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Evaluation of Meat Characteristics of West Africa Dwarf Rams Fed Graded Levels of Fungal Treated Maize Cobs

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Target Audience: Ruminant nutritionist, Sheep farmers, Researchers

Abstract

An experiment was conducted to determine the impact of fungal treated maize cob (FTMC) used as supplement on the carcass characteristics of West African dwarf (WAD) ram. Maize cob treated with Pleurotus tuber regium was supplemented at 0, 10, 20, 30 and 40% w/w to complete feed mixtures (CFM). A total of 20 grower rams with an average age of ten months were selected for the evaluation of carcass characteristics. The animals were starved of feed for 16 hours, weighed, stunned, slaughtered and properly bled. The thoroughly bled carcass were dressed and eviscerated. The dressed carcass were cut into half carcasses, left half was dissected to determine internal offal while the other half was cut into primal cuts: neck, rack, loin, flank and leg. The final body weight (27.33kg), mean weight gain (11.58kg), rib eye area (10.70%) and dressing percentage (50.11%) were significantly better for rams on treatment 5 and in general all rams on FTMC supplemented diets compared with the control. Similarly hot carcass weight increased with supplementation from 9.55kg (T_1) to11.99kg (T_2). Variations in rack and kidney weights as affected by treatments was not significant (P>0.05).Treatment effect on shoulder weight was significant (P<0.05) for animals on FTMC compared with the control groups. However, no significant (P>0.05) differences was observed for those on diets 3, 4 and .5 It can be concluded from the results obtained in this experiment that WAD rams fed FTMC improve the dressing percentage and rib eye area without any noticeable detrimental effect on the organ parts.

Keywords: carcass characteristics, primal cuts, dressing percentage

Description of Problems

By the year 2020,the global population is expected to increase by more than 40%, possibly exceeding the billion mark (1).Feeding these additional population with limited supply of suitable and livestock, poses a problem of immerse proportion in the developing countries, not industrial countries where 800 million people suffer malnutrition today (2). The benefits of fungal treatment of agricultural biotechnology are of particular importance to people living in the developing nations such as Nigeria in which quality meat could be improved through fungal treatment of crop residue (3).

One of the factors affecting economical sheep meat production is the higher growth and feed conversion efficiency of the material used. In view of this, the production of sheep mutton (especially rams) is carried out in a wide range of environment using various different production systems throughout the world (3). Meat from sheep accounts for approximately 18.0% of the total red meat production in Turkey (4). The present meat production of West African dwarf rams is far from optimal. However, there is paucity of information on the carcass quality of small ruminant fed fungal treated maize cob. There is therefore the need to continue to research on the performance of West African dwarf rams on different feeding regime using locally available feeding stuffs treatmentthat can improve their performance. Such feedstuff like fungal treated maize cob (FTMC) readily comes to mind. For this reason the carcass quality, mainly the prime cuts of West African dwarf rams previously on graded levels of fungal treated maize cob (FTMC) was evaluated.

Materials and Methods

Four (4) grower rams were randomly selected per treatment for carcass evaluation. Prior to slaughtering, the animals were starved overnight, weighed, slaughtered by severing the jugular vein and allowed to bleed. The animals were then dressed. Each dressed carcass was split down along the dorsal mid line. Each side was divided into prime cuts: neck, shoulder, rack, loin, flank and leg (5).

Animals

Twenty (20) West African dwarf (WAD) – rams, grower aged 5-6 month weighing 15.6-16kg were used for the experiment. They were purchased from the sheep market in Iwo, Oyo state. On arrival, the WAD-rams were given prophylactic treatments, which consisted of intramuscular application of oxytetracycline and vitamin B complex, at the dosage of 1ml/10kg body weight of the animal. They were also drenched with 10% lavasol to control endoparasite, and treated for mange and other ectoparasites using ectopore. A preliminary period of 14 days was allowed to acclimatize the animals to their new environment and feed. Each group was fed of the diets in which maize cob (g/100g) treated with Pleurotus tuber-reguimre placed wheat offal at 0, 25, 50, 75 and 100% as supplement to basal Panicum maximum, respectively.

