RESEARCH ON THE SLAUGHTER PERFORMANCE OF THE THREE BREED CROSS MEAT LAMBS COMPARED TO PALAS MERINO CONTEMPORARIES

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Abstract

The aim of the research is to test the fattening performance of the three breed cross meat hybrids compared to Palas Merino contemporaries.

The research was performed at Research and Development Institute for Sheep and Goat Breeding- Palas, Constanța on three breed cross meat hybrids compared to the control group consisting of 20 Palas Merino lambs, which were subjected to intensive fattening for 73 days. The compactness and muscularity index of the gigot, the muscularity index of the thigh, as well as the yields at slaughter were calculated.

The following results were obtained:

- *Three breed cross meat lambs have a significantly higher growth and weight gain in fattening than their Palas Merino contemporaries.*
- *Energy and protein consumption of the hybrids were significantly lower compared to Palas Merino lambs.*
- *Slaughter yields (Y_1 and Y_2) were significantly higher in the three breed cross meat hybrids compared to contemporaries in the control group.*
- *The carcasses of the hybrids were entirely in U_2 class (very good, slight fat cover carcass) compared to the carcasses of Palas Merino, which were classified in class R_2 (good, slight fat cover carcass).*

The research clearly demonstrates the superiority of the three breed cross meat lambs over Palas Merino lambs.

Key words: sheep, hybrids, Palas Merino, meat, yield

INTRODUCTION

Sheep farming is one of the important activities at national level. A concern in recent years is to increase production, especially in the direction of producing high quality carcasses.

Sheep farms can be made more efficient by producing and fattening three breed cross meat hybrids, which perform significantly better than Palas Merino lambs [7],[9].

MATERIAL AND METHOD OF WORK

The works were performed at R.D.I.S.G.B. Palas - Constanța on 20 three breed cross meat hybrids male lambs for meat (Romanov x Merino x Breed for meat - Palas) compared to the control group consisting of 20 Palas Merino lambs [1],[3],[5],[7].

Batches of lambs were subjected to intensive fattening for 73 days, using granulated compound feed with a content of 88% dry matter, 2570 Kcal and 160 g Digestible Protein per kilogram [2].

Throughout the fattening period (73 days) the lambs consumed on average, per day, 1.16 kg of granulated compound feed [7].

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After the end of the fattening, the lambs were weighed individually and body measurements were performed on 3 lambs from each variant [3].

The measurements were performed with the zoometer, the compass and the tailor's ribbon. The width at the coxofemural joints, the perimeter and the length of the gigot were measured in centimeters, calculating the compactness index of the gigot and the muscular index of the gigot, all these being closely related to muscle development and meat production [2],[4],[8].

The compactness index of the gigot was calculated according to Laville's formula:

$$\text{C.I.G.} = \frac{\text{Width of coxofemural joints}}{\text{Length of gigot}} \times 100$$

The muscularity index of the hind leg was calculated according to the formula of G.P. Vicovan - 2014 (unpublished data):

$$\text{M.I.G.} = \frac{\text{Perimeter of gigot}}{\text{Length of gigot}} \times 100$$

After weighing the lambs, 3 lambs were chosen with body weights similar to the average of the group, then being weighed and sacrificed after a 24-hour diet. The hot carcasses were weighed and refrigerated at a temperature of +2 - + 4°C for 24 hours. The next day, the carcasses were weighed individually and sectioned on the median line, using a metal rod inserted into the medullary canal and a chopper.

The right halves of the carcass were weighed and measured, and then sectioned into three regions: the gigot, the forelimb and the rest of the carcass [9]. Each part was carefully dissected, separating the fat (intermuscular and covering) from the muscles and bones. The tissues thus separated were weighed and the data operated in the experiment book.

The following measurements were made: the length of the carcass on the dorsal side with the ribbon between the base of the neck and the base of the tail; shoulder width with the compass between the back joints and the humerus; the width of the pelvis with the compass between the coxofemural joints; the length of the gigot on the inner side between the ischio-pubic symphysis and the middle of the tibio-metatarsal joint and the perimeter of the gigot with the ribbon around the hind leg passing over the buttocks and the knee joint [6],[8].

The thigh muscularity index was calculated according to Purchas' formula, quoted by Laville:

$$\text{T.M.I.} = \frac{\sqrt{\frac{G}{L}}}{L} \text{ where:}$$

G = weight in grams of the thigh muscles;
L = length of the femur in cm.

The areas of the sections of the Longissimus Dorsi muscle on the last rib and of the thigh in the middle of the femur were also measured in cm^2 copying on tracing paper the contour of the respective surfaces [9].

