EFFECT OF MAIZE STOVER ENSILED WITH VARYING LEVELS OF SUGAR CANE AS ADDITIVE ON THE PERFORMANCE OF WEST AFRICAN DWARF (WAD) GOATS

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This research work titled " Effect of Maize Stover Ensiled with Varying Levels of Sugar Cane as Additive on the Performance of West African Dwarf (WAD) goats " was carried out by OGUNWALE Stephen Oluwamayokun under my supervision and approved by me in accordance with the partial fulfilment of the requirements for the award of the degree of Master of Science (M.Sc.) in Animal Sciences, ObafemiAwolowo University, Ile-Ife, Nigeria.

DR J. A. ODEDIRE Date

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(HEAD OF DEPARTMENT)

DEDICATION

This project is dedicated to Almighty God and to my parent

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ABSTRACT

This study determined the chemical composition and volatile fatty acids profile of the maize residue ensiled with sugarcane as additive and assessed the growth performance and nitrogen utilization of West African Dwarf (WAD) goats fed maize residue ensiled with sugarcane as additive. This was in a view to determining the nutritional value of maize residue ensiled with sugarcane as additive.

Animal performance of the ensiled maize stovers were investigated using 24 growing West African dwarf (WAD) goats allotted to four treatment diets (0, 10, 20 and 30% sugar cane inclusion level as Diets 1, 2, 3 and 4 respectively) in a Completely randomized design with six goats per replicate. Feeding of the silage was done at 3% body weight of the animals with a concentrate supplement at 2% body weight. Feeding trial lasted 84 days and growth related parameters, such as Feed intake, Daily weight gain and Digestibility were measured. All data generated were subjected to Analysis of Variance of SAS package (2001) and significant differences between means were compared using the Duncan Multiple Range test (DMRT) of the same package.

The volatile fatty acid of the ensiled maize stover recorded Acetic acid predominating and there was no significant difference across the treatments in acetic acid and butyric acid. The propionic acid content varied significantly across the treatment with diet 4 (1652.70)being the highest and diet 3 (1104.51) being the lowest while lactic acid showed significant difference across the treatments, ranging from diet 4 (1906.70) to diet 2 (2152.41).The proximate composition of the diet was significantly different. Diet 2 had the highest ($p < 0.05$) crude protein content (18.37%) and Diet 1 has the lowest (14.87) value. Diet 3 has the highest dry matter value (84.20) with Diet 4 (82.67) being the lowest. The crude fiber ranged from 25.85 in Diet 2 to 23.45

in Diet 4. Ether extract has its highest value in diet 2 with 25.85 and lowest value in diet 3 with 0.75 Ash value ranged from 8.56 in diet 4 to 6.39 in diet 2. The diet with 10% sugar cane inclusion level had the highest crude protein, crude fiber and ether extractAverage daily feed intake was significantly different ($p < 0.05$) across the treatments, ranging from 389.8 g/day in Diet 4 to 408.6 g/day in Diet 3. Diet 2 and 3 showed good acceptability and palatability compared to other diets. Total weight gain and Average daily gain of the WAD goats were not significantly different across the various treatments ($P > 0.05$). The nitrogen balance of goats fed diet 2 and 3 were not significantly different. Likewise, values for goats fed on diet 1 and diet 4 were not significantly different. The trend for nitrogen utilization followed the same pattern as for nitrogen balance. The result indicated that nitrogen was well utilized in Diets 2 and Diet 3 compared to Diet 1 and Diet 4.

From the result obtained from the study it can be concluded that;maize stover ensiled with sugar cane is capable of supporting the growth of WAD goats without any deleterious effect. Goats fed with ensiled Maize stover with sugar cane at 10% (DIET 2) and 20% (DIET 3) inclusion levels utilized nitrogen better than those on 0% (DIET 1) and 30% (DIET 4) inclusion levels. Goats fed with ensiled Maize stover with sugar cane at 20% (DIET 3) inclusion levels digested the feed better than other diets.

CHAPTER ONE

I.0 INTRODUCTION

The feed of Small ruminants, in the humid region of West Africa, is largely based on natural pasture whose quantity and quality fluctuates with season, especially during drought which is associated with dry season (Aye, 2007). The feed resources for animals (cattle and other ruminants) in the tropical regions consist mainly of native plants, fodder trees, farm by-products (leaves and stems except for food use, straws, grains, brans, etc.), food processing by-products (cassava meal, soybean curd residue, brewery spent grains, molasses, etc. Ahamefule and Elendu (2010) had reported feed shortage as a major constraint for ruminant production, such as goats, in Nigeria. Native rangelands produce the cheapest source of nutrients for goats for a greater part of the year, although these grasslands do not supply sufficient nutrients to stock for greater productivity (Ndlovu, 1992).