Experimental diets

Five experimental diet supplements feed mixtures were formulated as follows:

Diet 1 contained 0% fungal treated maize cob

Diet 2 contained 10% fungal treated maize cob

Diet 3 contained 20% fugal treated maize cob

Diet 4 contained 30% fungal treated maize cob

Diet 5 contained 40% treated maize cob.

The dietary ingredients were mixed fortnightly and packed in sacks lined with polythene sheets to avoid rancidity and loss of palatability.

Data collection

Quantitative parameters measured were Dry Matter Intake (DMI), Mean Weight Gain (MWG) and Feed Conversion Ratio (FCR).

The rams were sacrificed and data were obtained on Hot Carcass Weight (HCW), Rib-Eye-Area (REA) and viscera organs.

$$\text{Dressing \%} = \frac{\text{Hot carcass weight}}{\text{Live weight at slaughter}} \times 100$$

Rib eye area – This is the area of the surface of the Longissimus dorsi at the ribbing site between 12th and 13th ribs perpendicular to the back line.
The rib-eye muscle was traced on an acetate paper and its area calculated in square centimeter by using graph sheet.
The offal was weighed.

Statistical Analysis

Data obtained were subjected toone way analysis of variance (ANOVA) using SAS, 1999 package (6). Significant means were separated using the Duncan Multiple range test of the same package and also standard error of mean (SEM) was also calculated using the same package.

Results and Discussion

The gross composition of the experimental diets (Table 1) showed consistency in all the feed ingredients with the exception of wheat offal (WO) and fungal treated maize cob (FTMC) in which FTMC replaced WO at 0, 25, 50, 75 and 100%, respectively.

The proximate composition of the experimental diets (Table 2) indicated the DM content of the control and test diets ranged between 89.21 and 89.88%.The CP varied from 15.96% to 16.74%. The crude fiber (CF) increased with increasing levels of FTMC.

Table 1: Gross composition (%) of experimental diets

Ingredient	Diets 1	2	3	4	5
Maize bran	30	30	30	30	30
PKC	10	10	10	10	10
GNC	10	10	10	10	10
Wheat offal	40	30	20	10	-
FTMC	-	10	20	30	40
Common salt	1.0	1.0	1.0	1.0	1.0
DCP	3.75	3.75	3.75	3.75	3.75
SBM	3.75	3.75	3.75	3.75	3.75
Vit. Premix	1.50	1.50	1.50	1.50	1.50
Total	100	100	100	100	100

T_1 = 0% Fugal treated maize cob, T_2 = 10% fungal treated maize cob, T_3 = 20% fungal treated maize cob, T_4 = 30% fugal treated maize cob, T_5 = 40% fungal treated maize cob, PKC = Palm kernel cake, GNC = groundnut cake, FTMC = Fungal treated maize cob, DCP = dicalcium phosphate, SBM = soybean meal.

Table 2: Proximate composition(%) and gross energy(Kcal/kg) of experimental diets

Parameters	Diets 1	2	3	4	5
DM	89.88	89.66	89.83	89.76	89.21
CP	16.56	16.74	16.38	15.96	16.14
CF	22.14	17.89	19.21	20.69	21.76
Ash	8.21	10.28	11.26	9.28	10.81
EE	3.87	3.64	3.61	3.76	3.58
NFE	49.22	51.00	49.54	50.31	48.21
GE	3985	3978	3876	3787	3724

T_1 = 0% Fugal treated maize cob, T_2 = 10% fungal treated maize cob, T_3 = 20% fungal treated maize cob, T_4 = 30% fugal treated maize cob, T_5 = 40% fungal treated maize cob,DM = Dry matter, CP = Crude protein, CF = Crude fibre, EE = ether extract, NFE = Nitrogen free extract, GE = Gross energy,

