Comparison between protein and amino acids of mushroom *Agarieus bispours* with some kinds of meat and meat's products

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Abstract. Results indicated that the percentage of protein in mushroom was approached with it in sheep's meat, but it was higher than the others. Also, the protein was higher than eggs, cow's milk, sheep's milk and cheese of cow's milk, while it was lower than it in cheese of sheep's milk which contained the higher one among these samples. Results show that sheep's meat contained highest percentage of Valine and Lysine while it contained lowest percentage of Isoleucine. Fish contained highest of Threonine and Isoleucine, but shrimp surpasse in Leucine. However, eggs contained highest of Phenylalanine and cow's milk was rich in Methionine. Threonine, Methionine and Lysine were found in lowest percentage in eggs, while cow's milk contained lowest of Leucine and Phenylalanine, also Valine was low in cheese of sheep's milk. Cow's milk contained highest of Glutamic acid, Proline and Tyrosine,while it contained lowest of Alanine. Shrimp contained highest of Aspartic acid and Glycine, but fish surpassed in Alanine, but sheep's meat contained the highest of Arginine. Glycine, Arginine, Proline and Tyrosine were found in lowest percentage in eggs, while cow's milk has the lowest portion of Glutamic acid. Also, chicken contained lowest percentage of Aspartic acid. Fish contained highest percentage of Serine, while cow's milk contained highest of Histadine. But cow's meat contained low amounts of Serine and Histadine. Methionine, Leucine, Phenylalanine, Glutamic acid, Arginine, Alanine, Tyrosine and Histadine in mushroom was close to sheep's meat as well as close to shrimp in the percentage of Methionine, Valine, Glycine and Proline. Also, the percentage of Lysine was close with it in cow's milk, Aspartic acid in mushroom was close to the percentage of it in cheese of sheep's milk, while Serine was close with it in chicken and cheese of cow's milk.

1. Introduction

Amino acid is the basic unit of composition of proteins and peptides in the bodies of living organisms, eight of them essential and that are not created by the human body, so they can be obtained from animals, and plants source. The rest of amino acids are non-essential that (can be manufactured within the human body, provided to healthy nutrition) despite the body's ability to manufacture of unessential amino acids, in some cases have to take supplements of the essential amino acids to ensure that the optimal quantity in the body, more resintly a third section is a semi-essential amino acids, which the body manufactures these acids, but in limited quantities [1].

Amino acid components of the proteins belong to category α-Amino Acids because the hydroxyl radical and the Secretary are linked to the first carbon atom in the chain. Although there were a large number of alpha-amino acids in nature the protein chains do not contain only 20 types [2].

In addition to build cells and repair tissue, amino acids are the main construction material for antibodies to combat invading bacteria and viruses, which are an essential part of enzymes and hormones system; as the amino acids play a major role to carry oxygen to different parts of the body,an essential component of muscle activity,and the amino acid play role of neurotransmitters and raw materials to certain hormones or as an energy source [1].

At the present time, the world is suffering at the present time a large food crisis, especially in developing countries, since the food protein occupies a privileged position it is natural diversity of ways to search and deal with its production agriculturally , industrially and work to save and spread it[3]. The most important sources of protein is meat, which is defined as a structures complex containing high vital interest food stuffs as they are considered a rich source of protein with full nutritional value.They are digested easily and includes commercial source of this meat both beef and buffalo, sheep, birds and fish which are the main source of meat [4].

The researchers of food take an interested to found new sources of non- classical for the production of food especially production of protein, Mushroom was fleshy growth of some types of fungi might be to grow above the ground, as the most types of mushrooms or might be growing under the surface of the earth as truffle[3].

Good species fungus which suitable to eat called mushrooms, and these types of mushroom produced in east Asia, China and Japan.Also,it was occupied first place in Egypt in the consumption of mushrooms, mushroom shiitake which was called the golden type was likable in most countries in Southeast Asian [5].

Chemical analyses of the mushrooms which have a high nutritional value exceeding the nutritional value of most types of fruit that vegetables and is approach a lot of nutritional value of the meat, therefore it considers as a food substitute for meat [6].

