CHARACTERIZATION OF PROLIFIC MERINOFIN EWES WITH CHAROLLAISE RAMS CROSSBREED INTENSIVELY FATTENED. YIELD AND QUALITY OF MEAT

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Background

Market requirements resulting from increasing consumer requirements make it increasingly important, also for producers of lambs, to pay more and more attention to culinary and dietary value of raw material produced by them (Borzuta and Strzelecki, 2001). This refers, in particular, to the most effective – from the point of view of producers – production systems of lambs based on the commercial crossing which employ prolific breeds whose application has, as a rule, a negative influence on the slaughter value and culinary quality of lamb carcasses (Borys B. and Borys A., 2001; Piwczynski et al., 2001). In the light of the above-said, it appears desirable, within the framework of research aiming at optimisation of commercial crossing programs involving sheep of prolific breeds and lines with rams of meat breeds, to take into consideration also studies on the efficiency of culinary cuts and meat quality.

Objective

The objective of the performed investigations was to determine the impact of commercial crossing of a newly developed prolific breed of Merinofin Mf-40 with rams of the meat breed Charollaise on yields of cuts and culinary elements as well as meat quality of lambs fattened intensively to the body weight of 35 – 40 kg.

Material and methods

The experiments were carried out in two repetitions (years 2000 and 2001) on the total of half-carcasses of 20 ram-lambs derived from a prolific breed of Merinofin (Mf) and F_1 hybrids obtained by crossing Mf ewes with rams of the meat breed Charollaise (ChMf). Following weaning at the age of 8 weeks, lambs were fattened intensively using complete diets and, after reaching the body weight of 35 – 40 kg, they were slaughtered. The cutting of half-carcasses into cuts and culinary elements was carried out according to the methodology developed by the Meat and Fat Research Institute (Borzuta and Strzelecki 2001). Measurements of pH and electric conductivity (LF) were taken 24 hours after slaughter in the following muscles: longissimus dorsi (LD), psoas major, semimembranosus, biceps femoris, quadriceps femoris and supraspinatus. Furthermore, in the m. LD the following values were also determined: content of intra-muscular fat (by Soxhlet method), colour brightness (Specol 11 spectrophotometer), free and thermal drips, water holding capacity, shearing force using Warner-Bratzler apparatus. Additionally, the sensory assessment of cooked meat was carried out applying the scale of 1 – 5 points. The following traits were evaluated: smell, juiciness, tenderness and palatability.

The obtained results were elaborated statistically applying the two-factorial analysis of variance (genotype, repetition) in an orthogonal system, model with interactions (Stanisz 1998).

Results and discussion

The applied commercial cutting of lamb half-carcasses failed to reveal any statistically significant differences in the field of yields of individual cuts and culinary meat (Table 1). However, a trend could be observed towards a more favourable (greater) proportion of the leg and shoulder in carcasses of hybrid ChMf lambs in comparison with the Mf animals. This referred both to primary cuts, where this share was by 1% higher, as well as to culinary meat (by 0.5 – 1%). Carcasses of lambs from the first repetition (2000) were found to have a significantly higher share of the breast with ribs and a lower share of the leg with shank, respectively by 2.44 and 2.98 percentage points ($P \leq 0.01$). In addition, half-carcasses in 2000 were also characterised by a significantly higher share of culinary meat (by the total of 4.70 percentage point, $P \leq 0.01$) at a higher loin (by 1.34 percentage point, NS) and breast (by 3.74 percentage point, $P \leq 0.01$) but lower yield of the leg (by 0.71 percentage point, $P < 0.01$).

With regard to the performed meat quality investigations (Table 2), statistically significant differences between the examined genotypes were only found in the case of measurements of LD tenderness evaluated by means of the employed apparatus. Muscles of hybrid lambs crossed with Charollaise turned out to be tenderer than those of Merinofins (by 19.2%; $P \leq 0.05$). All the remaining quality parameters did not differ significantly between the examined genotypes. This was also true about levels of intramuscular fat, which was very similar in the LD muscles of both groups of animals ranging from 2 – 3%, i.e. at the optimal level. Sensory assessments of the cooked lamb meat of the examined genotypes were similar and mean evaluation scores for juiciness, tenderness and palatability were all above 4 points, which confirmed good quality of the examined meat.

