

COMPARISON OF HYBRID COMBINATION OF PIGS WITH A VIEW TO MEAT QUALITY

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Abstract

This study evaluates carcass composition of three final hybrids of pigs and their meat quality. In 90 hybrids these traits were determined: live weight, lean meat proportion, percentual rate of main meat parts and ham. Next, the meat quality traits were evaluated (pH, lightness, drip loss, intramuscular fat content and texture). The highest lean meat proportion and percentual rate of main meat parts and ham was determined at A combination.

Key Words: Lean meat proportion, hybrid combination, meat quality.

One of the basic objectives of pig breeding is a cost-effective production of high-efficiency final hybrids that fulfill all the criteria of carcass and meat quality. At meat quality evaluation there are used particular quality traits: pH, color, drip loss, intramuscular fat content, juiciness, tenderness etc. Meat quality and generally all the foodstuffs is one of the most important factors of economical prosperity in advanced countries.

Material and Methods

The objective of this study was to compare three hybrid combinations of pigs (combination A, B, C; in each combination the rate of barrows and gilts is 1 : 1) with a view to quantitative and qualitative traits of meat. Selected traits of muscle quality (*Musculus longissimus dorsi*) were evaluated in 90 of hybrids.

There were determined these traits within the carcass weight in 90 hybrids: lean meat content (LM), live weight (LW), percentage of main meat parts (MMP) and ham. Next, the meat quality was observed (pH₄₅, pH₂₄, lightness of meat color [L*], loss of meat juice by drip, meat texture and intramuscular fat proportion [IMT]). The color was measured with the use of ColorEye XTH instrument. The texture was measured with the use of TA.Xtplus instrument with the help of Warner – Bratzler blade 48 hours post mortem.

Results and Discussion

It is obvious (Table 1) that the highest lean meat proportion was measured in the A combination (55,82 % lean meat). On the contrary the lowest proportion had the C combination, the lean meat proportion was about 4,36 % lower than A combination. Slaughter weight of C combination was 2,52 kg higher (117,71 kg) in comparison with the A combination (115,88 kg). PIPEK and JELENÍKOVÁ (1999) recommended that pigs should have average proportion of lean meat from 54 to 57 % to satisfy consumer's requirements. According to KOVÁŘOVÁ et al. (2006) slaughter pigs reach 53 – 55 % of lean meat proportion at common conditions. ŠIMEK et al. (2002) reported lean meat proportion within the interval 54,9 – 58,9 % in four groups of final hybrids in his study.

GU et al. (1992) observed the composition of carcass in pigs who grew to 127 kg of live weight and they resulted that growth of lean meat, back fat, skin and bones increased almost linear with gaining live weight.

GARCÍA-MACÍAS et al. (1996) showed that pigs with higher slaughter weight reached better dressing percentage and higher fatness.

Table 1. Live weight and lean meat proportion in particular hybrid combinations

Combination	n	LW (kg)		LM (%)	
		x	s	x	s
A	30	115,88	5,23	55,82	2,22
B	30	115,19	2,28	54,99	2,68
C	30	117,71	5,28	51,46	3,38
total	90	116,26	4,61	54,09	3,38

There are basic statistics of carcass analysis and meat quality of particular hybrid combinations in the Table 2. The lowest lean meat proportion was measured in the C combination, which was evaluated as statistically highly significant compared to combinations A and B. There were found out highly statistically significant differences in percentage of main meat parts and ham proportion – 51,24 %, or 20,77 % on behalf of combination A. Combination B embodied the lowest proportion of lean meat (48,89 %) and combination C had the lowest proportion of ham (19,25 %). OKROUHLÁ et al. (2007) referred that the ham proportion was 20,96 – 23,17 % in their study.

There was found no statistical difference among particular combinations in pH₄₅ value, but pH₂₄ differed significantly among combinations B:A and B:C. In lightness of meat color there were found the differences among combinations B:A, C (statistically highly significant difference) and between combinations A and C (statistically significant difference). KOUCKÝ and ŠEVČÍKOVÁ (2005) reported the value of pH₂₄ measured in chop within the interval from 5,33 to 5,35; ŠIMEK et al. (2002) observed this in value within the interval from 5,6 to 5,7.