In Table 3, the crude protein content were 6.93% (guinea grass), wheat offal (17.3%) and FTMC (18.8%).Variation in dry matter intake (DMI), final body weight (FBW) and FCR as affected by treatment was significant ($p<0.05$). The DMI for animals on diet 5 ($141.45W^{0.75}$) was significantly ($p<0.05$) higher than those on diet 4T_4 ($139.41W^{0.75}$), diet 3 ($136.46W^{0.75}$), diet 2 ($134.48W^{0.75}$) and diet 1 ($132.68W^{0.75}$) respectively. The FBW in response to DMI was significant ($p<0.05$). The FBW increased with the increasing supplementation and DMI. However, FCR was highest for animals on the control diet 1 (9.99). The FCR for animals on diets 2 and 3 were nevertheless, not significantly ($p>0.05$) different.

Table 3: Proximate composition (%) of Guinea grass, wheat offal and fungal treated maize cob (FTMC)

Parameters	Guinea grass	Wheat offal	FTMC
Dry matter	42.03	90.00	92.50
Crude protein	6.93	17.13	18.80
Crude fibre	43.49	12.17	19.36
Ether extract	3.21	5.56	8.73
Ash	10.15	6.30	7.85

In Table 5, internal/external offal of WAD rams fed graded levels of FTMC are shown. There were wide variations in the different internal and external organs measure with the exception of live weight at slaughter. The hot carcass weight was highest for rams on diet 2 followed by animals on diets3, 4, and 5. However, the variation between diet 1(control) and diet 4 was not significant. Dressing percentage (50.11%) and rib-eye-area ($38.30cm^2$) was significantly high for animals on diet 5 compared with other treatments. The least value was obtained for animals on diet 1, which is the control .The variation weights obtained for neck weight. Loin weight, flank weight and leg weight were consistently high for animals on diet 5, when compared with other treatments, followed closely by diet 4 in most of the cases. Variations in rack weight and kidney weight were not, however significant ($p>0.05$). The heart and lung/trachea weight increased with increase in fungal inclusion. The variations observed for the skin were not significant between diets 1 and 2, and between animals on diet 4 and 5. The weight of the head increased from 5.76kg in diet 1 to 7.67kg in diet 5. Nevertheless, the different values obtained in animals on diets 2 and 5 were not significant (p>0.05)..

The dressing percentage obtained in this study agrees with findings of other researchers (7, 8, 9, 10) who reported a range in values from 47.60 to 53.20%. These results were also consistent with those measured by (11, 12, and 13). The higher values obtained for those on treated diet could mean a beneficial effect of the fungal inclusion. It could also be deduced that the dressing percentage was influenced by differences in daily gain (Table 4).

Table 4: Growth Performance of WAD rams fed the experimental diets

Parameters	Diets 1	2	3	4	5	SEM
DMI g/d $W^{0.75}$	132.68^{e}	134.48^{d}	136.46^{c}	139.41^{b}	141.45^{a}	0.003
Initial body weight, kg	13	12.75	13	13	12.75	-
Final body weight, kg	21.13^{e}	22.33^{d}	23.57^{c}	26.01^{b}	27.33^{a}	0.003
Mean weight gain, kg	8.13^{e}	9.58^{d}	9.67^{c}	10.33^{b}	11.58^{a}	0.003
Total DMI/BW%	3.03^{c}	3.08^{a}	3.04^{bc}	3.05^{b}	3.08^{a}	0.020
Feed conversation ratio	9.99^{a}	8.83^{b}	8.34^{b}	8.28^{b}	7.79^{b}	0.210

abcd means along the same row with different superscripts are significant ($P < 0.005$), n=4, DMI g/d $W^{0.75}$Metabolic dry matter intake, SEM = Standard error of mean.

This observation agrees with those reported elsewhere (14) who observed higher carcass weight with goat slaughtered with higher slaughter weight. This however disagrees with findings elsewhere (15) who suggested that when slaughter weight increased, carcass consumption changed with a decrease in muscle proportion and an increase kidney pelvic and internal fat, which correspond to the standard lamb growth pattern. In this study there was no noticeable internal fat.

