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RESEARCH ON THE EFFECT OF CROSSBREEDING PROLIFIC PALAS EWES WITH PALAS MEAT RAMS COMPARED TO PALAS MERINO BREED ON QUANTITATIVE AND QUALITATIVE MEAT PRODUCTION IN MALE LAMB FATTENING

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Abstract

The research was carried out within the Research and Development Institute for Sheep and Goat Breeding (R.D.I.S.G.B) Palas - Constanta and aimed at testing the fattening performances of meat crossbreeds (Prolific Palas breed x Meat Palas breed) compared to contemporaries from the Palas Merino breed. The two batches were fattened intensively for a period of 73 days, using granulated fodder with a content of 88% dry matter, 2570 Kcal and 160g digestible protein/kg during fattening. The final body weight was higher by 5.89%, and the average daily gain achieved during the entire fattening period was 14.62% higher in meat crossbreeds compared to contemporaries from the Merino Palas breed. The specific consumption of nutrients was lower in the group of meat crossbreeds that consumed 12.75% less Kcal metabolized energy and respectively 11.03% less protein compared to Merino de Palas lambs. The slaughter yield was higher by 4.7 percentage points in the meat hybrid group. The tissue composition of the carcass was characterized by a higher content in muscle by 1.9 percentage points and lower in bones by 1.22 percentage points in the meat hybrid group compared to contemporaries from the Palas Merino breed. The carcasses of the crossbreeds fell entirely into the U_2 class (very good, low-fat carcasses) compared to those of the Palas Merino lambs which were classified into the R_2 class (good, low-fat carcasses). Researches have demonstrated the superiority of crossbred meat lambs compared to contemporaries from the Palas Merino breed).

Key words*: crossbreeds, Palas Merino, sheep, yield.*

INTRODUCTION

The diversity of productions obtained through the exploitation of sheep constituted and constitutes a particularly important advantage of this species. This led to the increase of sheep herds, in certain areas of the world, pursuing specialization for certain productions, increasing the volume but also the value of the productions made per head of exploited sheep, the level of productions being determined by the breed of sheep and the system of growth used. Romanian research in the field of animal husbandry, over time, has been concerned with increasing meat production in local sheep breeds, because the adaptation and breeding of specialized sheep for meat from other countries have not yielded results in our country, causing many losses through mortality, and decreasing significantly fertility and birth rate. The solution to improve meat production in local Romanian sheep breeds is the creation of F1 and R1 crossbreeds in the direction of this production, using local and improved breeds, created in other countries, and also benefiting from the effects of the heterosis phenomenon, which represents the increase in the productivity of hybrid organisms in the first F1 generation compared to the parental forms. Sheep breeding is one of the important activities of animal husbandry, which ensures the need for high-quality proteins used in human nutrition. In order to improve the carcasses obtained from the sheep species, the best solution is the crossbreeding of local breeds with specialized breeds, this determines the quantitative and qualitative improvement of meat production and implicitly, an increase in the economic

efficiency of sheep farms. In the current economic situation, the raising and exploitation of sheep must be oriented towards the realization of productions based on market requirements, aiming at the same time, the creation of lines and breeds of sheep with pronounced skills for these productions, as well as the obtaining of superior quality carcasses, in accordance with EUROP grid (Fahmy, 1995).
In developed countries (England, France, Australia, New Zealand, etc.) for the profitability of sheep farms, the most used method is that of industrial crossings to obtain first-generation crossbreeds with superior quality carcasses. (Casas et al., 2004; Fathala et al., 2014; Jakubec et al., 1977; Ciobanu et al., 2023; Nechifor et al., 2022; Pascal et al., 2023).

