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Carcass characteristics and organoleptic properties of West African dwarf goat as influenced by dressing methods

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Target Audience: Meat processors, Sellers and Home consumers

Abstract

A study on carcass characteristics and organoleptic properties of West African Dwarf Goat (bucks) as influenced by dressing methods was carried out. Nine (9) WAD bucks with an average weight of 18.00 ± 0.65Kg were allotted to three dressing treatment methods namely:- singeing, scalding and skinning, in three (3) replicates and 3 bucks per replicate. The experimental model was the completely randomized design (CRD). Parameters measured were; carcass weights and measurements, primal or wholesale cuts, chemical composition and sensory evaluation. The results showed that singeing significantly (P<0.05) increased intact carcass weight from 5.64 kg and 6.47 kg recorded in the skinned and scalded carcasses to 6.48 Kg, and relative weight from 3.97 kg recorded in both the skinned and scalded carcasses to 4.69Kg. Length of carcass was significantly (P<0.05) higher in the scalded carcass (36.67 kg) compared to the skinned and singed carcasses which recorded 30.67 and 28.67kg respectively. Skinning recorded a significant (P<0.05) higher weight for depth of chest and maximum width of leg, having 17.67 and 13.67cm compared to singeing and scalding which had 16.67cm each for depth of chest, 11.67 and 10.67cm respectively for maximum width of leg. Primal cuts yields of rack, neck, shoulder and shank were significantly (P<0.05) higher in singeing, while those of loin and leg were significantly (P<0.05) higher in skinning. Scalding recorded the least yields in all the primal cuts measured but imposed a higher moisture content of 72.87% on the meat sample which was not significantly (P>0.05) different among the dressing methods applied. It also scored higher in flavour (9.00) and overall acceptability (7.67) from panelists assessment. Singeing increased the ash and ether extract contents of meat samples to 2.26 and 2.30% respectively though not significantly (P>0.05) different among the dressing methods, and scored least in all the traits measured by the taste panelists. Skinning recorded significantly (P<0.05) higher values of 17.84 and 2.90% on the crude protein and nitrogen content of meat samples, it also rated highest for appearance (colour) and juiciness, with 6.67 and 8.33 scores respectively. By this, dressing methods influenced to a large extent the carcass characteristics and organoleptic properties of WAD buck goat meat.

Keywords: Singeing, Scalding, Skinning, Carcass characteristics, organoleptic properties.

Description of problem

The West African Dwarf (WAD) goat is the commonest and most important indigenous breed of goat in West and Central Africa (1), which can adapt to a broad range of environment, has the capacity to fill market opportunity and potentials for increasing productivity and allowing them to graze on land not available to other domestic livestock (2). The goats are hardy, small, early maturing, prolific and non-seasonal breeders (3). They are a prolific meat producing breed compared to other breeds. These attributes have established the goat meat as a lean meat with favourable nutritional qualities; low in calories, total fat, saturated fat and lesser cholesterol, accounting for approximately 63% of all red meat consumed worldwide (4).

In assessing the carcass characteristics of WAD goat, different methods could be employed.

Paramount among them is the dressing or dehairing methods employed for animal carcasses which include; singeing, scalding and skinning (5). Singeing is a method employed to burn off the hair of an animal, given the carcass skin a golden brown colour and an enhanced smoky flavour on the processed meat (6). Scalding is a method of floating carcass or dipping of well bled animal in hot water to loosen the skin follicles in order to ease its removal (7). While skinning or convectional dressing according to (8), is a simple act of pulling the subcutaneous skin, thereby removing some subcutaneous fat and exposing the internal carcass body. These dressing or dehairing methods will not only affect the temperature and ultimate pH of carcass and its rate of decline but will also affect the chemical composition and other carcass characteristics.

