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SENSORY AND ELECTRON MICROSCOPIC EVALUATION OF CAMEL'S MEAT COOKED IN CONVENTIONAL AND MICROWAVE OVENS

BY

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SUMMARY

Longismus dorsi muscle of five young male camels, less than 5 years old, were obtained immediately after slaughtering at main Cairo abattoir. Collected samples were examined after cooking by conventional and microwave ovens. The sensory variations were explained through, determining the topographical changes in both connective tissues and myofibers by the use of Scanning Electron Microscope "SEM". The microwave cooked samples have significant lower scores in flavor, juiciness, overall acceptability. The "SEM" investigation explains the unacceptable toughness of the microwave-cooked camel's meat on the basis of partial fragmentation of myofibers and incomplete degradation of connective tissue when compared with conventionaly cooked meat.

INTRODUCTION

Camel is one of the most important farm animals. It forms an integral part of the cultur e and agriculture in many countries for thousands of years. There are about 20 million camels in the world (FAO, 1990), most of them are mainly kept for transport across the deserts, secondary as draught, and as a cheap source of meat inspite of its relative toughness (Dorman, 1986).

Heat treatment of muscle tissue encompasses many changes including alterations in both myofibrillar and connective tissue proteins in the form of fiber shrinkage, increase in the intermyofiber spaces, myofiber fragmentation at Z-line, in addition to compactness and denaturation of connective tissues (Katsaras & Peetz, 1990; Emara, 1995, 1997). These alterations have the influence on the texture and tenderness of meat (Bouton and Harris, 1972).

The use of microwaves for cooking meat represents an extremely rapid and modern method of cooking. Although, meat cooked by this method always appears to be less tender than those cooked by conventional heat, however, the shear

values are not different (Ream et al., 1974 and Hostetler & Duston, 1978).

The present study was carried out to investigate the differences in the sensory quality of camel's meat cooked by conventional and microwave ovens, with explaination of expected differences through the determination of topographical changes in both connective tissues and myofibers by the use "SEM".

MATERIAL AND METHODS

1- Collection and preparation of samples:

Samples of Longismus dorsi muscle "Ld" of five young male camels less than 5 years age were obtained at the level of 11-13th rib immediately after slaughter at Cairo abattoir. Collected samples (each about 1 Kg) were kept in the refrigerator for 24 hours until the development of the post mortem changes. Each sample was incised lingitudinally into two separate portions, and each portion was then cut into 4 equal parts, followed by weighing of each part.

The pieces of the first portion were wrapped separately in aluminum foil and cooked at 149°C in a conventional oven to reach an internal end point temperature of 60°C, while those of the second porition were cooked in a microwave oven "Gold Star ER-535 MD" to an internal end point temperature of 60 °C according to the method described by Hutton et al., 1981.

2- Sensory evaluation:

All samples were cooled after cooking and weighed to calculate the cooking loss percentage. Each sample was sensory evaluated by five well trained panel members for tenderness, juiciness, flavor, and the overall acceptability according to the triangle test described by Jellinek, 1985.

3- Ultrastructural investigation "SEM":

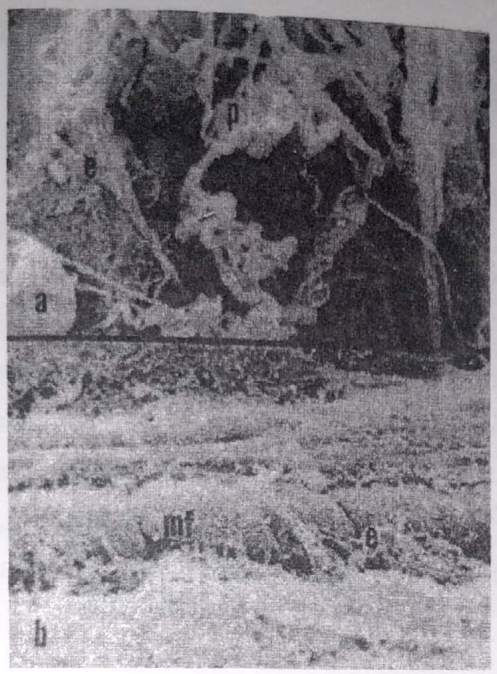
Five cores (1X1X3 mm each) were obtained from each sample and fixed in 2.5 % glutraldehyde and gold coated according to the technique described by Wu et al., 1985. Prepared specimens were examined in a "Jeol JSM 5300" "SEM" at 30KV.

