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CHANGES IN TYROSINE VALUE OF FRESH BUFFALO MEAT STORED AT 5 ± 1 °C

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ABSTRACT

Five trials were conducted to assess the changes in tyrosine value (protein degradation) of buffalo meat during storage at 5 ± 1 °C for periods of 0 (2.5 to 3.0 hr post-slaughter) 3, 6 and 9 days. To compare the degree of changes which might occur in buffalo meat due to microbial activity, antibiotic-treated meat was also analysed simultaneously during storage to serve as an autolysis control.

Initial values of tyrosine in fresh meat samples (Day 0) ranged from 0.331 to 0.430 mg/g meat. There was no significant difference in tyrosine value of antibiotic-treated control (T1) and untreated meat sample (T2) during storage. Values differed significantly ($P < 0.01$) between trials and between days of storage. However, interaction effects of treatment X trials and treatment X days in tyrosine value were insignificant. Tyrosine content showed significant increase on the sixth day of storage and reached a level of 0.507 ± 0.017 and 0.524 ± 0.022 mg/g in T1 and T2 treatments, respectively, on the ninth day of storage. There was positive but insignificant correlation between tyrosine value, SPC, and proteolytic bacteria during advanced stages of storage. However, it showed highly significant correlation ($P < 0.01$) with storage time (0.997) in T2 treatment in comparison to T1 treatment where, though the "r" value was high (0.924) but insignificant ($P < 0.05$) thereby indicating that the degradation of proteins was mainly due to autolysis.

INTRODUCTION

Hydrolytic changes in meat during storage can be caused either by bacterial proteolysis or autolytic changes by inherent meat tissue enzymes. The degree of autolysis and bacterial proteolysis have been assessed in fish and intact beef by means of estimating "tyrosine value" (Bradley and Bailey, 1940; Strange et al., 1977). Jay (1987) mentioned the determination tyrosine complex as one of the methods for detecting microbial spoilage in meats, poultry, and seafoods. Since information available on these aspects of buffalo meat during refrigerated storage is scanty, the present investigation was undertaken.

MATERIALS AND METHODS

Thigh muscles viz. *biceps fermoris*, *semitendinosus* and *gastrocnemius*, from adult Murrah buffalo (8 to 10 years of age) of either sex were collected within 2.5 to 3.0 hr post-slaughter. After trimming of fatty layers and removal of tendons and nerves, all the three muscles were cut and divided into two almost equal halves to form two lots: A and B. Muscles of Lot B were further cut into cubes of about 5-6 cm size and four sub-lots, i.e.,I, II, III and IV, were formed. After being wrapped in polyethylene bags, Sub-lot I was kept for Day 0 analysis. Remaining three sub-lots, i.e., II, III, and IV, were stored at 5 ± 1°C up to 9 days. Samples were randomly taken out and analysed for tyrosine value on days 3, 6 and 9 of storage. Control experiments where microbial growth was checked by antibiotic treatment (oxytetracycline 100 ppm and mycostatin 60 ppm) allowed the effects of autolysis by tissue enzymes to be separately assessed.

Before analysis the meat samples were minced twice in a motor-driven mincer to get uniform homogeneous material. Aseptic precautions were taken throughout thigh muscle collection, storage and the preparation of homogeneous material for analysis.

The tyrosine value in prepared minced meat samples was estimated according to the procedure described by Strange et al. (1977) and calculated as mg tyrosine per g of meat sample by referring to a standard graph which was prepared as per the procedure described by Pearson (1968b).

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regarding the use of tyrosine value as a rapid chemical test to detect minced beef spoilage. Tyrosine values have been reported to be of only little use even when estimated along with other physico-chemical parameters like TVN content, pH, and ERV value in minced beef (Daly et al., 1976). Though Strange et al. (1977) suggested that tyrosine and colour value (Δ % R) were the most effective monitors of bacterial contamination of intact beef (among seven analytical tests), they also emphasized that interference due to intrinsic changes were more likely to effect the tyrosine value than colour.

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Table 1. Mean values of tyrosine (mg/g meat) in antibiotic-treated control (T1) and untreated meat samples (T2) at different days of storage (5 ± 1 °C)

Treatments	Days of storage				Overall
	0	3	6	9	treatment means
T1	0.370 ± 0.018	0.383 ±0.026	0.405 ± 0.026	0.507 ± 0.017	0.416
T2	0.370 ± 0.018	0.400 ±0.028	0.458 ± 0.037	0.524 ± 0.022	0.438
Overall days means	0.370^{a}	0.392^{a}	0.432^{b}	0.516^{c}	
Means of trials	0.440^{b} (1)	0.389^{a} (2)	0.377^{a} (3)	$0.448^{b,c}$ (4)	0.482^{c} (5)

Figures in parentheses indicate order of trials
Means bearing the same superscripts in a row do not differ significantly ($P > 0.05$)

Table 2. Analysis of variance in tyrosine value as influenced by days of storage, treatments, and trials

Source of variation	d.f.	M.S.
Between treatments	1	0.00480
Between trials	4	0.01510**
Between days	3	0.04120**
Treatment X trials	4	0.00043
Treatment X days	3	0.00130
Error	24	0.00168

** = Significant at $P < 0.01$

Table 3. Correlation of tyrosine value with log standard plate count (SPC) and proteolytics

Parameters	Treatments	Correlation coefficient* (r value)			
		0d	3d	6d	9d
Proteolytics	T1	-0.840	-0.305	-0.680	0.586
	T2	-0.840	-0.480	-0.563	0.400
SPC	T1	-0.267	-0.150	-0.570	0.811
	T2	-0.267	0.254	0.440	0.196

T1 = Antibiotic-treated control
T2 = Untreated sample
d = Day of storage
* Values are nonsignificant