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Quality And Sensory Evaluation of Meat From Yankasa Rams Fed Sorghum Stover Supplemented With Varying Levels of Dried Poultry Droppings Based Diet

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Abstract

Sensory attributes and meat quality from Yankasa rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diet were determined in this study. Meats from the experimental animals were sampled to determine their chemical composition, meat PH and cooking loss. Untrained panelists were used to assess the meat samples for sensory attributes these include: colour, flavour, texture, juiciness, tenderness and overall acceptability of cooked meat samples using nine-point scoring scale. Results from the chemical constituent of the meat samples indicated that as the level of inclusion of the supplemental diet increases, the value obtained for crude protein and fat also increases. No significant difference among the treatment groups for cooking loss. While Meat PH values obtained in this study shows that treatment groups fed supplemental diets were within the range of 5.4 and 5.8 (low) PH which is a measure of good quality. Significant differences existed among the treatment groups for colour, flavour, texture and overall acceptability. It was concluded that meat from supplemented treatment groups had better meat qualities and overall acceptability.

Keywords: Dried poultry droppings, meat quality, sensory attribute, Sorghum Stover, Yankasa ram

1. Introduction

Meat is one of the most nutritive food items that human being eats, especially in view of the fact that it provides first- rate quality protein (essential amino acids), minerals (particularly iron) and essential vitamins (Sebsibe, 2014). Meat quality attributes are function of both sensory and chemical attributes (Dhanda *et al*, 1999) such attributes includes tenderness, flavour, juiciness and cooking loss. Tenderness and juiciness are part of the measures of overall meat eating quality (Chulayo and Muchenje, 2013) while meat PH is a key determinant of meat quality but consumers most times assess meat qualities on the basis of tenderness, juiciness and flavour of cooked meat. However, meat quality are also affected by other factors such as genetic factors, age and weight, sex, pre and post slaughter conditions, feed factors etc. (Chulayo and Muchenje, 2013 and Sebsibe, 2014). Research has shown that bulls fed forage-based, restricted diet had less glycogen, a high muscle PH, and darker muscle colour than bulls fed concentrate *adlibitum*. The same trend was observed with sheep and goats (Sebsibe, 2014). This present study was therefore initiated to examine the effect of feeding sorghum Stover a basal diet supplemented with varying levels of dried poultry droppings based diet on the meat quality and sensory attributes of Yankasa rams.

2. Materials and Method

2.1 Location of Experimental Site

The experiment was conducted at the Animal Production Department Research Farm, small ruminant unit of the Faculty of Agriculture and Agricultural Technology, Federal University of Technology, Minna. It is located at the Southern Guinea Savannah agricultural zone of the country (NSADP, 1995, Lanko, 2005). The mean monthly temperature is 30.5^{o}C observed in the Month of March and August and annual mean rainfall of 1400mm in the month of July and August. Humidity is in the range of 60% and 75% (Danwake, 1999).

2.2 Experimental Animals and their Management

Fifteen Yankasa rams not more than 12 Months old with an average weight of 13500 grams was used for this study. The animals were kept in pens. The floor of the pen was covered with sawdust for animal's comfort. The animals were treated against ectoparasites, dewormed against endoparasites and were administered with broad antibiotic to prevent bacterial infections. Thereafter the animals were shared into five experimental groups and fed for two weeks for acclimatization to the experimental diets before data collection. Salt-licks were supplied during the experiment. Water was supplied *ad-libitum*. Data were collected on feed intake; weight gain and feed conversion efficiency. The feeding lasted for 106 days. The animals were raised under confinement.

2.3 Experimental Design

The experimental rams were grouped into five treatments (T_1-T_5) consisting of three duplicates with one animal per duplicate in a complete randomized design. Treatment one (T_1) were rams fed 0 % dried poultry droppings (DPDBD), T_2 were fed with 20 %

DPDBD, T_3 were fed with 40 % DPDBD, T_4 were fed with 60 % DPDBD and T_5 were fed with 80 % DPDBD. The animals were fed for a period of 106 days.

