

The Development in Live Weight, Muscle and Fat of Crna Slavonska Pigs Kept in Different Rearing Systems

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Summary

Present study was carried out on 180 Crna Slavonska pigs, equally divided on barrows and gilts, distributed into two rearing systems: 80 animals were kept in indoor and 100 outdoor. Every three months, pigs from both experimental groups were sacrificed for growth analysis of muscle and fat in the series of subsequent dissection trials covering a total fattening period of 15 months for the pigs from indoor rearing system and 18 months for those kept outdoors. In first 4 trials covering the period from 3rd to 12th months of age, 8 pigs were sacrificed, while from thereafter to the end of investigation the number of pigs sacrificed for the dissection increased to 12. The results showed that rearing system had significant influence on the development of live weight, muscle tissue and fat of Crna Slavonska pigs. The differences in these traits between the Crna Slavonska pigs from two rearing systems were most pronounced at the end of fattening period, especially for the live weight and fat. Rearing system significantly affected also the gains of live weight, muscle tissue and fat in the way that indoor reared Crna Slavonska pigs had similar growth patterns of live weight and fat gain. In the last period of fattening the gain of muscle tissue began to stagnate while fat growth was increased. This trend was not observed for the muscle tissue gain of pigs kept outdoor. The results of present study pointed out that the production of lean and lean/fat ratio of Crna Slavonska pigs could be optimized. Further investigations of growth characteristics of Crna Slavonska pigs kept under different environmental conditions were recommended.

Key words

local pig breed, rearing conditions, growth characteristics

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Introduction

Crna Slavonska pig is autochthonous Croatian pig breed developed by planned crossing of Mangalitza, Berkshire and Poland China breeds. Results obtained by several researches (Uremović et al., 2000; Senčić et al., 2005) indicate that the Crna Slavonska pig is a low productive, combined (lean/fat) breed characterized by robust immunity, pigmented skin and ability to consume great quantity of voluminous food. Usually, Crna Slavonska pigs are traditionally reared outdoor due to their biological prerequisites that allow excellent adjustment to the local climatic conditions (Károlyi et al., 2007). The outdoor rearing of Crna slavonska pigs represents low input production system that is rather cost effective since these pigs do not need expensive accommodation facilities and their food requests are modest (Margeta et al., 2016).

Nevertheless, other rearing systems are also applied. For example, the rearing of Crna Slavonska pigs on deep litter represents a suitable system with reduced production costs compared to modern farming systems, but still allowing the pigs to express full genetic potential of growth (Butko et al., 2007; Margeta et al., 2013).

The aim of the present study was to determine the differences between Crna Slavonska kept in two different rearing systems (indoor and outdoor) in the growth patterns of live weights, muscle tissue and fat.

Material and methods

The experiment was carried out on 180 Crna Slavonska (CS) pigs. The animals were distributed into two rearing systems. A total of 80 pigs (40 gilts + 40 barrows) were kept indoor (deep litter) and 100 pigs (50 gilts + 50 barrows) were reared in the outdoor system. Surface of the barn for indoor pigs was 240 m², which allowed 3 m²/pig of available floor space. During the indoor experiment, 1.5 kg of straw-bedding per pig was added daily. The outdoor group of pigs was reared on the pasture allowing 300 m² space per pig with 80 m² of canopy, which pigs could use as a shelter from uncomfortable climate conditions. Basic diet for both groups was alfalfa *ad libitum* with the additional 2 kg of the whole grains per pig/day. Composition of additional diet was 50% corn, 25% barley, 10% triticale, and 15% extruded soybeans. Feed consumption of the indoor pigs was monitored on the pen basis. Starting at the age of three months, pigs from both experimental groups were sacrificed for the analysis of muscle and fat growth in the series of subsequent dissection

Table 1. Timetable of dissection trials carried out on the investigated group of pigs

Age (months)	Average live weight (kg)		Number of dissected carcasses (N)
	Indoor	Outdoor	
3	21.83	22.17	8
6	38.83	29.00	8
9	93.67	46.17	8
12	146.83	66.33	8
15	218.50	89.67	12
18	-	120.50	12

trials, covering a total fattening period of 15 months in the case of CS pigs from indoor rearing system and 18 months for those kept outdoors as presented in table 1.

In each dissection trial, the right side of pig carcasses was fully dissected according to the “Kulmbach reference method” as described by Branscheid et al. (1990). The data obtained in present study were analysed by Student’s t-test using Dell Statistica v. 12 software (Dell Inc., 2015), while graphical presentation of the data was performed using Microsoft Excel program (Microsoft, 2013).

Results and discussion

General growth patterns

Figure 1 shows the development of live weight, muscle tissue and fat in Crna Slavonska (CS) pigs kept in two different rearing systems. From the presented results, it can be observed that at the early age (3 months), investigated pigs were quite similar regarding the investigated traits, but afterwards their growth patterns started to exhibit different trends. Student’s t-test revealed significant differences ($p < 0.001$) between the investigated traits in all dissection trials with the exception of the first one, performed when pigs were at the age of 3 months. The most pronounced difference between the CS pigs from two rearing systems was observed in the live weight at the age of 15 months (128.83 kg); at the same time, the difference in the amount of fat tissue was also large (75.39 kg).

