CARCASS COMPOSITION IN SELECTED PIG HYBRIDS IN CZECH REPUBLIC

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Abstract

The aim of the study was to observe the carcass value by selected pigs in the hybridization programs in the Czech republic. Three hybrid combinations of pigs were put in the study sample. In the dam position were used by every of them the combination of breeds Czech Large White (ČBU) and Czech Landrace (ČL). In the sire position were used breeds Czech Large White – Sire Line (BO), Duroc (D) x Pietrain (PN) and in the third group Hampshire (H) x PN. The highest share of ham was observed in hybrids from the DxPN group – 24.94 ± 0.098 %. The hybrids having BO as sires reached the average value of the share of ham 24.57 ± 0.108 % and this value was significantly different from the other groups. Higher share of the ham was observed in the hybrids with the PN breed. The share of the tissue components in observed carcass parts were similar by all three hybrid combinations. For example the lean meat content in ham was in BO hybrids 71.46 ± 0.170 %. By the combination DxPN was the ham a bit leaner 71.72 ± 0.154 % and by the third combination (HxPN) reached the value 71.08 ± 0.182 %. These differences were very low and not significant.

Key Words: pig, carcass quality, body composition,

The selection and hybridization are the best evaluated proceedings used to improve the pig carcass value. It's formed on genetical base of the carcass components. In the pig carcass production are used almost entirely the final hybrids – products of the hybridizing programs (separately dam and sire lines). It's mainly the genotype which has the influence on the carcass composition and its differences by the carcasses with similar carcass weight. The carcass value parameters (lean meat content and carcass composition) are the most important for the price and the preferences of the consumers. The influence of the genotype, the used breeds described JAKUBEC et al. (2002), VÍTEK et al.(2008), BRANSCHEID et al. (2011) and others. From these studies follow that the genetical base is reduced on a few worldwide used pig breeds - *Large White, Landrace, Duroc, Hampshire* and *Pietrain.* These breeds are also the base of the hybridizing program in the Czech republic.

The aim of the study was to observe the carcass composition in the selected pig hybrids.

Material and Methods

The pigs of three hybrid combinations were selected into the observed sample according the Table 1.

The slaughter pigs were housed in the cyclic fattening system and slaughtered in selected slaughterhouses.

Every carcass was in 45 minutes *post mortem* weighted. 24 hours *post mortem* were the left halves divided into primal cuts and after that dissected according to the method of WALSTRA and MERKUS (1996). It was aimed on the composition of the ham, loin, shoulder and the belly. These main parts were dissected onto muscles (incl. ligaments), subcutaneous fat with skin, intermuscular fat and bones. The muscles are the red skeletal muscles which are dividable from the skeleton with the knife. By this dissection method are also all ligaments and fascies counted into the muscles.

The influence of the hybrid combination on the carcass composition was evaluated using the multifactorial analysis of variance and procedure GLM in SAS (vs. 8.2.).

Results and Discussion

The observed parts of the carcass were evaluated at first separately (Table 2). The highest share of the ham in the carcass was in the (ČBU x ČL) x (D x PN) hybrids – 24.94 ± 0.098 %. The hybrids having fathers (H x PN) reached the value 24.91 ± 0.116 %. Differences between these two hybrid combinations were not significant. The hybrids having BO fathers reached the value of the share of ham 24.57 ± 0.108 % and this value was significantly different from the two others hybrids. Higher share of the ham was detected by the two hybrid combinations using the PN breed in the sire position.

The share of the fat covering on the ham reached the average value 4.26 ± 0.664 % (100 %) in group with BO fathers. The hybrids with (D x PN) 4.09 ± 0.060 % (96 %) and the third combination it was 4.49 ± 0.071 % (105.4 %). Between the first and second group were not the differences significant. Similar tendencies were detected also in other carcass parts where the fat covering weight were observed.

The share of the loin in the carcass was within the BO hybrids 16.82 ± 0.147 % (100 %) and 16.55 ± 0.133 % (98.4 %) in the D x PN hybrids. The highest share of loin was detected in hybrids H x PN – 17.07 ± 0.157 % (101.5%). In the same order are the hybrid combinations ranged concerning the share of the shoulder in the carcass. By the first hybrid combination it was 12.98 ± 0.102 % (100 %), by the second 13.17 ± 0.093 % (101.5 %) and by the third 12.83 ± 0.109 % (98.8 %).