No statistically significant differences were observed in meat quality between the repetitions. Nevertheless, a trend towards a better meat quality of lambs fattened in 2001 could be observed. Lower pH values of all the examined muscles of animals from 2001 as well as the observed differences in some of the examined physical-chemical properties could have been associated with changes in maintenance conditions during fattening and before slaughter. Absence of the influence of the examined crossing program on slaughter value and meat quality was also reported in other experiments (Borys and Osikowski, 1998).

Conclusions

1. Commercial crossing of prolific Merinofin sheep with Charollaise meat rams did not exert a significant influence on changes in the proportion of cuts and culinary meat in half-carcasses of lambs fattened intensively to high weight standards (35 – 40 kg), although a trend towards a higher share of the leg and shoulder was recorded in F_1 hybrids.

2. No significant impact of lamb genotype on the examined physical-chemical traits of the meat was observed with the exception in F_1 hybrids of meat tenderness determined by the Warner-Bratzler apparatus.

References

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Table 1. Yield of cuts and culinary meat (%).

Cuts	Genotype		Repetition		SEM
	Mf (n = 10)	ChMf (n = 10)	2000 r. (n = 10)	2001 r. (n = 10)	
Half-carcass, kg	8,44	8,24	8,33	8,34	0,42
Shoulder with shank	15,92	16,95	16,66	16,21	0,68
Fore quarter without shoulder	19,38	18,44	18,34	19,45	1,66
Loin	14,57	14,32	15,08	13,74	1,30
Breast with ribs	14,49	13,95	15,46A	13,02B	1,57
Leg with shank	32,04	33,12	31,11A	34,09B	2,03
Less valuable parts (tail, kidney, kidneyfat)	3,60	3,22	3,25	3,49	0,42
Culinary meat:					
- from shoulder without shank	10,26	11,01	10,79	10,43	0,47
- from fore quarter	11,26	10,45	10,84	10,86	1,11
- from loin	14,57	14,32	15,08	13,74	1,30
- from breast	11,45	10,93	13,06A	9,32B	1,56
- from leg without shank	21,03	21,50	20,86A	21,57B	0,78
- shanks	7,30	7,03	6,16	6,92	0,45
- total culinary meat	68,57	68,21	70,66a	65,96b	5,34

A, B - significant at $P \leq 0,01$, a,b - significant at $P \leq 0,05$
Interaction: breed x repetition statistically non-significant
SEM – standard error of mean

Table 2. Physical, chemical and sensory traits of different lamb muscles

Specification		Genotype		Repetition		SEM
		Mf (n=10)	ChMf (n=10)	2000 (n=10)	2001 (n=10)	
M. LD -1/2 lumbar vertebra	pH	5,92	5,90	6,04	5,79	0,13
	LF	4,18	4,68	5,03	3,83	1,49
M. LD - 6/7 pectoral vertebra	pH	5,98	5,89	6,09	5,79	0,24
	LF	3,71	3,87	4,55	3,03	1,70
M. psoas major	pH	5,90	5,92	6,01	5,81	0,05
	LF	3,10	3,13	3,82	2,41	0,82
M. semi-membranous	pH	5,85	5,73	5,99	5,75	0,05
	LF	4,68	6,33	6,86	4,15	2,80
M. biceps femoris	pH	5,92	5,77	6,04	5,83	0,05
	LF	4,75	5,19	5,94	4,00	1,27
M. quadriceps femoris	pH	5,95	5,83	6,07	5,88	0,05
	LF	3,33	3,83	3,96	3,20	1,28
M. supraspinatus	pH	6,14	5,93	6,24	6,00	0,05
	LF	2,42	2,60	2,99	2,03	0,53
M. Longissimus dorsi:						
- intra-muscular fat content, %		2,28	2,26	2,53	2,01	0,39
- brightness of colour, %		46,15	46,77	43,32	49,59	2,40
- drip loss, %		2,10	1,84	2,94	1,01	0,65
- water holding capacity (WHC), %		36,65	36,26	38,16	34,75	1,73
- cooking loss, %		23,49	25,69	24,01	25,17	2,13
- flavour, points		3,97	3,87	3,77	4,07	0,25
- juiciness, points		4,19	4,31	4,19	4,44	0,40
- tenderness, points		4,41	4,18	4,24	4,35	0,35
- palatability, points		4,26	4,15	4,13	4,28	0,30
- shear force WB, N		55,19a	44,60b	45,39	57,42	0,75

(Designations as in Table 1)