2.4 Sensory evaluation

At the end of feeding trial, the rams were severed at the jugular veins and carotid arteries of the neck region after fasting them overnight (Okubanjo, 1997). After thorough bleeding, they were skinned and eviscerated; the carcasses were split into two halves longitudinally along the median plane of the vertebrae using a sharp knife. These carcasses were then separated into wholesale cuts (hind leg, foreleg, breast, back, neck) and weighed as described by (Isah *et al.*, 2009), while other carcass by-products and organs were weighed also as described by (Ahamefule and Udo, 2010).
Samples of meat from each treatment were collected after removing the flesh from the bone, cut into chops of an average of 40g and labeled for identification. They were cooked in water at a temperature of 65^{o}C for 30 minutes in a pot using a gas cooker as described by (Fasae *et al.*, 2010).Ten untrained panelists were used in the assessment procedure. They were instructed to chew on a sample from each treatment and score it for colour, flavour, texture, juiciness and tenderness. Bottled water was served to the panelists to rinse their mouths after scoring each sample to reduce flavour carryovers. The panelists scored each sample on a nine – point hedonic scale (9 = like extremely, 8 = like very much, 7 = like moderately, 6 = like slightly, 5 = neither like nor dislike, 4 = dislike slightly, 3 = dislike moderately, 2 = dislike very much and 1 = dislike extremely) (AMSA,1978). Overall acceptability was scored on a three- point scale (1 = least acceptable, 2 = more acceptable and 3 = most acceptable) (Iwe, 2002). Cooking loss percentage was determined as the difference between pre-cooked and post-cooked weights and divided by pre-cooked weights of meat multiplied by 100 according to (Fasae *et al.*, 2010).chemical constituent of the of the meat samples were determined according to (A.O.A.C, 1990) methods. Meat PH were determined using Digital PH Meter (Testo 205)

2.5 Statistical Analysis

All data generated were analyzed using analysis of variance with the general linear model of SAS (2008). Means were separated using least significant difference of SAS software.

3. Results and Discussions

3.1 Chemical Composition of meat sample from Yankasa rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diets

The chemical constituent of the meat sample is presented in table 1. The dry matter (DM) content of the sample varies from 28.50% in T_1 to 31.22% in T_5. The crude protein (CP), Ash and fat percentages were highest (34%, 3.12% and 26.49%) respectively in T_5. The dry matter content in this study is slightly higher than the value reported by Fasae *et al* 2010 in their study with West African dwarf (WAD) sheep. Similarly the crude proteins values reported in this present study is higher than the values reported by Fasae *et al* 2010, Adam *et al* 2012, Partida *et al* 2012 and

Costa *et al* 2012 respectively. The variations in the values observed in this study may be attributed to the dietary effect, which increases as the level of the inclusion increases. Similarly the fat content increases as the level of inclusions also increases, these results were at variances with the values reported by Fasae *et al* 2010, Adam *et al* 2012, Partida *et al* 2012 and Costa *et al* 2012 in their separate studies with sheep, goat respectively. The same trend was observed for Ash content of meat sample compare to the above authors.

Table 1. Chemical composition of meat sample from Yankasa rams fed sorghum stover supplemented with varying levels of dried poultry droppings based diets

Parameters	**Treatments**				
	T_1	**T_2**	**T_3**	**T_4**	**T_5**
Dry matter (%)	28.50	30.75	31.74	29.69	31.22
Crude protein (%)	30.11	31.59	32.78	33.11	34.00
Ash (%)	2.88	2.84	3.00	2.64	3.12
Fat (%)	21.59	22.41	25.28	25.16	26.49

3.2 Meat quality Attributes of Yankasa Rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diets

Table 2 shows some of the meat quality attributes of the sampled meat. There was no treatment effect on cooking loss attributes while meat PH values obtained in this study varies from 5.23 in T_5 to 5.95 in T_1 respectively. Significant ($P<0.05$) difference across the treatment groups for cooking loss was not observed. The non-significant value observed in this present study for cooking loss was also observed by Fasae *et al* 2010, Adam *et al*, 2012, and Ruzic-Muslic *et al*, 2012. Meat PH values reported in this present study were within the range of 5.4 to 5.8 reported by Costa *et al*, 2012, Partida *et al*, 2012 and Sebsibe, 2014 and lesser than the value reported by Fasae *et al* 2010 except for unsupplemented treatment group (T_1) whose value (5.95) is higher than the level considered for good quality meat.