The integration of livestock in farming system has led to an increase of crop production while animal productivity is still low. Many factors explain the low animal productivity among which feeding is reported to be the limiting one. Yet, the quality and even the quantity of natural forage, the main source of animal food, are prone to seasonal fluctuations. Therefore, it is essential to match the purpose and level of animal production to the seasonal availability of these resources Konimba 1996).

In the rainy season, the growth of herbage, including native grasses and pasture plants, is vigorous. Sufficient feed becomes available and in most cases animals can be fed enough by cut-and-carry or grazing. However, in the dry season, not enough feed tends to be secured and fed to animals, because herbage plants have stopped growing or they are dying due to the continued dry condition of the prevalent season Thus animals suffer malnutrition, reduction in milk production, loss of body weight, outbreak of diseases and reproductve disorders. These marked reduction in animal productivity cause the stagnation of income growth in animal farming and becomes a limitation factor for increasing population of the animal (Chiba*et al.*, 2005). There is therefore the need for a search towards alternative source of feed for these classes of animals especially in off season periods. It is important to make good use of the feed resources which are produced in these regions that are inexpensively and easily available (Chiba*et al.*, 2005). As a measure against feed shortage during the dry season, it is general that vigorously grown herbages in the rainy season (high temperature and heavy rain) are prepared, and stored as hay and silage and used in the dry season. However, it is difficult to make hay due to the climatic condition and cost. As a method for preparing and storing herbages under the climate condition of the rainy season, the silage making technology is the most reliable and low cost in silage production (Chiba*et al.*, 2005). Considering the real climate conditions, silage is the best method for preserving fresh forage with minimal losses (Yitbarek, 2014).

Silage quality and nutritional value are influenced by numerous biological and technological factors. When proper silage techniques are used, silage will have a high nutritive value and hygienic quality (Zehra, 2009). However, the results in practice indicate that the quality of silage is often poor or even unsatisfactory. These results are usually achieved when the fermentation conditions are difficult (Lattemae *et al.,*2006) The factors which influence fermentation includes degree of green fodder wilting, length of cut, ensiling technology type, and amount of additive used (Haigh, 1988).

Quality silage is achieved when lactic acid is the predominant acid produced.It is the most efficient fermentation acid and will reduce the pH of the silage. The faster the fermentation, the more nutrients will be retained in the silage (Schroeder, 2004).

Maize silage has a high nutritional value and is widely used in feedlots because it increases animal performance (Mariz *et al.,* 2013).

Silage is a forage, crop residue or agricultural by- products, preserved by acids either artificially added or produced by natural preservation, in the absence of air (Moran, 2005). Silage can also be defined as a succulent roughage which is made by keeping chopped silage materials air-tight in a suitable container (silo) to undergo mainly lactic acid fermentation with the aim of storing feed. (Chiba, 2005). It is also a fodder, typically fed to ruminants, consisting of undried vegetation stored in an airtight environment, which leads to its fermentation. Through lactic acid fermentation, the incorporated crops avoid spoilage and retain nutritional value (Brian, 2014). An airtight and anaerobic storage is required to produce quality silage. A well-packed, well-sealed silo filled quickly is key to reduce losses via spoilage and leakage. Forage plants begin their transformation into silage via cellular respiration as indigenous microorganisms consume the available oxygen that is present to some degree regardless of how well the silo is packed. The amount of oxygen available in the silo determines how long this phase lasts. Ideally, very little cellular respiration will occur because this phase results in an undesirable temperature increase and in nutrient losses (FAO, 1994). Oxygen and cellular respiration can be limited by ensuring that there are no leaks in the silo, that vegetation is ensiled at the appropriate moisture content and chopped to an appropriate particle size, and that the silo is filled and sealed quickly and packed well (FAO, 1994). After the available oxygen is depleted, lactic acid fermentation,an anaerobic process begins. A desirable fermentation in silage is the biochemical conversion of water-soluble carbohydrates, i.e. sugars, from the ensiled vegetation into cellular energy and lactic acid by anaerobic bacteria. Undesirable fermentations can produce alcohol or acetic acid, resulting in up to a 24% loss of the original sugar (Muck, 2000). Silage can spoil rapidly if exposed to air during storage and feed out. Lactic acid is produced when