Several authors have reported on carcass characteristics subjected to these different dressing methods. (7) reported on effects of dehairing pigs by scalding or singeing, where carcass weights and yields were noticeably higher after singeing than after scalding. (6) observed similar results for the chevon carcasses where dehairing by singeing resulted in markedly heavier carcass than after convectional dressing with lesser carcass weights. An increase in the percentage yield of leg in singed carcass and a decrease in loin, breast, shank and flank (BSF) was also reported by (6) when compared with those of the conventionally dressed carcasses. Also, reports from some workers have indicated that the chemical composition of the animal's body varies with body weight, breed, sex, age and plane of nutrition (9; 10 and 11). The often quoted standard composition of a normal adult mammalian muscle is 75% water, 19% protein, 25% lipid, 1.2% carbohydrate and soluble non-protein, 1.6% nitrogenous compounds, 0.65% minerals and less than 0.1% vitamins (12), thus, making meat one of the most nutritious food that humans consume particularly in terms of supplying high quality protein (essential amino acids). Also, sensory (organoleptic) evaluation have shown that goat meat is well acceptable, palatable and desirable to consumers, and it tends to be less tender, juicier and leaner than those of sheep meat (13).

These dressing methods although have been applied to different livestock, but information on the WAD goat is scarce. It is to this end that this study therefore seeks to provide information on carcass characteristics and organoleptic properties of WAD goats (buck) exposed to three different dressing methods.

Materials and Methods

Experimental Materials:

Nine (9) West African Dwarf goats (bucks) of between 18-20kg Live weight were purchased from the open market in Ekpoma and transported to the Livestock Unit of the Teaching and Research Farm of Animal Science Department, Faculty of Agriculture, Ambrose Alli University, Ekpoma. They were fasted for 16hours but had access to clean water.

Dressing methods:

The animals were slaughtered in batches of three, randomly allotted to each of the three dressing methods namely: singeing, scalding and skinning, with each representing a treatment.

Singeing – In this method, the hairs of goat were flamed off and scrapped using a metal scrapper on the fire, following the procedures of (6).

Scalding – Here, the bled goats were dipped in hot water of 85^{o}C for 30 seconds, after which the hairs were scrapped off with mental scrapper and knife, as described by (7).

Skinning- In skinning, a ring was made round one of the hind legs with a scalpel, which was inserted under the skin of the leg, to open it up to the root of the tail. The same was repeated with the other leg. While from the pelvic region, another incision was made up to the neck region. The hair was then pulled along the skin, thereby exposing the internal carcass, according to the procedures of (8).

Carcass Evaluation:

Evaluations of carcass were carried out as follows;

(a) Carcass weights and measurements: which include intact carcass weight, eviscerated and relative carcass weights, as well as length of carcass, depth of chest, length of leg and maximum width of leg, were measured using a table scale and meter rule.

