

# GENETIC RESOURCES IN PIG BREEDING – CARCASS QUALITY TRAITS OF BREEDS MORAVKA AND MANGALITSA \*\*

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**Abstract:** Objective of this paper was to evaluate phenotypic variability of carcass quality traits of pigs of Moravka and Mangalitsa breeds. Quantity and content of meat was determined based on *Regulation* (1985) and dissection of right carcass sides. Obtained data was processed using Least Squares Method (*Harvey*, 1990). Results of the investigation show that Moravka had in average higher quantity and content of meat in carcass sides than Mangalitsa. Shares of muscle, fat tissue, skin and bone tissue in pig carcass sides of Moravka breed, determined by dissection were: 32.91; 34.94 and 7.70%.

**Key words:** animal genetic resources, pig, native autochthonous breed, Moravka, Mangalitsa, carcass quality

## Introduction

In Republic of Serbia, there are three registered native, autochthonous breeds: Mangalitsa, Moravka and Resavka. The first one has the largest number of heads and the last one the least.

Mangalitsa is typical fat pig breed, i.e. it has in carcass sides 65-70% of fat and approx. 30-35% meat (*Egerszegi et al.*, 2003). Slightly lower values for average content of fat and muscle tissue with bones were established by *Ilančić and Romić* (1942 – cit. *Živković and Kostić* (1952a)). Results of the investigation in recent years (*Szabó*, 2001, 2002 – cit. *Egerszegi et al.*, 2003) show that there is less than 40% of lean meat in carcass sides but sufficient for production of high quality and valuable ham.

Moravka and Resavka are breeds of combined production abilities. Moravka has somewhat more meat with bones in carcass sides and considerably less fat than Mangalitsa (Živković and Kostić, 1952a,b). Traits of pigs of Moravka breed (body development, reproductive and fattening traits), identification, selection of heads and forming of herd, are presented in detail in paper by Petrović *et al.* (2005, 2007).

Objective of this paper was to evaluate phenotypic variability of carcass quality traits of pigs of Moravka and Mangalitsa breeds.

## Material and methods

According to set goal, investigation included heads of Moravka (two breeders) and white strain of Mangalitsa (one breeder). In total 37 heads were slaughtered, but investigation included only 29 heads (16 heads of Moravka breed and 13 of white strain of Mangalitsa). Animals were slaughtered in three slaughterhouses. On slaughter line, linear measures of warm carcass sides were taken. The print/mark of the long back muscle (*musculus longissimus dorsi* – *m.l.d.*) and fat was taken on tracing paper. Also, carcass sides were cut into major parts and right carcass side was dissected (12 heads of Moravka breed). The quantity and content of meat in carcass sides were determined according to *Regulation* (1985) for fatty pigs and based on dissection.

Obtained data was processed using several models of Least Square method (Harvey, 1990), in which breeder (region), breed, sex and body mass or mass of warm carcass sides (linear effect) were included.

## Results and Discussion

Average body mass of heads at slaughtering was  $125.06 \pm 24.82$  kg, with considerable variations between breeds and heads.

Carcass sides of heads of Moravka breed were 11.76 i.e. 6.02 cm longer than carcass sides of heads of Mangalitsa breed. Established differences were statistically very highly significant and highly significant (Table 1). Back fat thickness measured on different positions in Mangalitsa pigs was greater by approx. 13.6 (DSG) to 23.6 mm (DSKIII) compared to Moravka. Differences were smaller in regard to fat thickness at stomach (from 7.64 to 8.58 mm,  $P < 0.05$ ). All linear measures in carcass sides, except DSTI and DSTII, depended on body mass at slaughter (TM).

Average values of quantity and content of meat in warm carcass sides of Moravka and Mangalitsa pigs, determined according to *Regulation* (1985) are presented in table 2.

