IMPROVING THE PHYSICAL PROPERTIES OF MILLET STOVER (*PENNISETUM GLAUCUM*) WITH ENSILED UREA AND MOLASSES: TRANSFORMING ANIMAL PRODUCTION AND FOOD SECURITY IN AFRICA.

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ABSTRACT
This study was conducted to investigate the effect of improving the physical properties of millet stover (Pennisetum glaucum) with ensiled urea and molasses. Millet stover (MS) was chopped into 1 to 3cm long to facilitate compaction and consolidation. A 2 ×3 factorial arrangement laid in a Randomized complete Block Design (RCBD) was used for the experiment. The material was millet Stover (maiwa type) which were ensiled at three different levels of 3, 5 and 7weeks at 2.76kg, then molasses and urea were added on the millet stover at 3ml and 0.9% respectively, while the control was ensiled without any of the additives for treatment 3. The treatments were allocated to the experimental unit completely at random. Physical quality (pH, temperature, color and odor) were analyzed. The result of millet stover, silage at three, five and seven weeks on treatments 1, 2, and 3 (molasses, urea and control) fall under acidic conditions confirming good silages. Urea treatment had the highest pH values amongst all treatments with the following pH values; 4.65, 4.76 and 4.85 with a steady increase on pH level at weeks 3, 5 and 7. The physical characteristics in terms of pH of (MS) ensiled using additives made good silage as they were within the recommended range for quality silage. Urea and molasses are therefore recommended as additives for silage production using millet stover.
Keywords: Physical properties, Millet Stover, Urea, Yeast, and Additives.

INTRODUCTION

Livestock contribute to poverty alleviation to the national economy, such as traction power, transport, manure as fertilizers and fuel food, fiber, leather and generating significant household cash income through sales of live animal or livestock product. However, among the major constraints limiting the development of livestock production in many developing countries, inadequacy of animal, feed shortage, both qualitative and quantitative, limiting the livestock productivity. Different additives can be used to improve silage fermentation or provide supplementary nutrients to cattle (Ososanya and Olorunnisomo, 2015: Kuttu, *et al* 2020).

Silage making is a management tool that allows producers to match feed resources (forages, crop residues, agro-industrial by products, etc.) with feed demand for a herd. The basic function of silage-making is to store and preserve feed for later use with minimal loss of nutritional qualities. The need to store feed for use by livestock is not a novelty (Vanbelle and Bertin, 1985).

Millet (*Pennisetum spp*) is an important crop in the semi-arid tropics of Asia and Africa especially in India, Mali, Nigeria and Niger, with 97% of millet production in developing countries (Philip, *et al* 2010). Pearl millet (*Pennisetum glaucum*) is used as forage, and has the potential for silage production in regions where summers or drought are a problem, or when planted in succession or in the off-season after harvesting the main crop. This is due to its rusticity and adaptation to planting at the end of summer and the beginning of fall (Perera, *et al*., 1993).

Aim and Objectives

1 To evaluate the ensiling periods on physical properties of millet stover.
2 To evaluate the effects of additive on physical properties of millet stover
3 To evaluate the physical state of ensiled millet stover.

MATERIALS AND METHODS

The experiment was conducted in the Agricultural Laboratory at the Federal College of Education (Technical) Bichi, Kano state, Nigeria. Bichi has an area of 12km² and a population of 277,099 at the 2006 census. Its geographical coordinates are 12°14'8" North and 8°4'21" East. And 12°13¹ - 14N in the Sudan Savannah zone of Northern Nigeria. The zone is characterized by two distinct season namely, wet (season May-September) and dry (season October-April) mean annual rainfall range from 500-1000mm and temperature from 21-39°c. (KNARDA, 2001).

Experimental Materials
Millet Stover, Molasses, Urea, Water, Bama Bottles, Shears, Beaker, Spatula, pH Meter, Thermometer, Distilled water, Masking tape, Top bond, Stainless plate were used for the Research.