The highest rate of drip loss of meat juice was measured in the A combination (statistically highly significant). During the cut with the Warner – Bratzler blade the lowest power was exerted in the B combination (2,38 kg) in comparison with A and C combinations (statistically highly significant).

The highest value of intramuscular fat was found in the C combination (2,72 %), while the lowest value showed the B combination (0,50 %). The differences of

intramuscular fat content were evaluated as statistically highly significant for all three hybrid combinations.

HAMILTON et al. (2003) reported this proportion of intramuscular fat: 1,95 – 2,11 %. PALANSKÁ et al. (1993) considered 2,5% of intramuscular fat in back muscle as an optimal value. INGR, KLEINOVÁ (1998) and de VOL et al. (1988) indicate 2 – 3 % IMF in MLLT as optimal.

FERNANDEZ et al. (1999) recommend 2,5 – 3,5 % IMF in pork for consumers as optimal. According to OBADÁLEK (1999) the common content of IMF range between 1,6 and 2 %, below this limit the culinary quality of meat grow worse. Muscle fat content below 2 % causes lower tenderness and lower juiciness of pork, which is unfavorable both visually as well as culinary (INGR, 2005). LO et al. (1992) stated that the intramuscular fat content in meat is favorably influenced by duroc breed, where the IMF content range within the interval 2,4 – 2,5 %. CISNEROS et al. (1996) observed in their study that the IMF content increased with increasing slaughter weight, while the dry matter content decreased. On the other hand, OKROUHLÁ et al. (2006) found that the content of IMF in MLLT decreased with increasing slaughter weight.

Table 3 represent the appearance of qualitative abnormalities (PSE meat) in particulars combinations. For the evaluation the pH₄₅ and drip loss criteria were used. If one of these indicators was above the limiting value, the sample was marked as PSE inclined (iPSE), it meant 4 hybrids of A combination, 2 hybrids of B combination and 3 hybrids of C combination.

The PSE abnormality occurred in 5 – 30 % of pigs (MAKOVICKÝ et al., 2004).

Table 2. Results of basic statistical values and tests according to particular hybrid combinations

Indicator	Combination A (n = 30)		Combination B (n = 30)		Combination C (n = 30)		F - test
	x	s	X	s	x	s	
LW (kg)	115,88	5,23	115,19	2,28	117,71	5,28	2,447
LM - FOM (%)	55,82	2,22	54,99	2,68	51,46	3,38	19,830 ⁺⁺ ; C:A, B ⁺⁺
MMP (%)	51,24	1,94	48,89	2,24	49,06	2,84	10,607 ⁺⁺ ; A:B, C ⁺⁺
ham (%)	20,77	1,32	20,02	1,29	19,25	1,75	9,679 ⁺⁺ ; A:B, C ⁺⁺
pH ₄₅	6,32	0,23	6,21	0,25	6,34	0,34	1,474
pH ₂₄	5,50	0,30	5,67	0,17	5,46	0,13	8,307 ⁺⁺ ; B:A, C ⁺⁺
lightness (L*)	56,80	3,90	51,59	1,02	54,39	3,73	19,541 ⁺⁺ ; B:A, C ⁺⁺ , A:C ⁺
drip loss (%)	3,52	0,87	2,36	0,69	2,73	0,83	15,891 ⁺⁺ ; A:B, C ⁺⁺
texte (kg)	3,71	1,44	2,38	0,29	4,07	0,93	22,948 ⁺⁺ ; B:A, C ⁺⁺
IMF (%)	1,33	0,69	0,50	0,28	2,72	1,17	56,877 ⁺⁺ ; A:B, C ⁺⁺ , B:C ⁺⁺

Table 3. Qualitative abnormalities according to particular hybrid combinations

Meat	A	B	C
normal	26	28	27
iPSE - 1 indicator	4	2	3
PSE - 2 indicators	0	0	0
total	30	30	30

Conclusion

- the highest proportion of lean meat was measured in A combination
- the lowest proportion of lean meat was found in C combination with the highest live weight
- the highest rate of MMP and ham showed A combination
- the lowest rate of MMP was found in B combination and the lowest rate of ham was found at C combination
- in the B combination the lowest rate of intramuscular fat was measured.