Table 2. Meat quality attributes of Yankasa rams fed sorghum stover supplemented with varying levels of dried poultry droppings based diets

Parameters	**Treatments**					**Standard**	**Level of**
	T_1	T_2	T_3	T_4	T_5	**Error**	**Significant**
Cooking loss %	50.0	50.0	50.0	50.0	50.0	0.0	NS
Meat pH	5.95	5.45	5.20	5.36	5.23		

3.3 Sensory Evaluation of Meat Sample from Yankasa Rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diets

In table 3, results indicates that T_4 recorded significantly ($P<0.05$) highest value for colour, flavour and texture preferences compared to other treatment groups. No significant differences ($p>0.05$) were observed among treatment groups in juiciness and tenderness preferences. The significant ($P<0.05$) differences reported in this study

for colour, flavour and texture preferences were in conformity with the earlier values reported by (Mavimbela *et al*, 2000, Fasae *et al*, 2010). Similarly the non-significant values also observed in the present study for juiciness and tenderness preferences were also observed by the same authors and Partida *et al*, 2012. Abdel-aal and Suliman (2008) reported that cooked meat had highest scores for tenderness, juiciness, flavour etc. This report is at variance with the present study in which cooked meat sample had lower scores for tenderness, juiciness and flavour. This present scenario may be attributed to the variation in cooking time and the level of fat content in the samples.

Table 3 Sensory evaluation of meat sample from Yankasa rams fed sorghum stover supplemented with varying levels of dried poultry droppings based diets

Parameters	**Treatments**					**Standard Error**	**Level of Significant**
	T_1	**T_2**	**T_3**	**T_4**	**T_5**		
Colour	6.6^{c}	6.8^{bc}	7.3^{abc}	7.9^{a}	7.7^{ab}	0.35	*
Flavour	6.4^{b}	7.0^{ab}	7.0^{ab}	7.9^{a}	7.8^{a}	0.37	*
Texture	6.2^{b}	7.1^{ab}	7.0^{ab}	7.6^{a}	7.3^{ab}	0.36	*
Juiciness	6.0	7.1	7.0	7.6	6.9	0.16	NS
Tenderness	6.8	7.3	6.9	7.5	7.0	0.51	NS

abc: Mean values with the same letters along the row are not significantly different ($P < 0.05$)

3.4 Overall Acceptability of meat from Yankasa Rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diets

From the result obtained in this study, significant differences were reported within the treatment groups. T_5 recorded significantly ($P<0.05$) highest values in overall acceptability of the meat samples. The significant ($P<0.05$) difference reported in this present study for overall acceptability within the treatment groups were in tandem with the findings of Mavimbela *et al* 2000. However, this observation was at variance with the finding of Fasae *et al* 2010 and Partida *et al* 2012 respectively.

Table 4 Overall acceptability of meat from Yankasa rams fed sorghum stover supplemented with varying levels of dried poultry droppings based diets

Parameter	**Treatments**					**Standard Error**	**Level of Significant**
	T_1	**T_2**	**T_3**	**T_4**	**T_5**		
Overall Acceptability	1.5^{d}	2.1^{bc}	2.0^{c}	2.5^{ab}	2.6^{a}	0.44	*

abcd: Mean values with the same letters along the row are not significantly different ($P < 0.05$)

4. Conclusion

This study examines some meat quality and sensory attributes of Yankasa rams fed sorghum Stover supplemented with varying levels of dried poultry droppings based diets. Conclusively meat from supplemented treatment groups had better meat qualities and overall acceptability. It was therefore recommended that inclusion of dried poultry droppings in diet for sheep at levels up to 60% did not adversely affect the sensory and meat quality attributes of the meat, however higher inclusion levels might have a slight adverse effect on subcutaneous fat composition and sensory attributes.

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