ALTERNATIVE APPROACH FOR EVALUATING SMALL RUMINANT GENOTYPES FOR MEAT PRODUCTION IN ETHIOPIA

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Abstract

Slaughter data from 304 Menz and 153 Horro rams were analysed to determine between breed differences in yields of carcass and edible non-carcass components, with the primary aim of creating awareness in the way animal evaluations for meat production may be modified to incorporate local cultures. Total edible non-carcass component yield (ENCY) was obtained as the sum of weights of blood, lungs and trachea, liver, heart, kidneys, reticulo-rumen, omaso-abmasum, hindgut, omental and mesenteric fat and kidney fats. Total yield of consumable products (TCPY) was calculated as the sum of hot carcass weight (HCW) and ENCY. Slaughter weight, HCW, ENCY and TCPY were 24.7, 10.5, 4.3, and 14.8 kg, respectively, in the Menz and 24.9, 10.4, 4.6, and 14.9 kg, respectively, in the Horro. Only the breed difference in ENCY was significant ($P<0.01$). The Menz dressed higher ($P<0.01$) than the Horro (42 vs 41%). This study emphasises the need to pay attention to the total yield of consumable products rather than only to carcass weight and(or) dressing percentage in evaluating the suitability of genotypes for meat production in cultures where non-carcass items are traditionally consumed. Inclusion of this component in breed comparisons may help understand farmer and consumer preferences for certain breeds.

Introduction

Meat has a unique place in the nutrition of most Ethiopians. It is a highly valued food, reflecting the higher status of the consuming groups and individuals. Although income may influence the amount of meat consumption by some sectors of the society, consumption is not restricted to the wealthy as almost all Ethiopians consume meat on feasts and holidays. In most pastoral communities, meat and blood are among the most important daily meals.

Despite these facts, little has been done to improve meat production in the country. Much of the research on meat production in Ethiopia has largely focused on carcass yield and quality and generally has not been concerned with the non-carcass components. However, in many parts of Ethiopia, non-carcass components are also important. Blood from farm animals is a delicacy in pastoral communities like the Surma, the Boran and the Somali. Even in Addis Ababa and other big towns of the country, it is common to find dishes exclusively made from non-carcass items like the intestines, tongue, liver, etc. Among the most widely known dishes made of these non-carcass items, and those seen at the top of most hotel menus, are *dulet*, *milasina senber*, *tripa*, etc. Thus, it can be said that much of the research on meat and meat production has ignored an important component of traditional meat consumption by focusing only on carcass yield and quality and disregarding non-carcass items. Consequently, evaluation of genotypes for suitability of meat production has been restricted to the 'Western' definition of carcass and dressing percentage that excludes most of the tissues and organs widely consumed in this country. This paper presents results of comparisons of the Menz and Horro sheep for suitability of meat production based on yields of carcass and non-carcass components, with the primary aim of creating an awareness in the way meat research may be modified to incorporate local cultures. The Menz and Horro breeds are widely distributed in the highlands of Ethiopia and are primarily kept for meat production.

Materials and Methods

Study location

The study was conducted at the International Livestock Research Institute's (ILRI) Debre Berhan Research Station. The station is located about 120 km north-east of Addis Ababa at an altitude of 2780 m, in the

central highlands of Ethiopia. The climate is characterised by a long rainy season (June to September), a short rainy season (March to May) and an extended dry season (October to February). Annual rainfall averages 950 mm while ambient temperature ranges from 2.4°C in November to 23.3°C in June.

Animals and Management

One-hundred and fifty-three male Horro and 304 Menz sheep, born in eight lamb crops in dry (October/November) and wet (June/July) seasons from October 1992 to July 1996 at the ILRI's Debre Berhan research station, were used for this study. Animals were selected at about 13 months of age from on-station flocks. Subsequently, selected animals were individually fed for 105 (±12) days, until slaughter at an average age of 511 (±22) days. The diet during the feeding period consisted of ad libitum hay and a supplement mixture made of wheat bran, maize and cotton seed cake (18% CP).