References

- CISNEROS, F., ELLIS, M., MCKEITH, F. K. et al. Influence of slaughter weight on growth and carcass characteristics, commercial cutting and curing yields, and meat quality of barrows and gilts from two genotypes. *J. Anim. Sci.*, 1996, 74, s. 925 – 933.
- DE VOL, D. L., MCKEITH, F. K., BECHTEL, P. J. et al. Variation in Composition and Palatability Traits and Relationships between Muscle Characteristics and Palatability in a Random Sample of Pork Carcasses. *J. Anim. Sci.*, 1988, 66, s. 385 – 395.
- FERNANDEZ, X., MONIN, G., TALMANT, A. et al. Influence of intramuscular fat content on the quality of pig meat – 2. Consumer acceptability of m. longissimus lumborum. *Meat Sci.*, 1999, 53, s. 67 – 72.
- GACÍA-MACÍAS, J.A., GISPERS, M., OLIVER, M.A. et al. The effects of cross, slaughter weight and halothane genotype on leanness and meat and fat quality in pig carcasses. *Animal Sci.*, 1996, 63, 3, s. 487 – 496.
- GU, Y., SCHINCKEL, A. P., MARTÍN, T. G. Growth, development and carcass composition in five genotypes of swine. *J. Anim. Sci.*, 1992, 70, s. 1719 – 1729.
- HAMILTON, D. N., ELLIS, M., WOLTER, B. F. et al. Carcass and meat quality characteristics of the progeny of two swine sire lines reared under differing environmental conditions. *Meat Sci.*, 2003, 63, s. 257 – 263.
- INGR, I., KLEINOVÁ, I. Senzorické znaky jakosti vepřového masa. *Maso*, 1998, 9, 5, s. 42 – 44.
- INGR, I. Maso ve veřejném stravování. *Maso*, 2005, 3, s. 17 – 18.
- KOUČKÝ, M., ŠEVČÍKOVÁ, S. Odlišnosti ve výživových a technologických znacích jakosti vepřového masa. *Maso*, 2005, 4, s. 18.
- KOVÁŘOVÁ, K., LEDVINKA, Z., SAMEK, M. Kvalita vepřového masa jatečných prasat různých plemen. *Maso*, 2006, 5, s. 8 – 10.
- LO, L. L., McLAREN, D. G., MCKEITH, F. K. et al. Genetic analyses of growth, real-time ultrasound, carcass and pork quality traits in Duroc and Landace pigs: I. Breed effects. *J. Anim. Sci.*, 1992, 70, s. 2373 – 2386.
- MAKOVICKÝ, P., KULÍŠEK, V., HAŠČÍK, P. et al. Všeobecná charakteristika niektorých porúch stavby, alebo funkcií svalov vo vzťahu ku kvalite mäsa. *Maso*, 2004, 4, s. 24 – 26.
- OBADÁLEK, J. Vliv krmení na kvalitu vepřového masa. *Náš chov*, 1999, 8, s. 9 – 10.
- OKROUHLÁ, M., STUPKA, R., ČÍTEK, J. et al. Amino acid composition of pig meat in relation to live weight and sex. *Czech J. Anim. Sci.*, 2006, 51, 12, s. 529 – 534.
- OKROUHLÁ, M., STUPKA, R., ČÍTEK, J. et al. Porovnání jatečné hodnoty podle dosažené živé hmotnosti a pohlaví prasat. *Maso*, 2007, 5, s. 20 – 22.
- PALANSKÁ, O., MOJTO, J., HETÉNYI, L. Súčasný pohľad na kvalitu tuku jatočných ošípaných. *Náš chov*, 1993, 1, s. 25 – 27.
- PIPEK, P., JELENÍKOVÁ, J. HACCP při produkci jatečných zvířat, jatečném opracování a v masné výrobě. *Farmář*, 1999, V, 12, s. 63 – 65.
- ŠIMEK, J., KOČÍB, J., GROLICHOVÁ, M. Kvalita jatečně upraveného těla a masa u vybraných finálních hybridů prasat. *Maso*, 2002, 6, s. 9 – 12.

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