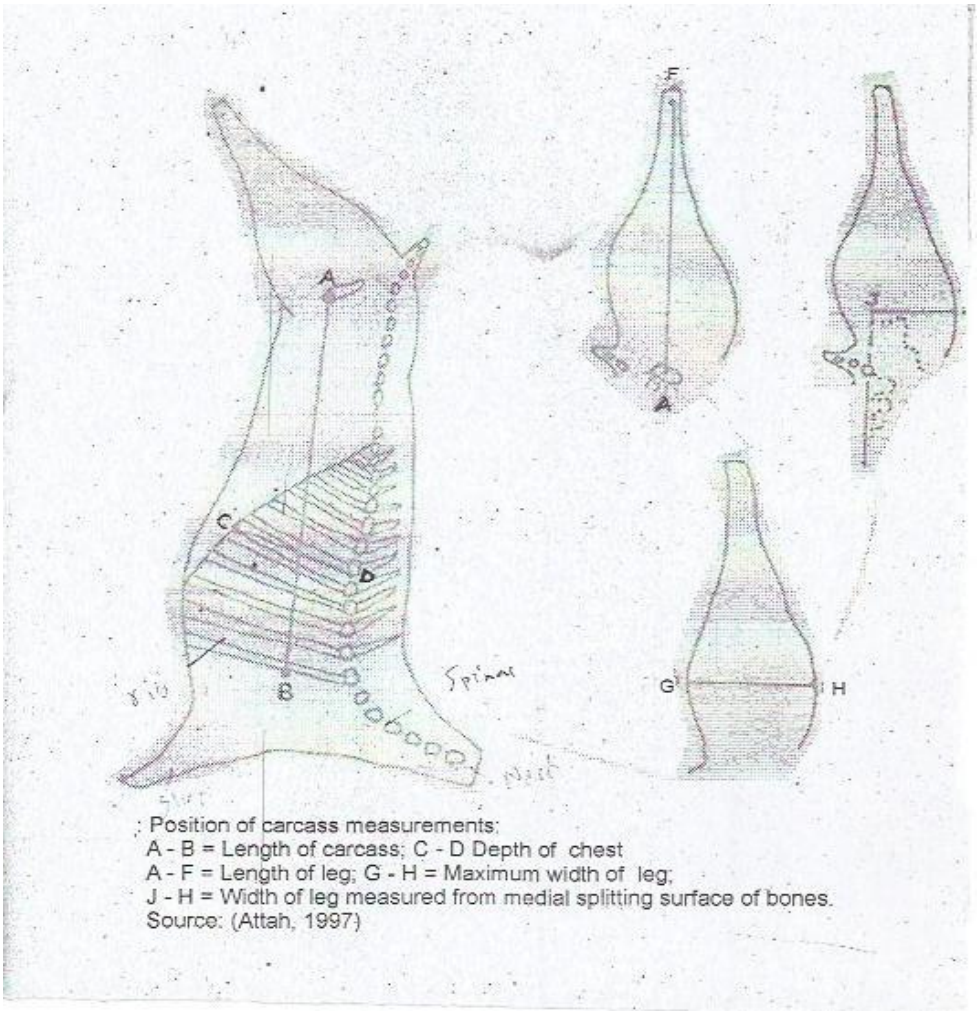

Fig.1: procedures for carcass measurements

(b) Primal or wholesale cuts: which include breast, back, neck, flank, loin, leg, shoulder and shank, were weighed with the aid of a table scale.