MATERIALS AND METHODS

The research was carried out within R.D.I.S.G.B. Palas - Constanța, on two batches of 20 heads each, as follows: Batch 1: mixed meat males (Prolific breed Palas x Meat breed Palas) Batch 2: Palas Merino males. Within the two batches, their growth performances were tested in the fattening process, determining the increase in weight, the consumption of nutrients as well as the quality of the obtained carcasses. For fattening the lambs, granulated mixed feed with an energy content of 2570 Kcal/kg, 16% crude protein, 3.5% crude fat and 8.5% crude cellulose was used. The length of the growing and fattening period was 73 days; the administered food was weighed daily and the leftovers after a period of 2-3 days, after which the average consumption of feed and nutrients per head and day as well as the specific consumption of nutrients obtained during the present experiment was calculated. The animals were kept in collective boxes, previously subjected to the disinfection process and ensuring a surface of 0.85 m^2 per head in both batches. Drinking water was provided at discretion, in watering troughs and before the start of the experience the lambs were subjected to the deworming process. After the end of fattening, 3 animals were chosen from each batch with body weights similar to the average of the batch, later being weighed and sacrificed after a 24-hour diet. Weighed the warm carcasses, which were refrigerated at temperatures of 2-4°Celsius, for 24 hours. The following day, the carcasses were weighed individually, sectioned on the median line, proceeding to be cut into regions (the jig, the front limb and the rest of the carcass). Each region was carefully dissected, separating muscle from fat (intermuscular and covering and bone). Slaughter yields were determined:

$$\text{Yield } 1 = \frac{\text{Cooled carcass weight (kg)}}{\text{Live weight (kg/head)}}\ x\ 100$$

$$Yield\ 2 = \frac{\text{Chilled Carcass Weight (kg)}}{\text{Empty Live Weight} *\ \text{(kg/head)}}\ x\ 100$$

*Empty live weight from which the gastrointestinal mass has been subtracted. (Pădeanu, 2000; Vicovan, 1980).
The tissue composition (%) of the carcasses consisting of muscle, fat and bone was determined.
The carcasses were classified according to the European classification grid (Czeslawa et al., 2001). All data were processed statistically, and the Fischer test (analysis of variance) was used to interpret the differences between the groups (Laville et al., 2002; Snedecor, 1968).
The solution to improve the quality of meat production in Romanian sheep breeds is the creation of F1 and R1 crossbreeds for this production, using local breeds and improved breeds, the latter being created in other countries, this causing the phenomenon of heterosis, which increases the vigor of hybrid organisms in the first F1 generation, compared to the parental forms (Stanford et al., 1998; Pascal et al., 2022).
Body measurements performed on live animals were performed with zoometer, compass and tape as follows:
- Width at the coxofemoral joints, measured with the compass between the coxofemoral joints;
- The perimeter of the jig, measured with a tape, passing over the knee joint and the buttock point;
- The length of the jig, measured with the ribbon well stretched on the inner side of the right hind limb, between the ischiopubic symphysis and the middle of the tibio-metatarsal joint.
Based on the body dimensions, the following body and constitution indices were calculated:
- Gigot compactness index according to the formula (Laville et al., 2002):

$$C.I.G = \frac{\text{Width of coxofemural joints}}{\text{Length of gigot}} x100$$

Muscularity index of the gigot (Vicovan et al., 2010)

$$M.I.G = \frac{\text{Perimeter of the gigot}}{\text{Lenght of gigot}} x100$$

RESULTS AND DISCUSSIONS

The body weight of the two batches at the beginning of fattening showed close values, respectively 28.09-28.65 kg (Table 1).

Table 1. Evolution of body weight and average daily gain in lambs subjected to intensive fattening

Spec	Nr.	Initial Body Weight (kg)		Final Body Weight (kg)		Average Daily Gain (g)	
		$\bar{x} \pm s_{\bar{x}}$	V%	$\bar{x} \pm s_{\bar{x}}$	V%	$\bar{x} \pm s_{\bar{x}}$	V%
Meat crossbreeds lambs	20	28.65 ± 0.79	12.33	43.15 ± 1.26	13.06	198.70 ± 5.21	11.73
Palas Merino lambs	20	28.09 ± 0.65	10.35	40.75 ± 1.20	13.17	173.35 ± 4.92	12.69

SUMMARY			
Groups	*Count*	*Sum*	*Average*
2	20	3467	173.35
1	20	3974	198.7
ANOVA			
Source of Variation	*F*	*P-value*	*F crit*
Between Groups	4053.377696	3.17	4.098171731
Within Groups			
Total	6486.4702	39	

