Some Characteristics of Egyptian Lamb Meat

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SUMMARY : The chemical composition, protein fractions, amino acids composition. phosphorus compounds, pH-WHC curves and emulsifying capacity of eight cuts from Egyptian lamb muscles were studied. The results revealed that the all cuts muscles of Egyptian lamb meat were rich in protein, essential amino acids and phosphorus compounds. The different cuts of lamb meat contained high percent of myofibrillar proteins which ranged from 44.5 to 62.6 % of total nitrogen. The breast cut possessed the highest Fibrillar to Stroma ratio, while flank had the lowest one. pH-WHC curves indicated that the isoelectric region of all cuts proteins were around pH 5. The breast proteins gave the higher emulsifying capacity and emulsion stability than the other cuts.

INTRODUCTION : Sheep meat is frequently consumed by Egyptian and Arabian people. The total number of sheep amounted to 2.08, 3.03, 3.5, 5.9, 8.1, 11.9, 15.5, 19.0 milions heads in Egypt, Saudia Arabia, Lebia, Tones, Syria, Algear, Sudan, Irak and maroco, respectively (F.A.O. 1974).

On the other hand, sheep meat contains several important classes of nutrients including proteins which are good sources of essential amino acids and the fat containing essential fatty acids. The meat fibers are tender, easy to chew or grind, easy to digest and flavor is mild and blends well with seasonings and other food(Sokolov et al, 1970). The present study is designed to give a more basic knowledge about some physical, chemical and nutritive properties of Egyptian lamb. The chemical composition, protein fractions amino acids content, phosphorus compounds, pH-WHC curves and emulsifying capacity of eight cuts from Egyptian lamb were studied.

MATERIALS AND METHODS whole carcass of Egyptian osymi lamb (1.5years) was brought from the Animal production Department Faculty of Agriculture, Minia University and divided according to Plamin et al 1995, into individual cuts namely : leg, shoulder, breast, flank, loin, 7 th 12 th ribs, neck and 1st-6 th ribs (Fig.1). Each cut was deboned and liberated from external fat and connective tissues. The separated lean meat passed through the meat grinder twice in quick succession to get a homogenous sample. The comminuted flesh was packed into glass jars and analysed. The chemical composition was estimated as described by A.O.AC., 1975. Sarcoplamic, fibrillar and stroma proteins were estimated by different buffer solutions according to baliga et al.(1962). Non-protein nitrogen was determined according to Lazarevisky (1965). The amino acid compsition of the protein was determined by the spackman et al. (1958) using the Hitachi KTA-3b,Amino Acid Analyzer and the procedure described by the manufacturer. Tryptophan was determined after alkaline hydrolysis by the method of Krelova and Lackovskia (1965). The total phosphorus of lean meat was determined by Chen et al.(1956). Acid-soluble phosphorus and inorganic phosphorus were determined according to Krelova and Lackovskia (1965). The phosphorus of lipids was determined in a chloroform : methanol (2:1) meat extract(Folch et al. 1957), as previously described in total phosphorus. The protein phosphorus was estimated by the difference between total phosphorus content and (lipids phosphnorus + acid soluble phosphorus) according to Lazarevisky(1965). PH, water holding capacity was estimated according to Hamm and Deatherage, (1960) for obtaining the pH WHC Curves in pH range between 3 to 7.5.The emulsification capacity of the meat of different lamb cuts was estimated according to swift et al. (1961). The stability of emulsion was detemined by the method of Inklaar and Fortuin, 1968.

RESULTS AND DISCUSSION : The chemical composition of the different cuts from Egyptian lamb is

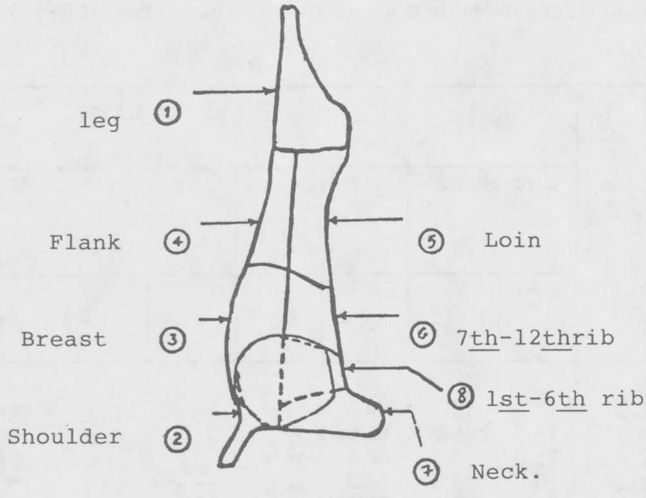

Fig.1 Different cuts of lamb carcass

Table (1) : pH and chemical composition of Egyptian lamb cuts(%)

