Pakistan Vet. J., 25(1): 2005

COMPARISON OF THREE TERMINAL SIRE BREEDS FOR WEANIMG WEIGHT OF LAMBS KEPT UNDER UPLAND GRASSLAND CONDITIONS IN THE NORTHEAST OF ENGLAND

M. Yaqoob, B. G. Merrell[1] and J. I. Sultan[2]

Department of Livestock Management, University of Agriculture, Faisalabad, Pakistan, [1]MAFF/ADAS, Redesdale EHF, Rochester, Otterburn, Newcastle upon Tyne, UK, [2]Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Pakistan

ABSTRACT

Crossbred females and castrated male progeny of three terminal sire breeds, namely Charollais, Suffolk and Texel, out of Mule ewes (Bluefaced Leicester sires x Scottish Blackface or Swaledale dams) were compared. Analysis of variance revealed that breed, sex and the year of birth were significant sources of variation ($P \leq 0.05$) for weaning weight. Suffolk sired lambs were significantly heavier than the Texel sired lambs at weaning (35.78 ± 0.18 versus 35.16 ± 0.18 kg), whereas they were not significantly heavier than the Charollais sired lambs (35.78 ± 0.18 versus 35.37 ± 0.18 kg). There was no significant difference between the weaning weights of Texel and Charollais sired lambs. The lambs born during 1989 were significantly heavier (36.97 ± 0.22 kg) than the lambs born during 1987 (35.96 ± 0.16 kg) and 1988 (33.81 ± 0.18 kg). Birth date and birth weight were significant sources of variation as well. The lambs belonging to fat class 2 were significantly ($P<0.05$) heavier by 1.05 and 1.65 kg at weaning than lambs belonging to fat class 3L and 3H. The lambs classified as 3L and 3H were weaned at similar weights. This study suggests that breed of sire can affect the weaning weights of lambs and this factor should require careful consideration in practical lamb husbandry.

Key words: Breed, terminal sire, weaning weight, fat, conformation.

INTRODUCTION

The northern areas of United Kingdom (UK) comprise of hilly and rough grazing lands. These areas play a vital role in the sheep industry of the UK and Ireland. In Northern Ireland only, approximately 26% of all lambs are produced from hill breed ewes (DARD, 1999). It has been estimated that over 75% of all lambs produced contain some proportion of hill breed genes. Thus, hill breeds and their crosses have a major impact on UK lamb production.

Stratified cross breeding programmes are used in the sheep industry of UK and Ireland. Texel sires have been shown to improve lamb carcass quality (Latif and Owen, 1980; Ellis *et al*., 1997; Carson *et al*., 1999). Within systems of sheep production in UK, choice of terminal sire is one of the main influences on lamb production. However, a number of sire breeds comparisons have been undertaken in the past (Wolf *et al*., 1980; Cameron and Drury, 1985; Kempster *et al*., 1987; Carson *et al*., 1999).

The diversity in the performance traits of sheep may be attributed to several genetic and non-genetic factors. Although any programme of breed improvement is based on the maximum exploitation of genetic variation, yet these traits also vary due to certain environmental factors as well. It is, therefore, important to study such factors, so that the genetic variation among animals can be used to devise effective breeding plans for their improvement. One of the traits of economic importance in sheep is weaning weight. The aim of this study was to compare the weaning weights of Charollais, Suffolk and Texel sired lambs kept under upland grassland conditions in the northeast 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, 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 x Scottish Blackface or Swaledale dams) were compared. Weaning weight records of 1042 crossbred lambs obtained during three years period from 1987 to 1989 were used. In the 1st 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 two 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 1st year, two sires of each breed were used, while during the 2nd and 3rd 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 1st year and 29 ewes in the 2nd and 3rd year each. Only lambs that were born and reared as twins were used in this study.

After the initial mating period, the test rams were removed and the groups combined, with commercial rams being allowed to mate any ewes returning to oestrus. Lambs, which were born more than 140 days after the test rams had been removed, were considered of uncertain pedigree and were not included in the analysis.

Ewe and lamb management was in line with normal commercial procedures for an upland flock. The management of the ewes, and subsequently the ewes with their lambs, was the same throughout, except for the initial division into mating groups. The flock was out-wintered on improved hill grazing and was given *ad-libitum* access to baled silage from approximately mid December each year. Compound feed was introduced approximately 8 weeks before the start of lambing and was offered to a maximum daily rate of 900 grams per ewe. This level of feeding was maintained for about 4 weeks after lambing.

