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MEAT CHARACTERISTICS OF BUNAJI, GUDALI AND KETEKU BREEDS OF CATTLE.

OKUBANJO, A. O., *OMOJOLA, A. B., OGUNSOLA, O. O., ADEWUMI, M. K., AJIBORO, O. G., ALABI G. F., AND BABAYEMI, O. J.
Meat Science Laboratory, Department of Animal Science,
University of Ibadan, Ibadan, Nigeria.

ABSTRACT

Carcass and meat quality traits of three breeds of cattle, which include Bunaji, Gudali and Keteku, were investigated. A total of five animals per breed were used for the study. The mean ages and live weights were not significantly different. Also, the mean carcass weight did not differ ($p>0.05$) significantly.

The dressing percentage for Bunaji was lower ($p<0.05$) than for Gudali and Keteku. Back fat thickness was significantly higher ($p<0.05$) for Keteku and Bunaji than for Gudali while the rib eye area that was measured on the longissimus dorsi was higher in Keteku with 50cm² while Gudali and Bunaji had 41cm² and 33cm² respectively. Texture of the lean meat was scored highest ($p<0.05$) in Gudali, followed by Bunaji while the least score was recorded for Keteku. However, the meat colour and marbling scores were not different ($p>0.05$) across the breeds.

Shear force and cooking loss were least ($p<0.05$) in Keteku while Bunaji and Gudali had similar values ($p>0.05$) for both traits respectively.

Key words: rib- eye area; longissimus- dorsi; cooking loss; shear force

Short Title: Meat characteristics of breed of cattle

INTRODUCTION

Carcass quality is the measure of carcass palatability and acceptability to the consumer (Renand and Fisher, 1997). Lack of facilities and the huge expenses involved in obtaining carcass information have severely limited knowledge of carcass composition of many types of beef cattle indigenous to Nigeria. The need for information is obvious if the quality of beef produced is to be maintained at high level demanded by consumers.

The challenge is to develop data collection system that captures information, identification and herd performance of these breeds. The characteristics and amount of variations present today in the different breeds of cattle and carcass must be assessed as accurately as possible if intelligent breeding and management plans are to be formulated for the improvement of cattle. The variations in carcass quality are mainly due to breed, sex, age and the nutritional requirement of the animals.

However, most investigators have been concerned with the evaluation of different feedstuff and feed additives in the nutrition of these animals while a relatively few work has been done to determine differences in carcass characteristics within and among breeds of cattle with a view to evaluate improvement through genetic methods.

The prediction from live animal is important in evaluating carcass value of meat animals for marketing or genetic purposes and is based mainly on handling score (Renand and Fisher, 1997) or diameter of subcutaneous adipose cells (Robelin and Agabriel, 1986). The main carcass traits used as predictor of carcass composition in beef carcass are carcass weight, subcutaneous fat thickness, eye muscle area and dissection of rib joints (Robelin, Grecy and Beranger, 1974, and Johnson and Baker, 1997).

The aim of this work is to evaluate the carcass quality of three Nigerian breeds of cattle.

MATERIALS AND METHODS

Animals

The breeds of cattle used were Bunaji, Gudali and Keteku. These animals were identified based on visual appearance of the coat colour, the presence or absence of well developed cervico- thoracic hump, presence or absence of well developed horns and whether shot or long horn, the body size and shape of the ear. A total of fifteen animals with five animals from each breed were used for the study. Samples were obtained from the university abattoir.

The animals were weighed before slaughtering. The ages of the animals were estimated by direct counting of the erupted incisor.

Carcass measurement:

After slaughtering and dressing, the hot carcass weight was obtained and the dressing percentage calculated (Price, 1976). The rib and the loin roasts were obtained by separating the rib section from the chunk with a cut between the 5th and 6th ribs perpendicular to the back line. The loin was separated from the sirloin with a cut between the last two lumber vertebrae or just anterior to the hipbone. The rib section was also separated from the short plate and flank by cutting about 7 inches from the chine bones from the 6th to the 13th bone and parallel to the lumber bone to the end.

The rib and loin sections were weighed immediately and wrapped in polythene bag. Evacuation of air from the bag was done before tying the bag so as to educe further oxidation of the meat. The samples were stored at 2^{o}C for 24 hours.

Rib eye area

The samples were allowed to equilibrate at room temperature and the loin was separated from the rib with a perpendicular cut between the 12th and 13th ribs. The rib eye muscle was traced on an acetate paper and the area calculated by using polar planimeter.

Back fat thickness

This was measured at the 13th rib as described by Tatum (1997).

Meat colour

The meat colour was assessed on the 12th and 13th rib interface and scored with reference to the colour and discolouration standards for retail beef and veal (Jeremiah and Greer 1982). The colour scale ranged from 1 (white) to 8 (extremely dark red).

Texture of lean

A five man panelist was made to assess the texture of lean by scoring according to texture scale which ranged from very coarse to very fine with a score of 1 for very coarse and maximum of 7 for very fine.

