CARCASS AND PORK QUALITY OF PUREBRED AND FOUR-RACE HYBRIDS

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Introduction

It is a well known fact that the increase of pork yield in carcasses can be achieved by crosbreeding of selectioned purebreds, resulting in multibred hybrids. However, due to effect of heterosis, the meat yield is higher compared to initial purebred heads purebred (Johnson, 1980).

Sveral authors have found that the increase of pork yield in halves is followed by technological meat quality decrease (Rahelić, 1977). Ih the scope of a widely stated selection and breeding program on one Yugoslav modern farm, the task was to find the optimal selection and crossbreeding model in order to achieve maximal yield of meat in the carcasses, but also better technological meat quality. A part of the results is presented in this paper.

Material and methods

The trial included 3 groups of pigs: Large Yorkshire (LY), Swedish Landrace (SL) and four-race hybrid (Hampshire x Pietrain) x (Swedish Landrace x Large Yorkshire) (HxP)x(SLxLY), in total 42 heads. The three experimental groups LY, SL and (HxP)x(SLxLY) included 18, 17 and 7 heads, respectively.

The pigs were fed in the usual way during fattening, and heads of uniform age and mass were slaughtered. The marking of animals, measuring of mass and determination of meat % of carcasses in-vivo using PIGLOG 105, were performed 48 hours before transport to slaughterhouse.

The stunning, debleeding and processing of carcasses were performed by standard technological procedure, after resting during night in the depot of the slaughterhouse.

The % of meat was determined on warm right halves, according to Yugoslav rulebook (1985) 45 min. p.m. Immediately after, the meat % was determined on the carcasses by FAT-O-MEAT-er (FOM) device.

pH_i value was measured 45 min. p.m. on caudo-cranial part of M. semimembranosus (MSM).

After chilling, 24 hours p.m., pH_u was measured at the same place. The chilled and weighed left halves were cut into 12 main parts, according to the procedure recommended in EU (1992). The four larger parts were totally dissected to basic tissues (muscle tissue, skin with subcutaneous fatty tissue, intramuscular fatty tissue and bones). The obtained data were used for calculation of meat % of carcasses.

Samples (200-300 g) were taken from the caudio-cranial part of MSM for colour and waterholding capacity (WHC) determination. The colour was determined sensorily (1 - very pale; 7 - very dark) and using MOMCOLOR 100 (CIE and CIELab) (Pribiš and Rede, 1982; Robertson, 1977). Water content (AOAC, 1999) and WHC (Grau and Hamm, 1953) were determined 24 hours p.m. in the laboratory.

Results and discussion

The obtained results are presented in 3 Tables and 2 Graphs.

The data presented in Table 1 and Graphs 1 and 2 show a higher meat yield in hybrid pigs than in carcasses of purebread heads, depending on the evaluation method, from 43,87% (Yugoslav rulebook), 59,79% (PIGLOG - in-vivo), 60-90% (FOM-device) and 61,24% (Dissection - EU), and this represents by 1,13% (SL - Rulebook) to 3,35% (LY - Dissection - EU) more meat than of carcasses of purebred pigs. The initial hypothesis that meat yield of carcasses of hybrids will increase due to effect of heterosis was confirmed.

Table 1. Evaluation of carcass quality of investigated groups of pigs (% of meat), by different methods

Groups of pigs	Parameter	% of meat			
		PIGLOG	FOM	Rulebook	Dissection
LY	$\bar{x}$	57,58	59,85	42,11	57,89
	Sd	2,64	4,44	2,72	4,24
	Cv	4,58	7,42	6,46	7,32
SL	$\bar{x}$	57,32	57,45	42,74	57,35
	Sd	3,96	4,64	3,02	5,57
	Cv	6,91	8,08	7,07	9,71
(HxP) x (SLx LY)	$\bar{x}$	59,79	60,90	43,87	61,24
	Sd	2,70	4,20	1,83	3,29
	Cv	4,52	6,90	4,17	5,37

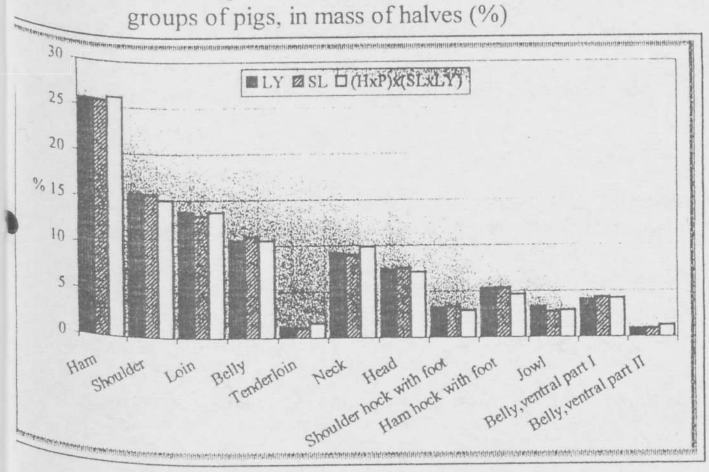
Correlating the results obtained by determination meat % of carcasses of investigated groups of pigs (Table 2), by different methods, it was found that the results obtained according to Yugoslav rulebook (1985) are not reliable (r = 0,4042, 0,276 and 0,7094), so it should be urgently changed. Further the results obtained using the FOM device in Yugoslav slaughterhouses, though its softwer was changed (Petrović Ljiljana et al., 1996) are not completely in accordance with results obtained by dissection (r = 0,821; 0,7572 and 0,7756). The same is the situation with PIGLOG device (r = 0,6681; 0,7708; 0,9459).

