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Comparison of Suffolk, Texel and Charollais sired lambs for slaughter traits under upland grassland conditions of the north east England

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ABSTRACT

Performance data on growth of lambs were collected for 3 years from crossbred females and castrated male progeny of three terminal sire breeds, namely Charollais, Suffolk, and Texel, out of Mule ewes (Bluefaced Leicester sires × Scottish Blackface or Swaledale dams) reared under upland grassland conditions in the north-east of England and were analyzed by general linear regression method using Genstate. The least square means for slaughter and carcass weights of Suffolk, Texel and Chairollais sired lambs were $42.023^{a}\pm0.16$ kg and $18.27^{a}\pm0.08$ kg; 40.277 ± 0.164 and17.89 ± 0.08; 41.247 ± 0.16 and 18.21 ± 0.08 respectively. Similarly slaughter age, killing out percentage and conformation of the lambs were compared as well. This study suggests that the breed of sire, year of lambing and sex of lamb can affect slaughter and carcass weights of lambs, and these factors require careful consideration in practical lamb husbandry.

Key words: Carcass weight, Slaughter weight, Slaughter age, Terminal sire

The northern area of United Kingdom (UK) comprises hill and rough grazing lands. It plays a vital role in the sheep industry of the UK and Ireland. It has been estimated that over 75% of all lambs produced contain some proportion of hill breed genes. Thus hill breeds and crosses have a major impact on UK lamb production. Within systems of sheep production in the UK, choice of terminal sire is one of the main influence on lamb production. A number of sire breeds comparison have been undertaken in the past (Carson *et al.* 1999). The aim of this study was to compare the slaughter and carcass traits of Charollais, Suffolk and Texel sired lambs kept under upland grassland conditions in the north-east of England.

MATERIALS AND METHODS

The lambs used in this study were produced on the Experimental Husbandry Farm of the Agricultural Development and Advisory Service at Redesdale, Otterburn in Northumberland, UK. Crossbred females and castrated male progeny of three terminal sire breeds, namely Charollais, Suffolk, and Texel, out of Mule ewes (Bluefaced Leicester sires × Scottish Blackface or Swaledale dams) were compared. Data on 1,042 crossbred lambs obtained during 3 years period from 1987 to 1989 were used. In the first year of the trial, ewes of both dam types were represented with about two-thirds being of Blackface origin and one-third Swaledale. In the subsequent 2 years no Swaledale crosses were used.

The ewes were mated to Charollais Suffolk and Texel rams. A total of 10 unrelated rams of each breed were used. In the first year two sires of each breed were used while during the second and third year four sire of each breed were used. This means that individual sires were confounded with years but the aim was not to look at individual sires. The Texel sires used in this study were largely descended from animals of Dutch origin, although animals from French importation were also represented.

Ewes were divided into balanced groups according to dam type, age, live weight and body condition and each group was randomly allocated to an individual ram for a 22-day mating period, beginning in early November each year. These groups comprised 58 ewes in the first year and 29 ewes in the second and third year each. Only lambs that were born and reared as twins were used in this study.

Ewe and lamb management was in line with normal commercial procedures for an upland flock. The lambs were selected for slaughter at an equal estimated level of subcutaneous fat cover, equivalent to Meat and Livestock Commission (MLC) fat classes 2 and 3L. The level of fat cover was assessed by subjective handling of the loin area.

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Whereas the conformation classes were also equivalent to Meat and Livestock Commission (MLC) conformation classes E, U, R and O. The data from multiple born, twin reared lambs born during 1987, 1988 and 1989 were analyzed. The slaughter and carcass weights of 994 lambs with respect to conformation and fat classes developed by Meat and Livestock Commission (MLC 1994) were analyzed as well. All the data was analysed by general linear regression using Genstate V (Payne *et al.* 1993).

RESULTS AND DISCUSSION

Age at slaughter

The least-square means for slaughter age of lambs belonging to various breeds of sire, sex, fat classes and lambs born during different years are presented in Table 2. Texel sired lambs were slaughtered at an earlier age compared to Suffolk and Charollaise sired lambs. Males were slaughtered at an earlier age as compared to female lambs. Age at slaughter was 136±1.15, 151±1.31 and 157±1.68136 days during first, second and third year ($P < 0.05$). The lambs belonging to fat class 2 were slaughtered at an earlier age as compared to lambs belonging to 3L and 3H. A difference of 6 days between the slaughter age of Suffolk and Texel sired lambs observed in this study is comparable to but slightly lower than the Johnston *et al.* (1999), Kremer *et al.* (2004) and Cloete *et al.* (2007). Hall and Henderson (2000) found no significant difference in age at slaughter between Suffolk and Texel. Merrell *et al.* (1990) reported non-significant difference between the slaughter age of the Suffolk, Texel and Charollais sired lambs. The age at slaughter increased with the increase in fat level, the lambs classified as fat class 2 were slaughtered 12 and 15 days earlier than 3L and 3H lambs. So the lambs can be slaughtered at leaner fat class if the age at slaughter is reduced. Here the proper nutrition and feeding management of the lambs also play a significant role in achieving the required goals. Differences in slaughter age can be ascribed to different environments and lambing systems.

