

Researches Regarding Slaughtering Output and Carcass Characteristics at Crossbreeds F1 Romanov x Palas Merino and F1 Prolific Breed-Palas x Palas Merino

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Abstract: At the Institute of Palas in 2016 as a result of crossbreeding of two prolific breeds, Romanov and the Breed with High Prolificacy - Palas with Merino of Palas two hybrids with high prolificacy (hybrid 1 and hybrid 2) resulted. They have been verified comparatively to Merino of Palas regarding the slaughtering output and the particularities of the carcass. So, the slaughtering output at the hybrids and at the Merino of Palas was between the limits of 45,71-48,46%, between genotypes not being significant differences. Regarding the indicators of the carcass there were significant differences only regarding the indicator of muscularity of the thigh (IMC) which had significantly bigger values ($p < 0,05$) at the two hybrids comparatively to Merino of Palas. Regarding the tissue structure of the carcasses resulted at the hybrid 2 (F1 Prolific Breed of Palas x Merino of Palas) the rate of muscles in the carcass was significantly smaller and the rate of fat in the carcass was significantly bigger comparatively to Merino of Palas. In conclusion it can be said that the hybrid 2 (F1 Prolific Breed of Palas x Merino of Palas) has good carcasses (R class) but fat (class 4), by EUROP grid; hybrid 1 (F1 Romanov x Merino of Palas) has good carcasses (R) in proportion of two thirds and good enough (O) in proportion of one third, the carcasses being thin (class 2) but Merino of Palas has totally good carcasses (R) and fairly fat (class 3).

Keywords: hybrid, slaughtering output, tissue structure, carcass indicator

1. Introduction

In the autumn of the year 2015 the institute of Palas crossed the Romanov breed (rams) with Merino of Palas (ewes) and the Breed with High Prolificacy - Palas (rams) (non-homologated) with Merino of Palas (ewes) with the purpose to obtain F1 hybrid ewes with high prolificacy and three-breed hybrid lambs of meat. In 2016 the F1 males were fattened were intensively fattened besides the witness lot of Merino of Palas until the average weight of 40 kg, after that from each variant there were slaughtered 3 exemplary each to establish the slaughtering output and the particularities of the carcass. Before slaughtering the lambs were shorn.

2. Material and Method

After slaughtering, the carcasses were cooled for 24 hours at the temperature of +2, +4°C.

• **The slaughtering output** was determined according to the formula:

$$\text{Output1} = \frac{\text{Cooled carcass weight}}{\text{Living weight}} \times 100$$

$$\text{Output2} = \frac{\text{Cooled carcass weight}}{\text{Empty living weight}} \times 100$$

Empty Living Weight = Living Weight from which the content of the digestive tube was reduced (pre-stomachs, glandular stomach, intestines).

• Carcass Indicators

$$\text{IC} = \frac{l}{K} \times 100$$

$$\text{IJ} = \frac{F}{L} \times 100$$

$$\text{IMC} = \frac{\sqrt{\frac{G}{L}}}{L}$$

NOTE:

IC = Indicator of the compactness of the carcass.

IJ = Indicator of compactness of gigot.

IMC = Indicator of the compactness of the thigh (by the Purchas' formula quoted by Laville [4].

Where:

l – Width at the coxo-femur articulations, measured with the compass.

K – Length of the carcass measured with the tailoring ribbon on the back of the carcass from the base of the neck to the base of tail.

F – Length of the gigot measured with the tailoring ribbon on the internal part of the mutton's leg

G – Weight of the thigh's muscles.

L – Length of the femur.

After V. Gheție and co-authors [3] the thigh's muscles are: *m.rectus femoris*; *m.vastus lateralis*; *m.vastus medialis*; *m.vastus intermedius*; *m.vastus profundis* ;

m. adductor minor, *m. adductor major*; *m. pectineus*; *m. sartorius*; *m. semimembranaceus*; *m. semitendineus*; *m. gracilis*; *m. biceps femoris*.

