FAT DEPOTS DISTRIBUTION IN ADULT CHURRA EWES

P. Frutos, A.R. Mantecón, J.S. González and P.R. Revesado

Estación Agrícola Experimental, C.S.I.C. Apdo 788. 24080 León. (Spain)

Sumary

Most sheep production systems under arid and semi-arid conditions are dependet on the ability of the animals to retain and movilize body fat. The aim of this paper is to study the effect of level of intake and body condition score on the proportions of the different fat depots in the Churra ewes. Thirty six mature Churra ewes were allocated to nine treatments, represented by 3 levels of intake (LI) of a low quality hay (high:"ad libitum", medium: "0.8 ad libitum" and low: "0.6 ad libitum") and 3 body condition scores (BCS) (good:>3, medium:between 2 and 3 and poor:<2). A joint taken from the lumbar region was dissected into muscle, bone, subcutaneous and intermuscular fat. There was a significative positive correlation between internal fat depots, as proportion of empty body weight (EBW), and BCS. The correlation coeficient between BCS and total internal fat (TIF) or mesenteric fat is not high (r=0.605 and r=0.609 respectively). A low correlation coeficient (r=0.433) was founded when BCS and omental fat was related. The results showed that internal fat depots variations are better explained by changes in live body weight (LBW) than BCS.
Keywords: Sheep. Body condition score. Fat depots.

Introduction

To Know the ability of animal to movilize body energy during restriction periods and recovery when increase food offer is important when extensive sheep production systems are going to be developed (Guada,1991), specially under difficult grazing conditions when supplementation is practically imposible.

Live body weight has been used as index of nutritive status of animal, but variations in the digestive tract content had done than different methods to achieve body composition had been developed.

Murray (1919) defined body condition as "the ratio of the amount of fat to the amount of non-fatty matter in the body of the living animal". Russel et al. (1969) showed a subjective technique, adapted from the one described by Jefferies (1961), in which each of six grades, from 0 to 5, is defined in terms of palpable characteristics in the lumbar region.

Body condition score technique was developed thinking in british genotypes which are based in meat production.

Differences in fat depots distribution are showed when different genotypes are compared (Taylor et al., 1989) with a high importance of internal fat against subcutaneous one in most primitive and milking breeds (McClelland et al., 1972; Butter-hogg, 1982 and Webster, 1986),and is hence, the differences between breed must be taken into account before a method of BCS will be generalised.

The objetive of this work is to know how is the fat depots distribution in adult Churra ewes at different body condition scores and levels of hay intake.

Material and Methods

Thirty-six mature Churra ewes were allocated to nine treatments, according to a 3x3 factorial desing represented by 3 levels of intake (LI) of a low quality hay (high:"ad libitum", medium: "0.8 ad libitum" and low: "0.6 ad libitum") and 3 BCS (good:>3, medium:between 2 and 3 and poor:<2).

All animals were individually penned throughout, food offered and refused was weighed daily and live body weight (LBW) was recorded twice weekly. After a period of five weeks on the experimental treatments all ewes were slaugthered and the LBW and the internal fat depots (perirenal, omental and mesenteric) were weighed.

A joint taken from the lumbar region, which is palpated to assess BCS was dissected into muscle, bone, subcutaneous and intermuscular fat.

Statistical analysis according to Steel and Torrie procedures (1981) was carry out.

Results and discusion

Data on initial and final live body weight and hay intake are showed in table 1. Initial LBW was higher for the group of intake 0.6 "ad libitum", and this could explain the higher content in total internal fat as proportion of EBW (see table 2).

There was a significative positive correlation between internal fat depots, as proportion of EBW, and BCS. In the other hand, animals with lower BCS has a lower value of perirenal fat and higher value of mesenteric fat expresed as proportion of total internal fat (TIF). Omental fat, as proportion of TIF was not affected by BCS variations.

In relation to check in BCS method in the Churra ewes, on table 4 is showed than a high correlation exist between BCS and subcutaneous loin fat (r=0.745) and this value is similar to relationship between BCS and perirenal fat (r=0.746). However, the correlation coeficient between BCS and TIF or mesenteric fat was no so high (r=0.605 and r=0.609 respectively). A low correlation coeficient was founded when BCS and omental fat was related and this value could be justified as consequence of a low value of correlation coeficient between subcutaneous loin fat and subcutaneous+intermuscular loin fat against omental fat.

Table 1:Relation of live body weight (kg) and hay intake (kg hay/ kg LBW/ day)

	LEVEL OF INTAKE				BODY CONDITION SCORE				
	ad lib	0.8	0.6	sig	>3	2-3	<2	sig	se
LBW initial	41.936	44.663	45.716	*	48.700	45.108	38.563	***	0.613
LBW final	42.400	43.136	44.266	ns	48.190	43.900	37.745	***	0.680
EBW	31.479	34.329	36.050	**	39.134	34.943	27.882	***	0.513
BCS	2.27	2.36	2.37	ns	3.09	2.35	1.56	***	0.060
Int.(kg/kgLW)	0.0175	0.0129	0.0102	***	0.0133	0.0114	0.0163	***	0.001

ns: no significative; *: P<0.05; **: P<0.01; ***: P<0.001

Table 2.- Total internal fat (TIF) and its components.

