EFFECT OF YEAST (*SACCHAROMYCES CEREVISIAE*) SUPPLEMENTATION ON NUTRIENT DIGESTIBILITY OF YANKASA RAM FED MAIZE SILAGE AND CONCENTRATE

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ABSTRACT

A study was conducted at the Small Ruminant Unit of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Zaria, Kaduna State, to determine the effect of yeast supplementation on nutrient digestibility of Yankasa ram fed maize silage and concentrate in ratio 60:40. The experiment was arranged in a completely randomized design (CRD) in 3 replicates. The treatments consist of four (4) levels of supplementation of yeast (Saccharomyces cerevisiae) 0, 2.5, 5.0 and 7.5 g/day. the study lasted for 21 days. Data was analyzed using general linear model of SAS and significant means were compared using Duncan Multiple range test (DMRT). The result of the apparent nutrient digestibility trial showed significant ($p<0.05$) difference on dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) and nitrogen free extract. The highest DM digestibility ($p<0.05$) was observed in rams fed 7.5 g/day YIL (55.02 %), followed by groups fed 0, 2.5 and 5.0 g/day YIL (53.69, 53.47 and 52.45 %, respectively) which were similar ($p>0.05$). Crude protein digestibility increased by 4.17 % in rams 7.5 g/day YIL (66.74 %) compared to rams on 5.0 g/day YIL (63.99 %), but statistically at par with rams on 0 and 2.5 g/day YIL (68.17 and 66.577 %, respectively). The digestibility of EE, CF and NFE were within 40.30-56.57 %, 80.93-81.97 % and 34.11-37.53 %, respectively. It was concluded that supplementation of yeast at 7.5 g/head/day improved the digestibility of crude protein by 4.17 %. Therefore, it should be supplemented to yankasa ram for better digestion of nutrient and fee utilization.

Keywords:Yeast, Silage, Concentrate, Yankasa ram and Digestibility

INTRODUCTION

Nigeria is blessed with various species of ruminant animals, comprising of sheep, goats and cattle, which constitute the farm animals largely reared by farm families in the country's agricultural system. Nigeria was estimated to have a population of 22.1million sheep and are largely concentrated in the northern region of the country than the southern region (Lawal-Adebowale, 2012). Sheep is a source of cash income, food, manure and fibre for smallholder farmers. Sheep production in the mixed crop-livestock production system is based on communal grazing land, which is shrinking due to cropping encroachment and gully erosion (Mengistie *et al.*, 2010). Therefore, there is a need for an alternative feeding strategy which could alleviate livestock feed problem. This is one of the major challenges to livestock production in Nigeria as to ensuring adequate feed supply throughout the year in terms of quality and quantity (Kallah *et al.,* 1997). Conservation of forage as silage should be of particular interest and value to Nigerian livestock farmers, since it provides ample opportunity to conserve wet season excesses for later use during the period of feed scarcity in the dry season (Amodu *et al.,* 2008). Yeast (*Saccharomyces cerevisiae*) is a probiotic commonly used in ruminant diet. It increases feed efficiency by improving rumen fermentation and effectively prevents rumen acidosis. Yeast has also been shown to be effective in restoring microbial balance in the gastrointestinal tract, especially when the animal is in a state of digestive disorder or stress (Elghandour *et al*., 2020). Addition of *Saccharomyces cerevisiae* culture to ruminant diets has improved the digestibility of DM, CP and hemicellulose, increased ruminal bacterial numbers and activities, which in turn leads to increase degradability of forages (Kamel *et al*., 2000).

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Small Ruminant Unit of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Zaria, Kaduna State. Shika is located on Latitude 11^0 12'W. Longitude 07^0 33'E and altitude 660m above sea level (Ovimaps, 2020).

Sources of Experimental materials

The silage was made from SAMAZ 17 harvested at 91 days after sowing. The animals were sourced from small ruminant unit of NAPRI, ABU Zaria Kaduna State, Nigeria.

Experimental animals and their management

Twelve (12) Yankasa rams with an average live weight of 18±0.5 kg were used for the study. The live weight was measured using weighing scale. The animals were housed in individual pens which was cleaned and disinfected before their arrival. They were prophylactically treated against internal and external parasites immediately after arrival. They were given 0.1mL/10kg body weight of ivomectin injection and 0.1mL/kg body weight Tetranor® (Oxytetracycline dehydrate, 20% weight/volume injectable solution). They were sprayed with Amiticks using knapsack spayer. They were allowed 14 days to adjust to feed and confinement before the actual start of the experiment which lasted for a period of 7 days.

Experimental design, treatments and Animal feeding

At the end of the feeding trial, three rams were allocated to four (4) dietary treatments in a Completely Randomize Design (CRD), to compare the effect of feeding maize silage supplemented with concentrate containing yeast at the rate of 0, 2.5, 5.0, and 7.5 g/kg, respectively. They were housed in metabolic crates for easy total faecal and urine collection as reported by Osuji *et al.* (1993). The animals were allowed 14 days' adjustment period to the crates and 7 days' collection period of faeces. Ort was collected and weighted each morning (8.000am). Total faecal output from each animal was collected, weighed, mixed thoroughly and sub-sampled (10 %) was taken for dry matter determination treated with 20 % formaldehyde before they were oven dried, to prevent further bacterial activities in polyethene bags during waiting period for laboratory analysis.

Chemical analysis

Samples of the feed offered and faeces collected were analyzed for proximate composition using the method described by AOAC (2019). Fibre fraction was determined using the procedure of Van-Soest *et al.* (1991). Urine was analyzed for nitrogen using Kjeldahl procedure (AOAC, 2019), these analyses were carried out at the Biochemistry Laboratory of the Department Animal Science, A.B.U, Zaria.

