E61

POST MORTEM PROPERTIES OF MEAT FROM CALVES OF DIFFERENT BREEDS

N. ALEXANDROVA, Ya. GORINOV, P. MARINOVA
Research Institute of Animal Science, Kostinbrod-2232, Bulgaria

Keywords: Meat Quality, Post Mortem Properties, Dark-Cutting, Calves, Breeds

Quality of meat from cattle is defined differently in different countries (Dikeman, 1993) and the term meat quality is sometimes used without an explicit definition. The use of meat quality as a breeding objective is still relatively new aspect (Lundstrome, 1993). But there are some muscle characteristics which provided essential information about post mortem changes in muscles.

The purpose of present study was to determined some meat quality characteristics in four cattle breeds numerically the most important in Bulgaria.

METHODS

For the study were used 212 entire male calves of breeds Black-White, Bulgarian Brown, Simmental and Hereford. Calves were breeded under same conditions and fed ad libitum. Animals were slaughtered at 450-500 kg live weight at 15-18 months of age respectively. The distances between farms and slaughter houses were not more than 20 km. Calves were slaughtered under commercial conditions after 24 hours pre-slaughter treatment according requirments of Bulgarian State Standart No 837/85. Samples for analyses were collected from m.Longissimus Dorsi at 11th rib from the left carcass side, 24 hours post mortem and after chilling. Samples were used to measure pH (48 hours post mortem), water holding capacity (WHC), color (reflectance at 525 nm wave length), myoglobin content, fat content and collagen content.

RESULTS AND DISCUSSION

The obtained results showed that pH values were high, exceeded 6.0, and dark-cutting incidence was observed in all four investigated breeds (Table 1). Dark-cutting or dark, firm and dry beef is very dark, purplishred color and its water holding capacity is very high (Dikeman, 1993). It were found significant differences in meat color between breeds. Reflectance corresponding with established myoglobin content. Myoglobin content was greater in muscles of Simmental calves and its color was darker respectively compared with Black-White calves. Libourissen et al (1977) and Guhe et al (1990) reported differences in

Table 1.

POST MORTEM PROPERTIES OF M. LONGISSIMUS DORSI

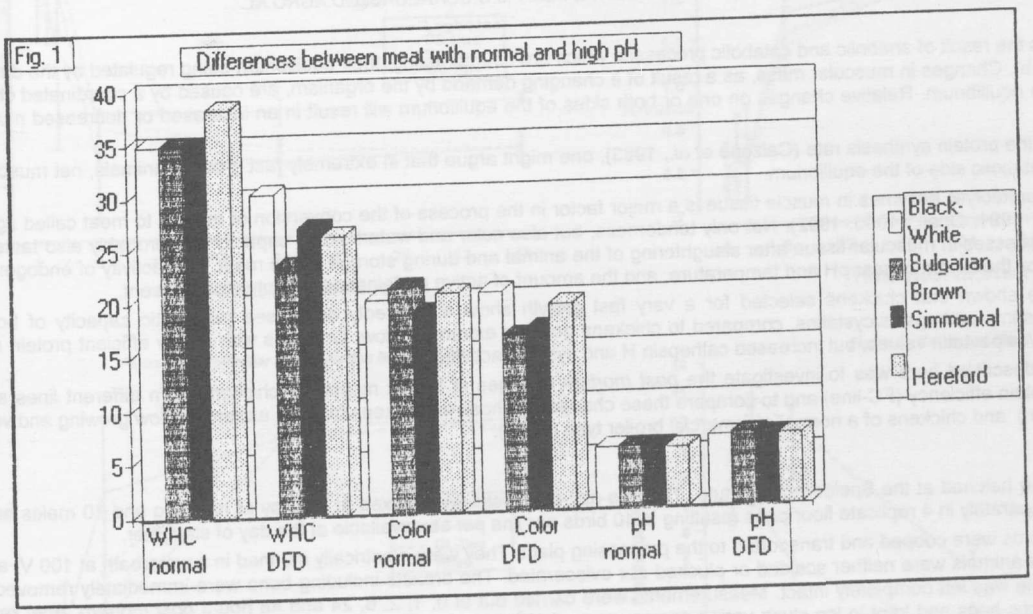
Breeds	n	pH, 48h x ± Sx	Color, 525nm x ± Sx	WHC, % x ± Sx	Myoglobin mg/g x ± Sx	Fat, % x ± Sx	Collagen mg/g x ± Sx
Black-White	87	6.00±0.06	20.25±0.27a* b***	30.01±0.78	3.82±0.13	1.32±0.71	5.21±1.81
Bulgarian Brown	23	6.26±0.12	18.44±0.80	28.41±1.49	3.97±0.16	1.42±0.14	6.77±1.91d*** a***
Simmental	65	6.11±0.06	17.78±0.35	30.42±0.81	4.21±0.09b*	1.05±0.09	5.66±1.52
Hereford	34	6.13±0.10	19.77±0.41f***	31.15±1.33	4.16±0.15	1.80±0.13e** f***	6.17±1.29f*** c***