Experimental Design
A 2×3 factorial arrangement laid in a randomized complete Block Design (RCBD) was used for the experiment. The factor was maize stover which were ensiled at three different levels of 3,5 and 7weeks at 3.2kg, then molasses and urea were added on the millet stover at 5 and 10% respectively while the control was ensiled without any of the above mentioned for all treatments. The treatments were allocated to the experimental units completely at random.

Experimental Layout for Millet Stover

Treatments	3Weeks	5Weeks	7Weeks
Urea	3U	5U	7U
Molasses	3M	5M	7M
Control	3C	5C	7C

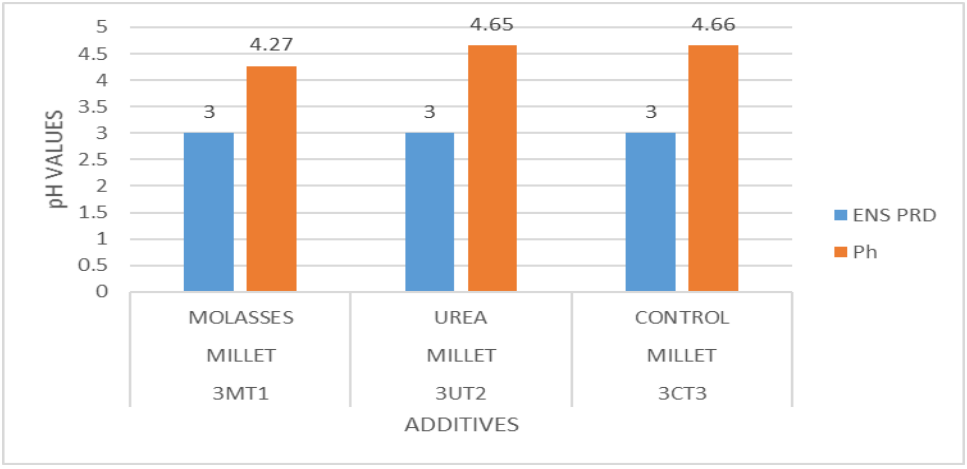
Note: Each of the treatment was replicated by 3 = 27.

Experimental Sample
The sample of this experiment is millet stover.

Preparation of the Experimental Sample
The experimental samples used were ensiled millet stover with or without Additives and are indicated as follows:
Treatments 1-Urea: 3.2kg of millet stover were mixed with 1.8ml of dissolved urea
Treatments 2- Molasses: 3.2kg of millet stover were mixed with 0.28ml of dissolved molasses
Treatments 3- Control: 3.2kg of millet stover without Additives were ensiled

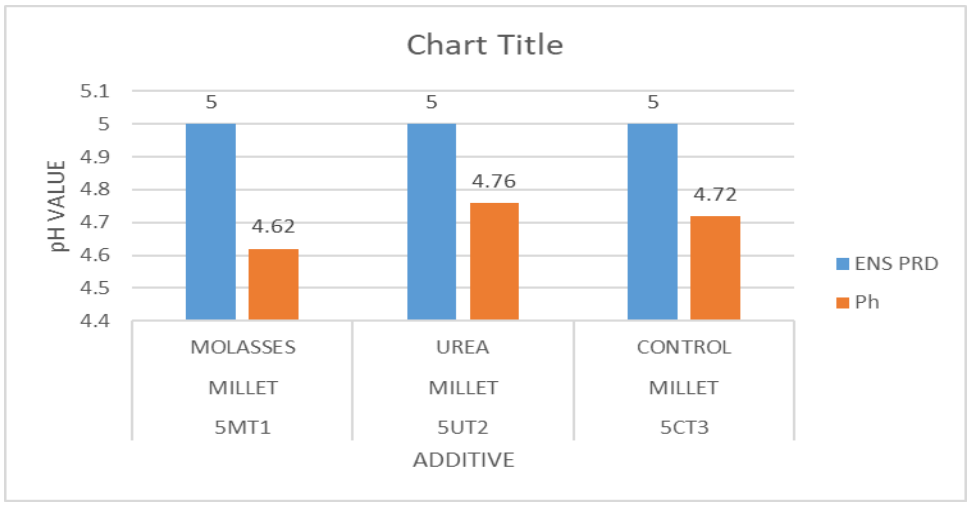
Statistical Analysis
The data generated were subjected to Microsoft Excel Office Software and analyzed using bar charts.