The nutritional value of mushroom was primarily in the content of the proteins that make up 5% of the weight of fresh mushroom, which is equivalent to 40-35% of the weight of dry matter and characterized by a high quality of these proteins, because the amino acids that made proteins very similar to those that made the animal proteins of meat, milk, eggs, and these proteins found in mushrooms can compensate animal proteins by 100% while other vegetable proteins of cereals, pulses and vegetables do not compensate for animal proteins, but up to 40-50%, and this makes mushroom competitor real and strong meat animal and the other products [6], mushroom was poor in its content of fatty substances ranging between 0.01 - 0.2%, which makes it suitable for diabetics and people with high cholesterol in the blood.The mushroom was appropriated for individuals who suffer from obesity and all those who they wish to maintain their health and their activity [3].

The aim of study was conducted to determint protein and amino acids for mushroom Agarieus bispours and compared it’s with the percentage of protein and amino acids for red and white meat samples such as (cow's meat , sheep’s meat, chicken, carb fish and shrimp) and meat products such as (eggs, cow's milk , sheep’s milk ,white, soft cheese made from cow's milk and from sheep’s milk).

2. Materials and Methods

2.1. Materials

Fresh samples were purchased from the local markets of Basra city during the period 1- 4- 2018, 50 grams of beef, lamb, chicken, carp fish *Cyprinus carpio,* shrimp *Metapenaeus affinis,* eggs, cow's milk, sheep'smilk,white, soft cheese made of cow's milk and sheep's milk and canned mushroom *(Agarieus bispours*) of Chinese origin were taken, these samples were dried in oven in 40 C° for three hours.

2.2. Working methods:

2.2.1. Protein:

The percentage of protein was estimated by Semi-microKjeldahl method that described by Pearson [7] for samples of meat, eggs and cheese, while the percentage of protein in the milk were estimated using the method of (Biuret) as stated in Wooton [8].

2.2.2 Pre-column Derivatization Method of amino acid analysis
Pre-column derivatization, the amino acids are derivatized before injection, then the reaction products are separated and detected. This concept is illustrated on the right. The "labels" shown indicate the derivatizing reagent. Using ion-exchange column and derive Alnnhedrin, a dimension of the column in auto- analysis system was Shimadzu Spd - 6 Av UV - Visible detector device ,using High Performance Liquid Chromatography (HPLC) in the Ministry of Science and Technology, Baghdad – Iraq, was used to determined the amino acids in the samples.

2.2.3.Material
Methanol HPLC grade (Fluka). Solutions of amino acid standards 25µg/ml, phenyl isothocyanate reagent 50 mM, were obtained from (Aldrich Chem. Co. Ltd).

2.2.4.Chromatographic System:
The HPLC Chromatography system consists of two Shimadzu model LC-6A pumps (Koyoto Japan), SIL-6A automated system controller for generation of elution a gradients and a Shimadzu Spd-6AV UV-visible detector equipped with 8µ flow cell. The sample injected into the column through Rheodye 7125-sample injector with 20µl injection loop. The data were processing and analyzed by RC-6A data processors.

The column used was Shimpack XR-ODS (50× 4.6 mm 1.d), 3um particle size. Gradient was formed between two degassed solvents. Solvent A: 5% methanol in 0.1 N sodium acetate buffer pH (7.0),
Solvent B: methanol.
linear gradients in from 0 -20 minutes
Detection: UV set at 254nm
Flow rate: 1 ml/min
Injection: 20 ml.

2.2.5.Extraction:
1.0 gram dry sample was blended with 50 ml of ethanol absolut:water 60:40 (V / V) the extracted sample were dissolved in 30 ml 6N of HCl and hydrolysed in vacuum-sealed glass tube at 110 C° for 6 hours using Dry bath incubator .hydrolyzed sample were filtered through glass filter and the filterate was concentrated by rotary evaporator to reach 5 ml then mixed 5 ml of 0.1M citric acid buffer (pH 2.2) and 10 µl was derivatized with phenyl isothiocyanate (PITC) reagent and 20 µl were injected on HPLC column under the optimum condition.