	LEVEL OF INTAKE				BODY CONDITION SCORE				
	ad lib	0.8	0.6	sig.	>3	2-3	<2	sig.	se
TIF (EBW)	0.0522	0.0571	0.0761	**	0.0806	0.0649	0.0387	***	0.0053
Perirenal									
EBW	0.0121	0.0129	0.0180	**	0.0198	0.0158	0.0069	***	0.0013
TIF	0.2260	0.2255	0.2349	ns	0.2536	0.2489	0.1799	*	0.0193
Omental									
EBW	0.0216	0.0258	0.0374	*	0.0384	0.0289	0.0171	**	0.0038
TIF	0.4149	0.4137	0.4829	ns	0.4546	0.4325	0.4253	ns	0.0317
Mesentéric									
EBW	0.0185	0.0184	0.0206	ns	0.0223	0.0202	0.0147	*	0.0017
TIF	0.3591	0.3608	0.2823	*	0.2918	0.3186	0.3947	*	0.0243

ns: no significative; *:P<0.05; **:P<0.01;***:P<0.001.

These results differ with data published by Teixeira (1989) and Russel (1969) which showed a higher correlation coeficient between omental and mesenteric fat against BCS. However, differences among genotypes, specially in milking ewes, must be taken into account and both authors have used meat production sheep genotypes and the Churra breed is a traditionaly milk production genotype.

The correlation coeficient of internal fat depots with subcutaneous + intermuscular fat was higher than with subcutaneous fat only.

The subcutaneous loin fat explained a higher proportion of total loin fat (r=0.966).

Table 3.-Disection of lumbar joint. Proportion of muscle, bone, subcutaneous and intermuscular fat

	LEVEL OF INTAKE				BODY CONDITION SCORE				LI-BCS
	ad lib.	0.8	0.6	sig	>3	2-3	>2	sig	sig
Loin (EBW)	0.0151	0.0146	0.0152	ns	0.0156	0.0151	0.0142	ns	ns
Musc.(loin)	0.4871	0.4797	0.5139	ns	0.4777	0.4933	0.5116	ns	ns
Bone.(loin)	0.2832	0.2727	0.2378	ns	0.2283	0.2429	0.3221	***	**
int. fat(loin)	0.0840	0.0920	0.0839	ns	0.0951	0.0901	0.0742	ns	ns
Gr.sub.(loin)	0.0986	0.1145	0.1240	ns	0.1668	0.1131	0.0583	***	**

ns: no significative; *:P<0.05; **:P<0.01; ***:P<0.001

Tabla 4.- Correlation coeficents between BCS, LBW and fat depots.

	BCS	LBW	PER	OM	MES	TIF	INT_L	SUB_L	INT+SUB	CAR
BCS	1.000	0.706	0.746	0.433	0.609	0.605	0.549	0.745	0.751	0.841
LBW	0.706	1.000	0.753	0.624	0.822	0.774	0.458	0.567	0.584	0.810
INT_L	0.549	0.458	0.532	0.393	0.570	0.515	1.000	0.608	0.791	0.556
SUB_L	0.745	0.567	0.662	0.222	0.507	0.432	0.608	1.000	0.966	0.747

PER=perirenal fat, OM=Omental fat, MES=Mesenteric fat, INT_L=Intermuscular fat of the loin, SUB_L=Subcutaneous fat of the loin, and CAR=Carcass fat.

Internal fat depots variations are better explained by changes in LBW than BCS and similar results are reported by Castrillo et al. (1991). This results force to think than BCS method must be checked before aplication to a large scale in different genotypes.

This work was supported for the CICYT (projet GAN 90-0906).

References

Butter-Hogg, B.W. (1982). Fat partitioning in Clun and Southdown lambs. **Anim. Prod.**, 34, 377 (Abstr.)

Castrillo, C. y Baucells, M. (1991).Estimación de la composición corporal del ganado ovino: métodos de difusión. In:Editor: F.F. Bermúdez. Nutrición de rumiantes en zonas áridas y de montaña. Madrid. pp: 137-

Guada, J.A. (1991). "Status" nutritivo y estrategias de alimentación del ganado ovino en régimen extensivo. In: Editor: F.F. Bermúdez. Nutrición de rumiantes en zonas áridas y de montaña. Madrid. pp: 203-

McClelland, T.H. and Russel, J.F. (1972). The distribution of body fat in Scottish blackface and Finnish Landrace lambs. **Anim. Prod.**, 15, 301-306.

Russel, J.F.; Doney, J.M. and Gunn, R.G. (1969). Subjective assessment of body fat in live sheep. **J. Agric. Sci., Cambridge**, 72, 451-454.
Steel, R.G.D. and Torrie, J.H. (1981).Principles and procedures of statistics. Ed: Mc Graw-Hill book company. Inc. New York.
Taylor, St. C. S.; Murray, J.I. and Thonney, M.L. (1989). **Anim. Prod.**, 49, 385-409
Teixeira, A.; Delfa, R. and Colomer, F. (1989). Relationship between fat depots and BCS or tail fatness in the Rasa Aragonesa breed. **Anim. Prod.**, 49, 275-280.
Webster, A.J.F. (1986). Factors affecting the body composition of growing and adult animals. **Proc. Nutr. Soc.**, 45, 45-53