• Cutting up the carcasses

The cooled carcasses were sectioned on the median line in two equal halves, all determinations being done on the right half. The gigot was separated from the carcass through the section between the articulation of the sacrum and the 6th lumbar vertebra (L6). The scapula was detached from the muscular insertion of thorax. The rest of the carcass is made of: neck with the bone base of the 7 vertebra; thorax with the bone base of the 13 thorax vertebra together with the 13 ribs and the stern bone; the lumbar zone with the bone base of the 6 lumbar vertebra, all covered with muscles. It also from the rest of the carcass also the abdomen muscles are included.

• Tissue structure of the carcasses

After the cutting up of the semi-carcasses in the three pieces, they were dissected, separating the muscles, fat (of coverage and inter-muscular) and the bones. Each tissue was weighed on electronic balance with a precision of ±5 g) establishing the tissue structure.

• Diameters and areas of sections

There were measured with the sliding callipers the big diameter and the small diameter of *m. Longissimus Dorsi* at

the level of the section between the thorax vertebra 12 and 13. Also, on the tracing paper it was copied the contour of the section of the *m. Longissimus Dorsi* for establishing the area of the section. It was sectioned the thigh at the half of the femur, perpendicular on its axe. On the tracing paper it was copied the contour of the thigh section (without the area of the femur section).

The determination of areas it was done on the computer through AutoCAD programme.

• Classification of carcasses

It was done after EUROP grid.

All obtained data were processed and statistically interpreted by Fisher test.

• Abbreviations

Hybrid 1 – F1 Romanov x Merino of Palas

Hybrid 2 – F1 Prolific Breed Palas x Merino of Palas

R1 – Slaughtering output - 1

R2 – Slaughtering output – 2

MP – Merino of Palas

3. Results and Discussions

In table 1 it is presented the slaughtering output at the hybrids comparatively to the Merino of Palas.

Table 1: Slaughtering output at the F1 hybrids besides Merino of Palas

No	Hybrid, Breed	R1			R2		
		n	X ± sx	V%	n	X ± sx	V%
1.	Hybrid 1	3	46,88±0,4080	1,51	3	52,32±0,7800	2,60
2.	Hybrid 2	3	48,46±0,9800	3,49	3	52,97±1,6200	5,28
3.	Merino of Palas	3	45,71±0,9400	3,55	3	51,19±0,7400	2,49

From the table it can be noted that R1 was of 46,88% at the hybrid 1 comparatively to hybrid 2 at which R1 had the value of 48,46% and with Merino of Palas at which R1 was 45,71%. R2 was between 51,19-52,97%.

Regarding Merino of Palas, similar data were found by Ciolcă N. [1] and Vicovan G. [5]. Czesława Lipecka and al. [2] have almost similar results for the hybrids obtained from crossbreeding the breed of Polish Lowland (ewes) with Romanov breed (rams).

The hybrids had the slaughtering output (R1) of 48,54%, the thickness of superficial fat being of 2,38 mm and the carcasses being of U and R classes by conformation and the 2nd class by the fattening degree. The differences between genotypes regarding the slaughtering output are presented in table 2.

Table 2: Differentiation of slaughtering output

No.	Specification	Differences between hybrids and MP		Significance of differences	
		R1	R2	Output1	Output2
		± per cent points	± per cent points		
1.	Between hybrid 1 and MP	+ 1,17	+ 1,13	p > 0,05	p > 0,05
2.	Between hybrid 2 and MP	+ 2,75	+ 1,78	p > 0,05	p > 0,05
3.	Between hybrid 1 and hybrid 2	- 1,58	- 0,65	p > 0,05	p > 0,05

From the table it results that there are not significant differences regarding R1 and R2 between hybrid 1 and Merino of Palas and between hybrid 2 and Merino of Palas, nor between hybrid 1 and hybrid 2. In table 3 there are presented the carcass indicators at hybrids comparatively to Merino of Palas.

Table 3: The carcass indicators at hybrids comparatively to Merino of Palas

No.	Specification	Determined values at:								
		Hybrid 1			Hybrid 2			Merino of Palas		
		n	X±sx	V%	n	X±sx	V%	n	X±sx	V%
1.	Indicator of the compactness of the carcass (IC)	3	0,30 ± 0,0066	3,80	3	0,29 ± 0,0069	4,16	3	0,30 ± 0,0079	2,62
2.	Indicator of the compactness of gigot (IJ)	3	0,76 ± 0,157	3,57	3	0,74 ± 0,0338	7,95	3	0,74 ± 0,052	10,67
3.	Indicator of the muscularity of the thigh (IMC)	3	0,47 ± 0,0163	5,97	3	0,47 ± 0,0186	6,89	3	0,42 ± 0,048	1,97

It is noted that the values of the indicator for the compactness of the carcass are between the interval of 0,29-0,30 at the hybrids and Merino of Palas and the values of the indicator for the compactness of the gigot are between the interval of 0,74-0,76 at the hybrids and the Merino of Palas.

