

## PDF - ESTIMATING PERFORMANCE AND METHANE EMISSION FROM YANKASA LAMB RAMS FED DIETS CONTAINING VARYING LEVELS OF CAMEL'S FOOT (PILIOSTIGMA THONNINGII) LEAF AND POD MEALS - researchcub.infoABSTRACT

This study was conducted to estimate the effect of *Piliostigma thonningii* leaf (PTLM) and pod (PTPM) meals on growth performance, nutrient digestibility, nitrogen balance, rumen metabolites, methane emission and the economic benefit of including PTLM and PTPM in diet of Yankasa lambrams. A total of eight lamb rams weighing 18 to 23kg on average were randomly assigned to four dietary treatments containing PTLM and PTPM of 13.91 and 13.59% crude protein in a complete diet. The diets containing 0, 5, 10 and 15% inclusion levels of PTLM and PTPM were fed to the lamb rams at 4% of their bodyweights in a trial period that lasted 90 days for both PTLM and PTPM in a 4x4 Latin Square Design. Results obtained showed that the average values for weight gain, average weight gain and feed conversion ratio respectively were significantly ( $P < 0.05$ ) affected by inclusion levels of PTLM and PTPM. Lambrams fed 5% inclusion of PTLM had corresponding values of 2.37kg, 169.64g/day and 5.79 compared to PTPM which had 2.63kg, 187.50g/day and 7.50. The crude fibre, ether extract and nitrogen free extract digestibility in Yankasa lambrams were significantly ( $P < 0.05$ ) affected by varying inclusion levels of PTLM and PTPM. Nitrogen balance (nitrogen intake, nitrogen absorbed, nitrogen retained and nitrogen retained as % intake) in Yankasa lamb rams was significantly ( $P < 0.05$ ) affected by PTLM and PTPM inclusions across the dietary treatment. Fitting into methane emission models, for model 1, the result revealed that lamb rams fed 0% (1.52MJ/day) and for model 2, those fed 5% (4.32L/day) inclusion of PTLM had the least methane production. While lambrams fed PTPM inclusions were significantly ( $P < 0.05$ ) affected for model 1 and model 2 with those fed 5% (1.55MJ/day) and 0% (11.24L/day) inclusion levels respectively having the least methane production. The pH and total volatile fatty acid were not significantly ( $p > 0.05$ ) affected across the dietary treatment of PTPM inclusions but significant ( $p < 0.05$ ) effect was recorded for the ammonia nitrogen. The cost of the diet reduces with increasing PTLM and PTPM inclusions although best performance was observed among animals fed 5% inclusion level of PTLM and PTPM respectively in this study. PTLM and PTPM at 5% inclusion in a complete diet can be used to alleviate the problem of feed scarcity in terms of quantity and quality in the dry season period and also to enhance efficient performance of Yankasa lamb rams. Furthermore, the inclusion of PTLM and PTPM in diet of Yankasa lamb rams decreased quantity of methane released into the environment.

## CHAPTER ONE

### 1.0 INTRODUCTION

Small ruminants have the potential of converting highly fibrous feeds such as grasses, legumes, forages, farm wastes and crop residues of poor quality and unsuitable for human consumption to body tissue (Fajemisinet al., 2010). Also, small ruminants serve a multitude of functions ranging from food to organic fertilizers that are essential to human life in both rich and poor countries (Gatenby, 2002). Small ruminants are an important part of global agricultural economy such that they play a major role in many local economies (Weaver, 2005). Traditionally, sheep and goats have served as means of ready cash and a reserve against skins that can feed the local leather industry. Sheep have high fertility and reproductive rates (Tona, 2011). However, seasonal variation in the supply of forage is one of the problems facing sheep production in Nigeria. This problem is more pronounced in Northern Nigeria during the dry season, when the rangelands are completely over-grazed.

Researchers attempted to address the issue of feed scarcity through the use of various browse plant species

such as; *Ficus thonningii* (Yousuf and Ogundun, 2005), *Daniellia oliveri* (Isah et al., 2014) and *Tithonia diversifolia* (Odedire and Oloidi, 2014). The supply of adequate feeds in terms of quality and quantity for small ruminant production becomes critical during the dry season period (Adegbola, 2002); this results in the assessment of the feeding value of the range plants which has been recently recognized as having the potential to address the problem of feed scarcity to ruminant livestock. Jimoh and Oladiji, 2005 reported the utilization of *Piliostigma thonningii* seeds as a cheap source of protein, energy, minerals and antioxidant supplement for ruminant livestock in southwest Nigeria.

