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Effect of Finnsheep crossbreeding on Lamon sheep performance: *in vivo* traits[1]

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Abstract. The objective of this trial was the comparison of the *in vivo* traits of Lamon (L), a local meat breed of the Eastern Italia Alps, and Finnsheep × Lamon (F × L) fattening lambs. Forty-one lambs (25 L and 16 F × L) of both sexes were weaned at 8 weeks of age and fattened for 14 weeks. The diet (11,6 MJ/kg d.m. M.E.) consisted of maize silage *ad lib.*, 200 g/d of dried sugar beet pulp, 150 g/d of soybean meal and 30 g/d supplement. F × L lambs grew slightly more than L lambs (197 *vs* 176 g/d; $P < .1$) during the suckling period but not during the fattening period (207 *vs* 203 g/d; n.s.), reaching a slightly higher slaughter weight (36.9 *vs* 35.5 kg; n.s.). Crossbred lambs consumed, during fattening, slightly more d.m. (75.9 *vs* 73.1 $g \cdot d^{-1} \cdot kg^{-1} \cdot L.W.^{.75}$) and M.E. (.88 *vs* .85 $MJ \cdot d^{-1} \cdot kg^{-1} \cdot L.W.^{.75}$). D.M. conversion was not different (4.24 *vs* 4.16; $P > .1$) while M.E. requirements for growth, estimated assuming a maintenance requirement of .44 $MJ \cdot d^{-1} \cdot kg^{-1} \cdot L.W.^{.75}$, resulted higher (+7 %) for F × L than for L lambs (2.18 *vs* 2.04 $MJ \cdot kgDG \cdot kg^{-1} \cdot L.W.^{.75}$; $P < .1$). The ram-lambs showed superior growth potential and feed efficiency in respect to the ewe-lambs. In conclusion it appears that crossbreeding with Finnsheep is not detrimental to the *in vivo* performance of fattening Lamon lambs except for a slight increase of the energy requirements for growth.

Index words: Finnsheep, Lamon, crossbreeding, fattening performance, growth, feed efficiency

Introduction

Among the Italian sheep breeds, the Lamon (L) breed belongs to the Alpine group. It is characterized by large size (wither height: 80—85 cm for the rams and 70—75 cm for the ewes; live weight: 100—120 and 65—70 kg, respectively for males and females), medium prolificacy (1.2—1.6), high birth weight (singletons 4—6 kg, twins 3—5 kg), good growth potential during suckling (200—250

[1] Reasearch project founded by Regione Veneto.

g/d) and during fattening (from 200 g/d with diet with a moderate energy concentration to 350 g/d with all concentrate diets), low at deposition rate and average muscularity of the carcass (2, 6, 7, 11).

Crossing with Finnsheep (F) has shown to be an effective method of increasing the prolificacy of L ewes, the average value of the crossbred ewes is 2.4 lamb per parturition (3), but concern has been expressed about growth potential, feed efficiency and slaughter traits of crossbred lambs (5).

The objective of this preliminary trial is to compare the *in vivo* performance of purebred L and crossbred F × L lambs.

Material and methods

The trial was carried out at the »Legnaro» Experimental Farm of the Padua University on 41 lambs (singletons) born in January 1987 from L ewes bred to 4 L rams (25 lambs-L) or 4 F rams (16 lambs—F × L); 17 of the lambs were males (9 L and 8 F × L) and 24 were females (16 L and 8 F × L).

The lambs were suckled by their mothers for 57 ± 6 days and had no access to creep feed. During this phase the ewes and lambs were maintained in confinement in an open barn and the ewes' diet consisted of maize silage *ad lib.* plus a limited amount of wheat straw (250 g/d), ensiled brewers grains (1000 g/d), soybean meal (150 g/d) and a vitamin mineral supplement (60 g/d).

At weaning the lambs were placed in wooden cages 1.2 × 1.4 m in a closed barn and offered 200 g/d of dried beet pulps, 150 g/d soybean meal, 30 g/d vitamin-mineral supplement and maize silage *ad lib.* The feedstuffs offered and orts were weighed daily and sampled weekly for chemical analysis (table 1) carried out according to the A.O.A.C. (1) methods.

The metabolizable energy (M.E.) content of the feedstuffs was estimated on the basis of the proximate analysis, and of the digestibility coefficients of feedstuffs obtained at the Experimental Farm (2) by applying the equation of HOFFMANN and SCHIEMANN (8). The M.E. requirement for growth was estimated by subtracting from the M.E. daily intake the maintenance requirement which was assumed to be .44 MJ/kg L.W.$^{.75}$ (10), and was expressed as MJ of M.E. per kg of weight gain per kg of metabolic weight (L.W.$^{.75}$).

The fattening phase ended after 14 weeks with the slaughtering of lambs. The daily gain was calculated on the basis of the fortnightly weighings of the animals.

All experimental data except birth weight were analyzed according to the following linear model (SPSS/PC):

$$Y_{ijk} = \mu + G_i + S_j + GS_{ij} + b(AW_{ijk} - \overline{AW}) + E_{ijk}$$

where:

Y_{ijk} = experimental datum;
μ = general mean;
G_i = fixed effect of the i^{th} genotype (1 = L; 2 = F × L)
S_j = fixed effect of the j^{th} sex (1 = ♂; 2 = ♀)
GS_{ij} = genotype × sex first order interaction;
$b(AW_{ijk} - \overline{AW})$ = covariance with the age at weaning
E_{ijk} = residual (0, σ^2)

As the interaction was never significant, only the adjusted least squares means of the main effects (genotype and sex) in the tables 2 and 3 are reported.