**Table 1. Linear measures of warm carcass of Moravka and Mangalitsa breeds**

Trait	$\mu \pm S.E.$	LSM $\pm$ S.E.		Level of significance for factors			
		Moravka (n=16)	Mangalitsa (n=13)	P <sup>1</sup>	R	TM	R <sup>2</sup>
OP-A <sup>2</sup> , cm	100.52 $\pm$ 0.78	106.40 $\pm$ 0.90	94.64 $\pm$ 1.39	** <sup>3</sup>	***	***	0.887
OP-1R, cm	83.63 $\pm$ 0.78	86.64 $\pm$ 0.90	80.62 $\pm$ 1.39	*	**	***	0.803
DSG, mm	65.54 $\pm$ 1.79	58.74 $\pm$ 2.05	72.35 $\pm$ 3.17	***	**	***	0.869
DSL, mm	43.63 $\pm$ 1.54	35.11 $\pm$ 1.77	52.15 $\pm$ 2.74	***	***	***	0.919
DSKI, mm	51.79 $\pm$ 2.30	42.56 $\pm$ 2.64	60.58 $\pm$ 4.09	***	**	**	0.863
DSKII, mm	50.93 $\pm$ 2.62	41.64 $\pm$ 3.00	60.21 $\pm$ 4.64	***	**	**	0.813
DSKIII, mm	54.89 $\pm$ 2.88	43.09 $\pm$ 3.30	66.69 $\pm$ 5.11	***	**	**	0.832
DSTI, mm	27.09 $\pm$ 1.53	31.38 $\pm$ 1.76	22.80 $\pm$ 2.72	NS	*	NS	0.280
DSTII, mm	32.67 $\pm$ 1.51	28.60 $\pm$ 1.74	36.74 $\pm$ 2.69	NS	*	NS	0.523
DSTIII, mm	44.64 $\pm$ 1.50	40.82 $\pm$ 1.72	48.46 $\pm$ 2.67	NS	*	*	0.520

<sup>1</sup>P- sex; R –breed; TM – body weight.

<sup>2</sup>carcass length: OP-A : os pubis-atlas; OP-1R: os pubis-1st rib; DSG – withers back fat thickness; DSL – back fat thickness, centre back; DSK – rump back fat thickness, three position measures (DSKI, DSKII and DSKIII); DST - fat thickness at stomach, three position measures (DSTI, DSTII and DSTIII).

<sup>3</sup>NS - P>0.05; \* - P<0.05; \*\*P<0.01; \*\*\* P<0.0001.

**Table 2. Total quantity and content of meat in carcass sides according to *Regulation* (1985)**

Trait	LSM $\pm$ S.E.		Level of significance for factors		
	Moravka (n=8)	Mangalitsa (n=9)	R <sup>1</sup>	TM	R <sup>2</sup>
MEAT-P, kg <sup>2</sup>	28.71 $\pm$ 0.60	25.49 $\pm$ 0.56	** <sup>3</sup>	***	0.749
MEAT- P, %	30.00 $\pm$ 0.70	24.85 $\pm$ 0.66	***	NS	0.669

<sup>1</sup>R –breed; TM – body weight.

<sup>2</sup>MEAT-P – Total quantity and content of meat in carcass sides according to *Regulation*

<sup>3</sup>NS - P>0.05; \*\*P<0.01; \*\*\* P<0.0001.

Moravka had in average higher quantity (+3.22 kg) and content of meat (+ 5.15%) in carcass sides than Mangalitsa. Established differences were statistically very significant. Quantity of meat in carcass sides depended on the body mass of head at slaughtering (P<0.0001), but not the meat content (P>0.05).

Average values of  $m.l.d.p$  area weren't statistically significantly different between Moravka and Mangalitsa (Table 3). However, fat area associated with the muscle ( $PS_{m.l.d.}$ ) established in Mangalitsa was by  $35.14\text{cm}^2$  greater ( $P<0.001$ ) than in Moravka. So the meat: fat ratio in Moravka was 1:1.865 and Mangalitsa 1:3.330, which indicates lower meat yield of Mangalitsa carcass sides. Lateral back fat thickness in Mangalitsa was by 35.45 mm greater than in Moravka. Both areas showed, as was previously evaluated, that carcass sides of Moravka pigs are meatier than Mangalitsa pigs. Number of evaluated carcass sides was lower than total number of slaughtered heads because of greater mass of carcass sides and summed back fat thicknesses which were anticipated by the *Regulation* (1985).