The surfaces were established on the computer using the Auto-CAD program.

Two yields at slaughter were determined, namely:

$$\text{Yield 1} = \frac{\text{Weight of cooled carcass (kg)}}{\text{Living weight (kg)}} \times 100$$

$$\text{Yield 2} = \frac{\text{Weight of cooled carcass (kg)}}{\text{Empty living weight (kg)}*} \times 100$$

* Empty living weight = live weight from which the contents of the digestive tract have been subtracted

The tissue structure of the carcasses (%) consisting of muscle, fat, bones was established.

The classification of carcasses was made according to the European classification grid – EUROP [2].

All data were statistically processed, and the Fisher test (analysis of variance) was used to interpret the differences between batches [6],[8]

RESULTS AND DISCUSSIONS

Weight gain

Following statistical data processing is found that at the beginning of the fattening, the average body weight was 28.65 kg/head and at the end of the fattening, the body weight was 43.15 kg/ head. (Table 1)

Throughout the fattening period, the lambs achieved an average daily growth gain in grams of 198.7 grams.

Table 1 Weight gain in three breed cross meat hybrids subjected to intensive fattening

Specification	Body weight (kg/head)						Average daily gain (g / head)		
	At the beginning of fattening			At the end of the fattening					
	n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%
Three breed cross meat hybrids	20	28.65 ± 0.7890	8.8	20	43.15 ± 0.7890	8.8	20	198.70 ± 6.9301	15.60

Note: Duration of fattening - 73 days

Following statistical data processing is found that during the period of intensive fattening, Palas Merino lambs achieved a weight gain of 173.35 g/head and feed day. (Table 2)

Table 2 Weight gain in Palas Merino lambs subjected to intensive fattening

Specification	Body weight (kg/head)						Average daily gain (g / head)		
	At the beginning of fattening			At the end of the fattening					
	n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%
Palas Merino lambs	20	28.09 ± 0.09073	14.44	20	40.75 ± 1.1984	13.15	20	173.35 ± 9.4728	24.44

Note: Duration of fattening - 73 days

Following statistical data processing is found that in terms of average daily weight gain, the difference between hybrids and Palas Merino is 25.35 grams (14.62%) in favor of hybrids, which is statistically significant. (Table 3)

Table 3 Differentiation of weight gain in three cross breed meat hybrids compared to the Palas Merino

Differences between hybrids and Palas Merino		The significance of the differences
The average daily gain in them		
± g/head	± %	
+ 25.35	+ 14.62	p <0.05 - significant

Fodder consumption

Following statistical data processing is found that the fodder consumption - hybrids and Palas Merino lambs had the same daily consumption of compound fodder (1.16 kg/head), but when calculating the efficiency of fodder conversion into grams of growth increase per kilogram of dry matter ingested, the hybrids achieve 195 grams increase growth compared to 170 grams in Palas Merino lambs.(Table 4)

Table 4 Hybrid fodder consumption compared to Palas Merino

No.	Specification	Combined feed consumption (kg)		Daily dry matter intake (g / head)	Intake of DM percentage of live weight	Fodder conversion efficiency (growth increase g / kg DM)
		On a daily basis on batch	On head and fed day			
1.	Three cross breed meat hybrids	23.13	1.16	1020	2.36	195
2.	Palas Merino	23.13	1.16	1020	2.50	170

The difference between the batches and its significance are observed in table 5 - for an equal daily intake of DM, hybrids achieve an increase in weight gain for 1 kg of ingested dry matter by 25 grams (14.7%) compared to Palas Merino lambs.

Table 5 Differentiation of daily DM intake expressed as a percentage of live weight and the efficiency of conversion of ingested fodder by genotype

Specification	± Differences				
	Daily DM intake		DM intake expressed as a percentage of live weight (±percentage points)	Efficiency of ingested fodder conversion	
	g/head	%		± grams increase per kg DM ingested	± %
Hybrids compared to Palas Merino	0.0	0.0	- 0.14	+ 25	+ 14.70

The researches demonstrates that at an equal consumption of metabolizable energy expressed in Kcal, per head and fed day, the hybrids consume for 1 kg weight gain 15009 Kcal compared to 17193 Kcal in Palas Merino lambs.

Also, the hybrids achieve 1 kg increase in growth with 952 grams of protein compared to 1070 grams in Palas Merino lambs (Table 6), so they consume 12.7% less metabolizable energy and 11.03% less digestible protein (Table 7).