RESULTS

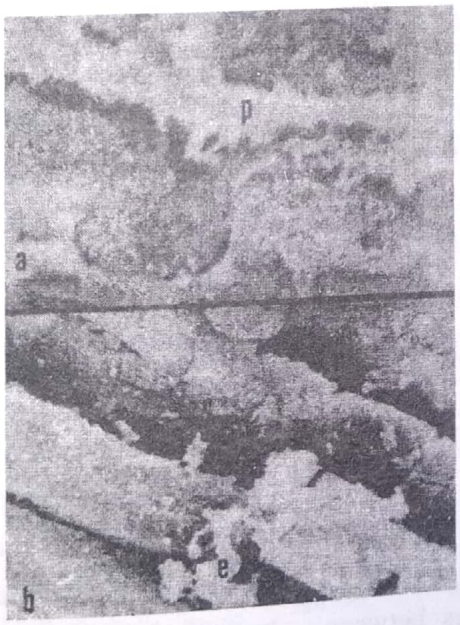
Table. (1): Sensory Panel scores of cooked camel's meat

Parameter	Conventional cooking	Microwave cooking	LSD
Flavor	2.06	1.0	0.4
Tenderness	2.3	2.3	0.5
Juiciness	2.4	2.0	0.3
Texture	2.5	2.5	0.4
Overall acceptability	2.6	2.1	0.3
Cooking loss %	41.4	51.3	1.6

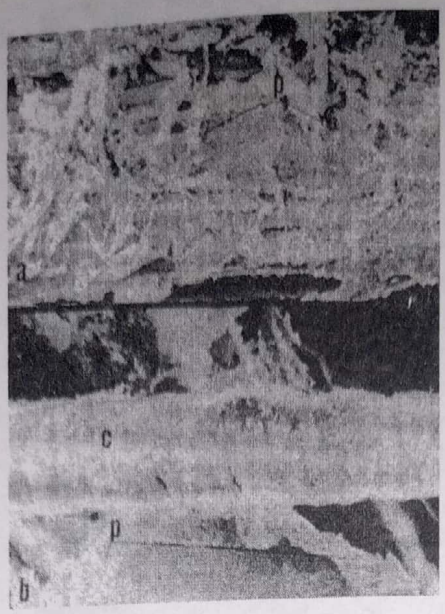
LSD = Least significance differnce



Figur (1): Scanning electron micrograph of unheated camel's "Ld" muscle (a) X 100, (b) X 200. e, endomysium; mf, myofibirs; p, perimysium.



Figur (2): Scanning electron micrograph of conventionally heated camel's "Ld" muscle (a) X 100, (b) X 200. c, cooking cracks; ;e. endomysium; p. perimysium.



Figur (3): Scanning electron micrograph of microwave cooked camel's "Ld" muscle (a) X 100, (b) X 200. c. cooking cracks; e. endomysium; p, perimysium.

DISCUSSION

Results given in Table (1) revealed the presence of significant difference in the investigated parameters between the oven treatments. Where the conventional heated samples have significantly higher scores in flavor, juiciness, overall acceptability, and lower cooking loss percentage. Whereas, tenderness and texture of the samples cooked by both methods showed no signifiance difference. Hutton et al., 1981 and Ream et al., 1974 found no difference in the tenderness score between roasts cooked by microwave and conventional heat. Although microwave cooking causes more increase in the collagen hydrolysis than with conventional cooking, however, this solubilization has no measurable effect on tenderness scores (Korschgen et al., 1976).

The differences in sensory parameters between the oven treatments may be attributed to the change in the rate of heating. The increased acceptability of meat cooked by the conventional heat could be attributed to the increased enzymatic activity (Laakkonen, 1970).

The results obtained by the "SEM" clearly identified that the structural changes in the muscle samples due to cooking by microwaves and conventional heat have been related to meat tenderness. Similar observations have been reported by Hearne et al., 1978. Micrographs of raw camel's "Ld" muscle are presented to compare the changes in both myofibers and connective tissues as a result of heating. Figure 1 (a&b) showed heavy perimysial and endomysial connective tissue networks that surrounding the individual myofibers and envelopes the muscle. The conventional

heat treated samples showed wide separation of perimysium with the conversion of its nature into granular mass.

The micrographs of conventional cooked samples (Fig. 2 a&b) showed multiple and deep transverse cracks across the myofibers in addition to scanty granular endomysial connective tissue. Whereas, the microwave cooked samples indicated partial conversion of the perimysial connective tissue into granular mass (Fig. 3 a), while Fig. 3 b showed few shallow breaks along the whole length of the myofibers.

The lower tender scores obtained in this study may be attributed to the slight effect of heat on the collagenous connective tissue elements in addition to the partial fragmentation of myofibers, similar findings were recorded by McClain et al., 1965.

The achieved results emphasized that the ultrastructural organization as well as the topographical changes in both myofibers and connective tissues of camel's meat have a direct effect on its tenderness after cooking. The use of microwave oven as a modern and rapid method of meat cookery gave lower sensory scores for examined samples; where in sensory analysis the overall impression of tenderness to the panelist includes texture which involves the initial ease of penetration of the meat by the teeth, the ease with which the meat breaks into fragments and the amount of residue remaining after chewing. It could be concluded that the eating quality of camel's meat should be improved to increase its acceptability for the consumer. Moreover, the microwave heating is not the suitable method for cooking of camel's meat.

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