CREATION BY CROSSBREEDING OF A NEW MEAT BREED WITH QUALITIES COMPARABLE TO SPECIALIZED BREEDS IN THE WORLD

A.-G. Vartic[1,2]*, P.-G. Vicovan[2], R. Răducu[2], C.-I. Neacsu[2], C.-Z. Zamfir[2], A. Enciu[2], A. Nicolescu[2], O.-C. Dordescu[2], C. Pascal[1]

[1]*Faculty of Food and Animal Sciences, Iasi University of Life Sciences, Romania*
[2]*Research and Development Institute for sheep and goat breeding Palas-Constanta, Romania*

Abstract

The research was carried out at Research and Development Institute for sheep and goat breeding (RDISGB) Palas Constanta by creating meat hybrids obtained from crossing the Rouge de L'Ouest and Texel breeds with the Prolific Palas breed. Morpho-productive and breeding indices were determined in hybrids compared to the Prolific Palas breed. The hybrid sheep of the two crossbreeding variants (F_1 Rouge de L'Ouest x Prolific Palas breed and F_1 Texel x Prolific Palas Breed) had less prolificacy than the Prolific Palas breed, but the performance of rearing, feed conversion and carcass quality had higher values in hybrid lambs. The average daily weight gain for hybrid lambs subjected to fattening was 302.47 ± 8.4981g for the Rouge de L'Ouest x Prolific Palas breed and 304.78 ± 13. 0869 g for the Texel x Prolific breed. Lambs of the Prolific Palas Breed had a weight gain of 235.47 ± 9.412 7g, with very significant differences from statistical point of view (P<0.001) compared to hybrid lambs. Also, the two crossbreeding variants had significantly better values for feed conversion, indices expressing the amount of meat in the carcass (Muscularity Index of Thigh), slaughter yield and classification of carcasses in quality classes by conformation. The obtained data clearly showed the superiority of F_1 hybrids with Rouge de L'Ouest and Texel breeds compared to the Prolific Palas breed in terms of daily gain, muscularity of carcasses, slaughter yield and quality of carcasses classified according to the EUROP grid.

Key words: *sheep, meat, new breed*

INTRODUCTION

Fattened lamb is an important product of sheep production in most developed countries. It is the subject of a wide international trade while being appreciated and demanded by consumers in the producing countries.

It is known that lamb's performance at slaughter weight varies with genotype, sex, age and fattening condition (Martynuk et al. 2001). By combining and simple crossing of 2 breeds, heavier lambs can be obtained at slaughter due to the manifestation of heterosis (Zupp, 2003).

The transformations that have taken place in sheep breeding in the last three decades and the alignment of policy in the field at the European level have highlighted the good suitability of native breeds for crossing with specialized breeds for meat, a field in which Romania, as a country located in the first places in terms of sheep herds, can contribute substantially to the supply of the domestic and foreign market with this product. The improvement of sheep meat production is dependent on the improvement of the reproductive capacity of the breeds so as to obtain a higher number of lambs/calving in a complex crossbreeding system that also includes meat breeds. The formation and approval of the new Prolific Palas breed can be the starting point for the application of a complex system of crossing with specialized breeds for meat, being able to achieve the priority objective of increasing this production in Romania.

Given that considerations and special results regarding the request for breeders from the Palas Meat Breed, we intend to continue research for the creation of a new breed of sheep specialized for meat, using the Prolific Palas Breed (Vicovan et al. 2020) and breeds imported Rouge de L'Ouest and Texel.

MATERIAL AND METHOD

The research was carried out at R.D.I.S.G.B. Palas Constanta, some meat hybrids by crossing Rouge de L'Ouest and Texel with the Prolific Palas breed. Thus, generation F_1 obtained hybrids between the Prolific Palas breed and the two specialized meat breeds determining morphoproductive indices and reproductive in hybrids compared to the Prolific breed.

The conducted researches aimed at determining the indices (fecundity, prolificacy) and testing the growth and fattening performance of the lambs obtained in the two crossing variants, compared to the maternal breed (Prolific Palas breed).

The fattening of the three batches of lambs (20 heads/ batch) was done with a combined feed that ensured a protein level of 16% DP and an energy level of 2570 kcal ME. The compound feed was administered at discretion together with 300g alfalfa hay /head/day.

It was established the daily ingestion of feed and nutrients, the growth intensity during fattening and the results of experimental slaughter.

Two slaughter yields were determined (Tafta, 2008; Vicovan et al. 2014)

$$\text{Yield } R_1 = \frac{\text{Cooled weight carcass (kg)}}{\text{Living weight (kg/head)}} \times 100$$

$$\text{Yield } R2 = \frac{\text{Cooled weight carcass (kg)}}{\text{Empty live weight (kg / head)}^*} \times 100$$

* Empty live weight – the live weight from which the gastrointestinal mass was subtracted

Calculated: thigh muscularity index, using the following formula (Laville et al. 2002):

$$\text{M.I.C.} = \frac{\text{Weight of thigh muscles (kg)}}{\text{Femur lenght (cm)}} \times 100$$

All data on morpho-productive and reproductive traits indices were processed using variant analysis and statistically interpreted. The Fisher test was used to analyze the significance of the differences. (Snedecor D.W., 1965)

RESULTS AND DISCUSSIONS
Reproductive indices

The obtained values for fecundity and prolificacy are presented in Table 1.