The belly (belly with bones) reached by the first hybrid group the value 10.07 ± 0.098 % (100 %), by the second 9.58 ± 0.089 % (95.1 %) and by the third 10.05 ± 0.105 % (99.8 %). The differences in the share of the belly were not significant between the hybrids BO and hybrids H x PN. In contrast to the combination D x PN, where the significantly lower share of the belly was detected.

The share of the filet in the carcass was in average by the BO hybrids 1.37 ± 0.019 % (100 %), by hybrids D x PN 1.32 ± 0.018 % (96.4 %) and by the third group (H x PN) also 1.32 ± 0.021 % (96.4 %). All these differences were not significant.

Globally, the observed carcass composition was comparable and similar to the values described in ŠPRYSL (2005).

The differences among all the observed hybrid combinations were minimal and the results for all the hybrids were very similar. This correspond with the breeding aims for the sire populations in the hybridizing programs in Czech republic presented by WOLF and ŽÁKOVÁ (2005).

Based on the detailed dissection of the main carcass parts (ham, loin, shoulder, belly and filet) were observed also the tissue components separately. The share of muscles, fat and bones was observed in these parts and also the share of intramuscular fat (IMT) in the loin. The results are shown in table 3 and figures 1 – 4. From these figures results, that the share of the tissue components are similar in all the observed parts. For example the lean meat content in ham reached by the BO hybrids 71.46 ± 0.170 % (100 %), by the hybrids (D x PN) was the ham a bit leaner – 71.72 ± 0.154 % (100.4 %) and by the third combination was it 71.08 ± 0.182 % (99.5 %). These differences were very low and significant only between the second and third group.

When comparing the selected carcass parts from the view of lean meat, then the filet is the most valuable, because it's the pure muscle tissue. On the second place is the ham, then the shoulder and the loin which has among the main meaty parts the highest share of fat. According to VALIŠ et al. (2005), the belly had the lowest share of pure muscle tissue and the highest share of the intermuscular fat. The differences between the hybrids were small and not significant. The observed hybrid combinations are comparable and the results confirm the selectional steps in the hybridizing programs. These hybridizing methods allow the high equability among all the hybrids in the carcass composition. Similar results from the fattening tests presented STUPKA et al. (2008) and VÍTEK et al. (2008) and others.

The share of the intramuscular fat (IMT) in loin was the highest in the hybrids with the Duroc (D) breed, where it was in average 1.6%. In comparison to other hybrids were these results however not significant. The only one significant was between the hybrids BO and DxPN. The breed Duroc is known for the higher share of the intramuscular fat and in our study we partly confirmed this when the hybrids DxPN had the highest share of IMT among other hybrids.

Table 1.The pigs of three hybrid combinations were selected into the groups

Hybrid	**Gilts**	**Barrows**	**Total**
I.(ČBUxČL) x BO	37	36	73
II.(ČBUxČL) x (DxPN)	43	45	88
III.(ČBUxČL) x (HxPN)	30	34	64
Total	**110**	**115**	**225**

ČBU Czech large white
ČL Czech landrace
BO Czech large white – sire line
D Duroc
PN Pietrain
H Hampshire

This value could be positively evaluated in comparison to WHITTEMORE (1998), who describes the average share of IMT circa 1%, and SLÁDEK ET AL. (2010) detected in the Czech republic the values varying between 1.5 and 2.5 %.

Based on the results we could say, that the factor of the hybrid combination is in the Czech pig population and hybridizing programs relatively stabile and very important. It depends on the basic population of the nucleus herds of purebred pigs in the Czech republic and the selection as described by ŠIMEK et al. (2004). Similar are the results in studies of KERNEROVÁ et al. (2007) or EIDELPESOVÁ, MATOUŠEK and KERNEROVÁ (2009) and others.

Contrary to earlier studies there are certain changes in the hybridizing programs and the selection of the dam and sire populations. Especially the sire populations are selected with the main aim – the lean meat content and this value increased in the Czech republic very rapidly in comparison with the year 1990. The breeding aim concerned on the lean meat content is by the sire breeds more then 60% of the lean meat in the carcass, by the PN breed is it more than 62%. The hybrids containing the PN breed have the highest lean meat content. It corresponds with the sire lines used in these hybridizing programs and confirm the effectivity of the selectional steps in hybridizing programs in the Czech republic. Awaiting the highest lean meat content when we use the purebred PN boars in the sire position.