Results and discussion

At birth F × L lambs showed a high live weight, not significantly lower than that of purebred L lambs (table 2).

During suckling F × L lambs grew slightly faster ($P < .1$) than L subject and at weaning they weighed one kg more (n.s. difference). This slight difference was maintained till slaughter because during fattening the growth rate of the two genotypes was very similar (table 2) confirming the results obtained on other maternal sheep breeds (9, 12, 13, 14). It is

Table 1. Chemical analysis of feed used.

		Maize silage	Soybean meal	Dried sugar beet pulp
Samples	No.	7	7	7
Moisture	%	65.4 ± 3.3	11.5 ± .7	11.0 ± .4
Crude Protein	% d.m.	8.6 ± .9	48.4 ± .9	9.3 ± .3
Fat	% d.m.	3.9 ± .6	2.1 ± .1	1.0 ± .1
Crude fibre	% d.m.	29.8 ± 2.0	7.1 ± .2	22.7 ± .3
Ash	% d.m.	4.7 ± .5	7.3 ± 1.0	4.4 ± .1
N-free extract	% d.m.	53.2 ± 2.7	35.1 ± 1.2	62.6 ± .5

Table 2. Live weight and gain.

	Genotype		Sex		r.s.d.
	L	F×L	♂	♀	
Live weight (kg):					
— birth	5.3	5.2	5.7^{B}	5.0^{A}	± .7
— weaning (57 d)	15.4	16.5	17.0^{b}	15.0^{a}	± 2.4
— slaughter (155 d)	35.5	36.9	38.9^{B}	34.0^{A}	± 4.1
Weight gain (g/d):					
— suckling	176^{α}	197^{β}	200^{b}	173^{a}	±38
— fattening	203	207	225^{B}	190^{A}	±32
— average	194	205	213^{B}	188^{A}	±25

α, β: P < .1 a, b: P < .05 A, B: P < .01

Table 3. Feed intake and efficiency during fattening.

	Genotype		Sex		r.s.d.
	L	F×L	♂	♀	
Dry matter:					
— intake (g/d L.W.$^{.75}$)	73.1^{α}	75.9^{β}	73.7	75.2	±2.8
— conversion	4.16	4.24	3.84^{A}	4.47^{B}	± .27
Metabolizable energy					
— intake (KJ/d L.W.$^{.75}$)	850^{α}	881^{β}	855	874	± .03
— growth requirements (KJ/g L.W.$^{.75}$)	2.04^{α}	2.18^{β}	1.84^{A}	2.31^{B}	± .15

α, β: P < .1 A, B: P < .01

also possible to note (figure 1) the rectilinearity, the closeness and the parallelism of the growth curves of the two genotypes, suggesting a high similarity in their growth mechanisms (4).

The superiority of ram-lambs over ewe-lambs in terms of live weight increased with time, as the daily gain of males was constantly higher than that of females (table 2). It is also possible to see that the difference between sexes became progressively greater especially after the 16th week (figure 1) concomitant with an increase in the adipogenesis of the ewe-lambs.

The controls of feed consumption during fattening indicated a slightly higher d.m. and M.E. intake capability (+4 %; P < .1) for the crossbred lambs as compared to the purebreds. The increase in dry matter conversion index (+2 %) was negligible while the increase in the M.E. requirement for growth, assuming that the maintenance requirements

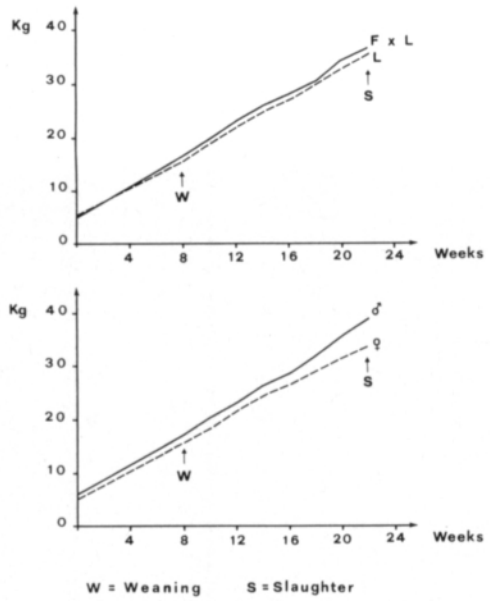

Fig. 1. Growth curves of different genotypes and sexes.

were the same, was slightly higher (+7 %; P < .1). This can be justified by an increase of fat deposition of only a few grams per day (about 10 g/d), which was confirmed at slaughtering and carcass dissection.

As expected, ewe-lambs showed similar intake capability but a lower feed efficiency in respect to the ram-lambs because of their higher growth requirements (+24 %; P < .01) attributable to a higher fat deposition.

Conclusion

The results of the present trial showed only some slight differences between the suckling and fattening performance of the straightbred L lambs and the crossbred ones obtained from F rams.

The positive judgement regarding the meat producing potential of the F crossbreds needs, however, to be sustained by the slaughter, carcass and meat quality evaluations.

Moreover it will be interesting to estimate what is the role of additive genetic, heterotic and maternal effects in determining the good performance furnished by the crossbred lambs. Investigations regarding this topic are now in progress.

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