Table 1. Reproductive indices achieved

Breed / Hybrid	Mounted ewes Heads (primiparous)	Lambing ewes Heads (primiparous)	Fecundity %	Prolificacy %
F_1 Rouge de L'Ouest x Prolific	75	72	96	138.89
F_1 Texel X Prolific Palas Breed	59	56	94.92	128.57
Prolific Breed Palas	80	79	98.75	150.0

Ewes F_1 Rouge de L'Ouest x Prolific Palas Breed at the first lambing had the fecundity 96% and the prolificacy 138.89% and the F_1 Texel x Prolific fecundity was 94.92% and prolificacy 128.57%. From the obtained data it turned out that there were significant differences between the three genotypes, of prolificacy, its value being lower by 8% in F_1 Rouge de L'Ouest x Prolific Palas Breed compared to the Prolific Palas Breed and with 16.67% in Texel x Prolific Palas Breed hybrids (Table 2). There is also information that hybrid sheep of the two breeds Rouge de L'Ouest and Texel had higher prolific value compared to Texel but lower than Rouge de L'Ouest (Carson et al. 2016).

Regarding the Prolific Palas Breed, a new Romanian breed approved in 2020, had significantly higher prolificacy compared to the sheep of the two crossbreeding variants.

Table 2. The difference of prolificacy between the realized genotypes

Genotype	Difference between genotypes		
	Percentage points	%	Significance
F_1 Rouge de L'Ouest x Prolific Palas Breed	- 11.11	-8	$p < 0.05$
F_1 Texel x Prolific Palas Breed	- 21.43	- 16.67	$p < 0.05$

The growth performance of the lambs from the experimental groups was tested after their intensive fattening. The speed of their growth is shown in Table 3.

Table 3. Growth rate in weight for hybrid variants compared to the maternal breed

Hybrid	Average daily gain by weight (g / head)	Differences between hybrids and prolific breed	
		± g	± %
F_1 Rouge de L'Ouest x Prolific Palas Breed	302.47 ± 8.4981	+ 67	+ 28.45 $p < 0.001$ (FS)
F_1 Texel x Prolific Palas Breed	304.78 ± 13.0869	+ 69.31	+ 29.43 $p < 0.001$ (FS)
Prolific Palas Breed	235.47 ± 9.4127	-	-

The obtained results reveal that the hybrid lambs from both crossing variants achieved average daily weight gain increases significantly higher than the Prolific Palas Breed, their value being of 302.47g at F_1 hybrids the Rouge de L'Ouest breed and 304.78g in hybrids with Texel, while the daily average gain of lambs of the Prolific Palas Breed was 235.47g. The obtained data highlight the beneficial effect of the two meat breeds on the growth intensity. There is scientific information that shows that crosses between breeds are significantly influenced by biosynthetic processes that are manifested by increased activity of mitochondria, more intense metabolic processes and greater activity of enzymes. Thus, experimental studies of the group of Russian authors (Sanikov el al. 1981) reveal that the activity of the aspartate-aminotransferase enzyme in hybrid lambs was higher on average by 16.4%. The conclusion issued by these authors is that there is a direct link between the level of activity of the two enzymes and the average daily growth rate of lambs.

The feeding of the three experimental batches was done with combined feed that provided a protein level of 16% DP and an energy level of 2570 kcal EM. Following the determination of the daily intake of feed and nutrients, the efficiency of feed conversion into growth gain was determined, the data obtained being presented in Table 4.

Table 4. Feed conversion efficiency by establishing the growth boost achieved at ingesta 1kg SU

Breed / Hybrid	Growth achieved at ingesta 1kg DM (g)	Difference between batches		
		± g	± %	significance
F_1 Rouge de L'Ouest x Prolific Breed Palas	237	+52	+28.11	$p < 0.05$ (significantly)
F_1 Texel X Prolific Breed Palas	234.5	+49.5	+26.76	$p < 0.05$ (significant)
Between lots hybrids	185	+2.5	+1.07	$p > 0.05$ (NS)

The obtained data showed that the lambs of the two crossing variants achieved a better feed conversion efficiency compared to the lambs of the Prolific Palas Breed. Thus, at the ingesta of one kg of DM hybrid lambs deposited an increase of 234.5g and 237g while lambs of the Prolific Palas Breed deposited 185 g, the differences being statistically significant in favor of hybrids.

After the fattening was completed, Experimental slaughter was carried out, 3 lambs from each batch, determining the thigh muscularity index (M.I.T), slaughter yield and classification of carcasses in the European classification grid (EUROP).

The M.I.T. values that give indications on the muscularity cover of the hind train and influence the meat production within the carcass are shown in Table 5.

Table 5. The value of the thigh muscularity index (M.I.T.)

