Characteristics of Beef from Baggara Zebu cattle and Friesian crosses slaughtered at 400 kg live weight.

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SUMMARY

Twelve samples of *Longissimus dorsi* muscles were obtained from Western Baggara (6 sample) and 50% Friesian bulls (6 sample) slaughtered at 400 kg live weight. The bulls were kept for a period ranged from 133-156 days. They were intensively fed on molasses feed (11.09 MJ/kg ME) on *ad libitum* base and sorghum straw (6.69 MJ/kg ME).

Chemically, muscles of Western Baggara bulls had significantly ($P<0.01$) more fat content and significantly ($P<0.05$) less moisture than 50% Friesian bulls meat. The sarcoplasmic protein concentration of Western Baggara bulls meat was significantly ($P<0.001$) lower than that of 50% Friesian bulls while the myofibrillar protein concentration was significantly ($P<0.001$) greater in Western Baggara. Friesian crossbred bulls meat was darker red in colour than Western Baggara. It had significantly ($P<0.05$) less cooking losses than Western Baggara. Meat juiciness and overall acceptability were significantly ($P<0.05$) higher in Friesian crossbred meat than Western Baggara bulls meat.

INTRODUCTION

World cattle numbers are currently 1.2 billion giving a ratio of approximate four humans to one bovine. Broadly speaking the developed world has one third of cattle while the countries of the developing world has two third of all cattle stocks (FAO, 1987). Sudan Western Baggara cattle is the major beef producing cattle in the country. They provide the bulk of meat consumed in Northern Sudan and contribute considerably in export trade of beef cattle (A.O.A.D., 1974).

Males from crossbred herd with Friesian offer a considerable scope for beef production. In this study the chemical composition and quality attributes of Western Baggara bulls meat and 50% Friesian bulls meat obtained from animals raised at the same level of feeding and slaughtered at similar weight 400 kg live weight were compared.

MATERIALS AND METHODS

Samples of meat from Western Baggara bulls and 50% Friesian bulls (12 samples from both) were taken from *Longissimus dorsi* muscles after 24 hours Postmortern. Determination of total moisture, ash, total protein and fat (ether extract) were performed according to AOAC (1975) methods. Samples for protein fractionation were trimmed of excessive sub-coetaneous connective tissue before mincing. The fractionation procedure was described by Babiker and Lawarie (1983). For pH determination, sample (weighing approximately one gram) was homogenized in 20 ml distilled water for one minute than the pH was read on a laboratory pH meter (adjusted with buffer, pH 7.0) at room temperature.

Water holding capacity and cooking loss determination as described by Babiker and Lawarie (1983) for shear force and connective tissues strength determination an Instron Model (1000 fitted) with a Warner Bratzelar Shear device was used. Rectangular meat samples having a cross sectional area of 1 cm 2 were shorn a cross the muscle fibres. Cubical meat samples (1x1x1 cm) were also cut from the cooked meat and were used to determine connective tissue strength by shearing along the muscle fibres. For sensory evaluation *Longissimus* *dorsi* muscles samples were overnight thawed at 4 ºC and roasted, wrapped in aluminum foil, in an electric oven at 175-180 ºC for one hour (Griffin *et al*.,1985). Semi trained panelists (n=9) evaluated coded meat samples in individual booths. Student t-test was used to analyze all data statistically (Snedcor and Cochran, 1980).

RESULTS AND DISCUSSION

As seen in table 1, the Western Baggara bulls meat had significantly (P<0.05) less moisture and significantly (P<0.001) more fat than 50% Friesian bulls meat. Breed difference is one of the factors affecting muscles composition (Lawarie, 1991).

Table 1. Meat chemical composition of Western Baggara and 50% Friesian bulls.

Item	Mean ± S.D.		Level of significance
	Western Baggara	50% Friesian	
Number of samples	6	6	-
Moisture (%)	72.6 ± 0.45	73.87 ± 0.72	*
Protein (%) (Nx6.75)	22.8 ± 0.73	21.93 ± 1.30	N.S.
Fat (%)	3.47 ± 0.22	2.32 ± 0.20	**
Ash (%)	1.15 ± 0.05	1.15 ± 0.04	N.S.
Sarcoplasmic protein (%)	4.9 ± 0.12	5.5 ± 0.15	***
Myofibrillar protein (%)	12.48 ± 0.10	12.23 ± 0.04	**
Non protein nitrogen (%)	0.45 ± 0.03	0.45 ± 0.02	N.S.
Muscle pH	5.77 ± 0.01	5.72 ± 0.02	N.S
			* Percent of fresh muscle weight.

**   P<0.05.*
***   P<0.01.*
****   P<0.001*

Ash content, protein and non protein nitrogen were similar in the muscles of the two breed. Differences in Sarcoplasmic and Myofibrillar proteins might be due to breed differences in muscle composition (Lawarie, 1991). Data pertaining to objective and subjective meat quality of Western Baggara and 50% Friesian bulls meat are given in table 2. Hunter colour values indicated that Western Baggara bulls meat had significantly ($P<0.001$) more lightness (L) values significantly ($P<0.01$) less redness (a) value than 50% Friesian bulls meat. Darker red colour means less lightness value (L) & more redness value (a).