Table 2. Carcass parts composition according to the hybrid combination

Characteristics (%)	**Hybrid**					
	I. (ČBUxČL)x BO (n = 73)		**II.(ČBUxČL)x (D x PN) (n = 88)**		**III.(ČBUxČL)x (H x PN) (n = 64)**	
	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$
Ham *	24.57[a]	0.108	24.94[b]	0.098	24.91[b]	0.116
Fat cover (ham)	4.26 [a]	0.664	4.09[a]	0.060	4.49 [b]	0.071
Loin*	16.82[ab]	0.147	16.55[a]	0.133	17.07 [b]	0.157
Fat cover (loin)	4.36 [a]	0.084	4.06[b]	0.076	4.49[a]	0.089
Shoulder*	12.98 [ab]	0.102	13.17[a]	0.093	12.83 [b]	0.109
Fat cover (shoulder)	2.26 [a]	0.055	2.19[a]	0.049	2.20 [a]	0.059
Belly*	10.07[a]	0.098	9.58[b]	0.089	10.05 [a]	0.105
Fat cover (belly)	1.98 [a]	0.051	1.78[b]	0.046	2.00 [a]	0.544
Filet	1.37 [a]	0.019	1.32[a]	0.018	1.32 [a]	0.021

* the parts are counted including the fat cover
Diferences between the means with the same letter are not significant (P ≤0.05)

Figure 1. Share of the components in ham depending on hybrid combination

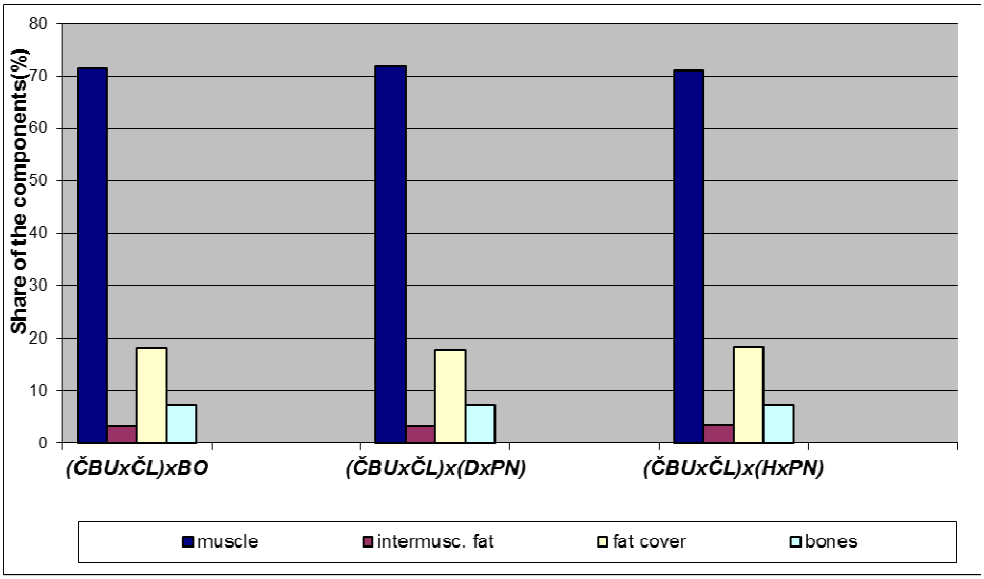


Table 3. Detailed analysis of the carcass parts depending on the hybrid combination (in %)