Table 1. Slaughter age (days) of lambs belonging to different breeds, sex, year of lambing and fat classes

Breed	N	LSM±SE
Suffolk	336	149^{b}±1.29
Texel	314	143^{a}±1.34
Charollais	341	146^{ab}±1.28
Sex		
M	478	152^{a}±1.08
F	513	141^{b}±1.05
Year		
1987	428	136^{c}±1.15
1988	343	151^{b}±1.31
1989	220	157^{a}±1.68
Fat Class		
2	396	138^{b}±1.22
3L	489	150^{a}±1.07
3H	106	158^{a}±2.33

Slaughter weight

Breed of sire, sex, year fat class had significant ($P<0.001$) effect on the slaughter weight of lambs. The Suffolk sired lambs were significantly heavier by 1.74 kg and 0.77 kg than the Texel and Charollais sired lambs at slaughter. A significant difference of 0.97 kg was obtained between the Charollais and Texel sired lambs at slaughter. Similar results were reported by Ellis *et al.* (1997), Johnston *et al.* (1999) and Cloete *et al*. (2007). There was a significant difference between the slaughter weight of Charollais and Texel sired lambs, which differed from the results reported by Cameron (1988). Similarly there was a significant difference between the Suffolk and Charollais sired lambs, which differed from the results reported by Ellis *et al.* (1997).

Male lambs were slaughtered at significantly heavier weight by 1.84 kg than the female lambs. The lambs born during 1989 were slaughtered at significantly higher weight by 2.12 kg and 2.20 kg than lambs born during 1987 and 1988. The lambs born during 1989 were slaughtered at significantly higher weight by 2.12 kg and 2.20 kg than lambs born during 1987 and 1988. The slaughter weight of the lambs born during 1987 and 1988 was similar. The higher weights of Suffolk, Texel and Charollais sired lambs observed in present study can be attributed to variations owing to years rather than breeds. Suffolk sired lambs were superior to both Texel and Charollais sired lambs. These differences in slaughter weights during different years, as mentioned earlier can be due to several factors, some under control of farm management and some beyond control. Any single factor can not be pinpointed which is responsible for these differences. Therefore, it is very difficult to explain these differences. Wolf (1980), Merrell, *et al.* (1990) and Cloete *et al.* (2007) also found that there were significant variations in slaughter weight due to year. Male lambs grow faster than females or castrates is well recognised. In this present study, males were also heavier at slaughter than females, which indicates faster growth of males than females. The explanation of differences in slaughter weights between different sexes of lambs is not simple as growth of farm animals is influenced by endocrine system as a whole. As the animal grows the secretion of sex hormones from the gonads increases (Hafez 1969). The differences in the weights of animals related to different sexes could be due to sex hormones as they have some relationship with the growth of animals as well.

Lambs classified as 3H were slaughtered at significantly heavier weight by 2.17 kg and 1.39 kg respectively than the lambs classified as 2 and 3L, whereas the lambs classified as 3L were 0.78 kg heavier at slaughtered than the lambs classified as 2. The slaughter weight of the lambs increased with the increase in fat measurement (i.e. fat class 2 to 3H) which was in agreement with the Wylie *et al.* (1997) who reported an increase in fat with increasing slaughter weight. With the increasing fat class, the slaughter weight also increased which was in line with the Carson *et al.* (1999).

Carcass weight

The carcass weight of lambs was significantly affected by the breed of sire, sex of lamb, year of lambing, and fat class ($P \leq 0.001$) respectively. The mean carcass weights are presented in Table 2. The carcass weight of Suffolk and Charollais sired lambs was significantly ($P<0.05$) heavier by 0.38 kg and 0.32 kg respectively than the Texel sired lambs. McEwan *et al.* (1988) reported that Suffolk sired lambs were superior to Texel sired lambs for carcass weight which is in agreement with present study. However, Henderson (1999) and Carson *et al.* (2000) did not find any significant difference between carcass weights of Suffolk and Texel sired lambs. The carcass weight of Charollais sired lambs was significantly heavier than the Texel sired lambs in present study (Table 2), whereas similar carcass weight of Charollais and Texel sired lambs was reported by the Cameron 1988). The carcass weight of male lambs was significantly ($P<0.05$) heavier by 0.82 kg than that of females (Table 2) which was in line with the findings of Wylie *et al.* (1997) who reported a non significant effect of sex on carcass weight of lambs.