2.2.6.Derivatization Procedure:
The general procedure for derivatization was as follow, 10 µL of aliquots of the standard or unknown sample was mixed with 10 µL of PTIC reagent after 1 minute, 50 µL of 0.1 M sodium acetate pH (7.0) was added. the sample was shaked and agitated in Ultrasonic bath for 10 minutes , The extract were filtered on disposable filters 0.2 um (supelco company cat No 16534K), then 20 ul were injected on HPLC column. The concentration for each compound was quantitatively determined by comparison the peak area of the standard with that of the samples[9; 10].

2.2.7. Statistical Analysis and Design
Complete Randomized Design (CRD) analysis was used for global trials and analyzed according to the Special Program For Statistical System (SPSS) (11). At a significant level ($P \leq 0.05$).

3. Results and discussions

3.1.Protein
It found that the percentage of protein in the mushroom higher than all kinds of meat except sheep's meat and also higher than other products such as eggs, cow's milk and white, soft cheese made from

cow's milk and sheep's milk, but it was less than the percentage of protein in the cheese made from sheep's milk, which contained the highest percentage of protein (30.03 %) (Table, 1).

When comparing these results with other studies, it can be observed that the protein content of the mushroom was higher than those obtained from the types of mushrooms *S. Crassa, P. salicinus* and *T. fracticum* which were (19.46, 10.72 and 13.85) % respectively, and lower than those obtained in the two types of mushrooms, *A. aegerita* and *H. leucopus* which were (34.1and 31.41) % respectively [3], as well as it was higher than the percentage of protein of mushrooms *A. mellea* who was (21.12%), but It's less than the percentage of protein in *S. imbricatus* and *C. cibarius* which were (27.45 and 34.17) % respectively [6], [12]reported that the percentage of protein in the mushroom *P. citrinopileatus* was (22.10%), this ratio was lower than obtained the percentage of protein in this study.

The percentage of protein in the cow's meat was (22.1 %). These results are not consistent with the results obtained from [13] which indicated that the percentage of protein in the thigh of fresh veal and cows were (19.80 and 18.76) % respectively. It is higher thanthe results explained by [14],[15],[16],[17] and [18] when they studied the chemical composition of the thigh muscle of cows and they reported that the percentage of protein was (18.80) %, (21.8) % ,(19 0.67) % , (18) % and (18.7)% respectively, [19] stated that the percentage of protein in beef taken from the markets (Alddrah,Kasra and Karrada) in Baghdad city were (20.58, 20.97 and 21.18) % respectively, and this ratio is less than the ratio in the current study.

[20] explained that the percentage of protein in meat products between 15-29 % and in cows and veal were 21.3 % and 22 % respectively. Lamb's meat contains protein ratio about 26.37 %, which was higher than the percentage (17 %) cited by [21] when studied in the same type of meat. [20] reported that the percentage of protein in lamb's meat and small lamb's meat (20.4 and 15.7) % respectively. [22] noted that the percentage of protein in the lamb's meat was 21.12 %, and [23] reported that the percentage of crude protein in the lamb's meat was 16.30%.

[24] found that the percentage of protein in the Najdy and Oraby lamb's meataged two weeks were (22.8 and 18.7) % respectively.

The results showed that the protein content in chicken meat under study was 19.50 %, which is less than what reported by [25] who stated that the percentage of protein in chicken meat amounted to 24%, and less than what [26] found, who stated that the protein of chicken meat was increased to 21.4%, [27] reported that the percentage of protein in the (thigh and breast) chicken meat were (23.32 and 24.9) % respectively, which is less than what [28](20.50 %) found when determined percentage of protein in chest muscle chicken meat and with the results 20 % indicated in chicken meat [29].