**Table 3. Eye muscle area and fat areas which associated muscle in Moravka and Mangalitsa breeds**

Trait	LSM±S.E.		Level of significance for factors		
	Moravka (n=8)	Mangalitsa (n=11)	R	TM	R <sup>2</sup>
$m.l.d.p$ , $\text{cm}^2$	24.78±0.97	24.43±0.80	NS <sup>3</sup>	*	0.373
$PS_{m.l.d.}$ , $\text{cm}^2$	46.21±5.96	81.35±4.96	***	*	0.762
DBS, mm	44.74±4.35	80.19±3.62	***	*	0.828

<sup>1</sup>R –breed; TM – body weight.

<sup>2</sup>  $m.l.d.p$  - eye muscle area;  $PS_{m.l.d.}$ - fat areas which associated muscle; DBS – back lateral fat.

<sup>3</sup> NS -  $P>0.05$ ; \* -  $P<0.05$ ; \*\*\* $P<0.001$ .

Ratios of certain tissues in carcass sides of heads of Moravka breed, after dissection, are presented in table 4. Investigations included two groups of heads which belong to the same breed but regions (region of Kuršumlija and Topola) and conditions (climate, nutrition, care) in which they were reared were different.

**Table 4. Shares of tissues in pig carcasses of Moravka breed**

Trait		$\mu\pm$ S.E.	Level of significance for factors		
			RE <sup>1</sup>	P	MTP
MEAT <sup>2</sup>	kg	14.13 ± 0.63	* <sup>3</sup>	NS	*
	%	32.91 ± 1.49	*	NS	*
MAKZ	kg	15.55 ± 0.65	NS	NS	***
	%	34.94 ± 1.88	NS	NS	***
KOST	kg	3.38 ± 0.33	*	NS	NS
	%	7.70 ± 0.52	**	NS	*

In carcass sides of investigated heads there was in average 32.91% of

muscle tissue, with considerable variations between the heads. Total mass of muscle tissue in carcass sides varied between heads which originated from different regions. With the increase of carcass side mass also the quantity of muscle tissue increased, statistically significantly ( $b_{yx} = 0.080$  kg) and its content decreased ( $b_{yx} = -0.207$  %). Share of muscle tissue and skin in carcass sides was in average 34.94%. Only the mass of carcass sides influenced the variation of total quantity of fat tissue and skin. With the increase of carcass side mass, also the quantity (+0.300 kg/kg of carcass side) and content of fat tissue and skin (+0.289 %/kg of carcass side) increased.

**Table 4. Shares of tissues in pig carcasses of Moravka breed**

Trait		$\mu \pm S.E.$	Level of significance for factors		
			RE <sup>1</sup>	P	MTP
MEAT <sup>2</sup>	kg	14.13 $\pm$ 0.63	* <sup>3</sup>	NS	*
	%	32.91 $\pm$ 1.49	*	NS	*
MAKZ	kg	15.55 $\pm$ 0.65	NS	NS	***
	%	34.94 $\pm$ 1.88	NS	NS	***
KOST	kg	3.38 $\pm$ 0.33	*	NS	NS
	%	7.70 $\pm$ 0.52	**	NS	*

<sup>1</sup> RE- region - Kuršumlija and Topola, P – Sex, MTP – weight of warm carcass.

<sup>2</sup> MESO – meat, MAKZ – fat+skin, KOST – bones.

<sup>3</sup> NS -  $P > 0.05$ ; \* -  $P < 0.05$ ; \*\* $P < 0.01$ .

