# MUSCLE FIBRE TYPES AND MEAT TRAITS OF CORN-SILAGE-FED BUFFALOES OF DIFFERENT AGES

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SUMMARY

A number of attempts have recently been made to utilise buffaloes for meat production and studies have been carried out to define the quality and acceptability of this type of meat. In this experiment 35 male buffaloes were used, five of which were slaughtered at 6 months of age. The remaining were divided into two groups fed with corn silage ad libitum or at fixed rations. These animals were then slaughtered at 10, 14 and 18 months. Fibre type distribution and some quality traits after a 7-days ageing period were evaluated on Ld and Sm muscles. No differences were detected between the two groups. In Ld muscles the percentage of IIA fibres was slightly lower and IIB fibres was slightly higher in the older animals whereas in Sm muscles the trend was exactly the opposite. Muscles from older animals had significantly lower moisture and a higher protein and fat content and were significantly darker.

## INTRODUCTION

Buffaloes have been bred for some time in certain areas of Italy to produce milk for the cheese industry. The profitable use of animals exceeding production needs, especially males, has been a constant problem for producers who traditionally sell very young animals to rid the herd of them as early as possible. Since the consumption of buffalo meat is not widespread in Italy many attempts have been made to improve the quality and the acceptability of this meat according to consumer demand which is oriented towards lean, bright red, tender and blander tasting meat (Romita et al., 1980; Romita et al., 1981; Matassino et al., 1984; Ferrara et al., 1993).
The quality of meat is related to a number of muscle characteristics before slaughter and conditions which actively interact with them after slaughter. Many factors such as diet, exercise and age affect the characteristics of muscles in live animals. Muscle type fibre distribution is one such characteristic which has been related to some meat quality traits. Therefore, giving buffalo calves a proper diet and slaughtering them at the most suitable age might help improve profit in producing this meat.
This study was aimed at evaluating the effect of two diets on muscle fibre type composition and some meat traits in buffaloes slaughtered at different ages.

## MATERIALS AND METHODS

Thirty-five male buffaloes were used in this experiment. Five of them were slaughtered at the age of six months. The remaining were divided into two groups, kept tied in stalls and fed with an integrated diet based on corn silage given ad libitum (Lib) or at fixed rations (Fix), respectively. Five animals in each group were slaughtered at the age of 10, 14 and 18 months. Immediately after slaughter samples were taken from Longissimus dorsi (Ld) and Semimembranosus (Sm) muscles for fibre type evaluation. The samples were wrapped in aluminium foil and frozen in liquid nitrogen. After equalisation at 16_C, 8_ sections were prepared for histochemical analyses. ATPase activity at pH 9.4 was tested according to Padykula and Herman (1955) after alkaline pre incubation at pH 10.3, and SDH activity was tested according to Nachlas et al. (1957). In addition, 12_ sections were stained with PAS reaction to evaluate glycogen content.
Carcasses were dissected after seven day's ageing at 4_C and large samples of Ld and Sm muscles were taken to measure pH, colour ( CIE, L* C* H* ), WHC by the filter paper pressure method and determine the chemical composition.

Analysis of variance was used for statistical evaluation.

## RESULTS AND DISCUSSION

Both aged muscles of all animals showed average pH values ranging from 5.49 to 5.62 with single values ranging from 5.35 to 5.80. Therefore no high pH values were detected thus excluding DFD or spoilage microorganism contaminated meat. The low pH values observed in a few cases were considered normal given the high percentage of PAS-positive fibres present immediately after slaughter in the muscles of virtually all animals studied.

No significant differences in fibre type distribution, colour or chemical composition were detected in Ld and Sm muscles between the animals in the two diet groups at any age (Table 1 , 2 and 5). Average WHC values expressed as meat area:fluid area ratio were between 0.62 and 1.05 in all groups and no differences were detected among the different groups of animals.

Differences in fibre type distribution, colour and chemical composition were observed in both muscles among the different age groups (Table 3, 4 and 6).

In Ld muscles, the percentage of IIA fibres was slightly lower and IIB fibres was slightly higher in the older animals whereas in Sm muscles the trend was exactly the opposite. However, the only significant difference was found for IIB type fibres in Sm muscles between the 6- and 18-month groups. The great variability of fibre type distribution recorded in each group for both Ld and Sm muscles stresses the difficulty to standardize the sampling area and to have a sample representing the whole muscle.

Muscles from older animals (14- and 18-month groups) had lower moisture and a higher protein and fat content than those from the younger animals. No differences were found for the WHC values. Both muscles tended to become darker in colour as age increased. C* and H* values detected in Ld muscle from the 14- and 18-month groups were similar to and the L* value slightly higher than those reported in a study on 13-14 months old buffaloes (Gigli et al., 1993).

Differences in fibre type distribution and C* value were detected between Ld and Sm muscles. Significant difference in fibre type distribution were found only among the older animals. The percentage of IIA fibres in the Ld muscle was lower ( $P < 0.05$) and that of IIB fibres higher ($P< 0.05$) than in the Sm muscle in the 14- and 18-month groups. Chroma values were significantly ($P<0.05$) higher in the Sm than in the Ld muscle in the 10-, 14- and 18- month groups.

## CONCLUSIONS

The different diets used in this experiment showed no effect on fibre type distribution, chemical composition or colour of Ld and Sm muscles. The distribution of fibre types was slightly affected by the age of animals whereas colour and chemical composition proved to be correlated to age.

Buffalo meat from animals corn-silage fed up to 18 months of age appeared acceptable in colour and very lean despite the high fat content commonly observed in the carcasses.

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TABLE 1 - Fibre type distribution in Ld muscles from buffaloes fed ad libitum or with fixed rations and slaughtered at different ages.
TABLE 2 - Fibre type distribution in Sm muscles from buffaloes fed ad libitum or with fixed rations and slaughtered at different ages.
TABLE 3 - Fibre type distribution in Ld muscles from buffaloes slaughtered at 6, 10, 14 and 18 months of age.
TABLE 4 - Fibre type distribution in Sm muscles from buffaloes slaughtered at 6, 10, 14 and 18 months of age.
TABLE 5 - Composition and colour (L*C*H_) in Ld and Sm muscles from buffaloes fed ad libitum or with fixed rations and slaughtered at different ages.
TABLE 6 - Composition and colour (L*C*H_) in Ld and Sm muscles from buffaloes slaughtered at 6, 10, 14 and 18 months of age