a differences between Black-White and Bulgarian Brown; * P<0.05
b differences between Black-White and Simental; ** P<0.01
c diferences between Black-White and Hereford; *** P<0.001
d differences between Bulgarian Brown and Simmental;
e diferences Bulgarin Brown and Hereford;
f diferences between Simental and Hereford

the same muscle properties between different breeds and crossbreds. Reflectance measured within the region of visible light will, however, be influenced by pigment content (Lundsrtom et al., 1988) and will thus not entirely depend on the degree of denaturation of the muscle proteins (Lundstrom, 1993). Regarding water holding capacity it were not found differences between breeds. Fat content was the greatest in muscles of Hereford calves and it was the lowest in Simmental calves (P<0.01). Koch et al (1982), More O'Ferrall et al (1989) and Guhe et al (1990) found significant differences regarding fat content between different breeds. The variability of this trail was greater compared with other investigated properties. The estimated coefficients of variation were from 41.67% for Hereford calves to 61.82% for Simmental calves. Collagen content was greater in muscles of Bulgarian Brown calves and Hereford calves and exceeded significantly collagen content in other two breeds.

Dark-cutting beef occurs when animals are stressed pre-slaughter and muscle glycogen

reserves depleted (Dikeman, 1993). The problem of DFD meat lies in mixing of different groups of bulls (Matzke et al., 1985), time of slaughter (Bartos et al., 1993) and transport to abattoir (Averdunk et al., 1993). Judge et al (1983) stated that the incidence of dark-cutting beef in the United States is about 3% of all carcasses. Bartos et al (1993)



reported that DFD meat incidence reached 30 and 40% in former Czechoslovakia. In the present study we established 41.38% dark-cutting in calves of Black-White breed, 56.52% in Bulgarian Brown calves, 56.92% in Simmental and 58.82% in Hereford calves. Alps and Matzke (1985) reported that the rate of pH decline in Gelbvieh bulls was heritable (0.20). However, this is the only reference found showing genetic effect on pH decline. Much data exist to demonstrate that pre-slaughter stress and rate of temperature decline have a much greater effect on pH decline (Dikeman, 1993). We devided muscles into two types: with normal pH and muscles with high pH (>6.0) (Fig. 1). In the meat with normal pH the tendency regarding meat color, myoglobin content, fat content and collagen content was the same as already discussed. It were established significant differences in meat color between meat with normal pH and high pH ($P<0.01$ for Bulgarian Brown calves and $P<0.05$ for Simmental calves). Significant differences were found in WHC also ($P<0.01$ for Black-White and Bulgarian Brown calves and $P<0.001$ for Simmental and Hereford).

CONCLUSIONS

It were found significant differences in some muscle characteristics between the breeds as meat color, myoglobin content, fat content and collagen content.
An average between 40 and 60% incidence of dark-cutting beef was found as a result of pre-slaughter treatment of calves in all investigated breeds.

LITERATURE

Alps, V. H. and P. Matzke. 1985. Zuchtungskunde. 57:332-346
Averdunk, G., H. Alps and P. Matzke. 1993. Proc. 5th WCGALP. Guelph. Canada. 7-12 August 1993. 19:540-544
Bartos, L., C. Frank, D. Rehak and Stipkova. 1993. Meat Sci. 34:275-282
Dikeman, M., 1993. Proc. 5th WCGALP. Guelph. Canada. 7-12 August 1993. 19:521-530
Guhe, M., R. Rheisinger, E. Kalm, M. Henning, C. Augustin. 1990. Differences in meat quality of bulls of various genetic groups, 41st Ann. Meeting of EAAP, Toulouse, France, 8-12 July 1990
Judge, M. D., E. D. Aberle, J. C. Forrest, H. B. Hedrick and N. A. Merkel. 1989. Principles of Meat Science (2nd Ed.) Kendall/Huut Publ. Co., Dubuque, Iowa
Koch, R. M., L. V. Cundiff and K. E. Gregory. 1982. J. Anim. Sci. 55:1319-1329
Libourissen, T., B. Bech Andersen, L. Buchter, K. Kousgaard and A. J. Moller. 1977. Livest. Prod. Sci. 4:31-43
Lundstrome, K., P. Barton-Gade, J. P. Andersen and I. Hansson. 1988. Proc. 34th Int. Congress of Meat Science and Techn., Workshop on Meat Quality, Brisbane, 39-43
Lundstrome, K., 1993. Proc. 5th WCGALP. Guelph. Canada. 7-12 August 1994. 19:507-510
Matzke, P., H. Alps, H. Strasser, I. Gunther. 1985. Fleischwirtschaft. 65:389-393
More O'Ferrall, G. J., R. L. Joseph, P. V. Tarrant and P. McGloughlin. 1989. Livest. Prod. Sci. 21:35-47