EVALUATION OF MINERAL COMPOSITION OF CROP RESIDUES ENSILED WITH MINERAL ADDITIVES

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ABSTRACT
This study was conducted to evaluated the change in mineral composition of ensiled crop residues (rice milling waste and sugar cane top) with and without salt and potash as additives. The experiment was laid in a completely randomized design consisting 5 treatments each replicated three times, as: T1 RSCT (control 75% rice straw + 25% sugarcane tops), T2 (RSCT + 50 g salt), T3 (RSCT + 100 g salt), T4 (RSCT + 50 g potash), T5 (RSCT + 100 g potash). The results showed that potash at 50 g significantly enhanced the mineral availability of Ca, Mg, Mn, and P. Salt treatments resulted in intermediate mineral values. Supplementation with potash at 50 g improved the mineral composition of ensiled crop residues, making them a valuable source of minerals for animal feed. This study suggests that potash-treated crop residues are a viable option for sustainable animal feed production.

Description of Problem

Available animal feed resources include forages from rangelands, crop residues and agro-industrial by-products. Overgrazing has gradually led to depletion of rangelands soil fertility, deterioration of its structure, increased erosion and decreased biological activity [1]. In addition, population growth and increased cultivation of marginal lands and fallows is leading to a significant decline in the available grazing areas and to a consequent growing demand for crop residues and agro-industrial by-products. [1]. A study by [2] revealed that, due to the increases in human population and consequent high cost and demand for conventional feedstuffs, it has become increasingly necessary to alternate these feedstuffs with other feed resources so as to reduce the competition between, Man and livestock. The trend in which agricultural by-products such as crop residues were considered as waste has changed and is now being used extensively for animal feed where they are converted into animal protein for human consumption [3]. Crop residues are considered as the fibrous parts of crops that remain after the parts edible by humans are removed [4]. Despite their abundance, there is limitation in their use as animal feed due to insufficient knowledge about their feeding potentials [5] and inefficient processing method. Ensiling is a traditional method for the conservation and improvement of low-quality forages and crop residues [6]. It is based on lactic acid bacteria converting water-soluble carbohydrates into lactic acid in anaerobic conditions, resulting in a decrease in pH and inhibition of undesirable microbial activities so that nutrients of forage can be well preserved [7]. Different silage additives are added to silage to improve the fermentation quality of prepared silage by producing high quality product [7]. Potash addition has been found to improve the fermentation quality of silage, as indicated by reduced pH values and increased lactic acid content [8]. This enhanced fermentation profile can lead to improved silage stability and reduced spoilage. This study was aimed to evaluate the mineral composition of crops residue ensiled with mineral additives.

Materials and Methods

Experimental Site

The study was conducted at Department of Animal Science and Biochemistry Laboratory. Federal University Dutse, Jigawa State, at a latitude: 11.0 °N to 13.0 °N and longitude: 8.0 °E to 10.1 °E.

Materials

Rice milling waste were collected from Gerawa Rice Mill Company and sugarcane tops were collected from Dandodoji integrated farm Jangargari, Birnin kudu local Government Jigawa state and salt and potash were purchased from Dutse ultra-modern market.

Treatments and Experimental Design

The experiment was laid in a Completely Randomized design (CRD) consisting 5 treatments and 3 replications. Treatment combinations were shown below

T1 (control RSCT) =75% rice straw+25% sugar cane top

T2=75% rice milling waste +25% sugar cane top +50g salt

T3 =75% rice milling waste +25% sugar cane top +100g salt

T4 =75% rice milling waste +25% sugar cane top + 50g potash

T5 =75% rice milling waste +25% sugar cane top + 100g potash

Preparation for Ensiling

Rice milling waste and sugarcane tops were collected and chopped into smaller sizes (1-2 cm) The collected materials were thoroughly screened to remove impurities. 75% of rice milling waste and 25% of sugarcane tops was weighed and mixed thoroughly with 100 ml/kg of water.

Ensiling Procedure

The treatments were ensiled in a four-litter capacity silo. Each treatment was replicated three times, the silo was adequately filled and compacted to enhance anaerobic fermentation and the cover was greased to prevent or circulation. After the fermentation days, the samples were open and taken for further analysis.

Determination of Mineral Analysis

Micro and micro minerals were analyzed using the official analytical chemist method [9] method using atomic assumption Spectrophotometry standard.

Statistical Analysis

All data generated were subjected to the analysis of variance (ANOVA) using GenStat version 17.0 and means were separated using DMRT.

Result and Discussion

The mineral composition of the silage (Rice milling waste+ sugar cane top RSCT) treated with salt and potash shows a significant variation in mineral concentrations across the five treatments as shown in Table 1.

T**able 1:** Mineral Composition of Ensiled Crop res**i**dues (Rice milling waste and **Sugar** cane top) Treated with Mineral additives (Salt and Pot**a**sh)

	Mineral element					
Treatment	Ca	Mg	Mn	Cu	Fe	P
T1	7.44^{c}	1.77^{c}	1.4^{c}	0.07^{c}	8.81^{c}	59.5^{e}
T2	5.72^{e}	1.53^{d}	1.04^{d}	0.09^{b}	5.69^{d}	79.31^{c}
T3	6.27^{d}	1.41^{e}	0.92^{e}	0.089^{b}	4.76^{e}	92.1^{b}
T4	12.08^{a}	1.88^{a}	1.59^{a}	0.09^{b}	9.4^{b}	106.5^{a}
T5	9.17^{b}	1.80^{b}	1.54^{b}	0.13^{a}	10.68^{a}	64.42^{d}
LSD	0.06	0.02	0.01	0.014	0.2	2.75

$^{a, b, c \text{ and } d}$ mean with different superscripts along columns differ significantly at (P>0.05)

The mineral composition in T1 (RSCT) shows a decreased values along the treatments which shows values explained by Muhammad [10] on ensiled rice milling waste similarly salt based treatments T2 and T3 relatively shows lowered mineral values except for P (79.31 and 92.1 respectively) it was explained by [11] silage samples with salt additive leads to a product with decreased micro and macro minerals. Comparatively, T4 and T5 has higher mineral values except for P in T5 which may be as a result of too much potash added to the sample (100 g). Generally, T4 has the highest values of Ca (12.8), Mg (1.88) Mn (1.59), and P (106.5) which indicates that 50 g potash can improve the feeding value in terms of mineral content of a silage product. The values obtained in T4 and T5 were within the range reported by [12] in staked silage.

Conclusion and Application

From the study above, it shows that addition of 50 g potash per kg silage can improve the mineral content of the silage product.

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