SlaughterData

Feed and water were withheld 12 hours prior to slaughter. Slaughter weight (SW) was measured immediately before slaughter to the nearest 0.5 kg. The weights of blood, skin, head, hot carcass, omental and mesenteric fat, gastro-intestinal tract content (digesta), empty reticulo-rumen, empty omaso-abomasum, hindgut, lungs (with trachea), heart, liver (with gall bladder), spleen, kidneys, perinephric fat, testicles (with penis), testicular fat and legs were recorded during the slaughter process.

Each ram record comprised breed (Menz, Horro), birth group (8), type of birth (single, multiple), date of birth, and dam parity (1, 2, 3, ^{3} 4). Birth group was the eight year-season of birth sub-classes. Slaughter age was the number of days between birth date and slaughter dates. Dressing percentage was based on hot carcass weight. Total edible non-carcass component yield (ENCY) was obtained as the sum weight of blood, lungs (and trachea), liver (and gall bladder), heart, kidneys, reticulo-rumen, omaso-abomasum, hind gut, omental and mesenteric fat, and perinephric fat. Total consumable products yield (TCPY) was calculated as the sum of hot carcass weight (HCW) and ENCY.

Statistical Analyses

Data were analysed using the General Linear Models (GLM) procedure of the SAS computer program (SAS, 1994). Fixed effects fitted in the analysis model were breed, birth group, type of birth, dam parity and one-way interactions found significant ($P<0.05$) in preliminary analyses. Age at slaughter was fitted as a covariate.

Results

Overall and sub-class least squares means (and s.e.) for breed, coefficients of variation, F-statistics, and partial regression coefficients for age are presented in Table 1.

Table 1. Summary of overall and sub-class least squares means (and s.e.) for breed, coefficients of variation (CV), F-statistics, and partial regression coefficients for age.

Variables	Overall	CV, %	Least squares mean±s.e.	
			Menz	Horro
	± s.e.			
Slaughter weight (SW), kg	24.8±0.2	9.9	24.7±0.2	24.9±0.3
Carcass weight, kg	10.4±0.1	11.2	10.5±0.1	10.4±0.1
Dressing percentage	41.7±0.1	4.8	42.3±0.2	41.2±0.2
Edible non-carcass items				
Blood, g	862.7±8.8	14.7	844.3±9.4	881.3±12.5
Lung (and trachea), g	479.3±8.1	24.0	476.6±8.6	481.8±11.5
Heart, g	106.0±4.4	60.4	99.4±4.7	112.4±6.2

Liver (and gall bladder), g	351.2±3.0	12.0	324.5±3.1	378.2±4.3
Kidneys, g	66.4±1.4	28.7	64.3±1.6	68.6±2.5
Perinephric fat, g	57.0±2.0	44.0	68.5±2.0	45.4±2.8
Reticulo-rumen, g	622.5±5.2	11.6	596.3±5.4	648.8±7.4
Omaso-abomasum, g	197.6±7.3	53.3	182.0±7.9	213.1±10.4
Hind gut [a)], kg	1.2±0.0	13.4	1.1±0.0	1.2±0.0
Omental and mesenteric fat, g	98.0±4.2	53.7	123.5±4.4	72.6±6.0
Spleen, g	71.7±1.1	20.3	69.7±1.1	73.7±1.4
ENCY,. Kg	4.4±0.0	9.1	4.3±0.0	4.6±0.0
ENCY / SW x 100%	18.0±0.1	7.9	17.5±0.1	18.5±0.1
TCPY, kg	14.9±0.1	9.8	14.8±0.1	14.9±0.2
TCPY/SW * 100%	59.8±0.2	4.8	59.7±0.2	59.8±0.3
Non-edible non-carcass items				
Head, kg	1.7±0.0	11.5	1.8±0.0	1.6±0.0
Skin, kg	2.5±0.0	15.2	2.7±0.0	2.2±0.0
Testicles (and penis), g	367.2±4.0	14.8	352.8±4.0	381.7±4.0
Testicular fat, g	59.9±1.9	44.2	64.3±2.0	55.6±2.7
Legs [b)], g	560.5±5.3	13.4	535.1±5.6	585.4±7.5
Gut contents, kg	4.7±0.1	16.6	4.3±0.1	5.0±0.1

[a)] Hind gut includes small and large intestines;

[b)] Legs include limbs below the carpo-metacarpal and tarso-metatarsal joints of the fore-and hind- limbs, respectively.

