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Short communication

Meat quality, some hematological and biochemical parameters in the blood of finishing pigs assigned to different carcass conformation classes in the SEUROP system

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Abstract

The results of laboratory analyses, including the proximate composition, physicochemical and sensory properties of meat from the studied pigs, point to its high processing suitability and eating quality. Hematological indicators in the blood of the analyzed animal groups were within the reference ranges, excluding MCHC levels which were somewhat elevated. Significant differences were observed in Hb, HCT, MCV, MCH, MCHC and WBC values, subject to the meat content of the carcass. Biochemical parameters such as glucose concentrations, ALT and AST activity levels varied considerably between groups, and average ALT values somewhat exceeded the norm for the species. These results, including significant variations in selected parameters, can probably be attributed to homeostatic changes in pigs during intensive growth.

Key words: finishing pigs, meat quality, meat content of carcass, blood

Introduction

Variations in the quality of pork can be attributed to a variety of factors, including production, biological factors and pre-slaughter handling of animals (Candek-Potokar et al. 1999, Fernandez and Monin 1999).

The objective of this study was to compare the meat quality and the hematological and biochemical parameters of pigs characterized by a different meat content of the carcass.

Materials and Methods

The experimental material comprised 55 hybrid [♀ (Polish Large White x Polish Landrace) x ♂ Duroc] finishing pigs. The carcasses of the experimental animals were categorized into four conformation classes in the SEUROP system which corresponded to four experimental groups: class S – 13 carcasses, class E – 22 carcasses, class U – 12 carcasses and class R – 8 carcasses. The proximate chemical composition,

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Table 1. Hot carcass weight, meat content of carcass, chemical composition, physicochemical and sensory properties of meat (*m. longissimus lumborum*) from finishing pigs.

| Specification | Stat. meas. | Conformation class | | | |
|---|-------------|--------------------|---------------------|---------------------|---------------------|
| | | S | E | U | R |
| Hot carcass weight (kg) | \bar{x} | 86.88 ^A | 85.03 ^a | 81.23 ^{Bb} | 79.14 ^B |
| | s | 2.72 | 3.81 | 4.42 | 2.17 |
| Meat content of carcass (%) | \bar{x} | 60.98 ^A | 57.01 ^{BC} | 52.41 ^B | 49.26 ^{BD} |
| | s | 0.86 | 1.48 | 1.42 | 0.61 |
| Dry matter (%) | \bar{x} | 24.94 ^B | 25.77 ^{Aa} | 25.39 | 25.13 ^b |
| | s | 0.81 | 0.46 | 1.03 | 1.18 |
| Total protein (%) | \bar{x} | 22.75 | 23.12 | 22.93 | 22.98 |
| | s | 0.58 | 0.59 | 0.35 | 0.31 |
| Fat (%) | \bar{x} | 1.61 | 1.82 | 1.75 | 1.64 |
| | s | 0.31 | 0.56 | 0.35 | 0.28 |
| Ash (%) | \bar{x} | 1.14 | 1.16 | 1.15 | 1.15 |
| | s | 0.05 | 0.04 | 0.01 | 0.02 |
| pH ₄₅ | \bar{x} | 6.16 | 6.01 | 6.05 | 6.14 |
| | s | 0.28 | 0.19 | 0.14 | 0.09 |
| pH _U | \bar{x} | 5.51 | 5.55 | 5.53 | 5.51 |
| | s | 0.12 | 0.21 | 0.07 | 0.05 |
| <i>L</i> * (lightness) | \bar{x} | 57.29 | 56.59 | 58.62 | 58.32 |
| | s | 3.21 | 3.23 | 3.34 | 1.75 |
| <i>a</i> * (redness) | \bar{x} | 6.22 ^b | 7.21 ^a | 7.45 ^a | 7.16 |
| | s | 1.02 | 1.09 | 1.16 | 0.84 |
| <i>b</i> * (yellowness) | \bar{x} | 14.06 | 14.36 | 14.51 | 14.19 |
| | s | 1.13 | 1.33 | 0.99 | 0.41 |
| Water-holding capacity (cm ²) | \bar{x} | 7.41 | 6.81 ^b | 8.27 ^a | 7.78 |
| | s | 2.01 | 1.72 | 1.62 | 1.64 |
| Tenderness (points) | \bar{x} | 4.38 ^a | 3.89 ^b | 4.46 ^a | 4.31 |
| | s | 0.61 | 0.65 | 0.58 | 0.59 |
| Juiciness (points) | \bar{x} | 4.51 ^A | 3.91 ^{Bb} | 4.29 ^a | 4.19 |
| | s | 0.54 | 0.55 | 0.31 | 0.22 |

^{ab} – $P \leq 0.05$; ^{ABCD} – $P \leq 0.01$

physicochemical and sensory properties of the meat (*m. longissimus lumborum*) were determined. Hematological and biochemical parameters were determined in blood and blood serum samples. Blood samples were collected from the superior vena cava five days prior to transport.