[20] found that the percentage of protein in poultry meat between (15-24) %. The results showed that the percentage of protein in the carp fish was 19.49 %, The results of this study were higher than [30] results who stated that the percentage of protein in the carp fish was 17.5 %, while [31] pointed that the percentage was 17.52 %, [32] reported that the percentage of protein in fresh carp fish was 17.2 % and in the imported carp fish was 14.98 %. Also, [33] noted that the percentage of protein in the carp fish was 18.68 %. In addition, [34] indicated in her study that the percentage of protein in the carp fish was 18.42 %, which is less than the results of the current study.

[35] reported that the percentage of protein in the grass carp fish and silver carp fish and common carp fish were (20.77, 16.82 and 17.43) % respectively, which were not consistent with the values of the current study.

[20] found that the percentage of protein in the river fish was between 15-20 % and in marine fish was between 15-19 %.

The percentage of protein in shrimp meat was about 20.11 %, which is higher compared with the [36], which was (18.45 %). [37] mentioned that the percentage of protein in the marine shrimp Penaeus semisulcatus and river shrimp Macrobrochium rosenbergii were (52.46 and 48.79) % respectively, which was higher than that reported in this study. While [38] reported that the percentage of protein in the marine shrimp (shrimp Arabian Gulf) and river shrimp (marshes shrimp) Metapenaeus affinis were(19.11and 12.97) % respectively, which is lower than the proportion of protein in shrimp under study. [19] found that the percentage of protein in crustaceans was between 15-19 %.

In egg percentage of protein was 21.4 %, this results was approached the percentage (21 %) that reported by [22]. While Organization FAO / WHO [39] reported that the percentage of protein in eggs was (3.8 %), While [20] found that the percentage of protein in chicken eggs was (12.5 %) which was less than the percentage reported in this present study.

The percentage of protein in the cow's milk was (4.2 %) which was higher than the percentage of protein in the cow's milk (3.03 %) studied by [40] or the percentage of protein in the cow's milk (3.1 %) reported by FAO / WHO [39].And this percentage was higher compared with the results of [41], [42] and [43] who pointed out that the percentage of protein in the cow's milk was (3.2 %),(3.1 % to 3.9 %) and (2.88 %) respectively. While it was lowerthanwhat recorded by [44] who reported about 13.9 %.

The percentage of protein in the sheep's milk was (5.49 %), And it was approached to percentage which were estimated in the milk of six domestic breeds of sheep (Suffolk ,Targhee, Finn, Dorset, Lincoln and Rambouillet) (6.1, 5.7, 6.5, 6.1 and 6.2) % reported by [45], [46] pointed out that the percentage of proteinin milk of seven Asian breeds of sheep (Lacaune, Boutsico, Vlahico, Karagouniko, Nadjii and Friesland) were (5.63, 6.52, 5.97, 4.75, 5.82 and 5.29) %, [47] ingested that the percentage of protein inlamb's milk was (6 %), Or [43] who showed that the percentage of protein in the sheep's milk was (5.88 %). this results were lower than the percentage which were estimated in the present study. It was also closed within the range of protein in sheep's milk (4.5- 7.0 %) mentioned by [42]. But [41] reported less protein (6.2 %) in sheep's milk.

When comparing the protein content in the white cheese made from cow's milk reported in this study with other studies, it turned out to be less than the percentage obtained by [48] which was (19.76 %), but higher than the percentage found by [49] in the five types of white soft cheese made from cow's milk (Almekaafi cheese, Abu shebik cheese,Galajacheese, Zriga cheese and Gozelahmeer cheese) were (15.73, 14.67,14.73, 13.57 and 14.17) % respectively, [44] mentioned that the percentage of protein in cheese was (8.5 %).

Table 1. percentage of protein (%) in mushrooms and types of meat and meat products

Sample		percentage of protein (%)
Meat	Cows	22.18 a
	Sheep	24.51 a
	Chicken	19.50 c
	Carp	19.49 c
	Shrimps	20.11 c
Eggs		21.40 ab
Milk	Cows	4.20 d
	Sheep	5.49 d
White, soft cheese made from milk	Cows	18.66 e
	Sheep	30.03 e
Mushroom		**24. 37** a

All results in the table are the rate of repeating.

