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EFFECT OF PROBIOTIC (*Bacillus Sp* AND *Bacillus Circulans*) LEVEL ON THE CONTENT OF DRY MATTER, ORGANIC MATTER AND CRUDE PROTEIN OF RICE STRAW SILAGE

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ABSTRACT

The aim of this study was to evaluate the inclusion level of a probiotic (*Bacillus sp* and *Bacillus circulans*) on the resulting dry matter, organic matter and crude protein content of rice straw silage. Five inclusion levels of 0, 2, 4, 6 and 8 % (designated R_0, R_1, R_2, R_3 and R_4, respectively), with four replicates of each, were applied. The results showed that inoculating rice straw with probiotics increased ($P<0.05$) the dry matter, organic matter and crude protein of silage relative to that of the controls (R_0). Further studies with respect to nutritive value and animal performance need to be undertaken.

Keyword : Probiotic, Silage, Dry Matter, Organic Matter, Crude Protein

INTRODUCTION

Probiotics are usually celled organisms which are used to beneficially manipulate an environment e.g. to ferment food (baking) or alter the microflora of the gastro-intestinal tract (Manin *et al,* 2002). Probiotics, such as lactic acid producing bacteria, have been used to accelerate the ensilage process so as to increase the quantity of nutrients retained. The ability of these bacteria to proliferate and degrade carbohydrate under acidic (pH 3.5 to 5.0) anaerobic conditions (Cowan, 1974; Manin *et al,* 2002) indicate that they may have a role in improving the nutritive value of the resulting silage.

Rice straw (RS) is an abundant co-product from paddy fields. BPSP Jambi (2000) identified rice grain production in Jambi province to be about 0.55 m t (1998). As rice straw production exceeds grain by a factor of five (Abbas *et al.*, 1985) this suggests that the associated rice straw production to be approximately 2.75 m t annually.

While this represents a considerable source of nutrients it is traditionally burnt in the fields post-harvest. This occurs as utilisation of rice straw by livestock is poor due to its inherent low nutrient content and poor digestibility. Laconi, 1992 reported the chemical composition of rice straw to be 66.2, 9.2 and 308.0 g kg^{-1} for crude protein, extract ether and crude fibre, respectively while Winugroho (1999) provided values of 130, 70, 330 and 260 g kg^{-1} for silica, lignin, cellulose and hemicellulose, respectively. It is therefore hypothesised that the fermentation (ensiling) of rice straw together with probiotics may offer an opportunity to improve its nutrient composition. The aims of this study were to evaluate the effect of probiotics when included as fermenting agents in rice straw silage on the resulting content of dry matter, organic matter and crude protein.

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MATERIALS AND METHODS

Twenty plastic silos were used to ensile rice straw. The probiotic (a mixture of *Bacillus sp* and *Bacillus circulans*) was collected from Laboratory of Animal Physiology and Reproduction, Jambi University, and prepared according to the procedure of Manin (2002). RS was treated and ensiled following the procedure of Bolsen *et al* (1996). The straw was chopped to 1 cm length, sprayed with 52 ml water and 5 g sugar solution and incubated according to treatment for 5 days (according to preliminary study). Five treatments were applied (replicated four times) with probiotic inclusion levels of 0, 2, 4, 6 and 8 % (v/w) of RS (defined as treatments R_0, R_1, R_2, R_3 and R_4, respectively). Dry matter (DM), organic matter (OM) and crude protein (CP) contents of the silages were determined according to AOAC (1990).

Analysis of variance (Duncan) was applied to identify differences between treatments (Steel and Torrie, 1993).

RESULTS AND DISCUSSION

Probiotic inclusion rate affected ($P<0.05$) DM, OM and CP content (Table 1). Treatment R_3 appears optimum as it increased DM, OM and CP to a greater extent than the other levels (Figure 1). Saona (1984) mentioned that dry matter might increase as microbial activity during incubation. This might also be due to the supply of sugar in silage. Bestari *et al.* (1999) reported that fermentation would occur where there was sugar as an energy source for microbial growth.

It is common to find excessive application levels counter-productive as with the highest level used here (R_4). This results from excessive microbial growth but little degradative activity and so a reduced quantity of acid production. Fardiaz (1978) argued that microbial population number would be decreased as not balance or few nutrients available and the atmosphere of silage for microbial life.

Table 1. Mean DM, OM and CP of RS silage for each treatment factor

Treatment	DM (g kg^{-1})	OM (g $kgDM^{-1}$)	CP (g $kgDM^{-1}$)
R_0	355.6^{e}	248.0^{d}	64.2^{d}
R_1	367.4^{d}	254.7^{d}	78.9^{c}
R_2	390.8^{c}	276.0^{c}	92.5^{b}
R_3	416.0^{a}	306.7^{a}	106.4^{a}
R_4	401.4^{b}	292.6^{b}	96.1^{b}

^{a,b,c,d,e}Means within columns with different superscripts are different ($P<0.05$)

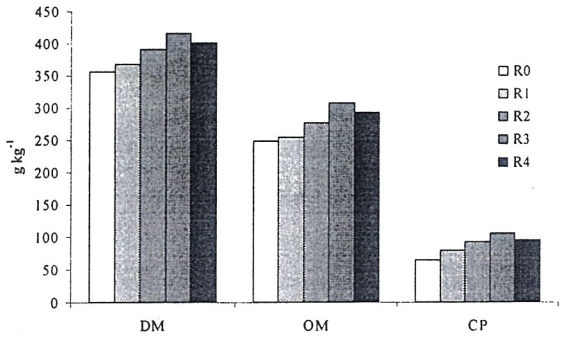

Figure 1. The DM, OM and CP content of rice straw silage

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CONCLUSION

It was concluded that the probiotic used modified the DM, OM and CP content of short-term ensiled rice straw, with the optimal level identified as the 6 % inclusion level. The use of more than 6 % was not indicated. Before such a treatment can be recommended further studies have to be conducted to examine the effect of incubation / ensiling period, additional chemical analysis, palatability and digestibility of the material and a cost-benefit analysis conducted.

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