The mean carcass weights of the lambs born during 1987, 1988 and 1989 were 8.12±0.08, 17.75±0.08 and 18.94±0.10 kg respectively. The carcass weights of the lambs born during 1989 and 1987 were significantly ($P<0.05$) heavier by 1.19 kg and 0.37 kg than the lambs born during 1988. A significant ($P<0.05$) difference of 0.82 kg was observed between the carcass weight of the lambs born during 1989 and 1988 (Table 2). Carcass weight was significantly affected by the year of lambing which was in agreement with Wolf (1980). Year 1988 and 1989 were better than 1987. The same trend was observed for the previous parameters, i.e. slaughter weights. The variations in carcass weight like the previous one can be attributed to climate, management decisions, disease outbreaks and possibly pasture conditions as well.

The mean carcass weights of the lambs having fat class 2, 3L and 3H were 17.61±0.08, 18.40±0.07, and 19.30±0.15 kg respectively. The carcass weight of the lambs classified as 3H and 3L was significantly ($P<0.05$) heavier by 1.69 kg and 0.79 kg than the lambs classified as 2. A difference of 0.90 kg was obtained between the carcass weight of the lambs classified as 3H and 3L (Table 2).

Table 2. Least square means of slaughter and carcass weights of lambs belonging to different breeds, sex, year of lambing and fat classes

	N	Slaughter weight	Carcass weight
Breed		LSM±SE	LSM±SE
Suffolk	336	42.02 ^{a}±0.16	18.27 ^{a}0.08
Texel	314	40.28 ^{c}±0.164	17.89 ^{b}±0.08
Charollais	341	41.25 ^{b}±0.16	18.21 ^{a}±0.08
Sex	.		
Male	478	42.18 ^{a}±0.14	18.56 ^{a}±0.07
Female	513	40.34 ^{b}±0.13	17.74 ^{b}±0.07
Year			
1987	428	40.82 ^{b}±0.149	18.12 ^{b}±0.08
1988	343	40.74 ^{b}±0.166	17.75 ^{c}±0.08
1989	220	42.94 ^{a}±0.205	18.94^{a}±0.10
Fat Class			
2	396	40.64 ^{c}±0.153	17.61 ^{c}0.08
3L	489	41.42 ^{b}±0.134	18.40 ^{b}±0.07
3H	106	42.81 ^{a}±0.288	19.30 ^{a}0.15

The killing out percentage

It was found that sire breed, year of lambing, and fat class showed a significant ($P<0.001$) effect on killing out percentage of lambs. The mean killing out percentages for Suffolk, Texel and Charollais sired were 43.62±0.12, 44.45±0.13 and 44.22±0.12 respectively (Table 3). The killing out percentage of Texel and Charollais sired lambs was significantly ($P<0.05$) higher by 0.83 and 0.60 respectively. There was no significant difference between the killing out percentage of Texel and Charollais lambs (Table 3). The mean killing out percentage of the lambs born during 1987, 1988 and 1989 was 44.52±0.11, 43.48±0.13 and 44.23±0.16 respectively. A significantly ($P<0.05$) higher killing out percentage was observed during 1987 and 1989 by 1.04 and 0.75 respectively than 1988, whereas it was similar during 1987 and 1989 (Table 3). There was significant ($P<0.05$) difference between killing out percentage of lambs belonging to different fat classes. The mean killing out percentage of the lambs belonging to fat classes 2, 3L and 3H was 43.43±0.12, 44.43±0.10 and 45.08±0.22 respectively. The killing out percentage of the lambs classified as 3H was higher by 1.65 and 0.65 respectively than the lambs classified as 2 and 3L. Whereas the difference between the killing out percentage of the lambs classified as 2 and 3L was 1 (Table 3).

Table 3. Killing out percentage for breed of sire, sex of lambs, year of lambing fat class and conformation of lambs

	N	Mean±SE
Breed		
Suffolk	338	43.62 ^{b}±0.12
Texel	315	44.45^{a}±0.13
Charollais	341	44.22 ^{a}±0.12
Year		
1987	428	44.52 ^{a}±0.11
1988	343	43.48 ^{b}±0.13
1989	223	44.23 ^{a}±0.16
Fat Class		
2	397	43.43 ^{c}±0.12
3L	490	44.43 ^{b}±0.10
3H	107	45.08 ^{a}±0.22

The higher killing out percentage of Texel lambs compared with Suffolks (Table 3) agrees with Elsley *et al.* (1978). There was no significant difference between killing out percentage of Texel and Charollais sired lambs (Table 3) which is in agreement with Cameron (1988), Kremer *et al.* (2004) and Cloete *et al.* (2007).