Similar letters mean there are no significant differences and different letters mean there are no significant differences.

The percentage of protein in cheese made from sheep's milk was (30.03 %) which was higher than the percentage of protein (28.45 %) in white, soft cheese reported by [50], and higher than that found in the studied by [51] in a cheese made from sheep's milk which was (22.27 %).

It should be noted that this percentage was not fixed, but it was variable depending on several factors, including the (environment, nutrition, season, gender, sex, and other)[52].

The differences in the percentages of protein in both cow's and sheep's meat and chicken and eggs, may be due to backward proportionality between the chemical components, particularly moisture and protein, However, when the percentage of moisture increases the percentage of protein was decreases. The differences between the results of the current study and other studies may be regarding the types of animals, breeds, nutrition, the part taken from the carcasses of animals and other [53].

The mushroom sample in current the study has the highest percentage of protein compared with other samples used in this study. so we can conclude that it was approaching the protein content of the sources of meat (cows, sheep, chicken, shrimp, fish, eggs and other animal products) protein so it was one of the healthy foods that are recommended taking it to maintain the overall health of the body.

Statistical results on the level ($P \leq 0.05$) showed that there was no significant differences in percentage of protein between beef and sheep meat as well as between chicken meat, fish meat and shrimp meat. While there were significant differences in the percentage of protein between beef and chicken meat and fish meat and shrimp meat and between sheep meat and these types of white meat. There were no significant differences in protein ratio between eggs, beef and sheep meat, but there were significant differences between eggs and between chicken meat, fish and shrimp. There were significant differences in protein ratio between cows milk, sheep milk and red and white meat species, while there were no significant differences in protein ratio between cheese made from cow milk and cheese made from sheep milk and between them and between meat types and milk and egg types. The percentage of protein in mushroom mushrooms did not differ significantly with that of beef and sheep, but they differed significantly with other meat and animal products.

3.2. The percentage of amino acids in meat and meat products

Table (2, 3 and 4) showed the essential, non-essential and semi-essential amino acids analysis by HPLC technique for samples of various meat and meat products, the results showed that the sample contained 18 amino acid, these acids varied depending on the types of meat and meat products proteins.

3.3. The percentage of essential amino acids in meat and meat products:

Table (2) showed that the meat and meat products contained seven essential amino acids and all lacked the tryptophan. Mushroom contained (9.14 %) of Threonine, it was observed that this percentage was less than the percentage found in the fish which was the highest, than the percentage in cow's meat, cow's milk and shrimp, but it was higher than sheep's meat, chickens, sheep's milk, both types of cheese and eggs. It was also noted that the percentage of Valinein mushroom was (3.70 %), and found to be less than the percentage in the sheep's meat which was the highest, then cow's meat and milk, followed by fish, eggs and shrimp, However, it was higher than cow's milk, cheese made from cow's milk, cheese made from sheep cow's milk and chickens.

The study showed that the percentageof Methionine in mushroom was (3.26 %), which was less than the percentage in the types of meat and meat products, except eggs, which contained (2.36 %) of this acid. Also, it found that the percentage ofIsoleucine in mushroom was (3.31 %), which was low compared to the percentage estimated in meat and meat products except sheep's meat, which contained (0.88 %) of this acid.

Results reported that Leucine content in mushroom was (3.54 %), it was noted that the percentage of this acid in mushroom was less than it in the types of meat and meat products except cow's and sheep's meat. Also, the percentage of Phenylalaninein mushrooms was (5.14 %), and it's low compared with those of the egg, which contained the highest percentage among the types of red and white meat, cow's and sheep's meat and milk, but it higher than the cheese made from sheep's milk and fish who contained an approximate values, then sheep's milk, chicken, cow's milk and meat.

Mushroom contained (4.48 %) of Lysine , it was observed that this percentage was less than a percentage in the lamb which was the highest, then the percentage in fish, chicken, sheep's cow's milk and cheese made of them, but it was higher than cow's meat, shrimp and eggs.