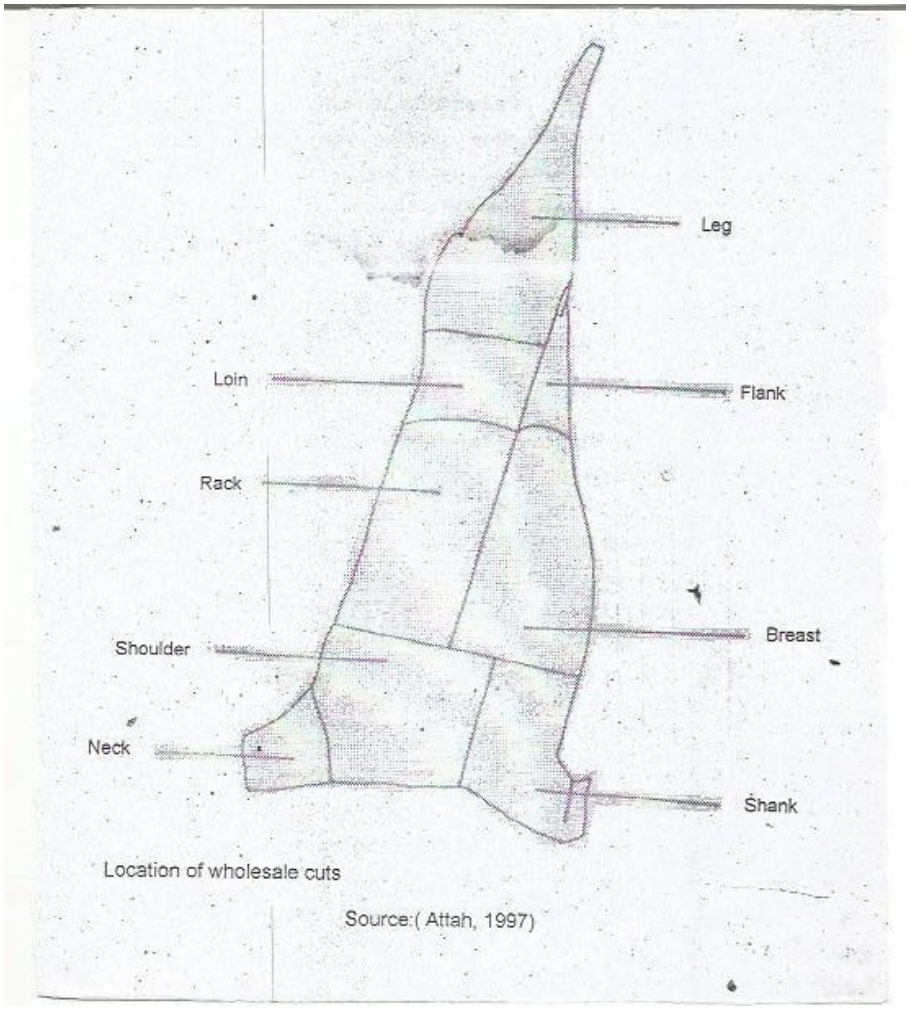

Fig. 2: Location of wholesale or primal cuts

(c) Chemical compositions: such as moisture content, crude protein, ether extract, ash and nitrogen were determined according to the method of (14).

(d) Organoleptic properties: such as appearance, tenderness, juiciness, flavour and overall acceptability, were determined by a nine-point Hedonic scale according to (15).

Experimental Design:

The design for the experiment was the completely randomized design (CRD), one way analysis of variance.

Statistical Analysis:

Data from the experiment were analyzed using Analysis of Variance (ANOVA), and

means that showed significance were separated appropriately by the procedure of (16).

Results and Discussion

The results of the mean values of carcass weights and measurements as influenced by dressing methods presented in Table (1), showed that singeing significantly (P<0.05) increased the intact carcass weight to 6.84 kg, as against skinning which weighed 5.64 kg, and scalding having 6.47 kg, though not significantly (P>0.05) different from singeing. This was as a result of the dressing methods applied, as heat tends to swell or increase carcass weight (17), while skinning reduces it.

Eviscerated weight was not influenced by the dressing methods, though singeing recorded a higher value of 3.84 kg compared to scalding and skinning with 3.67 and 3.64kg respectively. Relative weight of carcass was significantly (P<0.05) influenced by dressing methods, with singeing recording a higher weight of 4.69 kg compared to scalding and skinning having 3.97 kg both. This was as a result of the intact carcass weight which was initially higher in singeing.

Length of carcass was influenced by dressing method applied, with a higher significant (P<0.05) value of 36.67cm recorded for scalding as against singeing and skinning which had 28.67 and 30.67cm respectively. This was attributed to the dressing method applied, since carcass when subjected to hot water increases in size. This result contradicts the findings of (18), where skinning significantly (P<0.05) increased the carcass length of Red Sokoto goat compared to singeing and scalding.

Table 1: Mean values of carcass weights and measurements as influenced by dressing methods

Parameters	Scalding	Singeing	Skinning	SEM ±
Intact Carcass Weight (Kg)	6.47^{a}	6.48^{a}	5.64^{b}	0.241
Eviscerated weight (Kg)	3.67	3.84	3.64`	0.741
Relative weight (Kg)	3.97^{b}	4.69^{a}	3.97^{b}	0.377
Length of Carcass (cm)	36.67^{a}	28.67^{c}	30.67^{b}	2.267
Length of Leg (cm)	20.67	19.67	20.67	1.511
Depth of Chest (cm)	16.67^{b}	16.67^{b}	17.67^{a}	1.309
Maximum Width of Leg (cm)	10.67^{c}	11.67^{b}	13.67^{a}	1.309

abc: Means of similar superscripts along rows are not significantly (P>0.05) different

Length of leg was not affected (P>0.05) by the dressing methods applied, though scalding and skinning recorded higher values of 20.67cm each, while singeing had 19.67cm. Depth of chest showed a significant (P<0.05) difference among the dressing methods applied, with skinning having a higher value of 17.67cm, as against scalding and singeing which had 16.67cm each. The higher significance (P<0.05) recorded by the skinning method could be attributable to differences in the sizes of the carcass measured which could be higher in the skinned carcass. This result contradicts the report of (18), where scalding significantly (P<0.05) increased the depth of chest of Red Sokoto goat, as against singeing and skinning, which was attributed to the added weight and protective effects of the skin which was retained on the carcass as a result of the dressing method applied. Maximum width of leg was significantly (P<0.05) influenced by dressing methods applied, with skinning

having higher value of 13.67cm, compared to scalding and singeing which had 10.67 and 11.67cm respectively. This result was expected because Length of leg was initially higher in the skinned carcass.