Meat marbling

This was assessed on the longissimus dorsi chilled carcass at the 12th- 13th rib interface and scored against the USDA marbling chart grades of beef carcass (USDA, 1989). The marbling scores ranged from1 (very abundant) to 9 (traces).

Cooking loss

Samples for cooking loss were cut into steaks of approximately 4cm thick. Five steaks were selected in sequence from the rib end to the loin end and each steak was weighed before boiling.

Broiling was done at an oven temperature of 177°C with temperature stabilization for 5 minutes prior to the start of broiling. The steaks were broiled for40 minutes on each side to medium doneness and then cooled to room temperature to determine cooking loss.

$$\text{Cooking loss} = \frac{\text{weight of raw sample - weight of cooked sample}}{\text{Weight of raw sample}} \times 100$$

Shear force

Five cores of 0.5cm in diameter wee removed from samples used for cooking loss using an electric coring machine. Cores were removed from five standardized core locations on each steak. The core locations were center, ventral, media, dorsal and lateral. The coring was done parallel to the orientation of muscle fibre and each core was shared at three locations with Warner Bratzler shear force instrument.

Statistical Analysis

A one-way analysis of variance was used to evaluate the carcass and meat quality. A significant level of difference (p= 0.05) was applied according to SAS (1990).

RESULTS AND DISCUSSION

The mean age group of the breeds as reported in this study revealed that all the breeds fell within the same age limits which ranged from 3.16±0.16 to 3.50±0.28 years with low slaughter and carcass weight (Table 1). The result obtained in this work agrees with the work reported by Oyenuga (1982) that breeds of Nigerian cattle grow slowly, taking up to 4 years to reach maturity and attain slaughter weight with low dressing percentage. However, the result in this study is lower when compared with temperate breeds, which at the age of 3 years have live weights of about 500-563kg (Zhou *et al.*, 2001).

Table 1: Group means for age, live weight, carcass weight and dressing percentage for Bunaji, Gudali and Keteku breeds of cattle.

Characteristics	Bunaji	Gudali	Keteku
Age at slaughter (years)	3.50±0.28	3.16±0.16	3.16±0.44
Live weight (kg)	223.33±13.33	198.33±15.89	203.33±7.26
Carcass weight (kg)	100.50±6.00	96.76±3.06	99.43±4.76
Dressing percentage (%)	45.00±0.08[b]	49.00±2.48[a]	49.02±0.62[a]

N=5

[a b]Means with the same superscripts are not significantly different (p>0.05).

Management practices is one of the major factors that affect the overall age and weight of the Nigerian breeds of cattle. The fluctuations in feed availability also results in fluctuations in growth rate and this is partially responsible for the long time it generally takes the indigenous breeds to get to market weight. There exists a relationship across the breeds with regard to their age, live weight and carcass weight. As the age increases, the live weight also increases together with the carcass weight.

The dressing percentage of 45.00±0.08, 49.00±2.48 and 49.00±0.62 were obtained for Bunaji, Gudali, and Keteku breeds respectively. The dressing percentages obtained in this study fell within the range of 48-55% reported by Adebowale *et al.*, 1986 for Zebu steer. The dressing percentages were lower than 50-58% reported by Purchas *et al* (1992) for the exotic breeds. In a similar vein, the results were

lower than the result of 50-52% reported by Williams and Payne (1984) for White Fulani breed of cattle.

Table 2: Meat quality characteristics of Bunaji, Gudali and Keteku breeds of cattle

Characteristics	Breeds		
	Bunaji	Gudali	Keteku
Back fat thickness (mm)	1.45±0.28[a]	1.18±0.32[b]	1.51±0.49[a]
Meat colour	5.66±0.88	5.34±0.33	5.66±0.33
Texture of lean	5.60±1.33[ab]	7.00±0.10[a]	3.00±0.57[b]
Marbling	7.00±1.00	8.33±0.33	6.00±0.52
Rib eye area (cm^2)	33.00±3.05[c]	41.33±1.33[b]	50.00±1.52[a]
Cooking loss (%)	24.00±1.16[a]	8.70±2.06[ab]	16.97±2.15[b]
Shear force value (kg)	4.60±0.18[a]	4.93±0.18[a]	4.04±0.11[b]

[a b]Means with the same superscripts are not significantly different ($p>0.05$).

Although 52% was considered to be the standard (Zhou *et al.*, 2000), the same workers reported higher dressing percentage for Friesian cattle. Hans *et al.* (1989) reported a value of 65.1% for Friesian cattle. Dressing percentages for Bunaji was significantly ($p<005$) lower than for the other two breeds most probably due to relatively higher yield of hide, head feet and viscera when compared with others having lower proportion of the aforementioned parts. De Bryum (1991) confirmed that a higher hide yield and larger head was the reason for the low dressing percentage of some breeds. Strydom et al. (2000) also reported a higher dressing percentage for Nguni compared with Afrikaner breed, which they ascribed to the higher hide and fat proportions in the latter.

