GROWTH STUDY OF SOPRAVISSANA PUREBRED AND CROSSBRED LAMBS

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Abstracts

The aim is to test the improvement of the morphological development given by meat breeds on Sopravissana lambs (typical Italian breed). The experiment was carried out lambs of the following breeds: on 44 Sopravissana (S), 38 Bergamasca x S (BxS) and 32 Dorset Down x S (DxS), grazed on pasture until 75d and then in box until about 150d. The somatic measures, anatomical joint weight and tissue composition of animals slaughtered at 5 different ages (from 35d with an interval of 30±5d) were recorded. Logistic and Huxley equations to estimate the growth were used.

Generally, the growth was lower in purebred compared to crossbred. DxS was the best genotypes particularly in dorsal regions with a higher asymptotic value (+9%). BxS crossbred was more precocious and it showed flex point in side equation at 156d vs 170d of the others and at 138 vs 161 in fore regions.

The maximum speed of growth for leg (+19%) and for side (+10%) was higher in DxS.

The joint compared to size showed isoauxesis in leg and dorsal regions, b<1 in fore regions and b>1 in abdominal regions in all genotypes.

Key words: lambs, anatomical joint, growth equations.

Introduction

The Sopravissana is a typical ovine breed of central regions of Italy. It is generally used as maternal breed in crossbred with Italian or foreign meat breed (Romita et al 1979). The Sopravissana usually live in semi-extensive breeding and the lambs follow their mother on pasture until the slaughter, which is done very early to satisfy the demand of consumers. However, for the past few years the consumption of mature lambs has been increasing.

The aim of this paper is to test carcass and region growth of Sopravissana purebred and crossbred with Bergamasca and Dorset Down, using logistic equation. Mathematical models allow to condensing the informations contained in a data series into a few parameters with biological meaning that may be compared (Brownet al. 1968). This work is a part of a many years study performed in our Experimental Institute to control the performances of these purebred, crossbred and other tipical italian genotypes at different slaughter ages. The data in vita at slaughter and tissue composition on previous papers were reported (Borghese et al. 1984; Gigli et al. 1984).

Materials and methods

The experiment involved 114 male lambs (44 Sopravissana (S), 38 Bergamasca x S (BxS) and 32 Dorset Down x S (DxS)), grazed on pasture with their mother until 75d and then in box until about 150d fed on ad libitum with a concentrate mixture reported in table 1.

The somatic measures, anatomical joint weight and tissue composition on animal slaughtered at 5 different ages (from 35d with an interval of 30±5d) were recorded.(ASPA 1991)

Negative exponential growth curve were used (Nelder 1961): $Y=A(1-\exp(k-cx))^{-1}$; where Y = dependent variables (liveweight, weight of side, shoulder and neck, dorsal region, abdominal regions and leg weight); X = time (in day); A= asymptotic value of the weight when age approaches infinity and it indicates the average weight of the mature sheep; k = additive coefficient of time; c = moltiplicative coefficient of time.

Table 1 Composition of concentrate mixture

Dried beet pulp	50%
Maize grain	20%
Soybean meal	17%
Dehydrated alfalfa	10%
Vitaminic mineral mixture	3%
Crude fibre	14%
Crude protein	11.4%
ME(Mcal/kg)	2.25

The co-ordinates of flex point of logistic curve and the maximum value of speed were calculated too.

Furthermore, the growth speeds of the different joints compared to size were determined using Huxley equation ($Y=aX^b$) (Huxley 1972). The Marquard method with Nlin procedure of SAS statistic package was used to determinate the coefficients of non linear curve (SAS 1985). Convergence was assumed when the difference in residual sums of squares between the i^{th} -1 and i^{th} iteration relative to the iteration $+10^{-6}$ was $<10^{-8}$. Means were compared by a t-test using the error variance of the analyse of variance of the linear model as reported by Bathaei and Leroy (1996), while the b coefficient of Huxley equation was determined transforming it in a linear equation tanks the use of logarithm ($\log Y=\log a+b\log X$).

Results and discussion

The model used fitted well on independent variable trend, in fact we find high R^2 values (from 95% to 99%).

Generally, the growth was lower in purebred compared with crossbred, particularly with DxS genotype (table 2). This genotype in fact showed the highest asymptotic values in live weight (+6% vs BxS and +4% vs S), side (+8% vs BxS and +5% vs S), dorsal and abdominal regions (about 9% vs the other genotypes), while, both crossbred (BxS and DxS) showed a higher mature weight of leg compared to purebred. Similar asymptotic value for liveweight was found by Bathaei and Leroy (1996) in Mehraban sheeps using Brody's model (71.03), even if Brown (1968) asserted that logistic equation underestimate mature weight.

Additive coefficients of time (k) were significantly different in side with minimum value in BxS and maximum in S (1.858 vs 2.020), in fore regions (thoracic limb and neck), with similar trend (1.661 vs 1.867) and in leg, where it had the lower value in S. There were not significant differences in c coefficients in the considered parameters.