Table 2. Meat quality and subjective evaluation of Western Baggara and 50% Friesian bulls.

Item	Mean ± S.D.		Level of significance
	Western Baggara	50% Friesian	
Number of samples	6	6	-
			Colour [1]
L	35.36 ± 0.53	32.11 ± 0.61	***
a	11.50 ± 0.13	12.48 ± 0.42	**
b	8.11 ± 0.76	7.91 ± 0.34	N.S.
Water holding capacity (ratio)[2]	1.70 ± 0.11	1.54 ± 0.17	N.S.
Cooking loss (%)	32.87 ± 0.64	31.52 ± 0.14	*
Shear force (kg/cm^2)	4.38 ± 0.41	3.20 ± 0.06	***
Connective tissue strength (kg/cm^2)	2.61 ± 0.10	2.05 ± 0.09	***
			Subjective evaluation
Colour	3.70 ± 0.21	3.63 ± 0.33	N.S.
Flavour	2.85 ± 0.05	2.78 ± 0.15	N.S.
Juiciness	2.55 ± 0.15	2.15 ± 0.15	*
Tenderness	3.13 ± 0.13	3.20 ± 0.23	N.S.
Overall acceptability	3.68 ± 0.13	4.00 ± 0.14	*

(1):

L: Measure Lightness and varies from 100 for perfect white to zero for black.

a: Measure Redness when (+ ve).
Grey when (zero).
Greenness (- ve).

b: Yellowness when (t ve).
Grey when (zero).
Blueness when (- ve).

(2):

The greater the ratio the lower the water holding capacity.

The latter indicate more Sacroplasmic protein particularly more myoglobin. Dark red colour could also be attributed to less fat content (Table 1.) of the muscle. Friesian crossbred muscles were found to have greater water holding capacity than Western Baggara but not significantly so which resulted in significantly (P<0.05) lower cooking loss than in Western Baggara bulls muscles. This difference in cooking loss coincided with differences in water holding capacity mentioned before. Shear force, measures across muscle fibres and connective tissue strength were significantly (P<0.001) greater in Western Baggara bulls muscles than in 50% Friesian bulls muscles. This increase in Shear force and connective tissue strength values in Western Baggara bulls meat coincided with the decrease in their water holding capacity and could be attributed to breed differences in muscle tenderness. This finding proves the earlier claim that tropical beef is tougher than temperate beef (Carpenter *et al*., 1961; Koch *et al*., 1982). Subjective rating of cooked meat indicated that the colour of cooked 50% Friesian bulls meat was dark brown than that of Western Baggara a finding which accorded with objective measurement of meat colour (Table 2). Juiciness was significantly (P<0.05) higher in Western Baggara bulls meat than in 50% Friesian bulls meat. The higher juiciness rating of Western Baggara bulls meat agreed with the finding that Western Baggara bulls meat had high fat content (Table 1). The overall acceptability rating of 50% Friesian bulls meat was superior to that of Western Baggara bulls meat and could be due to the fact that 50% Friesian bulls meat had lower shear force and connective tissue strength values in addition to their greater water holding capacity. Thus the 50% Friesian bulls meat was superior in, of eating quality attributes as well as processing properties than the meat from Western Baggara zebu cattle slaughtered at 400 kg live weight.

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خصائص إنتاج اللحوم من عجول البقارة وهجين الفريزيان 50% مذبوحة في وزن نهائي 400 كجم وزن حي

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مخلص البحث:

أثنت عشرة عينة من عضلة الظهر من لحوم عجول البقارة وهجين الفريزيان (50%) تم ذبحها في وزن نهائي 400 كجم وزن حي استخدمت في التحليل . هذه العجول تم تسمينها لفترة تتراوح بين 133–156 يوماً علي علف المولاس المركز (11.09 ملي جول طاقة تمثيل) والقصب الجاف (6.69 ملي جول / كجم طاقة تمثيل) تغذية حرة .

بالتحليل الكيميائي أعطت لحوم عجول البقارة دالاً معنوياً باحتوائها علي نسبة دهن عالية ونسبة رطوبة منخفضة من لحوم العجول الهجين .

نسبة البروتين الساركوبلازي كانت أعلى في لحوم العجول الهجين بينما نسبة البروتينات الليفية كانت أعلى في لحوم عجول البقارة درجة قابلية حمل الماء أعطت دالاً إحصائياً في عجول الهجين أجود من عجول البقارة مما ينتج عنه قلة نسبة الفاقد من الماء أثناء الطبخ في لحم العجول الهجين .

درجة القبول العام للحوم أعطت دالاً معنوياً في العجول الهجين أعلي من عجول البقارة.