At the beginning of the experiment, the body weights were between 28.09 kg for lambs from the Palas Merino breed and 28.65 kg for the group of mixed meat lambs, the groups being homogeneous and similar in terms of age, sex and body weight. At the end of the intensive fattening period (73) days, the body weights were between 40.75 kg and 43.15 kg, being higher in meat hybrids by 5.89% compared to the batch of contemporary Palas Merino lambs. The average daily gain achieved in the two batches was 173.35- 198.70 g, being 14.62% higher in the batch with mixed meats, the differences being significant ($p < 0.05$). The statistical analysis was calculated with the help of the ANOVA program, which ensures the statistical processing of the data from the experiments carried out, while at the same time, with the help of the aforementioned program, a correct interpretation of the results obtained within the experiments is followed. The p value is extremely small (3.17) which indicates that there is a significant difference between the groups. So, the null hypothesis that there are no differences between the groups can be rejected. This interpretation is reinforced by the fact that the F value (4053.377696) is much higher than the F crit (4.098171731). The data obtained in the present experiment agree with those obtained by crossing sheep from the Transylvanian Merino breed with rams from the Suffolk, Merinofleisch and Berrichon du Cher breeds (Pascal, 1997). Thus, from their study, it is found that the groups subjected to fattening recorded relatively similar increases in growth (Table 2).

Table 2. Results obtained during the fattening of crossbreeds and purebred lambs (Maier, cited by Pascal, 2007)

Variant	Initial Body Weight (kg)	Final Body Weight (kg)	Average Daily Gain (g)
	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$
Suffolk x Transylvanian Merino	18.011 ± 0.97	43.117 ± 1.80	209 ± 8.92
Merinofleisch x Lowland Transylvanian Merino	15.864 ± 0.53	41.382 ± 1.04	212 ± 7.81
Berrichon du Cher x Lowland Transylvanian Merino	15.864 ± 0.53	41.342 ± 1.04	212 ± 7.81
Lowland Transylvanian Merino	18.305 ± 0.35	42.147 ± 0.76	198 ± 6.08

It can be seen that the four groups achieved close weight gains. It should be noted that the crossbreed lambs resulting from crossing the Transylvanian Merino with the Merinofleisch and Berrichon du Cher breeds achieved the highest daily average gain, being 1.43% higher than the Suffolk x Transylvanian Merino variant and 7.07% higher compared to the daily average obtained by fattening the Transylvanian Merino breed.

The daily average feed consumption per head and day was identical (1.16 kg/head) in the two groups studied, while the daily intake of dry matter was identical in the two groups studied, respectively 1020 g D.M./head.

Table 3. Feed consumption and nutrients in crossbred meat lambs (Prolific Palas breed x Palas Meat breed) compared to Merino de Palas lambs

Specification	Combined Feed Consumption (kg/head)		Daily Dry Matter Intake (g/head)	Dry Matter Intake (% of live weight)	Feed Conversion Efficiency (growth increment g/kg DM)
	Per lot daily	Per head per day feeding			
Crossbred meat Lambs	23.13	1.16	1020	2.36	195
Palas Merino Lambs	23.13	1.16	1020	2.50	170

If we report the intake of D.M. in terms of body weight, this is 2.36% in the meat crossbred batch and 2.50% in the batch of Palas Merino lambs, being higher in the latter by 5.93%. Regarding the efficiency of feed conversion, this was 195 g increase in growth in meat crossbreeds and 170 g in lambs from the Palas Merino breed, being superior to the first by 14.71% (Table 3).
The specific consumption of nutrients in the two batches is presented in Table 4.

Table 4. Feed consumption and nutrients in crossbred meat lambs (Prolific Palas breed x Palas Meat breed) compared to Merino de Palas lambs

Specification	Specific Consumption					
	Metabolized Energy (Kcal)			Digestible Crude Protein (g)		
	Total period per head	Per head per day feeding	Per 1 kg weight gain	Total period per head	Per head per day feeding	Per 1 kg weight gain
Crossbred Meat Lambs	217613	2981.2	15009	13548.80	185.60	952
Palas Merino Lambs	217613	2981.2	17193	13537.12	185.44	1070

In order to achieve 1 kg increase in live weight, 15,009 Kcal of metabolizable energy was consumed in the group of meat crossbreds and 17,193 Kcal of metabolizable energy in the group of Palas Merino lambs, being 12.70% lower in the crossbred meat group. The specific consumption of digestible crude protein per 1 kg of live body weight was between 952 g in the group of mixed meat lambs and 1070 g in the group of Palas Merino lambs, being higher in the latter by 12.39%.
After finishing the fattening period, the main indices of body conformation and constitution of the animals from the two batches under study were determined (Table 5).

Table 5. Body measurements and body indices on the live animal related to the development of the rear train, depending on the genotype

Nr. crt	Specification	Genotype	
		Crossbred lamb batch (Prolific breed x Palas Meat breed)	Merino Palas lamb batch
		$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$
1	Coxofemoral joint width (cm)	22.55 ± 2.05	21.98 ± 1.14
2	Perimeter of the gigot (cm)	56.33 ± 3.92	56.03 ± 3.56
3	Length of gigot (cm)	26.85 ± 2.07	26.75 ± 2.21
4	Compactness index of the gigot (C.I.G.)	83.99 ± 6.73	82.17 ± 6.23
5	Muscularity index of the gigot (M.I.G.)	209.80 ± 8.98	209.00 ± 8.62

From the data obtained in Table 5, it follows that the body dimensions are different, depending on the group studied. Thus, in the two batches the width of the carcasses showed dimensions between 21.98 ± 1.14 cm and 22.55 ± 2.05 cm at the coxo-femoral joints, the perimeter of the jig was between 56.03 ± 3.56 cm and 56.33 ± 3.92 cm, while the jig had a length between 26.75 ± 2.21 cm and 26.85 ± 2.07 cm, being higher in the meat crossbred group by 0.37-2.59%.
The compactness index of the jig was between 82.17 ± 6.23% and 83.99 ± 6.73%, and the muscularity index of the jig showed values between 209.00 ± 8.62% and 209.80 ± 8.89%, the values obtained being superior in both indices to the lot of meat crossbreeds (Prolific Palas breed x Palas Meat breed) compared to contemporaries from the Palas Merino breed.
The live weight at the experimental control slaughters was between 42.03 kg (the group of meat crossbreeds) and 43.93 kg (the group of Palas Merino lambs) as shown in Table 6. The empty weight was 37.19 kg for the group of meat mestizos and 38.77 kg for the batch of lambs from the Palas Merino breed. The weight of the cooled carcass presented values between 18.64 kg (lambs from the Palas Merino breed) and 19.43 kg (crossbred lambs), the values obtained being superior to the latter by 4.24%. Yield 1 at slaughter was between 42.40 and 47.10%, while the yield 2 at slaughter was between 48.10% and 53.24%.

Table 6. Slaughter yield in crossbred meat lambs (Palas Prolific breed x Palas Meat breed) compared to Palas Merino lambs

Specification	Units	Crossbred Lambs			Palas Merino Lambs		
		n	$\bar{x} \pm s_{\bar{x}}$	V%	n	$\bar{x} \pm s_{\bar{x}}$	V%
Live Weight	kg	3	42.03 ± 2.75	11.34	3	43.93 ± 1.64	6.46
Empty Body Weight	kg	3	37.19 ± 2.78	12.94	3	38.77 ± 1.65	7.37
Chilled Carcass Weight	kg	3	19.43 ± 1.67	14.58	3	18.64 ± 0.79	7.34
Yield 1	%	3	47.10 ± 1.28	4.71	3	42.40 ± 1.25	5.11
Yield 2	%	3	53.24 ± 1.32	4.29	3	48.10 ± 1.12	4.03

There is a superiority Yield 1 at slaughter in meat hybrids by 4.7 percentage points compared to Palas Merino lambs, the differences being significant ($p < 0.05$).

The slaughter yield 2 was between 48.10% and 53.24%, higher by 5.14 percentage points in the meat crossbreeds, the differences being significant ($p < 0.05$).

The tissue composition of the carcasses reveals that the meat crossbreeds had more muscle, by 1.9 percentage points, compared to the Palas Merino lambs (Table 7).

Table 7. The tissue composition of carcasses in meat crossbreeds (Palas Prolific breed x Palas Meat breed), compared to Palas Merino breed

Specification	Tissue Composition (%)		Differences between Crossbred Lambs and Merino Palas ± percentage points
	Crossbred Meat Lambs	Palas Merino Lambs	
Total, of which:	100	100	
Muscle	59.96	58.06	+ 1.9
Fat	16.14	16.82	- 0.68
Bone	23.90	25.12	- 1.22

Also, compared to lambs from the Palas Merino breed, the meat crossbreds had less fat and bones respectively in the carcass, with 0.68 and 1.22 percentage points, respectively.

The tissue composition of the carcass in the two groups was characterized by the following values: muscle 58.06-59.96%, fat 16.14-16.82% and bones 23.90-25.12%.

Table 8 presents the classification of the carcasses resulting from the intensive fattening of the two batches studied.

Table 8. The tissue composition of carcasses in meat crossbreeds (Palas Prolific breed x Palas Meat breed), compared to Palas Merino

Specification		Breed			
		Crossbred Meat lambs		Palas Merino lambs	
		Nr. of carcasses	%	Nr. of carcasses	%
Conformation Class	E	-	-	-	-
	U	3	100	-	-
	R	-	-	3	100
	O	-	-	-	-
	P	-	-	-	-
Fatness class	1	-	-	-	-
	2	3	100	3	100
	3	-	-	-	-
	4	-	-	-	-
	5	-	-	-	-
Total		3	100	3	100

It is observed that all the carcasses of the meat crossbreeds (Prolific Palas breed x Palas Meat breed), according to conformation, are of class U (very good carcasses), and according to the stage of fattening, they fall into class 2 (low-fat carcasses). The carcasses of contemporaries from the Palas Merino breed fall into class R (good carcasses), and according to the stage of fattening they are of class 2 (low-fat carcasses).

CONCLUSIONS

Following the intensive fattening of crossbred meat lambs (the Prolific Palas breed x Palas Meat breed) and those from the Palas Merino breed, the following conclusions were drawn:

The body weight at the beginning of the fattening period was between 40.75 kg and 43.15 kg, being higher by 5.89% in the batch of crossbred meat lambs (Prolific Palas breed x Palas Meat breed).

The daily average gain recorded was 173.35-198.70 g, the batch of crossbred meat lambs achieving a 14.62% higher gain compared to the Palas Merino lambs.

The combined average feed consumption per head and per day presented identical values (1.16 kg) in the two batches.

For 1 kg of D.M. ingested, crossbred meat lambs achieved a 195 g increase in growth compared to 170 g in Palas Merino lambs, the increase being higher in crossbred lambs by 14.71%. The specific consumption of nutrients was lower in the group of crossbreeds who consumed 12.70% more Kcal of metabolizable energy and

respectively 11.03% less protein compared to contemporaries from the Merino Palas breed.
The slaughter yield 1 was between 42.4-47.10%, being higher for meat hybrids by 4.7 percentage points.
The slaughter yield 2 was 53.24% in the meat crossbreeds and 48.10% in the batch of Palas Merino lambs, the difference of 5.14 percentage points being a significant one.
The tissue composition of the carcass was characterized by the following values: muscle: 58.06-59.96%; fat: 16.14-16.82%; bones: 23.90-25.15%.
The meat hybrids had more muscle in the carcass by 1.9 percentage points, and fewer bones, by 1.22 percentage points compared to the batch from the Palas Merino breed.
The carcasses of the crossbreeds fell into the U2 class (very good, low-fat carcasses) and the carcasses of the contemporaries from the Palas Merino breed fell into the R2 class (good, low-fat carcasses).
By determining the main indices of conformation and constitution of the males belonging to the two groups under study, higher values are obtained in the crossbred meat group compared to the lambs from the Palas Merino group.

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