Regarding the indicator of the muscularity of the thigh, it had the value of 0,47 at the hybrids besides 0,42 at the Merino of Palas.

In table 4 there are presented the differences between genotypes.

Table 4 .The differences between the values of the carcass indicators at the hybrids besides Merino of Palas and the significance of differences

No.	Specification	Differences between genotypes					
		Between hybrid 1 and MP		Between hybrid 2 and MP		Between hybrid 1 and hybrid 2	
		± UM	±%	± UM	±%	± UM	±%
1.	Indicator of the compactness of the carcass (IC)	0	0	- 0,01	- 3,30	+ 0,01	+ 3,45
		-		p > 0,05		p > 0,05	
2.	Indicator of the compactness of the gigot (IJ)	+ 0,02	+ 2,70	0	0	+ 0,02	+ 2,70
		p > 0,05		-		p > 0,05	
3.	Indicator of the muscularity of the thigh (IMC)	+ 0,05	+ 11,90	+ 0,05	+ 11,90	0	0
		p < 0,05		p < 0,05		-	

From table 4 it results that there are significant differences only in the sense of the muscularity of the thigh, both hybrids having significantly bigger values at this indicator comparatively to Merino of Palas fact that reflects a higher development of the thigh's muscularity of the thigh at

hybrids. Similar results regarding Merino of Palas were found by Vicovan G. [5]. In table 5 there are presented the results of cutting up the carcasses at the two hybrids comparatively to Merino of Palas.

Table 5: Results of cutting up the carcasses at the hybrids comparatively to Merino of Palas

No.	Specification	UM	Obtained results									
			Hybrid 1				Hybrid 2				MP	
			n	X±sx	V%	n	X±sx	V%	n	X±sx	V%	
1.	Weight of right half of carcass	g	3	9208,33 ± 364,8799	6,96	3	9378,33 ± 53,4115	0,98	3	9273,00 ± 147,4317	2,75	
2.	Weight of the gigot	g	3	3106,67 ± 172,0546	9,59	3	3098,33 ± 43,3331	2,42	3	3145,00 ± 82,6136	4,55	
3.	Proportion of the gigot in the carcass	%	3	33,70 ± 0,5300	2,73	3	33,04 ± 0,6300	3,32	3	33,92 ± 0,8400	4,28	
4.	Weight of scapula	g	3	1758,33 ± 119,5942	11,78	3	1788,33 ± 21,4303	3,61	3	1698,33 ± 26,1937	2,67	
5.	Proportion of scapula in the carcass	%	3	19,05 ± 0,5200	4,69	3	19,02 ± 0,4900	4,51	3	18,31 ± 0,1400	1,36	
6.	Weight of the rest of the carcass	g	3	4340,00 ± 85,1958	3,40	3	4498,00 ± 126,0401	4,85	3	4430,00 ± 112,5092	4,40	
7.	Proportion of the rest of the carcass	%	3	47,21 ± 1,0100	3,71	3	47,95 ± 1,0700	3,87	3	47,74 ± 0,7200	2,60	

From the table it is noted that both at the o hybrids and also at Merino of Palas, the gigot has a share in the carcass of 33,04-33,92%, the share of scapula is between the limits of 18,31-19,05% and the rest of the carcass has the share of

47,21-47,95%, between genotypes the differences not being statistically significant.

In table 6 it is presented the tissue structure of the carcasses depending on genotype.