Statistical analyses

Data collected at the end of the experiment was analyzed using analysis of variance (ANOVA) by General Linear Model (SAS, 2005). Treatment means were compared using Duncan multiple range test (DMTR).

RESULTS AND DISCUSSION

Nutrient digestibility of growing Yankasa rams fed maize silage supplemented with concentrate containing yeast inclusion levels.

The effect of yeast inclusion levels (YIL) on nutrient digestibility by Yankasa rams fed maize silage basal diet supplemented with concentrate containing yeast inclusion levels indicate significant differences ($p<0.05$) on DM, CP, EE and NFE (Table 1). Highest DM digestibility ($p<0.05$) was observed in Yankasa rams fed 7.5 g/day YIL (55.02 %), followed by groups fed 0, 2.5 and 5.0 g/day YIL (53.69, 53.47 and 52.45 %, respectively) which were similar ($p>0.05$). Crude protein digestibility increased by 4.17 % in rams fed 7.5 g/day YIL (66.74 %) compared to rams given 5.0 g/day YIL (63.99 %), but there was no statistical ($p>0.05$) with rams given 0 and 2.5 g/day YIL (68.17 and 66.577 %, respectively). Ether extract digestibility was higher ($p<0.05$) in rams fed 5.0 g/day YIL (56.57 %), which is similar to that of rams fed 2.5 g/day YIL (53.45 %), followed by rams on 7.5 g/day YIL (49.93 %) and the lowest value was recorded in rams fed the control group (40.30 %). The best digestibility ($p<0.05$) of crude fibre was observed in rams fed 7.5 g/day YIL (81.97 %), which is at par with rams on 2.5 and 5.0 g/day YIL (81.72 and 81.55 %, respectively). The lowest digestibility of crude fibre was observed in the control group (80.93 %), which is also at par with rams on 2.5 and 5.0 g/day YIL groups. Nitrogen free extract digestibility was higher in rams fed 7.5 g/day YIL (37.53

%) compared to rams on 5.0 g/day YIL (34.11 %), but similar with rams fed 0 and 2.5 g/day YIL (35.91 and 35.28 %).

The result of this study showed significant difference in nutrient digestibility of DM, CP, EE, CF and NFE across the yeast inclusion levels. This increased digestibility in the supplemented diet may be reasoned to the addition of yeast, which resulted in an improved rumen ecosystem as well as enhanced microbial activities especially that of cellulolytic microbes (e.g*., Fibrobacter succinogenes and Ruminococcus flavefaciens*), such that they increase fiber digestion, reduce lactate accumulation and the concentration of oxygen in rumen fluid (Lila *et al.*, 2004). Yeast also increases the population of beneficial microorganisms; such as lactobacilli and bifidobacteria. These healthy bacterial colonies then inhibit the growth of harmful microorganisms by producing substances (e.g., bacteriocins and/or organic acids) and by competitive exclusion (Gita, 2023). *S. cerevisiae* provide vitamin B_1 (thiamin) for fungi zoosporogenesis and growth factors (amino acid, peptide and organic acid) essential for lactate utilizing bacteria (Ding *et al*. 2014)

Fibre degrading bacteria are sensitive to low pH produced by high concentration of volatile fatty acid when animals consumed more sugars, starch and other non-structural carbohydrates, consequently decreasing the number and activities of these microbes (Anjum *et al.,* 2018). Supplementation of S. cerevisiae raised the pH by hindering the activities of starch degrading and lactate producing bacteria while total bacteria, fungi, protozoa, fibre-degrading and lactate utilizing bacteria increased (Ding *et al*. 2014 and Kampanat *et al.,* 2021). Meanwhile, degradation rate of DM, CP, EE, CF and NFE are improved (Sawsan *et al.,* 2012). The higher nutrient digestibility observed in this study is in agreement with the findings of Ding *et al*. (2014) who fed steer different concentrate to forage ratios of Alfalfa hay supplemented with S. cerevisiae. It is also consistent with the report of Mohanty *et al*. (2022) when chromium and yeast were supplemented in the diet of Deccani sheep fed sorghum stover based complete diet.

Table 1: Nutrient digestibility of growing Yankasa rams fed maize silage supplemented with concentrate containing yeast (*Saccharomyces cerevisiae*) inclusion levels

Parameters (%)	Inclusion levels of yeast(g/kg)				
	0	2.5	5.0	7.5	SEM
Dry matter	53.69^{b}	53.47^{b}	52.45^{b}	55.02^{a}	1.08*
Crude protein	68.17^{a}	66.57^{a}	63.99^{b}	66.74^{a}	0.91*
Ether extract	40.30^{c}	53.45^{ab}	56.57^{a}	49.93^{b}	2.00*
Crude fibre	80.93^{b}	81.71^{ab}	81.55^{ab}	81.97^{a}	0.51*
Nitrogen free extract (NFE)	35.91^{a}	35.28^{a}	34.11^{b}	37.53^{a}	1.50*
Neutral detergent fibre (NDF)	55.19	54.45	53.65	55.21	1.13^{NS}
Acid detergent fibre (ADF)	62.38	61.87	61.30	61.72	0.85^{NS}

^{abc} Means with different superscripts within row differed significantly ($p<0.05$), SEM = Standard error of mean

CONCLUSION

The study reveals that supplementation of yeast at 7.5 g/day to Yankasa rams fed maize silage and concentrate at 60:40 ratio resulted in the digestibility of crude fibre of 81.97 %. it also causes significant increase in the digestibility of dry matter and nitrogen free extract.

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