Cut	Moisture	Protein	Fat	Ash	pH
Leg	73.64	21.43	3.81	1.13	5.89
Shoulder	72.75	21.76	3.75	1.14	5.89
Breast	73.46	22.41	4.61	1.14	5.78
Flank	72.74	21.84	4.21	1.15	5.75
Loin	72.56	23.12	3.07	1.21	5.73
7th- 12 th ribs	73.55	21.37	3.62	1.23	5.80
Neck	72.49	22.91	2.77	1.13	5.70
1 st- 6th ribs	75.92	20.48	4.09	1.24	5.89

Table(2): The proportion of different cuts, seperateable muscles and protein fraction of Egyptian Lamb cuts

Cut	% of carcass	Seperateable muscles (% of cut)	Protein fractions: Sarcoplasmic A	Sarcoplasmic B	Fibrillar A	Fibrillar B	Stroma A	Stroma B	N. P .N . A	N. P .N . B	Fib / Str. C
Leg	37.0	62.2	25.2	15.7	44.6	27.7	17.5	10.6	12.7	7.8	2.5
Shoulder	26.0	48.3	19.5	9.4	46.0	22.2	10.8	9.3	14.2	6.9	2.3
Breast	8.6	62.5	21.0	13.1	62.6	39.2	6.2	3.9	9.6	6.0	10.1
Flank	1.8	100.0	18.5	18.5	44.5	44.5	25.1	25.1	12.0	12.0	1.8
Loin	13.8	31.5	22.0	6.9	52.0	16.4	12.5	3.9	12.7	3.9	4.2
7th- 12 th ribs	6.4	30.2	20.2	6.1	56.1	16.9	12.7	3.8	13.3	4.0	4.4
Neek	2.8	22.9	17.6	4.5	56.1	12.8	11.4	2.6	14.6	3.3	4.9
1st 6 th ribs	3.6	29.2	20.5	5.9	55.5	16.4	12.6	3.7	13.4	3.9	4.4

A - % of total nitrogen
B - % of lean
C - Fibrillar / Stroma, ratio

shown in Table 1. It has been observed from these results that the cuts slightly varied in their chemical composition. Table 2 showed that the leg cut recorded the highest percentage of the carcass and the flank the lowest. The flank cut recorded the largest yield from lean meat because it contains no bone. The results revealed also that the neck cut had the lowest amount of lean (22.9%). From this table it could observed that fibrillar protein constituted the highest percent in all cuts. It ranges from 44.5 to 62.6% of total protein or from 12.8 to 44.5 % of lean. The breast cut possessed the higher percentage of fibrillar (62.6%). while leg cut had the lower percent (44.5). stroma proteins varied in all cuts of Egyptian lamb. Flank cut had the higher perent of stroma protein (25%) than the other cuts. The Fibrillar Stroma ratio (Fib./ Str.) in all cuts was shown in Table 2. It is known that stroma composes of collagen and ellastin proteins which belong to the inferior proteins. Sarcoplasmic and fibrillar proteins belong to the hight biological value proteins (Dvorak, 1965). The breast cut gave the highest ratio (10.1) and flank gave the lowest (1.8). The cuts studied could be classified according to their Fib/str. ratio into 4 goups : The breast occupied alone, the first place (10.1). The second group included loin, 7th- 12th ribs, neck and 1 st- 6 th ribs with Fib/ str ratio ranged from 4.2 to 4.9 The third group included leg and shoulder (2.3 and 2.5). The flank cut occupied the last group and possessed th lowest Fib/str. ratio (1.8). from these results it could be said that the breast cut possessed the highest nutritive value and flank had the lowest.

The amino acids composition of the different lamb cuts was shown in Table 3. The amino acids had been calculated as mg. per 100 g flesh. Glutamic acid, lysine, aspartic acid, leucine, argimine and alanine were the largest amounts in all cases. Breast and loin cuts had higher content than the others. The present values of amino acids composition of differents Egyptian lamb cuts agree with the averages found in the literature (Sokolov, et al 1970).

Table(3) : Amino acid composition of the muscle of different cuts from Egyptian lamb carcass

Amino Acids	mg /100g meat							
	Leg	Shoulder	Breast	Flank	Loin	7th-12th ribs	Neck	1st-6th ribs
Lysine	1644	1661	1671	1786	2066	1919	1688	1925
Histidine	507	436	481	522	763	683	437	571
Arginine	1047	983	1064	1122	1273	1203	1109	938
Asparagine	1631	1637	1635	1675	2044	1775	1629	1676
Threonine	473	447	519	553	585	527	489	595
Serine	863	883	924	947	908	881	887	869
Glytamic acid	2877	2715	2876	2955	3476	3141	2976	2984
Proline	658	755	875	789	882	823	858	810
Glycine	875	382	980	909	1007	930	1091	916
Alanine	1085	1007	1104	1116	1328	1194	1155	1058
Valine	940	879	930	1003	1193	1060	955	935
Methionine	304	324	316	361	419	381	319	366
Isoleucine	796	760	785	875	1009	912	794	928
Leucine	1606	1548	1597	1690	2023	1831	1607	1566
Tyrosine	359	360	333	490	447	392	393	362
Phenylalanine	834	687	825	710	1106	798	808	727
Tryptophan	298	263	325	190	302	272	275	276
Total (1)	16797	16062	17237	17756	20836	18722	17470	17513
E.A.A.(2)	6895	6570	6968	7231	8705	7700	6935	7316
2/ 1 / %	41.04	40.9	40.07	40.6	41.77	41.13	39.69	41.7

E.A.A. - Essential Amino Acids

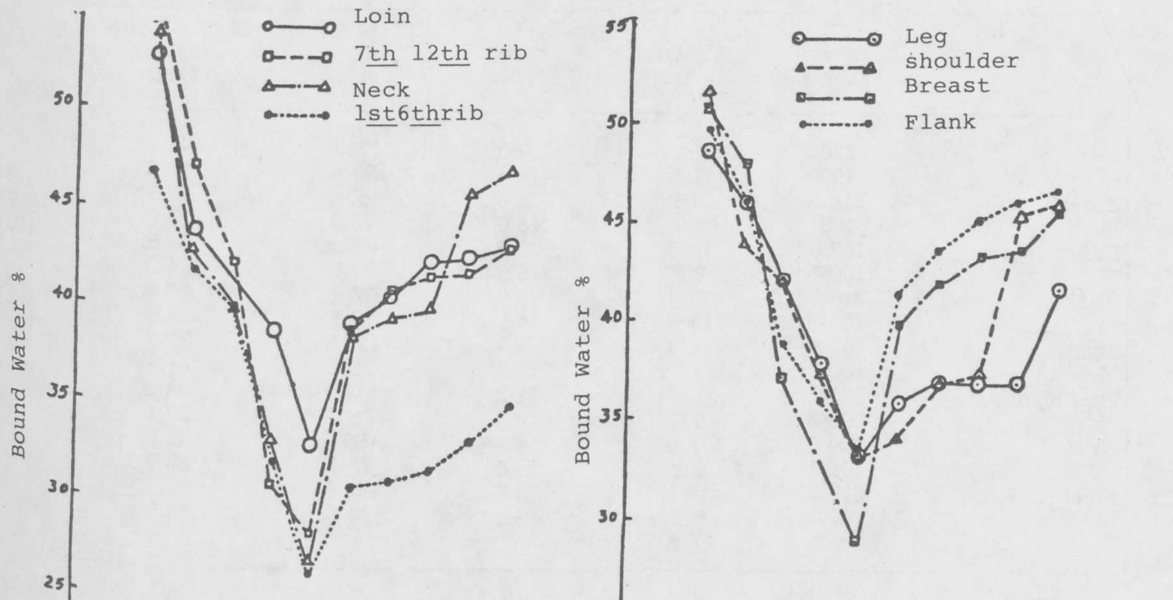

Fig2 PH-WHC curves of different lamb cuts

The phosphorus compounds contents of different cuts of Egyptian lamb are shown in Table 4 . It can be seen this table, that total phosphorus in the muscles of these cuts ranged from 187.0 to 310 mg/100 g. fresh-weight. The highest phosphorus content was recorded in flank cut and the lowest in breast cut. These values include phosphorus of lipids, phosphorus of proteins, and acid, soluble phosphorus. It could be noticed from the table that most of the phosphorus content in the studied lamb cuts was present in acid-soluble form which constituted average of 72-76 % of the total phosphorus in all casses. The acid-soluble phosphorus includes a small percentage of organic phosphorus which constituted from 13-20.9 % of total phosphorus. These data are correlated with those obtained by Hammadi et al. 1976 in fish muscles.

The pH-WHC curves of the different lamb cuts studied were made in an attempt to explain their textural features and their suitability for processing (Fig.2). The normal pH of the meat is that pH at which the meat is cooked. If such pH is near to that of the isoelectric point of the meat proteins shall take upon cooking causing a taugh texture (Hamm, 1960). The data obtained showed that the normal pH of the studied cuts ranged from 5.70 to 5.89 (Table 1). The isoelectric points or the pH of the lowest hydration were around 5 for all cuts. From the Fig.2, it could observed also that the proteins of different cuts of lambs meat kept a various percentages of bound water around electrical point (pH 5) . The proteins of breast, 1st-6th ribs, 7th-12 th ribs and neck bound the lowest percent of water at pH 5, while loin, shoulder, leg and flank kept the highest.

Table 5 showed the emulsifying capacity (E.C.) and emulsion stability (E.S) of the proteinof eight cuts from osymi lamb studied. It could be noticed from this table emulsion capacity of the lamb cuts studied ranged from 137 to 176ml oil/2.5 g. tissue. or from 21.1 to 34.3ml oil/ 100 mg protein. The highest E.C. Value was record-

Table (4) : Phosphorus compoud contents in different cuts muscles of Egyptian lamb(mg/100 Fresh weight).

Lambs cuts	Total phos.	Lipids Ptds	Protein phos	Acid soluble phos. total	organic	Inorganic
Leg	238	25.0	39.3	173.7	45.2	128.5
%	100	10.5	16.5	73 0	19.0	54.0
Shoulder	212.5	21.2	38.3	153.0	27.6	125.4
%	100	9.9	18.0	72.0	13.0	59.0
Breast	187.0	18.5	29.2	139.3	26.5	102.8
%	100%	9.8	15.6	74.5	14.2	55.0
Flank	310.0	37.3	44.9	227.8	60.4	178.8
%	100%	12.0	14.5	73.5	19.5	54.0
Loin	262.5	25.0	40.7	196.8	57.7	139.1
%	100%	9.5	15.5	75.[illegible]	21.9	53.1
7th-12th ribs	220.0	21.60	31.2	167.2	44.3	23.2
%	100%	9.8	14.2	76.0	20.1	56.0
Neck	204.0	16.8	34.2	153.0	42.8	112.2
%	100%	8.2	16.8	75.0	20.9	55.0
1st-6th ribs	215.5	19.5	35.5	160.5	35.5	125.0
%	100%	9.0	16.5	74.5	16.5	58.0
Average of lamb	231,2	23.1	32.4	171.4	43.8	128.0
%	100	10.0	14.0	47.3	18.9	55.4

Table (5) : Emulsifying Capacity and stability of the proteins of different Egyptian lamb

Cuts	Emulsifying capacity (ml. oil)		Emuslsion Stablilty %	Seperated Water %
	per 2.5 g. tissue	per 100 mg. protein		
Leg	160	30.0	38.75	64.0
Shoulder	146	26.8	38.36	77.33
Breast	192	34.3	7.81	50.67
Flank	110	21.3	18.97	37.33
Loin	137	25.7	13.14	42.76
7th - 6th ribs	157	31.6	16.56	56.00
Neck	167	29.4	18.75	45.33
1 st - 6 th ribs	162	30.70	17.90	50.67

ed in breast cut and the lowest in flank cut. It may be due to the fact that the fibrillar proteins have the highest binding property of all the proteins of meat while stroma protein have the lowest one (Saffle, 1968).

Table 5 showed also the emulsion stability of different cuts from lamb meat as a percentage of seperated oil of the total amount of oil added after heating at 85C, cooling and centrifugation. The results showed that the emulsion from breast cut had the higher stabillity than those of the other cuts. The shoulder and leg cuts released the highest content of oil during heating and centrifugation.

Conclusion : The different cut of Egyptian lamb meat have a high nutritive value in terms high protein percentage and high essential amino acids . In addition the phrotein funcxionality of all cuts are suitable for meat processings.

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