Table 6: Tissue structure of the carcasses

No.	Specification	UM	Hybrid 1				Hybrid 2				MP			
			n	X±sx	V%	n	X±sx	V%	n	X±sx	V%			
1.	Weight of the semi-carcass	g	3	9208,33 ± 369,8799	6,96	3	9378,33 ± 53,4115	0,98	3	9273,33 ± 147,4317	2,75			
2.	Semi-carcass	%	3	100,00	-	3	100,00	-	3	100,00	-			
3.	Muscles share	%	3	65,71 ± 0,7700	2,04	3	57,47 ± 0,5800	1,75	3	62,54 ± 1,1000	3,06			
4.	Bones share	%	3	21,96 ± 0,5500	4,30	3	23,59 ± 0,4400	3,24	3	22,81 ± 0,5700	4,32			
5.	Fat share	%	3	12,31 ± 0,7400	10,43	3	18,95 ± 0,1400	1,25	3	14,62 ± 0,9600	11,38			
6.	Meat share*	%	3	78,02 ± 0,5200		3	76,41 ± 0,4600	1,04	3	77,17 ± 0,5700	1,29			
7.	Muscles – bones ratio			2,99 : 1			2,44 : 1			2,74 : 1				
8.	Meat – bones ratio			3,55 : 1			3,24 : 1			3,38 : 1				
9.	Muscles – fat ratio			5,34 : 1			3,03 : 1			4,28 : 1				

* The meat is represented by muscles together with the covering and inter-muscular fat

So, the share of the muscles in the carcass is between the limits of 57,47-65,71%, the bones have a share of 21,96-23,59% and the fat has a share of 12,31-18,95% the significant differences being only for the ratio of muscles at the hybrid 2 besides Merino of Palas (table 7).

From the table it is noted that there are some differences between genotypes regarding the share of the various tissues and of the ratios: muscles-bones, meat-bones, muscles-fat.

Table 7: Differentiation of the share of the various tissues from the carcasses of the 3 genotypes and the significance of differences

No.	Specification	Per cent points			
		Muscles	Bones	Fat	Meat
1.	Differences between hybrid 1 and MP	+ 3,17	- 0,85	- 2,31	+ 0,85
		p > 0,05	p > 0,05	p > 0,05	p > 0,05
2.	Differences between 2 and MP	- 5,07	+ 0,78	+ 4,33	- 0,76
		p < 0,05	p > 0,05	p > 0,05	p > 0,05
3.	Differences between hybrid 1 and hybrid 2	+ 8,24	- 1,63	- 6,64	+ 1,61
		p < 0,05	p > 0,05	p < 0,05	p > 0,05

As it results from the table there are significant differences regarding the share of muscles in the carcasses of hybrid 2 which is smaller with 5 per cent points comparatively to Merino of Palas. There are also significant differences between hybrid 1 and hybrid 2 regarding the share of muscle which is bigger with 8,24 per cent points and the share of fat

which is smaller with 6,64 per cent points in the carcasses of hybrid 1 besides hybrid 2.

In table 8 there are presented the diameters of *m. Longissimus Dorsi* measured on its sections at the two hybrids comparatively to Merino Palas.

Table 8: The diameters of *m. Longissimus Dorsi* at the hybrids comparatively to Merino of Palas

No.	Specification	Big diameter (mm)			Small diameter (mm)			The thickness of the layer of superficial fat (mm)		
		n	X±sx	V%	n	X±sx	V%	n	X±sx	V%
1.	Hybrid 1	3	60,00±3,4641	10,01	3	36,67±1,4530	6,86	3	2,00±1,0000	86,60
2.	Hybrid 2	3	54,33±2,3332	7,44	3	34,00±1,7321	8,82	3	6,00±1,0000	28,87
3.	Merino of Palas	3	58,00±1,0000	2,99	3	34,00±1,1547	5,88	3	2,33±0,8819	65,47

As it can be noted in the table the big diameter of *m. Longissimus Dorsi* at the 3 genotypes is between 54,33-60,00 mm and the small diameter is between 34,00-36,67 mm, not being significant differences between the 3 genotypes.

Regarding the thickness of the layer of superficial fat from the table it results that it is much thicker at the hybrid 2 than at the hybrid 1 and Merino of Palas.

The differences are better noted in table 9.