Table 6 Specific consumption of three cross bread hybrids compared to Palas Merino

No.	Specification	Specific consumption					
		Metabolized energy (Kcal)			Digestible raw protein (g)		
		Total period per head	On head and fed day	For 1 kg increase in weight gain	Total period per head	On head and fed day	For 1 kg increase in weight gain
1.	Three cross breed hybrids	217613	2981.2	15009	13548.80	185.60	952
2.	Palas Merino	217613	2981.2	17193	13537.12	185.44	1070

Table 7 Differentiation of specific consumption in hybrids compared to Palas Merino lambs

Specification	± Differences			
	Metabolizable energy consumption for 1 kg increase		DRP consumption for 1 kg increase	
	Kcal	%	grams	%
Hybrids compared to the Palas Merino	-2184	-12.70	-118	-11.03

Body measurements and constitutional indices

The main body measurements and constitutional indices on the live animal that reflect the development of the muscles on which meat production depends were performed and the results are: in hybrids the compactness index of the gigot has the value 103.45 compared to 78.75 in Merino lambs, and the muscularity index of the gigot has the value 285.30 compared to 217.87 in Palas Merino (Table 8).

Table 8 Constitutional measurements and indices on the live animal with reference to the development of the rear train

No.	Specification	Three breed cross hybrids			Palas Merino lambs		
		n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%
1.	The width at coxofemural joint (cm)	3	23.33±0.6667	4.95	3	19.67±0.3333	2.94
2.	Perimeter of gigot (cm)	3	62.67±1.2019	3.32	3	54.33±0.5774	5.92
3.	Length of gigot (cm)	3	22.00±0.5773	4.55	3	25.00±0.5773	4.00
4.	Compactness Index of gigot (C.I.G.)	3	103.45±8.3789	14.03	3	78.75±2.3053	5.07
5.	Muscle Index of gigot (M.I.G.)	3	285.30±10.0418	6.10	3	217.87±11.9614	9.51

The differences between the two genotypes and their significance were calculated (Table 9): in hybrids, the compactness index of the gigot has a value higher by 24.7 units compared to the Palas Merino, the difference being significant; the muscularity index of the gigot is higher in the three cross breed meat hybrids by 67.43 units than that of the lambs of Palas Merino breed, the difference being very statistically significant.

Table 9 Differentiation of constitutional indices established on the live animal

Specification	Differences for constitutional indices			
	compactness index of gigot		The muscularity index of the gigot	
	± compactness units	Significance	± units of muscularity	Significance
Hybrids compared to the Palas Merino	+ 24.7	p < 0.05	+ 67.43	p < 0.001

Yield at slaughter

In regard to our researches, the following results were observed (Table 10): the hybrids have the yield 1 at slaughter has the value 47.10% compared to only 42.40% in Merino lambs, and yield 2 has the value 53.24% compared to the yield of Palas Merino lambs, which is 48.10%.

Table 10 Yield on slaughter in three cross breed hybrid lambs compared to the Palas Merino

No.	Specification	Breed / Hybrid					
		Three cross breed hybrids			Palas Merino		
		n	$\overline{X}$ ±s$_{\bar{x}}$	V%	n	$\overline{X}$ ±s$_{\bar{x}}$	V%
1.	Live weight before slaughter (kg / head)	3	42.03 ± 2.7523	11.34	3	43.93 ± 1.6384	6.46
2.	Empty live weight (kg / head)	3	37.19 ± 2.7784	12.94	3	38.77 ± 1.6506	7.37
3.	Cold carcass weight (kg / head)	3	19.83 ± 1.6685	14.58	3	18.64 ± 0.7882	7.34
4.	Yield 1 (%)	3	47.10 ± 1.2800	4.71	3	42.40 ± 0.3100	1.25
5.	Yield 2 (%)	3	53.24 ± 0.8400	2.73	3	48.10 ± 0.060	0.21

Note: Empty live weight is the body weight from which the contents of the digestive tract were subtracted

The differences between the two genotypes, which show that in hybrids the yield 1 is 4.7 percentage points higher and the yield 2 is 5.14 percentage points higher than the Palas Merino, both differences being statistically significant (Table 11).

Table 11 Differentiation of slaughter yield in fattened lambs

No.	Specification	Differences between hybrids and Merino Palas (± Percentage points)	
		Yield 1	Yield 2
1.	Hybrids compared to Palas Merino	+ 4.70	+ 5.14
2.	The significance of the differences	p < 0.05	p < 0.001

Thigh muscle strength index

As results of the research, in hybrids the index has the value of 0.5633 compared to 0.4784 in Palas Merino lambs (Table 12).