It found that the types of mushrooms (B. aestivalis, B. aereus, B. appendiculatus, B. badius and B. crocipodius, B. edulis, B. granulatus, B. impolitus, B. luridus and B. luteus) contained percentage of Threonine but (0.8, 1.2, 7.3, 2.3, 3.1, 0.9, 1.1, 1.4, 2.6 and 3.2) %,Valine were (3.0, 2.2, 0.9, 0.6, 0.6, 2.2, 1.6, 1.1, 2.7 and 0.8) %, Leucine were (0.8, 1.2, 0.9, 2.1, 0.9, 0.6, 0.8, 0.9, 1.3 and 1.1) %, Isoleucine were (0.8, 5.4, 3.8, 2.2 , 1.7, 3.3 , 8.1 , 5 0.4, 3.2 and 6.1) %, Phenylalanine were (2.2, 1.9, 3.4 ,5.2, 1.1, 0.9, 6.2 ,0.8, 0.7 and 3.6) % and Lysine were (0.8, 0.5, 1.9, 2.4, 0.5, 2.1, 0.5, 0.7, 2.3 and 0.6) % respectively (54). Also, the percentage of these acids in mushrooms (P. citrinopileatus) were (0.83, 0.85, 0.30, 0.61, 1.07 and 0.81) % (11), which was low values and sometimes fluctuate compared to the current result.

The organization FAO / WHO [39] ,[55],[56] and [57] reported that the percentage of Threonine in the cow's meat was (4.0, 4.0, 3.03, and 4.5) % respectively, and the percentage of Valine was (10, 3.4, 3.05 and 3.2) % respectively, while the percentage of Methionine was (10, 0.75, 2.03 and 0.8) % respectively, and the percentage of Isoleucine was (3.0, 3.9, 3 0.47 and 2.9) % respectively. whereas, cow's meat contained (4.7, 3.9, 7.08 and 5.2) % respectively of Leucine and (7.72, 1.7, 7.30 and 3.05) % respectively, of Phenylalanine and Lysine about (28.4, 3.4, 2.5 and 5.4) % respectively.

The USDA [17] and [56] reported that the percentage of Threonine estimated in sheep's meat was (3.2 and 2.88) %,Valine (1.3 and 3. 02) %, Methionine (8.4 and 2.13) %, Isoleucine (2.4 and 3.10) %, Leucine (5.4 and 5.82) %, PhenylAlanine (5.4 and 3.02 %) and Lysine (1.6 and 8.35) % respectively, and these results don,t agree with the current results.

[35] reported that the percentage of Threonine in the grass carp fish, silver carp fish and common carp fish was (8.82, 9.17, 9.37) % respectively, Valine was (6.95, 6.77, 6.6) % respectively, Methionine was (5.57, 5.6, 6.47)% respectively, Isoleucine was (5.57, 5.6, 6.47) % respectively, Leucine was (8.82, 9.1, 9.37) % respectively, Phenyl Alanine was (3.57, 3.27, 3.9) % respectively, and Lysine was (8.02, 7.82, 8.07) % respectively. Whereas, USDA [17] indicated that the percentage of these acids in the fishes of the two cables was (6.10, 9.0, 3.50, 5.7, 13.0, 5.6 and 10.9), respectively, and in herring (9.0 and 10). 0, 4.10, 9.0, 16.0, 7.0 and 18.0 %, respectively,While [57] reported that the percentage of these seven amino acids in fish were (5.3, 3.0, 1.8, 3.1, 6.6, 5.3, 3.4) % respectively.

[36] showed that the percentage of Threonine,Valine, Methionine, Isoleucine, Leucine, and Phenyl Alanine in marine shrimp Macrobrochiumro senbergii and river shrimp Penaeus semisulcatus were (2.53, 2.90)%,(4.65 ,5.46) %,((3.41,3.08) %,3.01,3.12) % , (2.69,3.18) %, and (2.79,1.92) % respectively. All these results were lower from the current study.

USDA [17] reported that the percentage of Threonine was (7.26) % in chicken,Valine was (9.13) %, Methionine was (4.13) %, