

ORGANIC FARMING OF CHIENINA CATTLE: ANIMAL WELFARE AND MEAT QUALITY TRAITS.

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Background

The Chianina is well known for being the biggest and oldest breed of cattle in central Italy. It was long used for agricultural work as well as for meat production but the former of these uses became unnecessary thanks to machinery. Afterwards, the Chianina was mainly bred indoors, in small groups and only for the production of high quality meat. Nevertheless, in the last decade its rearing in open lot systems was suggested (Verità et al., 1986).

Due to its slow growth, it is not very competitive in intensive farming conditions. For this reason, several authors believe that organic farming could enhance the typical characteristics and the meat quality traits of this breed (Morbidini et al., 1999).

Objectives

The aim of this research is to consider whether the Chianina is suitable for organic farming, in particular as regards to health and meat quality aspects, and if free range farming according to the organic system could compromise the welfare of the animals. The influence of different animal ages and of ageing periods of different length on meat quality traits were also evaluated in order to define the best age for slaughtering these animals and the proper traditional ageing period to obtain the best quality of the organic Chianina meat.

Methods

A survey was carried out in an experimental organic farm of the University of Perugia (Stocchi et al., 1999) during a three-year period. At present the farm includes 58 heifers, 1 adult bull for reproduction, and 117 males and females intended for slaughter. All the animals are being reared according to EC regulation n° 2092/91 and 1804/99; in particular each group of ten animals is stabled in a 54 m² box with free access to a 60 m² paddock. The calves are kept with their mothers until weaning and then transferred into the above mentioned boxes. At farm level, we considered the occurrence of health-related problems.

Data of 49 young bulls were collected in order to evaluate problems at loading and during transport to the slaughterhouse, as well as post-mortem findings.

All the analyses were performed on *Longissimus dorsi* muscle at the level of the last thorax and the first lumbar vertebrae. The pH was evaluated at one hour after slaughter (pH1). Ageing was performed in a conventional way with a slow chilling rate. At the end of the ageing period the pH (pHu), water holding capacity (WHC), colour (C.I.E. L* a* b* system), cooking loss and shear force were measured (Ranucci et al., 2000). Data were distributed into three classes of animal ages and two classes of carcass ageing periods.

All data were analysed using the Statview package (SAS Institute Inc. 1992-1998).

Result and discussion

During the observation period some animals had diarrhoeic problems that rarely needed to be treated even though they caused a very limited number of deaths. There were also some accidental deaths and two cases of lethal nutritional myodystrophy. Respiratory problems occurred in few young bulls after the introduction of new animals into the farm and these were self-limiting. At the slaughterhouse, a frequent post-mortem finding was nonsuppurative interstitial nephritis known as "white-spotted kidney" which is considered common in bovine (Jubb et al., 1985). Some animals with Johne's disease were also detected. On the basis of our data, Chianina could be considered sufficiently resistant to the adverse conditions that can occur in free-range systems, even though there is a lack of comparable data in the literature. Nutritional myodystrophy is frequently observed in this breed (Hutchinson et al., 1982). This pathology in our region has been attributed to the low amount of selenium and vitamin E present in the pasture, which should therefore be given in the cows' diet. While the use of selenium is allowed by the organic regulation, adding vitamin E could be a problem for organic production.

The mean slaughtering age recorded was 21.68 months with a standard deviation of 1.48 and the body weight was 704.08 kilograms with a standard deviation of 58.64. The average dressing percentage was 60.45 with a standard deviation of 2.14, similar to that found by other authors (Giorgetti et al., 1991).

The meat quality traits recorded are reported in Table 1 and show the good quality of the Chianina meat that was produced in this organic farm. Our data are comparable with that found in conventional Chianina meat (Russo et al., 2000) but the average L* value recorded by us was slightly lower, as was expected. This evidence in extensively reared cattle was also recently confirmed (Keane et al., 1998). Dark firm and dry (DFD) meat was not observed even if relatively high ultimate pH was detected in two cases (6.02 and 6.07). The meat derived from these two animals, that had shown some difficulties during loading, transportation and stunning probably due to their weight (770 and 850 Kg live weight) had L* values of 36.92 and 35.80, respectively, which however were not the lowest of the observed samples. Nevertheless, neither the WHC (0.64 both) nor the shear force (4.76 and 4.32) differed from one another and from the other data collected, even if the length of the ageing period of these two carcasses was different (18 days vs. 12 days).

The average data did not statistically differ ($p < 0.05$) among the same age group (Table 2), thus proving that in our experiment the final quality traits of the meat were reached at 18.5 months and remained nearly the same until 25.5 months. This effect could be probably related to the slow growth of this breed and could be very important in order to plan the best time for slaughter for commercial needs. Nonetheless, other authors (Giorgetti et al., 1996) refer data about the limited development of valuable cuts and low meat dressing percentage due to the typical growth of young bulls that is faster in the cranio-dorsal region and slower in the distal limb, proximal limb and loin. After ageing periods of different lengths ranging from 12 to 20 days (Table 2) no differences in the meat traits were noticed ($p < 0.05$). Our data prove that in such an ageing range the meat traits are stable even in animals of different ages. This was also observed by other authors (Gigli et al., 1992). Tenderness is only affected below 12 days of ageing (Gigli et al., 1992; Ranucci et al., 2000).

Conclusions

Our results show that the Chianina breed could be farmed according to the organic system, as it seems not to suffer any negative effect of open air rearing. High quality organic meat is obtained from bulls slaughtered at the age of about 18 to 25 months and aged for a period longer than 12 days. In conclusion, our data seem to justify the high consumer appreciation for organic Chianina meat and the fact that they are willing to pay more for a product that is certainly free of residues and chemicals and more respectful of animal welfare.

Pertinent Literature

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Table 1. Meat quality traits.

After slaughter	Mean	Standard Deviation
pH 1	6,78	0.19
After ageing		
pH u	5.72	0.10
L*	39.16	1.95
a*	24.73	2.35
b*	9.60	1.31
WHC	0.62	0.11
Cooking loss (%)	39.42	2.59
Shear force (kg/cm ²)	5.03	1.44

Table 2. Distribution of the animals according to the age and the length of the ageing period.

		Animal age (months)		
		18.5 - 20.9	21.0 - 22.9	23.0 - 25.5
Length of ageing period (days)	12 - 13	11	15	8
	14 - 15	4	5	2
	18 - 20	1	2	1