Table 2: Mean values of primal cuts as influenced by dressing methods

Parameters (Kg)	Scalding	Singeing	Skinning	SEM±
Breast	0.20^{b}	0.30^{a}	0.30^{a}	0.007
Rack	0.25^{c}	0.35^{a}	0.30^{b}	0.008
Neck	0.20^{c}	0.40^{a}	0.30^{b}	0.007
Flank	0.15^{b}	0.20^{a}	0.20^{a}	0.009
Loin	0.20^{c}	0.25^{b}	0.30^{a}	0.008
Leg	0.35^{c}	0.70^{b}	0.80^{a}	0.007
Shoulder	0.40^{c}	0.50^{a}	0.45^{b}	0.006
Shank	0.40^{b}	0.50^{a}	0.50^{a}	0.007

abc: Means of similar superscripts along rows are not significantly (P>0.05) different

The results of primal or wholesale cuts in Table (2) showed that singeing significantly (P<0.05) elevated the yields of almost all the cuts measured, though not significantly (P>0.05) different from skinning for the breast carcass, with both having a weight of 0.30kg. It also increased significantly (P<0.05) the weights of rack and neck, having 0.35 and 0.40kg, compared to skinning and scalding, which had 0.30Kg each, as well as 0.25 and 0.20kg for rack and neck respectively. Weight of flank was not significantly (P>0.05) different between singeing and skinning, with both having 0.20kg, but significantly different (P<0.05) from scalding which had 0.15kg. The higher weight in flank recorded in this study for the skinned carcass is in line with the findings of (6), where yields of breast, shank and flank (BSF) significantly decreased (P<0.05) in singed carcass when compared with those of the conventionally skinned carcass.

Skinning imposed significantly (P<0.05) higher weights for loin and leg, having 0.30 and 0.80Kg, compared with singeing and scalding which had 0.25 and 0.70 kg, and 0.20 and 0.35kg for lion and leg respectively. This result is in agreement with report of (6), that yield of loin was significantly (P<0.05) higher in conventionally skinned carcass, but disagreed that the percent yield of leg significantly (P<0.05) increased in the singed carcass. Yield of shoulder was significantly (P<0.05) higher in singeing, having 0.50 kg compared with skinning and scalding which had 0.45 and 0.40kg respectively. While, the weight of shank did not differ significantly (P>0.05) between singeing and skinning, with both having 0.50kg each but differs significantly (P<0.05) from scalding which had 0.40Kg. The high weight recorded in shank in this study for the skinned carcass is in line with the findings of (6).

A significantly (P<0.05) higher and lower weights recorded for leg and flank respectively among other primal cuts in this study, were also observed by (19) for the Red Sokoto and West African Dwarf goats, and (20) for the Red Sokoto goats. Differences in weights of these primal or wholesale cuts can be attributed to differences in sizes and shapes of the meat parts.

Table 3: Chemical Composition of WAD goat meat as influenced by dressing methods

Parameter (%)	Singeing	Scalding	Skinning	SEM±
Moisture	69.28	72.87	72.14	10.67
Protein	14.05[b]	15.45[ab]	17.84[a]	7.54
Ether Extract	2.30	2.12	1.82	0.51
Ash	2.26	1.75	1.93	0.27
Nitrogen	2.45[b]	2.66[ab]	2.90[a]	1.34

abc: Means with similar superscripts on the same row are not significantly (P>0.05) different.

The results of chemical composition analysis of goat meat in Table (3) showed that moisture content of meat samples was not significantly (P>0.05) affected by the dressing methods applied, though scalding had a higher value of 72.87, compared with singeing and skinning which had 69.28 and 72.14% respectively. This is possibly as a result of the treatment effect, where water used in scalding could have added to the moisture content of intact carcass, thereby leading to a toughened skin.

The low value for the singed carcass was expected since flame would have evapourated some moisture in the carcass during processing. Crude protein content was significantly (P<0.05) affected by dressing methods, as skinning recorded higher crude protein value of 17.84, followed by scalding and singeing which had 15.45 and 14.05% respectively. The higher value recorded by the skinned carcass could be as a result of the of dehairing method applied, as no heat was applied in processing the carcass, hence the crude protein content was intact. Also, the collagen and myofibrilla components which are protein sources, were not distorted (17). Ether extract was not affected significantly (P>0.05) by dehairng methods applied, although singeing imposed a higher value of 2.30, as against scalding and skinning which had 2.12 and 1.82% respectively. The least value observed for the skinned carcass could be as a result of the removal of the skin which resulted in the removal of some underlying fats. It has been established that some degree of fat is laid beneath the skin of animals and when processed by skinning, a lot of these fats layers will be removed (5). Values recorded for ash content in the meat samples were not significantly (P>0.05) different among dressing methods, though a higher value was recorded for the singed carcass (2.26), as compared to the skinned and scalded carcasses, having 1.93 and 1.75% respectively. This finding was in line with (17), who reported that flaming of meat increases its ash content. Also, nitrogen content of the meat samples was significantly (P<0.05) affected by the dressing methods applied, with skinning imposing a higher value of 2.90 compared with scalding and singeing, which had 2.66 and 2.45% respectively.

Table 4: Organoleptic properties of WAD goat meat as influenced by dressing methods

Parameter	Singeing	Scalding	Skinning	SEM±
Appearance (Colour)	4.33	6.33	6.67	4.955
Tenderness	5.33	8.67	8.67	3.990
Juiciness	5.33	7.67	8.33	3.660
Flavour	4.00	9.00	8.67	5.280
Overall Acceptability	4.33	7.67	6.22	4.410

The results of the organoleptic properties of the meat samples from panelists assessment as presented in Table (2), showed that dressing methods did not impose any significant ($P>0.05$) difference on any of the traits measured. Appearance (colour) of skinned meat sample was rated as the highest (6.67) by panelists followed by scalded (6.33), while singed meat sample was rated least (4.37). The findings contradict previous report of (21), where colour was rated highest for fried meat samples of singed carcass. Both scalded and skinned meat samples were rated highest for Tenderness, scoring 8.67 each, while singed meat scored the least (5.33). This result was expected, as the singeing processing method is known to reduce the moisture content of the meat, thereby making it less tender when chewed.

Juiciness was rated highest for skinned meat, having 8.33, followed by scalded and singed meat samples which were rated 7.67 and 5.33 respectively. The low value of the singed meat sample could be attributed to the treatment effect, where flame was applied, thereby reducing the moisture/juice of the meat sample.

Panelists preferred the flavour of the scalded meat most, compared with skinned and singed meat samples. Smoking or flaming of meat imposes a characteristic smell on meat, which increases it flavour (17). This report contradicts the result of a higher flavour in scalded meat recorded in this study. The result of a higher flavour in the scalded meat samples is attributable to some concentration of the underlying fats deposited on the carcass during processing (scalding), thereby increasing its flavour. Thus, fat (broth) concentration in meat during cooking is known to increase its flavour. The overall acceptability of the meat was rated highest in the scalded meat samples, scoring 7.67, followed by skinned meat with 6.22 and singed least with 4.33. The scalded meat sample being rated highest among the skinned and singed meat for overall acceptability was expected, as it previously rated highest in the flavour, which is the most important factor for considering palatability or organoleptic traits of meat (17).

Conclusion and Application

From this study, it was shown that:

1. Dressing methods influenced to a large extent the carcass characteristics and organoleptic properties of West African Dwarf goat.
2. Singeing elevated carcass weight and measurements of most parameters while scalding increased carcass length and gave highest flavour and overall acceptability of meat.
3. Skinned goats had higher depth of chest, maximum width of leg, primal cuts and some organoleptic properties of meat.
4. Meat processors, sellers and home consumers can apply findings from this study.

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