EFFECT OF AGING ON QUALITY OF MEAT PROTEINS

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INTRODUCTION

Many studies favouring proteolytic changes during post-mortem aging have been reported. El-Badawi et al. ,1964 found that tyrosine/tryptophan protein index was increased during aging which would indicate the increase of solubility of sarcoplasmic proteins.Abas et al.,1981 and Al-Suraify and Al-Aswad, 1986 reported that tyrosine/tryptophan non protein index(T/TNP) increased during aging and tyrosine/tryptophan protein index (T/TP) increased till the 6th day of aging of Karady lamb meat and Karady ewes meat,respectively Many investigators reported the increase of total volatile nitrogen(TVN) during storage of meat at low temperature (Al-Dulaimy et al., 1985 and Al-Suraify and Al-Aswad,1986) .
Yada and Skura,1981 and Locker and Wild,1983 concluded that some changes was happened in the myofibrilial protein during aging when electrophoresis technique was used . Chen et al.,1981 noticed the increase of the solubility of myofibrilial protein during storage at + 2 C .
This study was undertaken to investigate the effect of aging of old sheep on the quality of meat proteins. The study has been directed toward the use of gel-filtration(GF), gel electrophoresis (GE) and isoelectric focousing (IEF) and densitometric scaning(DS)of the patterns which are capable of detecting these changes.

MATERIALS AND METHODS

Sampling:The intact longissimus dorsi muscles from Karadi ewes (6-7 years old)were aged up to 12 days at + 4 C. Samples were obtained at zero day(3-4 hours after slaughter),3,6,9, and 12 days of aging. Samples prepared for analysis,excluding as much intramuscular fat and connective tissue as possible,were diced and ground twice in an electrical meat chopper and mixed well .

Extraction of myofibrilial proteins (MP):MP extract was prepared according to Petropakis,1970. The extract was dialyzed against deionized water for 36 hours at + 4 C, then freeze dried and stored at freezer.
Analysis:T/TP and T/TNP indices were determined according to El-Badawi et al.,1964. The GF technique used is the same as mentioned by Petropakis,1970 using sephadex G-150 medium gel. GE apparatus(2117 Multiphor,LKB/Bromma) with sodium dodecyle sulphate on polyocrylamide gel was used (1977). IEF was done using Ampholine PAG plate (1804 - 121) from LKB/Bromma. DT of the patterns were used using lazer densitometer (2202 ULTROSCAN) and recorded using 2220 recording integrate (LKB/Bromma).

RESULTS

Table 1 represent a summary of T/TP , T/TNP and TVN of the samples of aged meat.It can be seen that T/TP and T/TNP indices increased till 9 days of aging and decreased after that till the end of aging period.The result of T/TP index agrees with those obtained by Abas et al.,1981 and Al-Suraify and Al-Aswad,1986 who related the increase of T/TP index to the solubility of muscle protein and the decrease to the protein denaturation . On the Other hand the increase of aromatic free amino acids (T/TNP index)indicated some degradation of proteins and/or peptides (Parrish et al.,1969) and or proteolytic bacteria such as Pseudomonas fragi(Bala et al.,1979).The decrease of T/TNP index at the last 3 days of aging can be related to the consumption of non protein nitrogen by the bacteria(Yada and Skura,1981). But the decrease in T/TP index can be related to the increase in bacterial count during the same period(Abas et al.,1981 and Al-Nagmawi and Al-Aswad,1987)or to the protein denaturation(Kronman and Winterbottom,1960).
TVN was determined as an index or guide to the degree of decomposition and proteinaceous constituents breakdown. TVN increased continuosly during the aging period.

Table 1.Some parameters changes of LD muscle during aging period.

Period of aging (days)	T/TP	T/TNP	TVN
Zero	2.59	1.50	14.0
3	2.71	1.58	16.8
6	3.00	1.64	19.1
9	4.46	2.28	25.2
12	4.20	1.80	26.8

Fig. 1 show typical GF patterns of LD samples at zero day and after 6 and 12 days of aging. GF patterns for the zero day of samples showed four peaks. The first peak is assumed to be myosin and the second actin and troponin(Penny et al.,1974). The third one is assumed to be tropomyosin and a - actinin. The last peak is small nucleotides . After 6 and 12 days of aging the absorbance is increased (for the first three peaks) . This results agrees with those reported by El-Badawi et al. 1964 . However the absorbance of protein - like nitrogen compounds decreased . This may be the result of autolyses by cathepsins(Iodice et al.,1966) or/and the action of proteolytic bacteria (Hasegawa et al.,1970) .
When using GE the electrophoretic patterns were found to be more efficient in showing changes of MP compared to GF . But it was difficult to notice the changes which were usually faintly visible . This result indicate the need for additional investigation . Therefor lazer densitometer technique was used (Fig. 2 and 3).Densitometric tracing showed clearly the changes occured in MP during aging on both gels (7.5% and 10%). In addition some alteration was detected in muscle MP bands when different concentration of gel was used . Such alterations included the loss of some fractions and appearance of new compounds,while other fractions diminished . The absorbances were decreased in some fractions and increased in others . The decrease may be due to partial breakdown of protein, while the increase is probably related to the binding of different fractions having approximate molecular weight or as a result of the increase in their solubilities .
The IEF patterns of MP is more efficient and more developed in showing changes compared to electrophoretogram,but it was also difficult to notice these changes. The electrophoretogram obtained does not always give clear seperation of the protein fractions and can be estimated approximately from visual observation of the seperation patterns due to the heavy background of the sample tracks.Therfor lazer densitometer technique was used . The densitometric tracings(Fig. 4) clearly demonstrate the changes occured in MP fractions during aging compared to the densitometric tracing of GE. The absorbance was also decreased in some fractions and increased in the others due to the same reasons mentioned above .

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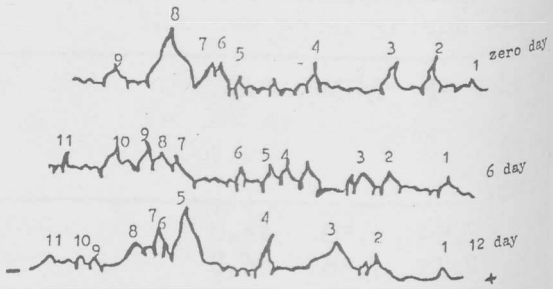


Fig.3 Densitometric tracing of the electrophoretic patterns seperated at 10% gel of MP of LD muscle during aging.

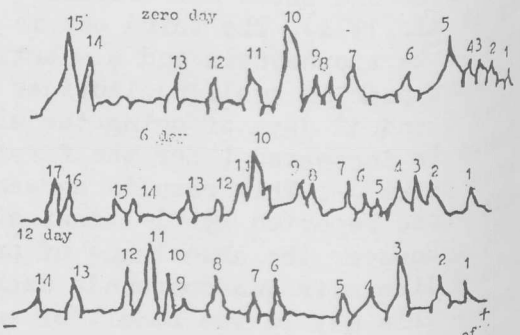


Fig.4 Densitometric tracing of the IEF patterns of MP of LD muscle during aging.

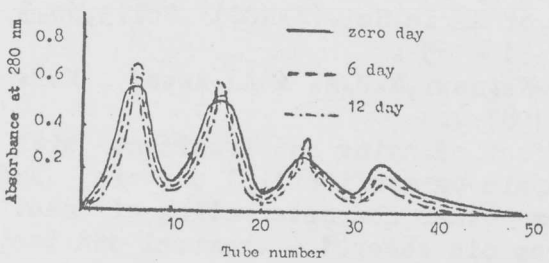


Fig.1 GF patterns of MP of LD samples during aging.

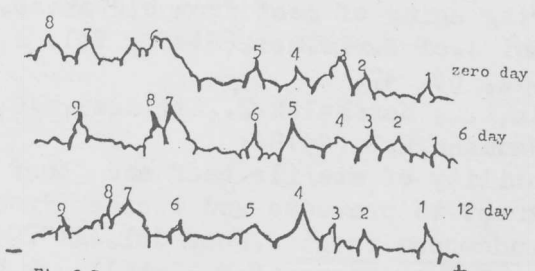
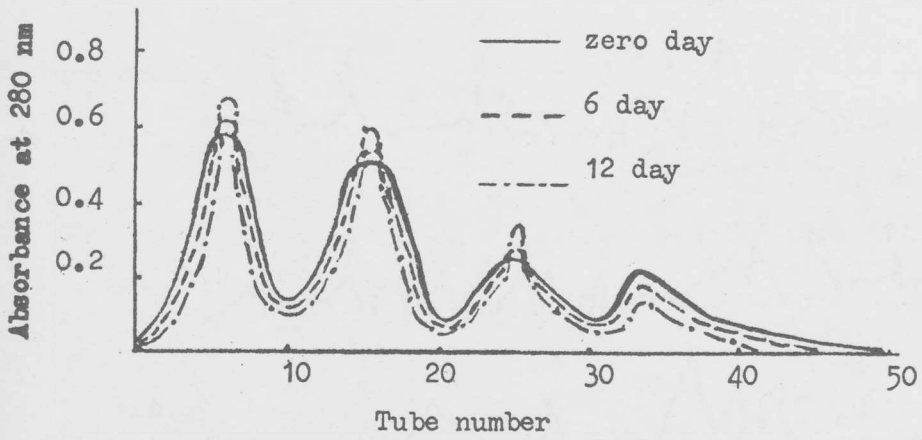


Fig.2 Densitometric tracing of the electrophoretic patterns seperated at 7.5% gel of MP of LD muscle during aging.