Length of carcass sides of Moravka breed were greater than established by *Belić and Ognjanović* (1958). *Gajić et al.* (1997) state literature sources for length of carcass sides of Moravka and Mangalitsa breeds, which are smaller than in this investigation. However, *Senčić et al.* (2005) established somewhat shorter length os pubis-atlas, but longer os pubis-1.rib in Black Slavonian breed. Fat thickness – centre back in white strain of Mangalitsa is similar to values stated by *Gajić et al.* (1997, 5.2cm) and *Holló et al.* (2003, 5.9cm). Moravka in our research had thinner centre back fat (35.11 vs. 46.8-84.1mm) than stated by *Gajić et al.*(1997), *Belić and Ognjanović* (1958) and *Živković and Kostić* (1952a,b). Average stomach fat thickness in Moravka was (3.36 cm) and is close to value determined by *Živković and Kostić* (1952b, 3.73cm) but thinner than stated by *Živković and Kostić* (1952a) and *Belić and Ognjanović* (1958).

Area of *m.l.d.p* established in Moravka (24.78cm<sup>2</sup>) is slightly smaller than stated by *Gajić et al.* (1997) for the same breed (25.18 cm<sup>2</sup>). In black Slavonian breed, *Senčić et al.* (2005) established greater area of *m.l.d.*

(33.00cm<sup>2</sup>). Content of meat in warm carcass sides of Mangalitsa, evaluated according to *Regulation* (1985), was lower (24.85%) compared to the content stated by *Ilančić and Romić* (1942 – cit. *Živković and Kostić* (1952a), *Egerszegi et al.* (2003), *Szabó* (2001, 2002 – cit. *Egerszegi et al.*, 2003) and *Gajić et al.* (1997). Contrary, meat yield of Moravka carcass sides in researches was higher than stated by *Živković and Kostić* (1952a, b). They established that content of meat with bones in carcass sides is from 25.66 to 27.52% of body mass at slaughtering. If obtained results are calculated following the methods of other authors, value of meat with bones of 31.25% of mass of head at slaughter. Content of fat tissue and skin is lower in carcass sides of Moravka than stated by *Gajić et al.* (1997), *Živković and Kostić* (1952a, b) and *Senčić et al.* (2005).

## Conclusion

Results of the investigation of the pig carcass side quality traits show that heads of Moravka breed had longer carcass sides than white strain of Mangalitsa breed. Back fat in Mangalitsa was thicker than in Moravka.

Moravka had in average greater quantity (+3.22 kg) and content (+ 5.15%) of meat in carcass sides than Mangalitsa. Shares of muscle, fat tissue, skin and bone tissue in pig carcass sides of Moravka breed determined based on dissection were: 32.91; 34.94 and 7.70%.

## GENETIČKI RESURSI U SVINJARSTVU – OSOBINE KVALITETA POLUTKI RASE MORAVKA I MANGULICA

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## Rezime

Rezultati ispitivanja osobina kvaliteta polutki svinja pokazuju da su grla rase moravka imala za 11.76 odnosno 6.02 cm duže polutke od belog soja mangulica. Ledjna slanina u mangulice bila je deblja (za 13.6 do 23.6 mm) nego kod moravke.

Na osnovu *Pravilnika* (1985) je ustanovljeno da je moravka imala prosečno veću količinu (+3.22 kg) i sadržaj mesa (+ 5.15%) u polutkama od

mangulice ( $P < 0.01$ ). Prosečne vrednosti površine *m.l.d.p* nisu bile statistički značajno različite između moravke i mangulice. Površina slanine koja pripada mišiću (*PS<sub>m.l.d.</sub>*) utvrđena u mangulice, bila je za  $35.14\text{cm}^2$  ( $P < 0.001$ ) veća nego kod moravke. Tako da je odnos meso:mast kod moravke 1:1.865 a mangulice 1:3.330.

Udeo mišićnog, masnog tkiva i kože i koštanog tkiva u polutkama svinja rase moravka, utvrđen na osnovu disekcije, je bio: 32.91; 34.94 i 7.70%.

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