The flex point X co-ordinate (time) derives by k and c coefficients (table 3), therefore it had similar trend as k. The point of inflection occurs when the estimated growth rate changes from an increasing to decreasing function (Brown et al 1968) and in this period the animal reaches the sexual maturity.

The weight at this time (Y co-ordinate of flex point) is half of asymptotic weight (y=A/2).

The three genotypes reached the flex point of liveweight curve at same age (142d in the average), while the side and the joins developed them in different times, even if they all arrived at plateau around 2 years of age as reported by Näsholm and Dannell (1990). Side (156.22 vs 170.11 d in flex point) and fore regions (138.42 vs 161.08) showed a development more rapid in BxS genotype compared to the others, while the lowest values of X co-ordinate in flex point was in S for leg weight parameter.

The genotypes DxS, therefore showed more backward development in carcass components and more daily gain (growth speed) with 0.277 kg/d as maximum value in liveweight (table3).

Considerable differences in growth speed were noticed in leg (+19% of DxS vs other genotypes) and in abdominal regions (+12%). Furthermore, the DxS genotype in side exceeded about +10% than S and + 6.5% than BxS.

Using Huxley equation, significant difference of b coefficient did not notice among the genotypes. All animals had b<1 for fore regions and b>1 for abdominal regions (table 3), remaining regions showed isoauxesis according to the trend observed in other species.

Conclusion

Using the mathematical model is been possible to define the growth and carcass development of three different genotypes. These informations could be used to plan a right production system attending in the different growth time of animals to favour the particular region development. The obtained results allow to choose the optimum time for slaughtered the animals obtaining carcasses with good qualitative characteristics. The crossbred, generally improve the animal performances, particularly the DxS is suitable to heavy carcasses production, while the BxS is more precocious and it is right to produce light carcasses.

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Table 2 Logistic curve coefficients of liveweight, side and regions.

	Liveweight			Side		
	S	BxS	DxS	S	BxS	DxS
A±a.s.d	72.413±19.556 ab	70.857±9.144 b	75.468±9.502 a	21.217±6.765 b	20.529±7.076 c	22.329±7.232 a
k±a.s.d	2.021±0.164	1.961±0.069	2.068±0.071	2.020±0.623 a	1.859±0.245 b	1.973±0.232 ab
c±a.s.d	0.0138±0.0010	0.0140±0.0008	0.0147±0.0007	0.0114±0.0007	0.0119±0.0007	0.0121±0.0006
MSE	11.007	6.135	5.011	0.824	0.468	0.416
	Leg			Fore regions		
A±a.s.d	6.025±1.654 b	6.437±1.889 a	6.326±3.116 a	5.506±2.533 ab	5.163±1.312 b	5.686±1.599 a
k±a.s.d	1.685±0.186 b	1.809±0.204 ab	1.860±0.514 a	1.863±0.481 a	1.661±0.163b	1.770±0.192 ab
c±a.s.d	0.0116±0.0007	0.0110±0.0007	0.0108±0.0008	0.0110±0.0009	0.0120±0.0008	0.0116±0.0007
MSE	0.0390	0.0378	0.0649	0.0641	0.0374	0.0331
	Dorsal regions			Abdominal regions		
A±a.s.d	5.195±3.407b	5.360±2.472 b	5.837±2.809 a	3.862±2.079 b	3.984±2.086 b	4.315±2.805 a
k±a.s.d	2.086±0.509	2.059±0.344	2.064±0.362	2.317±0.860	2.289±0.618	2.297±0.489
c±a.s.d	0.0123±0.0007	0.0131±0.0007	0.0120±0.0006	0.0133±0.0008	0.0131±0.0007	0.0135±0.0009
MSE	0.0466	0.0373	0.0375	0.0413	0.0277	0.0335

Note: 1) a.s.d.= asymptotic standard deviation of mathematics model coefficients ($Y=a(1-\exp(b-cX))^{-1}$.
2)different letters mean significant differences for $p<0.05$;

Table 3 Evaluation of flex point speed and coefficient b of Huxley equation.

	X of Flex point (day)			Maximum speed (kg/d)			b
	S	BxS	DxS	S	BxS	DxS	
Liveweight	146.40	140.07	140.68	0.250	0.248	0.277	–
Side	177.19	156.22	163.06	0.0605	0.0611	0.0675	–
Leg	145.26	164.45	172.22	0.0175	0.0177	0.0217	0.929
fore regions	169.36	138.42	152.58	0.0151	0.0155	0.0165	0.832 *
Dorsal regions	169.59	170.16	172.00	0.0160	0.0176	0.0175	1.023
Abdominal regions	174.21	174.73	170.15	0.0128	0.0130	0.0146	1.254*

* different by 1