The lambs were selected for slaughter at an equal estimated level of subcutaneous fat cover, equivalent to Meat and Livestock Commission (MLC, 1994) fat classes 2 and 3L. The level of fat cover was assessed by subjective handling of the loin area. The leaner meat on the basis of fat class, the carcass falling into fat classes 2 and 3L fulfill the market demand. Whereas the conformation classes were also equivalent to Meat and Livestock Commission conformation classes E, U, R and O (MLC, 1994).

Statistical analysis

The data from multiple born, twin reared lambs born during 1987, 1988 and 1989 were analysed. The weaning weights of 994 lambs with respect to conformation and fat classes developed by Meat and Livestock Commission (MLC, 1994) were analyzed as well. Data were analysed to determine the effect of year of lambing, breed of sire and sex of lamb on the weaning weight by General Linear Regression, using Genstat V (Payne *et al*., 1987).

RESULTS AND DISCUSSION

Year of lambing

Year of lambing was a significant ($P<0.001$) source of variation for weaning weight of lambs when data were analysed without adjusting and after adjusting for fat class. Mean weaning weights during 1987, 1988 and 1989 were 35.96 ± 0.16, 33.81 ± 0.18 and 36.97 ± 0.22 kg, respectively. The lambs born during 1987 and 1989 were 2.15 and 3.16 kg heavier at weaning than the lambs born during 1988. There was a difference of 1.01 kg between the weaning weights of lambs during 1987 and 1989 ($P\leq0.05$, Table 1).

These results are in agreement with those of More-O'Ferrall and Timon (1977) and Wolf *et al*. (1980). The differences in weaning weight during different years can be attributed to various factors like supply of feeds and fodder, seasonal fluctuations and variation in management.

Breed of sire

The weaning weight of lambs was also significantly affected ($P<0.01$) by the breed of sire. Mean weaning weights of Charollais, Suffolk and Texel lambs were 35.37± 0.18, 35.78 ± 0.18 and 35.16 ± 0.18 kg, respectively. The Suffolk lambs were significantly heavier by 0.62 kg than the Texel lambs at weaning ($P\leq0.05$). The weight of Charollais sired lambs did not vary significantly from Suffolk and Texel sired lambs at weaning (Table 1).

The effect of breed on weaning weights of lambs during different stages from birth to weaning is well documented. The changes in weight from birth to weaning are governed by breed, milk producing ability of the dam, the environment under which lambs are maintained, notably availability of adequate feed supply (Notter and Copenhaver, 1980; Burfening and Kress, 1993; Bathaei and Leroy, 1996).

Results of the present study are different from those of Latif and Owen (1980) but similar to these of More-O'Ferrall and Timon (1977) and Wolf *et al.* (1980). The former workers observed a non-significant difference, whereas the latter ones observed a significant difference, between the weaning weight of the Suffolk and Texel sired lambs. The weaning weight of Charollais sired lambs was comparable to that of Suffolk sired lambs for unadjusted data and was 0.32 kg lighter than the Suffolk sired lambs when adjusted for fat class. Cameron (1988) found a non-significant difference between the weaning weights of Texel and Charollais sired lambs, which is in agreement with the results of the present study.

Effect of sex of the lamb

The results of this study indicated that sex of lambs was a significant (P<0.001) source of variation for weaning weight. The male lambs were significantly (P<0.05) heavier by 0.58 kg than the female lambs (Table 1). This is consistent with the conclusions of O'Riordan and Hanrahan (1992).

Sexual development in the lamb is a general process, beginning early in foetal life, and is controlled by a complex interaction between the hypothalamus, anterior pituitary and gonads. The considerable variation which exists, both between and within breeds of sheep, in the age and body weight can be attributed to both genetic effects and environmental factors, particularly to the nutrition of both sexes (Dyrmundsson, 1987).

Table 1: Effect of year of lambing, breed of sire and sex of lambs on the weaning weight

Factors	Number of lambs	Weaning weight (kg) LSM ± SE
Years		
1987	442	35.96 ± 0.16^{b}
1988	362	33.81 ± 0.18^{c}
1989	238	36.97 ± 0.22^{a}
Breed		
Suffolk	348	35.37 ± 0.18^{ab}
Texel	330	35.78 ± 0.18^{a}
Charollais	364	35.16 ± 0.18^{b}
Sex		
Male	499	35.85 ± 0.22^{a}
Female	543	35.27 ± 0.22^{b}

Column values within a group with different superscripts differ significantly (P≤0.05).