Carcass parts and components (%)	Hybrid					
	I.(ČBUxČL)x BO (n = 73)		II.(ČBUxČL)x (D x PN) (n = 88)		III.(ČBUxČL)x (H x PN) (n = 64)	
	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$	$\bar{x}$	$s_{\bar{x}}$
Ham (carcass)	24.57^{a}	0.108	24.94^{b}	0.098	24.91^{b}	0.016
- muscle	71.46^{ab}	0.170	71.72^{a}	0.154	71.08^{b}	0.182
- intermusc. fat	3.23^{a}	0.089	3.30^{a}	0.081	3.41^{a}	0.095
- fat cover	18.12^{ab}	0.191	17.62^{a}	0.173	18.18^{b}	0.204
- bones	7.19^{a}	0.076	7.36^{a}	0.068	7.33^{a}	0.081
Loin (carcass)	16.82^{ab}	0.147	16.55^{a}	0.133	17.07^{b}	0.157
- muscle	56.58^{a}	0.288	57.08^{a}	0.261	57.07^{a}	0.308
- intermusc. fat	4.98^{a}	0.144	5.41^{b}	0.131	5.30^{ab}	0.154
- fat cover	26.77^{a}	0.310	25.81^{b}	0.281	26.28^{ab}	0.331
- bones	11.67^{a}	0.186	11.70^{a}	0.168	11.35^{a}	0.198
Shoulder (carcass)	12.98^{ab}	0.102	13.17^{a}	0.093	12.83^{b}	0.109
- muscle	65.46^{a}	0.202	64.91^{b}	0.183	65.64^{a}	0.216
- intermusc. fat	6.75^{a}	0.235	7.39^{b}	0.213	7.90^{b}	0.251
- fat cover	18.55^{a}	0.038	18.19^{a}	0.034	17.34^{b}	0.041
- bones	9.24^{ab}	0.124	9.51^{a}	0.112	9.12^{b}	0.132
Belly w.bon. (carc.)	10.07^{a}	0.098	9.59^{b}	0.089	10.07^{a}	0.105
- muscle	54.73^{a}	0.336	54.46^{a}	0.304	53.27^{b}	0.358
- intermusc. fat	17.38^{a}	0.344	18.18^{ab}	0.312	19.11^{b}	0.367
- fat cover	20.68^{a}	0.299	20.07^{a}	0.271	20.00^{a}	0.319
- bones	7.21^{a}	0.102	7.29^{a}	0.093	7.62^{b}	0.109
Filet (carcass)	1.37^{a}	0.019	1.32^{a}	0.018	1.33^{a}	0.021
IMT (g . kg^{-1})	14.04^{a}	0.615	16.37^{b}	0.557	15.08^{ab}	0.656

Diferences between the means with the same letter are not significant (P ≤0,05)

