20 g/pot	50.60 d	56.60 d
Concentration of 15 % biourine+ FMA 20 g/pot	65.10 c	70.25 c
Concentration of 30 % biourine+ FMA 20 g/pot	72.40 b	75.60 b
Concentration of 45 % biourine+ FMA 20 g/pot	78.10 a	82.34 a

The numbers in the same row followed by different letters are significantly different at level 0.05

3.2 Digestion of Dry Materials and Organic Materials

The results of the average digestibility of dry matter and digestibility of organic matter obtained in this study are listed in Table 2.

Table 2. Effect of biourine treatment with FMA on digestion of dry and organic materials

Treatment	Digestion In-vitro (%)	
	Dry Materials	Organic Materials
Concentration of 0% biourine+ FMA 20 g/pot	50.43 c	48.43 c
Concentration of 15% biourine+ FMA 20 g/pot	51.54 c	49.15 c
Concentration of 30 % biourine+ FMA 20 g/pot	54.58 b	51.14 b
Concentration of 45 % biourine+ FMA 20 g/pot	57.13 a	55.24 a

The numbers in the same row followed by different letters are significantly different at level 0.05

Increased digestibility of dry matter and organic matter is caused, due to the ability of mycorrhizae in helping the absorption of nutrients and water in the soil.This causes plants to grow fertile, thus affecting the digestibility of dry matter and organic matter. Organic matter is a part of dry matter so if the dry matter increases it will increase the content of organic matter. Sutardi [8] states that digestibility of dry matter is positively correlated with digestibility of organic matter. Increased digestibility of dry matter also gives an indication of increased digestibility of organic matter. Another factor that also plays a role in increasing the digestibility of dry matter and organic matter is the development of soil microorganisms. The development of soil microorganisms is the beginning of the biological nitrogen transformation process in the soil, resulting in the conversion of organic nitrogen forms into inorganic forms available to plants [9].

3.3 Crude Protein

The results of the analysis of variance showed that the treatment had an effect ($P<0.01$) on crude protein content. The average forage protein content obtained in the study is listed in Table 3.

Increasing biouring treatment can increase the protein content of crude forage. This is because the hypha from mycorrhiza associated with roots helps plants absorb nutrients in the soil and the water from the soil pores will be more numerous. Mycorrhiza infects the root system by forming hyphae intensively so that it can increase nutrient uptake especially phosphorus nutrients for carbohydrate metabolism, improve soil structure that allows plant roots to develop properly, thus affecting the quality of forage. Spores of mycorrhizae contain nitrate reductase so that its external hyphae has a

nitrate absorption capacity [10]. External hyphae can also increase the absorption of N, Ca and Mg nutrients that are mobile [11], and micro nutrients such as Zn, Cu, and B [12].

Table 3. Effect of biourine treatment with fungi of mycorrhizae arbuscular towards crude protein content

Treatment	Crude Protein (%)
Concentration of 0 % biourine + FMA 20 g/pot	12,10 c
Concentration of15 % biourine + FMA 20 g/pot	13,65 b
Concentration of30 % biourine + FMA 20 g/pot	15,20 a
Concentration of45 % biourine + FMA 20 g/pot	15,35 a

The numbers in the same row followed by different letters are significantly different at level 0.05

3.4 Root Infection by Mycorrhizae

Results of the analysis of variance showed that the treatment had an effect (P <0.01) on the percentage of root infection by mycorrhizae. The percentage of root infections by mycorrhizae are listed in Table 4.

Table 4. Effect of biourine treatment with fungi of mycorrhiza arbuscular towards root infection by mycorrhiza

Treatment	Root Infection by Mycorrhiza (%)
Concentration of 0 % biourine + FMA 20 g/pot	20 c
Concentration of15 % biourine + FMA 20 g/pot	32 b
Concentration of30 % biourine + FMA 20 g/pot	47 a
Concentration of45 % biourine + FMA 20 g/pot	50 a

The numbers in the same row followed by different letters are significantly different at level 0.05

The increasing percentage of root infections in the treatment of biorine + FMA, due to the increasing treatment of biourin allows the presence of carbohydrate content and the availability of phosphorus in supporting the optimal root infection process. The results of observations on the roots found the structure of vesicles, spores and hyphae which characterizes root infection by mycorrhiza. Fungi of mycorrhiza arbuscular infect plant root systems by forming intensive external hyphal braids, thereby increasing root capacity in nutrient and water absorption [13]. Mycorrhizal roots can absorb nutrients in the form of bound and not available in the soil, with hyphae as root hair (rhizomorf) which functions to absorb all nutrients from the soil and water. However, the spread of hypha in the soil is very wide so that it can absorb relatively more water.

4. CONCLUSION

The treatment concentration of 45% biourine + FMA 20 g / pot shows the result and forage nutrition value is higher than the treatment of 30% biourin + FMA 20 g / pot, 15% biourine + FMA 20 g / pot and the treatment of 0% biourine + FMA 20 g / pot.

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