Year effects on carcass composition of lambs, reviewed by Kirton *et al.* (1998) have been attributed to undefined environmental factors such as differences in feed supply and composition (protein), daylight/dark ratio, etc. In this experiment, year effect was significant in a number of variables, probably resulting from a higher level of nutrition (in quantity and/or quality) in the first year manifested by higher growth rate and a lower age at slaughter. Studies on the effect of nutrition influencing changes in fat content of carcasses generally showed that high level of nutrition results in an increase of fatness at a set level of weight (Chestnutt 1994). The killing out percentage of the lambs increased with increasing fat and conformation score.

Conformation and fat score

The mean fat score of Suffolk, Texel and Charollais sired lambs was 9.93±0.09, 9.77±0.10 and 10.34±0.09 respectively. There was no significant difference between the fat classification of Suffolk and Texel sired lambs, whereas the fat classification of Charollais sired lambs was significantly ($P<0.05$) higher by 0.57 and 0.41 units than the Texel and Suffolk sired lambs (Table 4).

The mean fat score of male and female lambs was 9.82±0.08 and 10.20±0.08 respectively. Female lambs were significantly ($P<0.05$) superior by 0.38 units than male lambs in fat classification (Table 4). The mean conformation score of Suffolk, Texel and Charollais sired was 3.080.03, 3.26±0.03 and 3.04±0.03 respectively. The Texel sired lambs excelled in conformation by 0.18 and 0.22 units than the Suffolk and Charollais sired lambs, whereas Suffolk and Charollais sired lambs had similar conformation (Table 4). The mean conformation score of male and female lambs was 3.10±0.03 and 3.14±0.03 respectively. There was no significant difference between the conformation of male and female lambs.

Table 4. Fat class and conformation score of lambs belonging to different breeds of sire and sex of lamb

	N	Fat class	Conformation score
Breed		LSM±SE	LSM±SE
Suffolk	338	$9.93^{a}\pm0.09$	$3.08\ ^{b}0.03$
Texel	315	$9.77\ ^{a}\pm0.10$	$3.26\ ^{a}0.03$
Charollais	341	$10.34^{b}\pm0.09$	$3.04\ ^{b}0.03$
Sex			
M	479	$9.82\ ^{b}\pm0.08$	$3.10\ ^{a}0.03$
F	515	$10.20\ ^{a}\pm0.08$	$3.14^{a}\pm0.03$

Fat class: 8, lean 13; Fat; conformation score: 2, Good; 4, Poor.

The carcass weight of the lambs increased with increase in fat measurement (i.e. fat class 2 to 3H) and with increasing conformation, the carcass weight increased as well. These results were in line with the Wylie *et al.* (1997) and Carson *et al.* (1999) who reported an increase in the carcass weight with fat and conformation respectively.

Texel sired lambs have been found to have similar fat classification scores compared with Suffolk sired lambs (Merrell *et al.* 1990, Johnston 1995, Carson 1997, Ellis *et al.* 1997 and Wylie *et al.* 1997). The fat classification score of Charollais sired lambs was significantly higher than Suffolk and Texel sired lambs. Cameron (1988) and Merrell *et al.* (1990) also reported a higher fat score for Charollais sired lambs than Texel sired lambs.

There was a clear effect of sex on the levels of carcass fat; the female had significantly higher fat level than male lambs. It is widely recognized that female lamb carcasses are fatter at equal weight to those of male lambs. Carcass conformation classification was 0.18 units higher for Texel sired lambs than the Suffolk sired lambs, which is comparable to 0.3 reported by Carson (1997). The results of this study were different from those of Cameron (1988) who recorded higher conformation scores for Charollais than Texel crosses. The male lambs had significantly lower fat classification was in agreement with Carson *et al.* (1999). An improvement in lamb conformation is important, as it remains the basis of most producer payment systems. Kempster *et al.* (1981) Reported that although Texel-sired lambs improved carcass composition they did not have sufficiently high conformation scores to identify clearly this advantage. In contrast, Carson *et al.* (1999) reported that the EUROP classification system identified improvements in carcass lean content associated with increasing proportion of Dutch Texel genes. The present study clearly demonstrates improvements in conformation associated with using Texel sires.

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