Figure 2. Share of the components in loin depending on hybrid combination

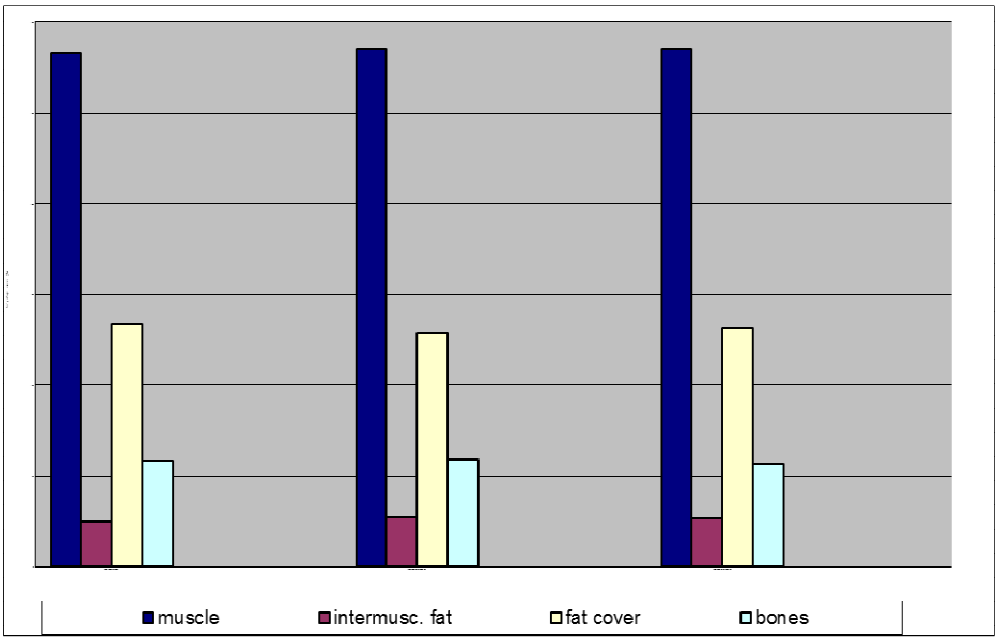


Figure 3. *Share of the components in shoulder depending on hybrid combination*

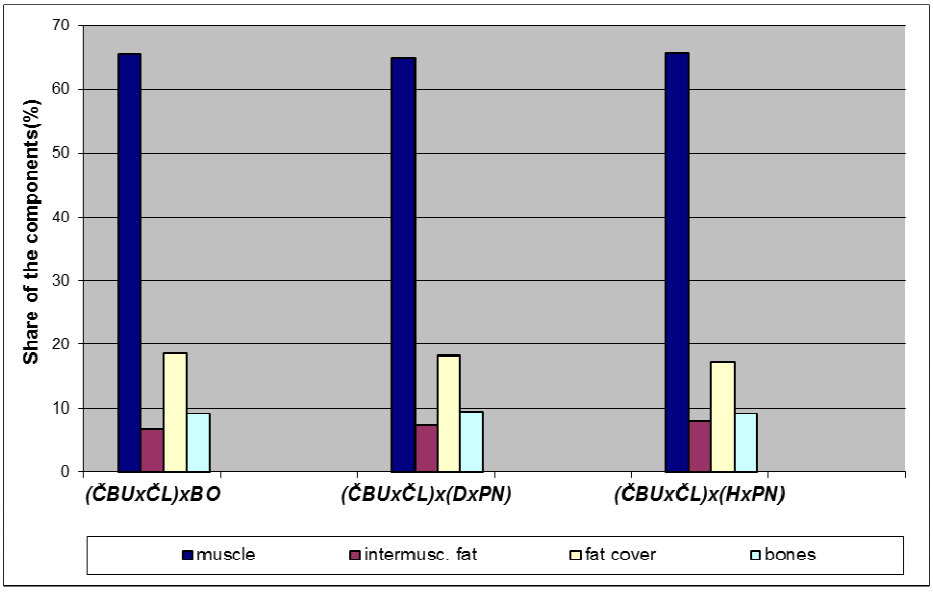
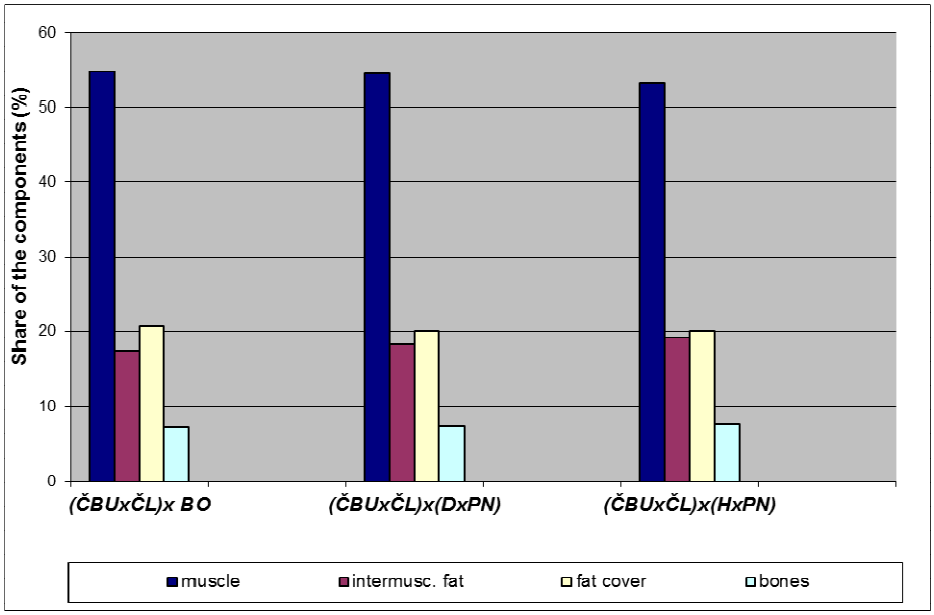


Figure 4. Share of the components in belly with bones depending on hybrid combination



Conclusion

In the study were evaluated three groups of slaughter pigs of different hybrid combination. The aim was to observe the differences in carcass composition among the selected hybrids.

The highest share of ham was observed in hybrids from the D x PN group – 24.94 ± 0.098 %. The hybrids having BO as sires reached the average value of the share of ham 24.57 ± 0.108 % and this value was significantly different from the other groups. Higher share of the ham was observed in the hybrids with the PN breed.

The share of the tissue components in observed carcass parts were similar by all three hybrid combinations. For example the lean meat content in ham was in BO hybrids 71.46 ± 0.170 %. By the combination D x PN was the ham a bit leaner 71.72 ± 0.154 % and by the third combination (H x PN) reached the value 71.08 ± 0.182 %. These differences were very low and not significant.

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