Effect of birth weight

The weaning weight of lambs was significantly (P<0.001) influenced by the birth weight of lambs. It was found that 1 kg advantage at birth was translated into an advantage of 1.95 kg at weaning. McFee (1985) found that birth weight had a significant (P≤0.01) relationship with the weaning weight. The relationship between birth and weaning weight has been considered by many other workers (Notter and Copenhaver, 1980; Burfening and Kress, 1993; Bathaei and Leroy, 1996).

Birth weight, which itself is affected by dam size, dam body condition and litter size, influences the survival rate and pre-weaning growth performance of offsprings, as confirmed by Laes-Fettback and Peters (1995). These workers observed that kids born to relatively heavier does, and those which had heavier birth weight among the multiple born kids, had a better chance of survival. Notter *et al.* (1991) have also reported that birth weight of lambs is greatly influenced by production system, lamb sex, ewe effects and ewe x season interaction. The interpretation of the fact that there was an increase of 1.95 kg in weaning weight for each kg increase in the birth weight involves the knowledge of lamb's breed, nutrition and management of both mother and offspring from birth to weaning, mother's milk yield and competition among the twins, etc.

Effect of fat and conformation classes

Both fat score and conformation class reflect the carcass quality. The current demand in the UK is for leaner carcasses. The lambs having better conformation and fat class that fulfils the market demand fetch a better price and the current demand is for a carcass falling into fat class 2 and 3L and conformation U and R. Most of the major buyers in Britain prefer a leaner carcass of fat classes 1, 2 and 3L (Simm and Steane, 1988). The proportion of fat can influence the commercial value of sheep carcasses (Taylor *et al.*, 1989).

According to British Meat and Livestock Commission (MLC, 1988), the carcass belonging to fat class 2 is leaner (6.0 to 9.9% external fat) than the fat class 3L (10.0 to 11.9% external fat) and 3H (12.0 to 13.9% external fat). In the present study, the fat class significantly affected the weaning weight of lambs, whereas it was not significantly affected by conformation score. The lambs classified as 2 were weaned significantly (P<0.05) at heavier weight by 1.05 and 1.65 kg than lambs classified as 3L and 3H. The lambs classified as 3L and 3H were weaned at similar weights. The least squares means alongwith the standard errors and relevant mean comparisons are presented in the Table 2.

Table 2: Weaning weight of lambs belonging to different fat and conformation classes

Factors	Number of lambs	Weight (kg) LSM ± SE
Fat class		
2	397	36.36 ± 0.20[a]
3L	490	35.04 ± 0.18[b]
3H	107	34.12 ± 0.43[b]
Conformation class		
U	133	35.43 ± 0.36[a]
R	608	35.48 ± 0.15[a]
O	253	35.62 ± 0.27[a]

Column values within a group not followed by a common superscript differ significantly (P≤0.05).

The mean weaning weights with respect to their respective conformation score were 35.43 ± 0.36, 35.48 ± 0.15, and 35.62 ± 0.27 kg for U, R and O, respectively. The comparison of least squares means did not reveal any significant difference between the weaning weights of lambs belonging to different conformation classes (Table 2). Improvement in lamb conformation is important, as it remains the basis of most producer payment systems. Carson *et al*. (1999) reported that the European classification system identified the improvements in carcass lean content associated with increasing the proportion of Dutch Texel genes. In contrast, 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.

Based on the results of the present study, it can be concluded that breed of sire, sex and birth weight of lambs can affect their weaning weights and these factors require careful consideration in practical lamb husbandry. The variation in weaning weights of lambs during different years of lambing reflects the level of management, as well as some environmental effects, on the ewes during rearing.

REFERENCES

Bathaei, S. S. and P. L. Leroy, 1996. Growth and mature weight of Mehraban Iranian fat tailed sheep. Small Ruminant Research, 22: 155-162.

Burfening, P. J. and D. D. Kress, 1993. Direct and maternal effects on birth and weaning weight in sheep. Small Ruminant Research, 10: 153-163.