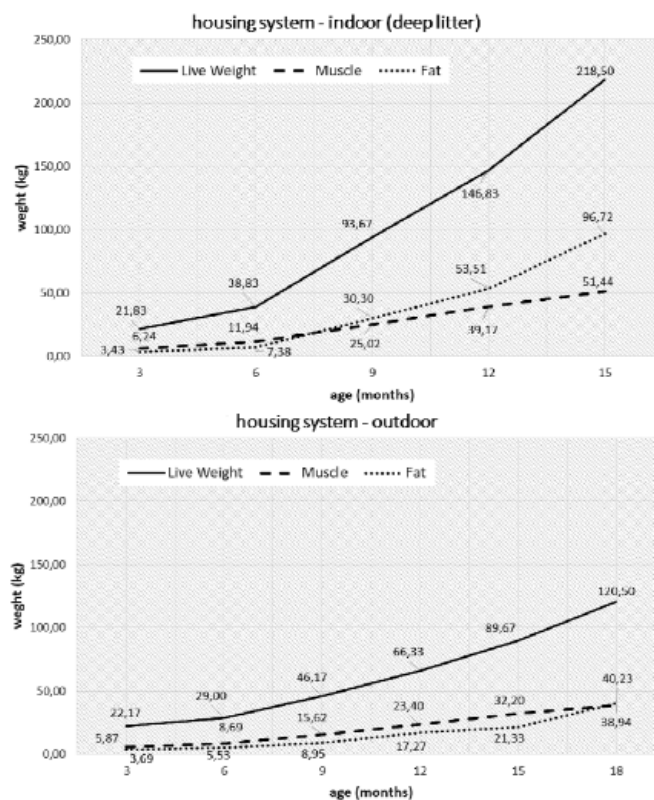


Figure 1. Growth pattern of live weight, muscle and fatty tissue of Crna Slavonska pigs reared indoor (left) and outdoor (right)

It is known that CS pigs are characterized by high percentage of fat tissue and low percentage of lean as shown by Butko et al. (2007) and Karoly et al. (2007). Similar carcass characteristics can also be found in the other traditional pig breeds, such as Italian Cinta Senese or Alentejano from Portugal (Pugliese et al., 2003; Freitas et al., 2007). Although results of the present study generally confirm these findings, results presented in Figure 1 show that lean/fat ratio can be significantly improved when the pigs are kept outdoors until 15th months of age, because at this point fat amount is still lower than the amount of muscle tissue; unfortunately, at rather low live weights. In addition, at the age of 15 months, CS pigs from indoor rearing system produced significantly more muscle tissue than CS pigs reared outdoor, indicating that capacity of muscle growth could be better utilised. According to Vincek et al. (2013), the significant accumulation of fat tissue in commercial breeds starts at higher live weights that are not economically important for meat industry. However, in the production of traditional pork products higher live weight or age is very important as heavier/older pigs are characterized by more favourable meat quality traits (Lattore et al., 2003). Having this in mind, better utilization of muscle growth in pigs raised for production of traditional meat products would be welcomed.

Live weight, fat and muscle gain

The developments of daily gains of investigated CS pigs regarding the live weight as well as the weights of muscle and fat are presented in Figure 2.

The differences in live weight, muscle and fat gain of CS pigs kept in two different rearing systems were statistically significant ($p < 0.001$).

From Figure 2 it can be observed that CS pigs held in indoor rearing system had considerably higher live weight gain compared to those kept outdoor. In the period from 6th to 9th month of age, live weight gain of CS pigs kept indoors was increased by 420.37g, while in CS pigs kept outdoor live weight gain increased by only 114.81g during the same period. This makes more than 3-fold difference in favour of the indoor rearing system. However, it seems that after that period CS pigs from the indoor rearing system reached a certain plateau since in following three-month period no increase in live weight gain was observed; on the contrary, a slight decrease in live weight (-18.52g) was detected.

In the group of CS pigs kept outdoors, the increase of live weight gains during the entire fattening period was modest, but constant. Throughout the investigated fattening period, the average daily gain of CS pigs kept indoors was 546.30g and those kept outdoors was 183.33g. If CS pigs are compared to conventional pig breeds, these differences are even more pronounced as shown by Uremović et al., (2000). The authors compared production traits of CS with conventional pig breeds and observed that CS pigs had significantly lower daily gain (450 – 500g) than conventional pig breeds (658 – 927g).