RESULTS AND DISCUSSIONS
Average pH values at week three is shown on Figure 1. Molasses treatment had the lowest pH value of 4.27, while control treatment had the highest pH value of 4.66. Although all treatment fell under acidic conditions, molasses treatment seems better than urea and control treatments.



ENS PRD = Ensiling Period
Figure 1: Average pH Values of Millet Stover at Week Three

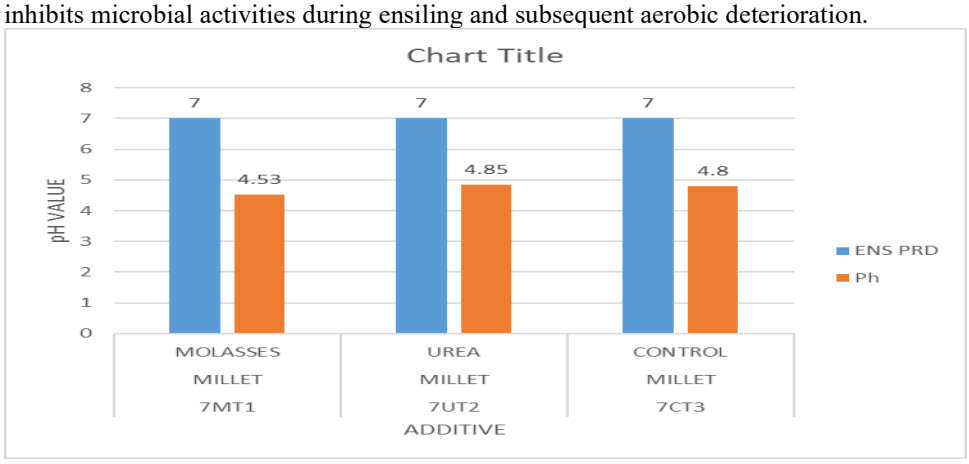
pH Values of Millet Stover Silage (MSS) at Week Five
Average pH Values of Millet Stover at Week Five
This figure shows the average pH values of ensiled millet stover at week five. Treatments 1, 2 and 3 all fall under acidic conditions by pH values. Treatment 1 which is molasses had the lowest pH value of 4.62, while treatments 2 urea had the highest pH value of 4.76



ENS PRD = Ensiling Period
Figure 2: Average pH Values for Millet Stover at Week Five

Average pH Values for Millet Stover at Week Seven

Figure 3 shows the average pH values of millet stover silage at week seven. Molasses treatment had the lowest pH value of 4.53, while urea treatment had the highest pH value of 4.85. Urea, molasses and control treatments all fall under acidic pH conditions making ensiling period at week seven an excellent silage. Although all treatments fall under acidic pH conditions, molasses treatment gave best results. Urea treatment at weeks 5 and 7 have the highest pH values of 2.87, and 4.85 at 5 and 7 weeks respectively though under acidic condition as compared to control and molasses, which confirms the statement of Bolsen, *et al*., (1995) and Kuttu *et al* (2020), which says, addition of ammonia increases the pH level of silage to 6 or 9. According to Hill & Leaver, (2002) and Kuttu, *et al.,* (2021), the presence of ammonia nitrogen (NH3-N), in high concentrations in conserved feeds, inhibits microbial activities during ensiling and subsequent aerobic deterioration.



ENS PRD: Ensiling Period
Figure 3: Average pH Values of Millet Stover at Week Seven

CONCLUSION AND RECOMMENDATIONS

It was concluded that, millet stover silage (MSS) at three, five and seven weeks make a good silage with or without additives (molasses and urea). Based on the above conclusion, the following recommendations were made. Molasses and urea can be used as additives in making millet stover silage, especially during feed scarcity (dry season).

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