Cameron, N.D., 1988. Genetic improvement of lean meat production in terminal sire breeds of sheep. PhD Thesis, Univ. Edinburgh, UK.

Cameron, N.D. and D. J. Drury, 1985. Comparison of terminal sire breeds for growth and carcass traits in crossbred lambs. Anim. Prod., 40: 315-322.

Carson, A. F., B. W. Moss, R. W. J. Steen and D. J. Kilpatrick, 1999. Effect of percentage of Texel or Rouge de l'Ouest genes in lambs on carcass characteristics and meat quality. Anim. Sci., 69: 81-92.

DARD, 1999. Statistical review of Northern Ireland agriculture. A Government Statistical Publication, Economics and Statistics Division, UK.

Dyrmundsson, O. R., 1987. Advancement of puberty in male and female sheep. In: New Techniques in Sheep Production, by I. Fayez, M. Marai and J. B. Owen (Eds.) Butterworth, London, UK.

Ellis, M., G.M. Webster, B.G. Merrell and I. Brown, 1997. The influence of terminal sire breed on carcass composition and eating quality of crossbred lambs. Anim. Sci., 64(1): 77-86.

Kempster, A.J., D. Croston, D.R. Guy and D.W. Jones, 1987. Growth and carcass characteristics of crossbred lambs of ten sire breeds compared at the same level of subcutaneous fat proportion. Anim. Prod., 44: 83-98.

Kempster, A.J., D. Croston and D.W. Jones, 1981. Value of conformation as an indicator of sheep carcass composition within and between breeds. Anim. Prod., 33: 39-49.

Laes-Fettback, C. and K. J. Peters, 1995. A comparative study of performance of Egyptian goat breeds. II. Growth performance and productivity. Arch. Tierz., Dummerstorf., 38 (5): 563-575.

Latif, M. G. A. and E. Owen, 1980. A note on the growth performance and carcass composition of Texel and Suffolk sired lambs in an intensive feeding system. Anim. Prod., 30: 311-314.

McFee, L. G., 1985. Factors affecting birth weight, weaning weight and post-weaning average daily gain in ram lambs. MS Thesis, Dept. Anim. Sci., Iowa State Univ. Ames, Iowa, USA.

MLC, 1988. Sheep Yearbook and Sheep Carcass Classification Service, Meat and Livestock Commission, Milton Keynes, UK.

MLC, 1994. Sheep Yearbook. Meat and Livestock Commission, Milton Keynes, UK.

More-O'Ferrall, G.J. and V.M. Timon, 1977. A comparison of eight sire breeds for lamb production. I. Lamb growth and carcass measurements. Irish J. Agri. Res., 16: 267-275.

Notter, D. R. and J.S. Copenhaver, 1980. Performance of Finish Landrace crossbred ewes under accelerated lambing. II. Lamb growth and survival. J. Anim. Sci., 51(5): 1043-1050.

Notter, D.R., R.F. Kelly and F.S. McClaugherty, 1991. Effects of ewe breed and management system on efficiency of lamb production. II. Lamb growth, survival and carcass characteristics. J. Anim. Sci., 69(1): 22-23.

O'Riordan, E.J. and J.P. Hanrahan, 1992. The effects of sex and castration on growth rate and carcass traits of lambs. Irish J. Agri. Food Res., 31: 157-162.

Payne, R.W., P.W. Lane, A.E. Ainsley, K.E. Bicknell, P.G.N. Digby, S.A. Harding, P.K. Leech, H.R. Simpson, A.D. Todd, P.J. Verrier, R.P. Whiter, J.C. Gower, G. Tunnicliffe Wilson and L.J. Paterson, 1987. Genstat V Reference Manual, Oxford Univ. Press, Oxford, UK.

Simm, G. and D.E. Steane, 1988. Genetic improvement of meat production in sheep and cattle: Current industry schemes and future possibilities. Animal breeding opportunities. Occ. Publ. Breed Soc. Anim. Prod. No. 12, pp: 202-220.

Taylor, S.C.S., J.I. Murray and M.L. Thonney, 1989. Breed and sex differences among equally mature sheep and goats. IV. Carcass muscle, fat and bone. Anim. Prod., 49: 385-409.

Worf, B.T., C. Smith and D.I. Sales, 1980. Growth and carcass composition in the crossbred progeny of six terminal sire breeds of sheep. Anim. Prod., 31: 307-313.