

Welfare and meat quality of Limousine organic calves

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In the Mediterranean area, pastures produce grass only in limited periods (spring and autumn) and beef cattle are traditionally fattened in stables from 6-8 to 18-20 months of age. Local farmers believe that grazing negatively influences meat quality. Organic farmers are also influenced by climatic and cultural restraints, thus research in this field has to be conducted to verify the effect of grazing on animal welfare and on meat quality and food safety (Martini et al., 2008).

The trial was carried out in the 'Fattoria Valdastra', organic farm of the Mugello area. Mugello is a hilly/mountainous region located in the northern part of Florence province. A traditional extensive agriculture and the typical high quality production system characterise the Mugello region, raising the awareness of producers and consumers towards the organic production.

In order to verify the effect of farming system on behaviour and meat quality of organic beef cattle, eight Limousine calves were group-housed in a barn (group B), while other eight were allowed to graze on natural pasture up to 3 months before slaughtering (group P), according to the organic Regulation (EC) 834/2007; animals from both groups were slaughtered at 19 months of age.

Behavioural observations were carried out on pasture and in the barn; blood samples were collected before and after the grazing period; *in vita* and *post mortem* performances and zoometric indices were measured; physical meat analyses and determination of the fatty acid profile were performed. Steaks from LD muscle were employed for sensory evaluation by a panel of twelve members previously selected for their taste and smell sensitivity. Behavioural data were analysed by chi-square; *in vita* data by ANCOVA (on the live weight at the trial starting) with group, day and interaction between group and day as fixed factors; analytical and sensory *post mortem* data were subjected to ANOVA with group as fixed factor.

As expected, animals from group P were observed more often grazing and walking compared with animals in the barn ($P < 0.001$). Social activity and self grooming did not show any statistical difference. During the finishing period, group B showed longer laying periods ($P < 0.001$); group P showed higher feeding activity ($P < 0.001$), probably due to the regular food availability in the barn. Moreover, these animals showed higher exploration ($P < 0.05$) of the new environment; contrary to other authors, few stereotypies were observed in both groups (Redbo, 1990).

Blood parameters (cholesterol, Cl, Mg, P, Ca, albumin, total protein, globulin and glucose), measured before and after the grazing period in both groups, showed significant differences between days: cholesterol ($P \leq 0.01$), albumin ($P \leq 0.01$), total

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protein ($P \leq 0.01$) and globulin ($P \leq 0.05$) increased, whereas **P and** glucose ($P \leq 0.001$) decreased. No differences were observed between groups.

In group P body weight and zoometric measure (chest girth, body length and rump length) increments slowed down during the grazing period ($P \leq 0.05$), but due to a compensatory growth in the following 3 months of finishing, both groups showed the same performances at slaughter.

Group P showed heavier, albeit not significantly, body (630.86 ± 12.15 *vs* 609.00 ± 12.15 kg for groups P and B, respectively) and carcass weights (399.29 ± 8.63 *vs* 390.71 ± 8.63 for groups P and B, respectively); only a significant difference for chest height (41.21 ± 0.89 *vs* 37.93 ± 0.89 cm for groups P and B, respectively) was found ($P \leq 0.01$). The results seem to confirm previous trials where a different body development was found in the animals reared on pasture (Martini et al., 2004).

Physical analysis on tissues composition (muscle, fat and bone), cooking loss, drip loss, tenderness, pH, water holding capacity and colour did not show any significant difference between groups, demonstrating that grazing did not negatively influence these quality parameters.

Fatty acid profile of LD muscle showed significant higher levels of 15:0 anteiso and 15:0 ($P \leq 0.05$), 18:2 n6cis (linoleic acid) ($P \leq 0.01$), 18:3n3 (a-Linolenic acid) ($P \leq 0.001$), and **polyunsaturated** n6 ($P \leq 0.01$) in group B, but atherogenic and thrombogenic indices, and n3/n6 ratio were not different between groups.

Sensory analysis showed that keeping the animals on pasture did not adversely affect beef sensory properties. No differences were observed either for the basic tastes (bitter, sweet, salty, acid) or for the attributes specific to beef (odour intensity, flavour intensity, juiciness, chewiness, tenderness). Importantly, tenderness was not significantly reduced by grazing (45.53 ± 2.83 *vs* 49.98 ± 2.37 for P and B, respectively). Physical activity can determine meat toughening. However, in our experiment the 3 months finishing period of group P along with an extended ageing period (eight days, common to both groups) may have reduced differences in tenderness.

In conclusion the animals reared on pasture did not show significant differences neither on performances nor on meat quality, whereas the group P had a bigger development of the chest height, and behavioural observations showed that pasture did not modify the behavioural pattern even when the animals returned to barn. The increased locomotion showed on pasture may positively affect their health and welfare. Results indicated that organic animals may be conveniently raised on pasture for the whole rearing period and kept in the barn only for the 3 months of finishing, as specified by the Regulation (EC) 834/2007.

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