The rib-eye-area is an indication of meatiness. In the present study, rams on treated feeds were more meaty than the control. There are some reports that suggest that rib-eye-area decreased with the increased metabolic energy levels (16). Generally, the internal/external offals were heavier in the treated diets compared with the untreated. Maybe fungal treatment was responsible for providing a condition which facilitates easy digestion of animals leading to increase in sizes of offals. The general superiority of FTMC over other diets supports this view. However, the fibrous components of the untreated (control) could have limited the digestibility, hence the reduced internal/external organs.

Chestnutt (17) reported that plain of nutrition had no effect on *Longissimus dorsi* muscle. (18) further stressed that breed and plain of nutrition did not influence *Longissimus dorsi* muscle and its depth. Similar result was reported by (16) in Lori-Bakhtiari rams' lambs.

Several authors (15,9 and 10)noted that the effect of slaughter weight is associated with the offal. However, in this study, the effects are small and insignificant. The internal organs (Heart and lung/trachea) which were heavier for rams on treated diets could be probably due to the demand for oxygen in the blood myoglobin for respiration. This may also be attributed to better multiplication of rumen microbes and increase by-pass protein for small intestine enzymatic digestion and formation of body tissues.

Table 5: Base slaughter parameter of West African Dwarf (WAD) rams fed fungal treated corn cobs as percentage of slaughtered weight

Parameters	Diets					SEM
	1	2	3	4	5	
Life weight at slaughter (kg)	21.00	22.20	21.12	21.35	21.35	0.170
Hot carcass weight (kg)	9.55^{c}	11.99^{a}	10.47^{b}	10.20^{bc}	10.70^{b}	0.150
Dressing %	45.47^{e}	49.50^{b}	48.47^{c}	48.30^{d}	50.11^{a}	0.020
Rib-eye-area (cm^{2})	28.55^{e}	30.70^{d}	32.35^{c}	36.50^{b}	38.30^{a}	0.260
Neck weight (kg)	0.75^{c}	0.76^{c}	0.78^{b}	0.79^{b}	0.82^{a}	0.003
Shoulder weight (kg)	0.65^{b}	0.68^{ab}	0.70^{ab}	0.72^{ab}	0.76^{a}	0.020
Rack weight (Kg)	0.40	0.43	0.44	0.47	0.50	0.020
Loin weight (kg)	0.25^{d}	0.27c	0.27^{c}	0.29^{b}	0.32^{a}	0.003
Flank weight (kg)	0.52^{d}	0.58^{c}	0.58^{c}	0.61	0.63^{a}	0.003
Leg weight (kg)	0.65^{d}	0.75^{c}	0.77^{b}	0.78^{b}	0.81^{a}	0.003
Head (kg)	5.76^{b}	6.14^{a}	7.07^{a}	7.25^{a}	7.67^{a}	1.280
Heart (kg)	0.28^{d}	0.27^{c}	0.27^{c}	0.29^{b}	0.32^{a}	0.003
Skin (kg)	11.67^{c}	11.99^{bc}	12.62^{ab}	12.94^{a}	13.02^{a}	0.150
Lung/Trachea (kg)	1.19^{e}	1.30^{d}	1.46^{c}	1.84^{b}	1.98^{a}	0.020
Kidney (kg)	0.14	0.14	0.14	0.14	0.14	0.003

^{a,b,c,d} means along the same row with different superscripts are significant different ($P < 0.005$), n=4
T_1 = 0% Fugal treated maize cobs, T_2 = 10% fugal treated maize cobs, T_3 = 20% fungal treated maize cobs, T_4 = 40% fungal treated maize cobs, SEM = Standard error of mean.

Conclusion and Application

It can be concluded that rams on fungal treatments influenced the carcass composition and dressing percentage of West African Dwarf rams. The best result was however observed at 100% level of inclusion in their diets.

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