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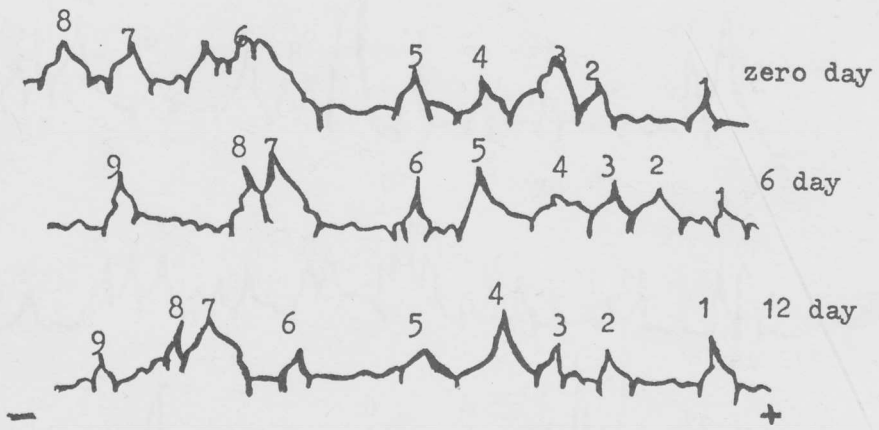

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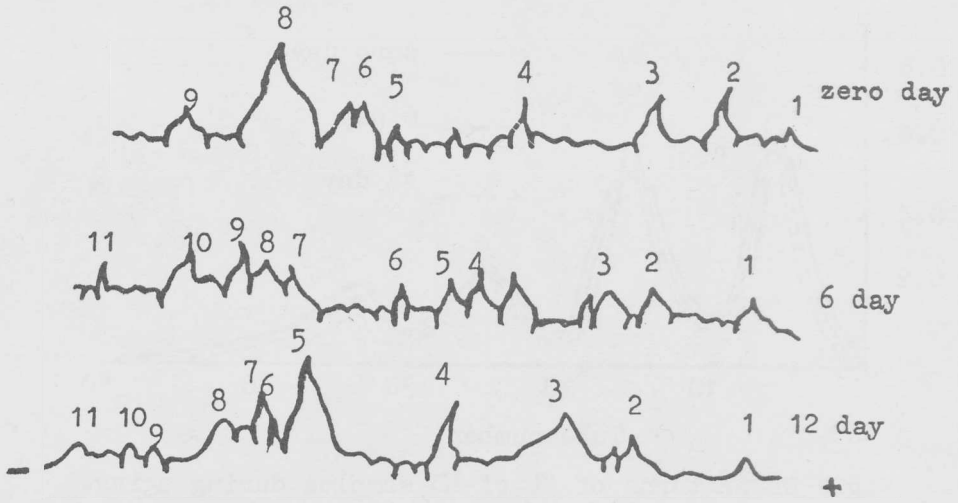

Fig.3 Densitometric tracing of the electrophoretic patterns seperated at 10% gel of MP of LD muscle during aging.

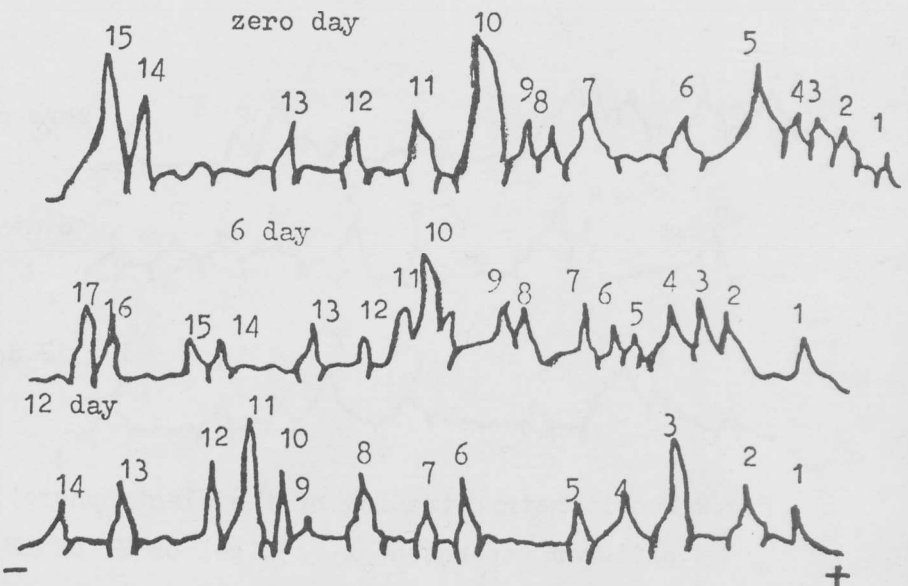

Fig.4 Densitometric tracing of the IEF patterns of MP of LD muscle during aging .