Table 2. Correlation coefficient (r) between % of meat of carcasses determined by different methods

Groups of pigs		LY	SL	(HxP)x (SLxLY)
% meat EU	FOM	0,8210	0,7756	0,7756
	PIGLOG	0,6681	0,7708	0,9459
	Rulebook	0,4042	0,5276	0,7094
FOM	PIGLOG	0,4674	0,8202	0,6685
	Rulebook	0,2548	0,5351	0,9307
PIGLOG	Rulebook	0,7968	0,5661	0,6385

On the bases of data obtained by cutting of halves in 12 parts (Graph 1), as well as by determining the portion of basic tissues in four main parts of the half (according to EU method 1992) (Graph 2), meat % was calculated and presented in Table 1. This value (meat %) was regarded as absolutely accurate compared to meat % determined by other methods (Table 2). However, it is interesting to review the results presented in Graphs 1 and 2, since meat industry is interested in great portion of these parts as well as of meat in the halves. So, these data show that the ratio of hamm in mass of the half (Graph 1), further of muscle tissue in the ham is insignificantly but nevertheless the biggest in four-race hybrid. The portion of shoulder, loin and belly in these halves is even somewhat lower than in halves of purebred races, while the portion of muscle tissue in these parts from halves of hybrid pigs is noticeable bigger, resulting in bigger % of meat in the whole half, and on the other side confirming the statement that the quality of carcasses is increased by hybridization.

Graph 1. Portion of parts obtained by dissection of halves (according to EU methodology) of investigate groups of pigs, in mass of halves (%)



Graph 2. Portion of tissues in the main parts of halves of investigated pigs groups (%) (Sequence of groups of pigs is the same as in Graph 1)

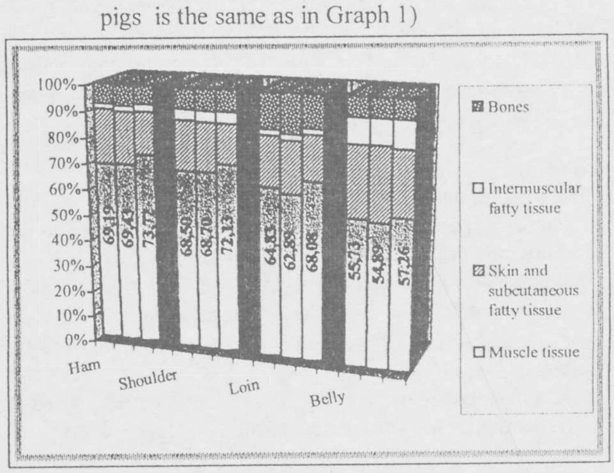


Table 3. Technological and sensory characteristics of M. semimembranosus of investigated groups of pigs

Groups of pigs	Par.	pH_i	pH_u	WHC	Characteristics: Colour: CIE: Y	λ	B**	CIELab: a*	b**	L	Sens.
LY	$\bar{x}$	6,37^a	5,91	50,36^a	17,48	595,11	12,94^b	8,52^b	7,30^b	48,50	3,75
	Sd	0,30	0,32	9,11	1,59	4,38	1,70	2,32	0,93	1,58	0,73
	Cv	4,73	5,41	18,09	9,10	0,74	13,14	27,23	12,74	3,26	19,47
SL	$\bar{x}$	6,28	5,76	49,18^a	18,38	594,65	15,53^a	9,36	9,01^a	49,84	3,68
	Sd	0,28	0,17	5,03	2,23	2,50	3,85	1,58	1,95	2,77	0,77
	Cv	4,46	2,95	10,22	12,13	0,48	24,79	16,88	21,64	5,56	20,92
(HxP)x (SLxLY)	$\bar{x}$	6,08^b	5,68	37,60^b	18,48	595,86	16,23^a	10,30^a	9,28^a	49,92	3,93
	Sd	0,25	0,24	10,36	2,99	1,46	1,74	1,27	1,13	3,55	0,93
	Cv	4,11	4,23	27,55	16,17	0,25	10,72	12,33	12,18	7,11	23,66

*P<0,05; **P<0,01

The determination of technological and sensory characteristics of MSM of investigated groups of pigs (Table 3) showed that the technological characteristics of muscles of four-race hybrids are poorer than of purebred races (LY and SL). The pH_i value of these muscles is significantly lower ($P<0,05$), pH_u value lower and WHC highly significantly ($P<0,01$) lower, however, the colour was not lighter i.d. regarding some parameters (red colour portion and also sensorily), these muscles were graded as somewhat darker than the muscles of purebred race pigs. Regarding the characteristics, the muscles of four-race hybrids correspond to RSE (Reddish-pink, Soft, Exudative) quality (Kauffman et al., 1993; Kim et al., 1996) although that halothene positive heads were excluded from the breeding and that all antistress measures were taken.

Conclusion

The multi-race crossbreeding (four-race) results in increase of meat yield in carcasses, but in the same time the technological quality of meat decreases, pointint to necessity of sistematic work to solve this problem.

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