Meat quality characteristics:

The amount of fat distribution contributes to the organoleptic qualities of meat. The result of this study showed that Gudali has lower back fat thickness ($p<0.05$) than Bunaji and Keteku whose back fat thickness was statistically similar. The low fat cover of Gudali would make the beef more acceptable by the consumers.

The result obtained in this study showed that tropical breeds of cattle usually produce less fat cover than the temperate breeds (Barton *et al.*, 1994). Reyman *et al.*, (1997) also reported a higher value of fat at the 12/13th rib with values of 4.8, 4.5 and 7.5mm for Braham, Brafold and Africander steers respectively as against values of 1.18, 1.45 and 1.51 obtained for Gudali, Bunaji and Keteku breeds respectively.

Appearance of meat as displayed is the most important factor that determines retail selection (Van Oeckel *et al.*, 1999 and Conforth, 1994). Risvik (1994) stressed the importance of colour and indicated that consumers display two different preferences when purchasing meat. The visual appearance should meet the minimum requirement of the cut to be selected while palatability is of secondary importance and influences future buying decision. Colour is influenced by the muscle biochemical and contractile characteristics together with external factors such as pre and post slaughter treatment and the rearing and feeding regime.

With regard to colour, there was no significant difference ($p>0.05$) among the three breeds of cattle considered in the present study. This might be due to the uniform age of the animals. The values obtained in this study were within the range of bright cherry red and slightly dark red, which have been shown to readily command consumer acceptance (Okubanjo and Aziza, 1986).

Marbling: Is the intramuscular fat, which is visible in meat and located in the perimysial connective tissue between muscle fibre bundles (Ikeme, 1990). The architecture of muscle influences the pattern of fat deposition. The degree of intramuscular fat deposition in muscle is one of the main factors that influence the organoleptic properties of meat.

Although in terms of marbling, the difference among the mean scores for the three breeds under investigation were not significant ($p>0.05$), the scores showed that Keteku was scored least with a value of 6.00 ± 0.57, while Bunaji and Gudali had values of 7.00 ± 1.00 and 8.33 ± 0.33 respectively. These were within slight to modest degree of marbling and contrast sharply with corresponding values in temperate breeds which are often of moderate or greater degree of marbling. However, some quantity of marbling is adequate to lubricate the muscles and thus provide for juicy and flavorful cooked products. This work was in agreement with that of Jones (1985) that breed has a small effect on the distribution of fat. However, Zembayashi and Hunt (1995) reported that breed was a highly significant source of variations in marbling. Also, De Bryum (1991) observed breed differences in fat distribution.

Texture: With regard to the texture of lean meat from the breeds, Keteku had the least score for texture but no difference ($p>0.05$) was noticeable between Bunaji and Gudali. Thus these two breeds had relatively firm and fine textures while Keteku produced a texture that was firm and relatively coarse in nature. The result of this study is consistent with that of Okubanjo (1982) who associated lean characteristics with breed, sex and age of the animal.

Rib eye area: The rib eye area is commonly relied on to yield an estimate of the amount of lean meat in the carcass and this is a valuable criterion for evaluation of

the carcass. The rib eye area measured over the 12th/13th rib is lower for the indigenous breeds of cattle in this study. Keteku had 50cm² while Gudali and Bunaji had 41cm² and 33cm² respectively. The importance of higher value for rib eye area is the expected higher yield of meat relative to bone in the carcass. The higher the value, the higher the meatiness of the carcass. The result of this study was similar to that of Choche and Alshasson (1991) that reported a rib eye area of 42.5cm² for Gudali. In the case of the exotic breeds, a rib eye area of 51cm² was reported for Friesian and Jersey breeds, which were 2 years old (Barton *et al., 1994*), compared with the age of over 3 years in this study

The result indicated that Keteku with a higher rib eye area and a higher dressing percentage than the others would have a higher lean meat which could represent economic advantage in a weight based marketing system (Strydom *et al*., 2000).

Cooking loss: The mean cooking loss result of the different cattle breeds were different ($p<0.05$) from one another. Bunaji had higher ($p<0.05$) cooking loss than Keteku. Water loss is of economic concern because it affects weight loss along the distribution chain during cooking.

Shear force: the result of this study showed that the shear force value of Bunaji and Gudali were similar ($p>0.05$) while the least shear value was recorded for Keteku breed.

In establishing consumer threshold values for beef tenderness, Miller *et al*. (2001) classified beef with Warner Bratzler shear values over 5.7 as being very tough, above 4.9 to 57 as tough, above 3.0 to 4.9 as intermediate and below 3.0 as tender. Based on these classifications, all the three breeds of indigenous cattle furnished meat of intermediate classification which is in acceptable range of consumers.

CONCLUSION

From the result, it can be deduced that breed has a significant effect on the meat quality, with Keteku producing the best meat quality, compared with Bunaji and Gudali that have almost the same quality.

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