Table 9: Differentiation of the superficial fat layer at the 3 genotypes

No.	Specification	The superficial fat layer		
		± mm	±%	Significance of differences
1.	Differences between hybrid 2 and hybrid 1	+ 4,00	+ 200,00	p < 0,05
2.	Differences between hybrid 2 and Merino of Palas	+ 3,67	+ 157,51	p > 0,05
3.	Differences between hybrid 1 and Merino of Palas	- 0,33	- 14,16	p > 0,05

From table 9 it results that there are differences between genotypes regarding the thickness of the superficial fat layer, the hybrid 2 having it significantly thicker than that of hybrid 1.

In table 10 there are presented the areas of the *m. Longissimus Dorsi* sections and those of thighs sections at the 3 genotypes.

Table 10: Areas of sections at the 3 genotypes

No.	Specification	Area of <i>m. Longissimus Dorsi</i> section (cm ²)			Area of the thigh section (cm ²)		
		n	X±sx	V%	n	X±sx	V%
1.	Hybrid 1	3	19,93±0,5698	4,95	3	124,62±13,1314	18,25
2.	Hybrid 2	3	16,39±0,8517	8,99	3	125,50±2,8822	3,98
3.	Merino of Palas	3	18,45±1,1736	11,02	3	122,31±6,0556	8,58

As it results from the table the areas of the section of *m. Longissimus Dorsi* at the hybrids and Merino of Palas are between the limits of 16, 39-19, 93 cm² and the areas of the section of the thigh are between the limits of 122,31-125,50

cm². The differences between genotypes are presented in table 11.

Table 11: Differentiation of sections areas and the significance of differences

No.	Signification	Area of <i>m. Longissimus Dorsi</i> section		Area of the thigh section	
		± cm ²	±%	± cm ²	±%
1.	Differences between hybrid 1 and hybrid 2	+ 3,54	+ 21,60	+ 0,88	+ 0,70
		p < 0,05		p > 0,05	
2.	Differences between hybrid 1 and Merino of Palas	+ 1,48	+ 8,02	+ 2,31	+ 1,89
		p > 0,05		p > 0,05	
3.	Differences between hybrid 2 and Merino of Palas	- 2,06	- 11,17	+ 3,19	+ 2,61
		p > 0,05		p > 0,05	

As it can be noted in the table there is only one significant difference, that regarding the area of *m.Longissimus Dorsi* section which is bigger with 21,6% at hybrid 1 besides hybrid 2, the difference being statistically significant.

In table 12 it is presented the classification of the carcasses by EUROP grid.

Table 12: Classification of the carcasses from the lambs that were experimentally slaughtered

No.	Specification	Class by conformation				Class by the degree of fattening					
		R		O		2		3		4	
		nr.	%	nr.	%	nr.	%	nr.	%	nr.	%
1.	Hybrid 1	2	66,7	1	33,3	3	100,0	-	-	-	-
2.	Hybrid 2	3	100,0	-	-	-	-	-	-	3	100,0
3.	Merino of Palas	3	100,0	-	-	-	-	3	100,0	-	-

From the table it results that at the hybrid 1 cca.67% of the carcasses by conformation are from R class (good carcasses) and 33% are from O class (good enough carcasses) and by the degree of fattening all carcasses are from 2nd class (weak carcasses).

The carcasses of hybrid 2, by conformation are all from R class (good carcasses) and by the fattening degree all are of 4th class (fat carcasses). The carcasses from Merino of Palas by conformation are of class R (good carcasses) and by the fattening degree all are of 3rd class (fairly fat carcasses).

4. Conclusions

In conclusion it can be said that at the hybrid F1 Romanov x Merino of Palas by conformation two thirds of the carcasses are from U class (good carcasses) and one third are from O class (good enough carcasses) and by the degree of fattening all carcasses are from 2nd class (weak carcasses). The carcasses of the F1 hybrid Prolific Breed Palas x Merino of Palas, by conformation are from R class (good carcasses) and by the fattening degree all are of 4th class (fat carcasses).

The carcasses of the Merino of Palas lambs, by conformation are of class R (good carcasses) and by the fattening degree all are of 3rd class (fairly fat carcasses).

The European Union countries that are big meat producers (Great Britain, France, Spain) commercialize properly carcasses of fattened lambs which by conformation are from E, U and R classes and by the fattening degree are from 2nd and 3rd classes.

Carcasses from O class (good enough) and from 4th and 5th classes (fat and very fat carcasses) are sold in butcherries after having been chopped into commercial pieces and the excessive fat had been removed.

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