Performance of Krškopolje Pigs in Extensive and Intensive Production Systems

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Introduction

Krškopolje pig is the only Slovenian autochthonous pig breed. The interest for Krškopolje breed is increasing in the last years, esp. on organic farms and on family farms with direct product sales. The public aid for conservation of this breed contributes to its wider use. Many small scale farmers still rear pigs in the traditional extensive systems with self-grown feeding resources, in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops. Some farmers rear Krškopolje pigs also in intensive systems with commercially available complete feed mixtures. We recently demonstrated that growth performance of Krškopolje pigs does not differ between ecological and conventional production system if diets fed are equivalent in supply of energy and protein (Batorek-Lukač et al., 2016). No data is available about productive traits of Krškopolje pigs in traditional (extensive) farming system. Therefore, performance data is available about productive traits of Krškopolje pigs in particular cooked root crops.
the beginning of the study (86 days of age) and until approximate age of 130 days and 45 kg BW, INT and EXT groups did not differ in BW denoting similar growth rate in both groups (Figure 1). Thereafter, due to increased growth rate, INT pigs were heavier at all weighing points.

While EXT pigs exhibited similar growth rate throughout the study, growth rate of INT pigs was doubled in the period until 195 days of age (between 45 and 90 kg) and was almost 2-fold higher than in EXT pigs in that period (Figure 1b) resulting in 31.5 kg more gain of INT than EXT pigs. It is worth noting that growth rate of INT pigs strongly decreased in the last period (after 90 kg) and was then comparable to growth rate of EXT pigs. The achieved growth rate of Krškopolje pigs in the first period is similar to daily gains reported for Iberico breed and lower than in modern breeds (Rivera-Ferre et al., 2005).

If we relate growth performance with estimated consumption of ME and CP according to growth stage, then we can observe that until 45 kg, growth rate was similar in INT and EXT pigs, which can be related to comparable consumption of energy and nutrients in both systems. A deficiency in lysine in this period indicates that full growth potential of Krškopolje pigs probably could have been achieved with higher lysine intake. As shown by Rivera-Ferre et al. (2005) 35% lysine deficiency of recommended supply reduced daily gain of growing Iberico pig by 60%. Based on our results we can conclude that in this initial growing stage covering the amino acid requirements is essential for pigs to fully exhibit their growth potential. Growth rate of Krškopolje pigs in the subsequent growing periods (until 90 kg) was 455 g/day in EXT and 878 g/day in INT system. It can be assumed that pigs in INT system could fully exhibit their growth potential as they were fed ad libitum and their estimated energy and nutrient intake covered their nutrient requirements. It can also be observed, that their protein and lysine intake was well above requirements, therefore it could be suggested that protein content of the diets for Krškopolje pigs in the BW range 45-90 kg could be lower than in feed mixtures for lean fatteners. It could also be considered that nutritional requirements of Krškopolje pigs are more similar to other breeds with low genetic potential for lean tissue deposition (as Iberico) than to modern breeds. In a study of Nieto et al. (2002) on Iberico,

**Results and discussion**

**Growth performance.** Regarding the EXT system, it should be noted, that we didn’t interfere with the farmer’s usual way of feeding, we merely carried out the weighing of pigs, recorded the feed distribution and conducted the laboratory analyses of diets. Table 2 gives an overview of the estimated intake of ME, CP and lysine based on the quantity of distributed feed (dry matter - DM) according to growth stage. Relating to theoretically expected DM feed intake (106 g/kg BW\(^{0.75}\), according to NRC, 1998) we could note that pigs in EXT group received sufficient quantity of DM in all stages of growth, but in the second stage of growth (45-75 kg), the offered feed was well over their theoretical DM intake (not consumed completely), which indicates that the intake of energy and proteins based on actually distributed feed (Table 2) is very likely overestimated for EXT pigs at this stage of growth (for about 20%). Regarding INT pigs, it can be concluded that their intake was in agreement with theoretical expectations and it can be considered that they were fed ad libitum (3-4×MEm). It can also be concluded that the supply of proteins was sufficient in INT pigs, whereas in EXT pigs protein supply was satisfactory only in the first growing stage (until 45 kg) and thereafter the meal was deficient in proteins. With regard to lysine needs (17-19 g/day, according to NRC, 1998; 17.7 g/day according to Nieto et al. 2015 for fatty type Iberico pig) results show that in the first growing stage both EXT and INT pigs were somewhat deficient, whereas in the following stages EXT pigs were largely deficient and INT pigs were highly above their requirements. At
the maximum deposition of proteins was achieved with a diet having 129 g CP/kg DM (ideal protein concept; 15.4 MJ ME/kg DM) and that increasing the level of proteins did not increase protein accretion. In EXT pigs, the observed growth rate was 1.9-fold lower as in INT despite being fed ad libitum and with energy above their needs. This can only be explained with lysine deficiency. It can be estimated that in EXT system only about 50-60% of the recommended lysine intake was achieved with the offered diet, which corroborates the ratio between observed daily gains for EXT and INT pigs. An interesting point to comment on relates to the last growing stage (90-120 kg) in which only INT pigs were monitored. Their growth rate (580 g/day) was significantly lower in this period compared to the preceding two stages (45-90 kg) despite receiving 2.9×MEm. Two aspects could be responsible; energy losses due to metabolism of excess proteins and changed composition of gain in favour of fat deposition. When the relationship between protein deposition and ME intake is declined, a relative increase in lipid gain was observed (Katsumata et al., 2000). Oxidative metabolism (Gondret et al., 2005), similarly Lebret et al. (2015) showed that muscles of extensively reared Basque pigs exhibited lower glycolytic potential and darker colour. Higher oxidative capacity of muscle fibres was also demonstrated in group of pigs restrictively fed (app. 60% restriction) for 3 weeks (Katsumata et al., 2000).

Conclusion

Traditional feeding and rearing system influenced growth performance and lipid deposition in Krškopolje pigs (slower growth due to lysine deficiency) with some indicative benefits in terms of meat quality of extensively reared pigs.

References


Figure 2. Back fat thickness (mean±SE) of Krškopolje pigs reared in extensive or intensive system at a) slaughter (the same age) and b) at the same body weight (88 kg)

Table 3. Meat quality traits (mean) of Krškopolje pigs reared in extensive or intensive system

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Extensive (n=6)</th>
<th>Intensive (n=6)</th>
<th>RMSE</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMF, %</td>
<td>3.1</td>
<td>2.8</td>
<td>1.2</td>
<td>0.700</td>
</tr>
<tr>
<td>pH 24 h</td>
<td>5.43</td>
<td>5.46</td>
<td>0.13</td>
<td>0.671</td>
</tr>
<tr>
<td>Drip loss after 24 h, %</td>
<td>3.7</td>
<td>4.2</td>
<td>1.5</td>
<td>0.580</td>
</tr>
<tr>
<td>Drip loss after 48 h, %</td>
<td>5.4</td>
<td>5.8</td>
<td>1.7</td>
<td>0.714</td>
</tr>
<tr>
<td>CIE L*</td>
<td>47.8</td>
<td>50.4</td>
<td>1.9</td>
<td>0.044</td>
</tr>
<tr>
<td>CIE a*</td>
<td>8.5</td>
<td>6.6</td>
<td>0.9</td>
<td>0.003</td>
</tr>
<tr>
<td>CIE b*</td>
<td>1.0</td>
<td>0.9</td>
<td>0.5</td>
<td>0.740</td>
</tr>
</tbody>
</table>

RMSE – root mean square error; IMF – intramuscular fat.