The gain of muscle tissue of CS pigs kept indoors was increasing until 12th month of age, after which it started to decrease during the last three months of fattening. This can be explained by the fact that pigs from indoor housing system does not have to move and use their body resources in search for food unlike the pigs reared outdoor. The muscle gain in these pigs was for

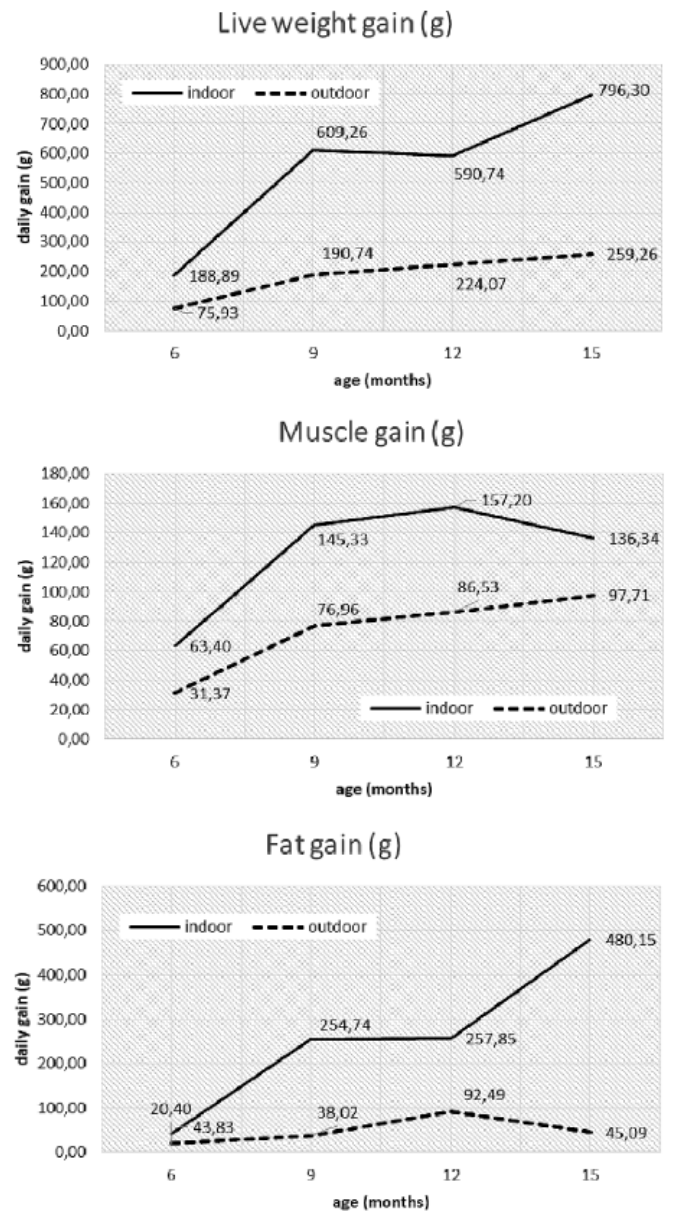


Figure 2. Live weight, fat and muscle daily gain of CS pigs from indoor and outdoor rearing system

that matter significantly lower. This pattern was also observed by Butko et al., (2007); the authors concluded that the housing system significantly influenced the carcass composition as well as the quality of meat and fat.

Fat gain pattern of CS pigs kept indoor was similar to the gain of live weight. These similarities are most obvious for the period between 9th and 12th months of age when both patterns showed stagnation in gains. More precisely, once the fat gain reached its peak in the first trimester, the period of stagnation occurred and lasted for the next three months. However, after the above-mentioned stagnation, the fat gain increases steeply, reaching its peak at 15th month of age. This similarity between

the patterns of live weight and fat gain is in agreement with the results obtained by Čitek et al., (2012) who investigated growth traits of DanBred pigs. In their study, they have observed that increase in live weight gain was accompanied with the increased fat gain in the pig carcasses. Additionally, if the values of fat and muscle gain of the pigs held indoor are compared, it is clear that the increase in fat gain is accompanied with lower muscle gain, as previously reported by Njoku et al., (2015) and Solanes et al., (2009), although on commercial pigs.

The results from present study showed that fat gain of CS pigs from outdoor system was increasing until 12th month of age, after which a significant decrease was observed. This could be explained by the fact that CS pigs kept outdoor are in constant move, searching for food. However, the decrease in fat gain resulted in more favourable lean/fat ratio in the carcasses of CS pigs reared outdoor. This supports the earlier findings of Senčić et al., (2005) who found better lean/fat gain ratio in CS pigs reared in outdoor rearing system.

Conclusion

The results obtained in the present study show that rearing system had significant influence on the growth characteristics of Crna Slavonska pigs. The series of subsequent dissections revealed the patterns of muscle tissue and fat growth. The pigs kept in the indoor housing system grew faster, but the growth was characterised by overproduction of fat. On the other hand, pigs kept outdoor were growing at the slower rate, having more favourable lean/fat ratio. Furthermore, the closer look at the development of muscle tissue of the CS pigs from investigated housing systems indicate that muscle growth capacity of the outdoor kept pigs was not fully utilised. This point to the conclusion that the production traits of Crna Slavonska pigs could be optimized in terms of lean/fat ratio, so further investigations of muscle tissue and fat growth dynamics are suggested. The combination of different housing systems during growth or the usage of protein rich feed supplements in the additional diets for the pigs kept outdoors could be an interesting start point in this direction.

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