In the dry season, grasses and browse plants dry up and there is dehydration with high degree of lignification which results in loss of weight in grazing animals. Therefore, there is need to integrate feeding of *Piliostigma thonningii* leaf and pod meal to serve as protein sources which is usually low in feed during the dry season and also to improve feeding of sheep. Ruminants have become extremely efficient at converting food such as grass, silage, hay and concentrates into agricultural products such as milk and meat. At the same time, feed quality, ration formulation and herd management have all contributed to the overall increase on productivity.

However, one of the by-products of rumination, the process by which animals such as sheep and cattle digest food, is methane – a powerful greenhouse gas (GHG) which is produced during the anaerobic fermentation of hydrolyzed dietary carbohydrates in the rumen and represents an energy loss to the host besides contributing to emissions of greenhouse gases into the environment (Raghavendra and Osamu, 2007). Greenhouse gases are gases that trap heat in the atmosphere. They include carbon dioxide, methane, nitrous oxide and fluorinate gases such as hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride, which are emitted from a variety of industrial processes (EPA, 2016).

### 1.1 Justification of the study

The major constraint to ruminant livestock production in the tropics is the availability of cheap and quality feedstuffs, especially in periods of drought or dry season. The increasingly expensive nature of most feed ingredients has resulted in reduced livestock production activities by subsistence farmers who constituted the majority of the livestock holder in the typical sub-Saharan Africa, and this has impact negatively on the available animal protein for human consumption (Odedire and Oloidi, 2014). Nutrition is one of the most important aspects of livestock production which can be used to enhance animal productivity. Minister for Agriculture and Rural Development released a census of livestock in the Country by National Agricultural Sample Survey which indicated that Nigeria is endowed with an estimate of 19.5 million cattle, 72.5 million goats, 43.1 million sheep, 7.1 million pigs and 28, 000 camels (Ogeh, 2016).

Yankasa sheep is a medium sized animal in addition to its hardiness and ecological spread in Nigeria. This breed of sheep is very popular among sheep farmers, most especially in the Northern Nigeria. At the smallholder level, sheep play a very important role in the socioeconomic and cultural life of the farmers. Sheep produce skin that can feed local leather industries. The sheep skin has been estimated at 7,500 tonnes annually (FAO, 2004).

Under traditional system, the growth performance of sheep has remained generally low due to poor management, which is related to low plane of nutrition. This problem results from seasonal changes which affect natural rangelands and the availability, palatability and nutritive value of feedstuffs, especially in dry season period (Odedire and Oloidi, 2014). Ruminant livestock in Nigeria cannot utilize many browse plants in the rangelands due to high contents of anti-nutritional factors, high fibre levels, and low palatability of leaves.

Although some of these plants may be of high nutritional quality, but they are hardly utilized by farmers for the purpose of feeding livestock, despite their abundance in the rangelands. There is therefore need for exploring the potentials of such browse plants in feeding ruminant livestock in Nigeria. One of such plants is camel's foot (*Piliostigma thonningii*), which has the potential of solving the problem of feed scarcity to livestock, especially during dry season period, because it exists throughout the year.

Presently, there is global concern about the climate change, which is known to affect farmers negatively (EPA, 2016). Emissions from livestock rearing and related practices such as storage of liquid manure are believed to be the highest contributors of Green House Gases compared to those from the soil, chemical fertilizers, burning of fossil fuels and others. For ruminant livestock, emissions of nitrous oxide, methane and carbon dioxide from enteric fermentations of the rumen serve as significant pathways of losses of nitrogen, energy and organic matter that undermine efficiency and productivity of livestock (EPA, 2016). About 44 percent of emissions from livestock are in the form of methane, while the remaining part is almost equally shared between nitrous oxide (29%) and carbon dioxide (27%) (FAO, 2016). Calculating the exact amount of these gases emitted by ruminant livestock reared under crop-livestock system requires the use of sophisticated tools, which are practically unavailable in Nigeria. However, these gases can be estimated through the use of some models designed for ruminant livestock.

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