Results and Discussion

A decrease in the meat content of the carcass was accompanied by a drop in carcass weight in the compared groups. The meat content of the carcass, determined in the range of 60.98% to 49.26%, decreased by around 3 to 4% between the analyzed groups (Table 1).

The results of physicochemical and sensory analyses point to high processing suitability and eating quality of the studied meat samples. An evaluation of the functional properties of the pork revealed normal pH values, high water-holding capacity and a desirable color. The results of tenderness and juiciness analyses confirmed that the meat of Duroc crosses is characterized by highly satisfactory sensory properties (Table 1).

The hematological parameters of the studied finishing pigs were within the reference intervals (Winnicka 2011) (Table 2). The only exception was MCHC which exceeded the reference limit in two groups of animals characterized by the lowest carcass meatiness (conformation classes U and R). In this study, the above parameter exceeded the reference limit only

Table 2. Level of hematological and serum biochemical indices in the blood of finishing pigs.

| Specification | Stat. meas. | Conformation class | | | | Reference intervals (Winnicka) |
|---|----------------|-----------------------------|------------------------------|------------------------------|-----------------------------|--------------------------------|
| | | S | E | U | R | |
| Hematological indices | | | | | | |
| RBC (red blood cells) ($10^{12}/l$) | \bar{x} s | 6.61 0.31 | 6.79 0.52 | 6.39 0.59 | 6.34 0.44 | 5.0-8.0 |
| Hb (hemoglobin) (mmol/l) | \bar{x} s | 7.06 ^{Bb} 0.31 | 7.59 ^A 0.51 | 7.51 ^a 0.52 | 7.93 ^a 0.42 | 6.21-9.93 |
| HCT (hematocrit) (l/l) | \bar{x} s | 0.39 ^A 0.02 | 0.40 ^A 0.04 | 0.35 ^B 0.05 | 0.34 0.02 | 0.32-0.50 |
| MCV (mean corpuscular volume) (fl) | \bar{x} s | 60.34 ^{Aa} 2.53 | 58.63 ^c 4.39 | 54.58 ^{Bd} 4.53 | 53.52 ^b 2.91 | 50.0-68.0 |
| MCH (mean corpuscular hemoglobin) (fmol) | \bar{x} s | 1.06 ^{Bb} 0.04 | 1.12 ^{ad} 0.06 | 1.18 ^{Ac} 0.09 | 1.25 ^A 0.07 | 1.05-1.43 |
| MCHC (mean corpuscular hemoglobin concentration) (mmol/l) | \bar{x} s | 17.79 ^{Bb} 0.24 | 19.23 ^{Dad} 2.02 | 21.79 ^{Ac} 2.07 | 23.37 ^{Ac} 1.79 | 18.6-21.08 |
| WBC (white blood cells) ($10^9/l$) | \bar{x} s | 14.52 ^{Bb} 1.65 | 16.38 ^a 2.53 | 18.19 ^A 3.11 | 17.74 ^a 2.39 | 10.0-20.0 |
| PLT (platelets) ($10^9/l$) | \bar{x} s | 347.31 42.11 | 336.01 103.41 | 347.31 92.64 | 289.11 124.91 | 120.0-450.0 |
| Biochemical indices | | | | | | |
| Urea (mmol/l) | \bar{x} s | 4.24 1.09 | 4.27 1.02 | 4.08 1.11 | 4.65 0.78 | 3.32-6.64 |
| Glucose (mmol/l) | \bar{x} s | 3.76 ^B 0.84 | 4.97 ^A 0.39 | 5.12 ^A 0.69 | 5.24 ^A 0.56 | 2.5-5.6 |
| ALT (alanine aminotransferase) (U/l) | \bar{x} s | 52.62 ^a 10.28 | 57.14 ^{Ac} 18.63 | 38.82 ^{Bb} 12.45 | 29.38 ^d 3.55 | 9.0-43.0 |
| AST (aspartate aminotransferase) (U/l) | \bar{x} s | 40.15 ^{Aa} 7.79 | 31.91 ^b 8.35 | 25.75 ^B 8.64 | 17.12 ^B 2.08 | 16.0-65.0 |

abcd – $P \leq 0.05$; AB – $P \leq 0.01$

insignificantly. An analysis of variance revealed highly significant variations in glucose levels, but the noted values were within the reference interval (Winnicka 2011) (Table 2). Significant differences in ALT and AST values were also reported between the analyzed groups. The highest levels of ALT and AST activity were observed in pigs characterized by the highest meat content of the carcass, i.e. in S and E conformation classes. The mean ALT values in the above groups insignificantly exceeded the upper reference limits given by Winnicka (2011) as well as Leman et al. (1992) (15 – 46 U/l).

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