COMMUNICATION

Meat quality of calves obtained from organic and conventional farming

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ABSTRACT - The aim of this study was to compare meat quality of organically and conventionally raised Simmental calves. Fifteen organic and fourteen conventional carcasses were considered, 8th rib and M. Longissimus thoracis were sampled on each carcass. Different tissues percentage of 8th rib were evaluated and meat colour, chemical and fatty acids composition of M. Longissimus thoracis were analysed. Fat percentage of 8th rib of organic calves was lower (P<0.01) than conventional ones. Cooking weight losses were lower (P<0.001) in organic meat compared to the conventional ones and red index was higher in organic calves due to the high content of heminic iron (P<0.001). Ether extract (P<0.001) and cholesterol content (P<0.05) was lower in organic meat with respect to conventional one. Positive value, from a nutritional point of view, were found in organic veal about n-3 fatty acids, n-6/n-3 ratio and CLA content.

Key words: Organic farming; Meat quality, Calves, Fatty acids.

Introduction – Dairy calves obtained from organic farming could be a resource for the production system of organic beef. However only a little part of the calves born on the organic dairy farms are slaughtered and commercialised as organic products (Nielsen et al., 2002). Meat characteristics of calves produced by organic system are almost unknown and in literature there are few studies about the comparison between organic and conventional meat (Woodward et al., 1999). This experiment was carried out to compare meat quality of organically and conventionally raised Simmental calves.

Material and methods – Fifteen carcasses of organic calves (144.8±18.6kg) and fourteen carcasses of conventional calves (155.4±26.6kg) were considered. The average age at slaughtering was 6 months and all calves belonged to Simmental breed. Organic calves were reared at the pasture and were subjected to natural suckling. The conventional calves received milk replacers and roughage sources according to EU rule (97/2/EC). At slaughtering the 8th rib from the right side of each carcass was removed and immediately vacuum-packed. After 7 days of ageing at 4°C the samples were separated into muscle, bone and
intramuscular fat and fresh samples of *M. Longissimus thoracis* was used for the determination of pH and colour (Minolta CM500 Spectrophotometer) (ASPA, 1996) while on the freeze-dried samples the chemical composition was determined (AOAC, 2000). Cholesterol and heminic iron contents were detected according to Casiraghi *et al.* (1994) and Hornsey (1956) respectively. Cooking losses and Warner-Bratzler shear force (kg/cm²) were estimated (ASPA, 1996). Fatty acids were analysed by GC analysis after lipid extraction (ASE® instrument, Dionex) and trans methylation (Christie, 1982). The effect of production system (organic vs conventional) was statistically evaluated by ANOVA (SAS, 2004).

**Results and conclusions** – Fat percentage of 8th rib of organic calves (Table 1) was lower (P<0.01) than conventional ones. Less state of fattening of organic carcasses was found in literature (Russo *et al.*, 2005). The lack of difference in percentage of bone observed indicate no different skeletal development in organic calves.

Cooking losses (Table 2) were significantly lower in organic meat compared to the conventional ones (P<0.001) while tenderness did not differ between the two groups. Values of lightness and hue were lower in organic meat compared to the conventional one. Higher redness of organic meat, due to the high content of eminic iron (P<0.001), was probably

| Item                | ORG  | CON  | P-value | SEM₁ |
|---------------------|------|------|---------|------|
| Lean, %             | 69.00| 64.08| *       | 1.38 |
| Fat, %              | 2.90 | 7.36 | **      | 0.90 |
| Bone, %             | 28.10| 28.56| ns      | 1.59 |

*: P<0.05; **: P<0.01; ns=non significant; ¹Standard error of the mean.

Table 1. Different tissues percentages of 8th rib of organic and conventional calves.

| Item                  | ORG  | CON  | P-value | SEM₁ |
|-----------------------|------|------|---------|------|
| Cooking losses, %     | 26.17| 31.59| ***     | 0.80 |
| Shear force, kg/cm²   | 2.94 | 2.73 | ns      | 0.80 |
| Meat colour           |      |      |         |      |
| L* lightness          | 32.56| 43.09| ***     | 0.99 |
| a* redness            | 9.05 | 4.73 | ***     | 0.72 |
| b* yellowness         | 9.80 | 11.68| *       | 0.49 |
| H* hue                | 47.07| 69.88| ***     | 2.37 |
| Chemical composition, %|      |      |         |      |
| Dry matter            | 24.27| 24.70| ns      | 0.26 |
| Lipids                | 0.76 | 1.31 | ***     | 0.10 |
| Crude protein         | 22.29| 21.91| ns      | 0.24 |
| Ash                   | 1.11 | 1.08 | ns      | 0.01 |
| Cholesterol, mg/100g  | 53.95| 58.52| *       | 1.29 |
| Heminic iron, mg/kg   | 47.53| 26.07| ***     | 1.78 |

*: P<0.05; **: P<0.01; ***: P<0.001; ns=non significant; ¹Standard error of the mean.
due to grazing activity of organic animals. Ether extract content of *M. Longissimus thoracis* of organic calves was lower than those of conventional ones (P<0.001). The amount of cholesterol was low in organic calves (P<0.05) also respect to the standard value reported for veal by IEO (2008).

About intramuscular fatty acids (FA) composition (Table 3) the SFA and PUFA contents were higher in organic meat in comparison with conventional one. From the nutritional point of view positive values were observed in organic meat about n-3 FA and n6/n3 ratio. In addition, CLA content was very high in organic meat and similar (French *et al.*, 2000) or higher (Thomas *et al.*, 2008) respect to the results obtained for meat from grazing cattle.

| Item          | ORG  | CON  | P-value | SEM1 |
|---------------|------|------|---------|------|
| SFA           | 48.45| 42.21| **      | 1.35 |
| MUFA          | 29.38| 39.13| ***     | 1.02 |
| PUFA          | 21.93| 18.58| ***     | 1.95 |
| SFA/MUFA+PUFA | 0.96 | 0.73 | **      | 0.05 |
| n-6           | 15.14| 15.44| ns      | 0.56 |
| n-6/n-3       | 2.66 | 6.77 | ***     | 0.23 |
| CLA           | 1.08 | 0.31 | ***     | 0.13 |

****: P<0.01; ***: P<0.001; ns=non significant; 1Standard error of the mean.

In conclusion, lower fat percentage of carcasses and lower ether extract of meat, higher content of heminic iron, low cholesterol content and FA suggest a better nutritional profile of meat obtained from organic farming. Further researches are needed to confirm our findings.

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