** $P<0.01$, *$P<0.05$, NS $P>0.05$

The Horro weighed 0.2 kg more than the Menz at slaughter. However, HCW of the Menz was 0.1 kg heavier than that of the Horro. These breed differences were not significant ($P>0.05$). However, dressing percentage was significantly ($P<0.01$) higher in the Menz.

As given in Table 1, the weights of lung (and trachea) and kidneys were not significantly ($P>0.05$) different between the two breeds. However, most of the tissues and(or) organs classified as 'edible non-carcass items', i.e. heart, liver (and gall bladder), reticulo-rumen, omaso-abomasum, the hind gut, and spleen, were greater (at least $P<0.05$) for the Horro. The weight of blood was also greater ($P<0.01$) in the Horro. Among the tissues and(or) organs classified as 'edible non-carcass items' in this study, only weights of omental and mesenteric fat and perinephric fat were greater ($P<0.01$) in the Menz. ENCY, the total weight of all edible non-carcass items, was 4.3 kg in the Menz and 4.6 kg in the Horro, representing 17.5 and 18.5% of live weight of the Menz and the Horro, respectively. TCPY, the sum of HCW and ENCY, was similar ($P>0.05$) between breeds. TCPY represented about 60% of the live weight in both breeds (Table 1).

Discussion and Conclusion

The carcass weight and dressing percentages obtained in this study are within the range of those previously reported for Horro and Menz sheep (Akalu et al., 1983; Demeke, 1993). The weights of the individual non-carcass components reported in this study agreed with previous reports for yearling Horro lambs (Akalu et al., 1983).

Despite similar SW and HCW between breeds, dressing percentage and HCW expressed as a percentage of SW were greater for Menz vs Horro. The slightly lower SW but slightly higher HCW in the Menz resulted in higher dressing percentage compared with the Horro. The higher dressing percentage in the Menz indicates that non-carcass components represented a larger proportion of slaughter weight in the Horro than in the Menz. Digesta in the gut alone weighed 0.7 kg more in the Horro ($P<0.01$). Gut fill obtained in this

study of 20 and 18% of fasted live weight for Horro and Menz respectively, is in agreement with Akalu et al. (1983), who also reported about 20% of the fasted live weight in yearling Horro lambs. Similarly, Demeke (1993) reported about 19% gut fill in Menz lambs fasted for about 12 hours.

It appears that if the ranking for meat production potential was based on carcass weight and(or) carcass contribution to the slaughter weight (i.e., dressing percentage), the Menz would be considered superior to the Horro as it had a higher dressing percentage. However, a comparison of the two breeds in terms of the total yield of both the carcass and edible non-carcass components indicates no breed difference. Thus, as can be seen from this study, disregarding the edible non-carcass components (30% in this study) in animal evaluations does not adequately reflect the real picture of consumer habits or potential differences of the genotypes evaluated. Thus, it is suggested that meat research should take into account the total consumable products rather than only to the carcass weight and(or) dressing percentage. Inclusion of the edible non-carcass components in breed comparisons may help explain preferences shown by farmers and consumers for certain breeds.

As consumption of the non-carcass components varies widely from place to place, the figures reported here should be interpreted accordingly. The items included as edible in this paper may not be considered edible in some parts of the country, while certain parts considered non-edible here may be consumed in other regions. Furthermore, items like tongue and the oesophagus were not weighed individually and, thus, were not included in the analyses of edible totals. Conversely, because the gall bladder and liver were weighed together, the gall bladder contributed to the weight of edible-products. This study, by no means an exhaustive study of edible non-carcass components, can help in creating an awareness in the way meat research may be modified to incorporate local cultures. It is suggested that this approach be examined and considered when evaluating goats for meat production.

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