Breed / Hybrid	MIT	Difference between genotypes and significance		Variants compared
	$X \pm s_x$	$\pm$ UM	$\pm$ %	
Prolific Palas Breed (v.1)	0.510 ± 0.0199	-	-	-
F_1 Rouge de L'Ouest x Prolific Palas Breed (v.2)	0.683 ± 0.2344	-0.173	- 33.92 p< 0.001	1 and 2
F_1 Texel x Prolific Palas Breed (v.3)	0.655 ± 0.2169	+0.145	- 28.43 p< 0.001	1 and 3

The obtained results show that lambs from the two variants of hybrids had clearly superior values for the thigh muscularity index, which was 0.510 to 0.0199 for the Prolific Palas Breed and higher by 33.92 % for hybrids with Rouge the L'Ouest (0.683 ± 0.2344) and with 28.43%, you have high in hybrids with the Texel breed (0.655 0.2168). The differences between the maternal breed and the hybrids obtained were very statistically significant. Two values were determined for slaughter yield, the results being observed in Table 6.

Table 6. Slaughter yield in hybrid lambs compared to Prolific Palas Breed

Breed / Hybrid	Yield 1	Yield 2	Difference from the Prolific Palas breed	
			percentage points	$\pm$ %
F_1 Rouge de L'Ouest x Prolific Palas Breed	47.10±0.4452	54.16±0.3055	-0.2	-0.42 p > 0.05
F_1 Texel x Prolific Palas Breed	49.84±0.6360	56.80±1.3631	+2.54	+5.37 p < 0.05
Prolific Breed Palas	47.30±0.8203	53.89±0.8899	-	-

The two values for slaughter yield had significantly higher values than the Prolific Palas Breed (P<0.05) only in Texel x hybrids Prolific Palas Breed, namely R_1 - 49.84 % and R_2 - 56.80 % vs. 47.30 % (R_1) and 53.89 % (R_2) to the maternal race. Values obtained in F_1 Rouge de L'Ouest x Prolific Palas Breed were similar to the maternal race, with no statistically significant differences.

The classification of carcasses by EUROP grid is given in Table 7. From the table it follows that in hybrids F_1 Rouge de L'Ouest x Prolific Palas Breed 33 % of carcass were in Class E (excellent carcasses) and 67% were in Class U (very good carcasses). The F_1 Texel x Prolific Palas Breed 50% of the carcasses were in class E (excellent carcasses) and 50% were classified in Class U (very good carcasses), while in the Prolific Palas breed, all carcasses were classified in class R (good carcasses).

Table 7. Classification of carcasses by EUROP grid

Breed / Hybrid	Carcasses of classes (%)		
	E	U	R
F_1 Rouge de L'Ouest x Prolific Palas Breed	33	67	-
F_1Texel x Prolific Palas Breed	50	50	-
Prolific Palas Breed	-	-	100

CONCLUSIONS

Summarizing the preliminary results obtained in the direction of creating precursors of a new Romanian meat sheep breed, it can be concluded that the two studied hybrid variants have achieved growth intensities, a conversion of feed into growth increase and conformation of carcasses that allow them to be classified in higher quality classes. Research should be continued to determine other carcass quality indices and the existing ratio between muscle-adipose and bone tissues.

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REFERENCES

1. Carson A. F., McClinton L. W, Steent R. W. J., (2016). Effect of Texel or Rouge L'Ouest genesin lowland ewes and rams on ewe proliferation, lambs viability and weaned lamb output https://www.cambridge.org/core/journals/animal-science/article/abs/effects-of-texel-or-rouge-de-louest-genes-in-lowland-ewes-and-rams-on-ewe-prolificacy-lamb-viability-and-weaned-lamb-output/D1F30C953336C6FC8AB5E0AD2322F2C8

2. Laville E., Bouix J., Sayd T., Eychenne F., Marcq Leroy P. L., Bibi Horizonte B., (2002). LA conformation Bouch vaticre des agneaux. Etude d'apr horizontals la variabilit portugalgen horizontique entre races, INRA production animals, no.15, pp. 53-66

3. Martynuk E., Olech W., Klewrec I. (2001). Body weight assesed slaughter performance in Olkuska sheep lambs. Arch.Tierzucht 44, pp.374-384

4. Sanikov M. I., Kazanovsky S. A. (1981). Biohemics osnovi heterozisa U ovec. Naucnije trudi Vashil, 210-218

5. Snedecor G.W. (1965)- Statistical Methods applied to Experiment in Agriculture and Biology, Iowa, USA. The Iowa State University Press.

6. Tafta V., (2008). Sheep and goat breeding, Ed.Ceres, Bucharest;

7. Vicovan P.G. et al., (2014). Hybridization programs to increase meat production in goats, Ed.Europolis, Constanta;

8. Vicovan P. G. et al. (2020). Approval of Prolific Palas Breed (unpublished material submitted to ANZ for approval)

9. Zupp W. (2003). Realize slaughter lambs for the market by crossbreeding. Arch. Tierzucht 46, pp 78-83