Table 12 Thigh muscle index (TMI) values in fattened lambs

Specification	Thigh muscle weight (g)			Femur length (cm)			Thigh Muscle Index (TMI)		
	n	$\overline{X}$ ±s$_{\overline{x}}$	V%	n	$\overline{X}$ ±s$_{\overline{x}}$	V%	n	$\overline{X}$ ±s$_{\overline{x}}$	V%
Palas Merino	3	1213.33 ± 133.4583	19.05	3	17.40 ± 0.5859	5.83	3	0.478 ± 0.0182	6.59
Three breed cross hybrids	3	1446.67 ± 93.378	11.18	3	16.57 ± 0.1667	1.74	3	0.5633 ± 0.0143	4.40

The difference between the two genotypes is observed in table 13- the index of the hybrids is 17.75% higher than Palas Merino lambs, the difference being distinctly statistically significant.

Table 13 Differentiation of the thigh muscle index (TMI)in hybrids compared to Merino Palas

Thigh Muscle Index (TMI)	
Differences between hybrids and Palas Merino (±%)	The significance of the difference
+ 17.75	p < 0.01

Areas of sections

The areas of the Longissimus Dorsi muscle and thigh sections were calculated and the results are in favor for hybrids: the area of the Longissimus Dorsi muscle section is 26.8% larger in hybrids than the area of the Merino section and the area of the thigh section in hybrids is 25.9% larger than the Palas Merino, the difference being a significant one (Table 14).

Table 14 Areas of sections of Longissimus Dorsi and thigh muscle

No	Specifica-tion	Area of sections		Differences between hybrids and Merino		Statistical Significance	
		Longissimus	Thigh	Longissimus	Thigh	Longissimus	Thigh
		cm^2	cm^2				
1.	Three breedcross hybrids	17.21	141.21	+ 3.64 (+ 26.8%)	+ 29.02 (+25.9%)	p > 0.05 insignificant	p < 0.05 significant
2.	Palas Merino	13.57	112.19				

Tissue structure of carcasses

The half-carcasses of the hybrids are composed (gravimetrically) of more muscles by 1.9 percentage points, less fat by 0.68 points and less bones by 1.17 percentage points compared to the half-carcasses of Palas Merino lambs (Table 14A).

Table 14 A Tissue structure of carcasses in hybrids compared to Palas Merino

Specification	Tissue structure (%)		Differences between hybrids and Palas Merino ± percentage points
	Three cross breed hybrids	Palas Merino	
Total half-carcass of which:	100.00	100.00	-
Muscle	59.96	58.06	+ 1.90
Fat	16.14	16.82	- 0.68
Bones	23.92	25.09	- 1.17

Classification of carcasses

We notice that all the carcasses of the hybrids by conformation are of class U (very good carcasses) and according to the degree of fattening they fall into the class 2 (thin carcasses). Palas Merino lamb carcasses fall into class R (good carcasses) according to conformation, and according to the degree of fattening they are of class 2 (thin carcasses). The results are observed in table 15.

Table 15 Classification of carcases according to the EUROP grid

Specification		Race / Hybrid			
		Three cross breed meat hybrids		Palas Merino	
		Number of carcasses	%	Number of carcasses	%
Class by conformation	E	-	-	-	-
	U	3	100	-	-
	R	-	-	3	100
	O	-	-	-	-
	P	-	-	-	-
Class by degree of fattening	1	-	-	-	-
	2	3	100	3	100
	3	-	-	-	-
	4	-	-	-	-
	5	-	-	-	-
Total		3	100	3	100

CONCLUSIONS

The following conclusions can be observed from the data presented:

1. In three cross breed meat hybrids, the weight gain during fattening is significantly higher compared to Palas Merino lambs.

2. Hybrids have a significantly lower energy and protein consumption for a kilogram of weight gain than the Palas Merino, the hybrids achieving a weight gain of 14.7% higher for the intake of one kilogram of dry matter.

3. In hybrids, the compactness index of the gigot and the index of muscularity of the gigot(on which the meat production depends) have significantly higher values compared to the values of the indices in Palas Merino.

3. In hybrids, both yields at slaughter (Y_1 and Y_2) have significantly higher values than those of the Palas Merino.

5. The index of thigh muscularity (TMI) in hybrids has significantly higher values compared to the Palas Merino.

6. The carcasses of the hybrids are all in the U class$_2$ (very good, thin carcasses), and the carcasses of Palas Merino lambs fall into class R$_2$ (good, thin carcasses).

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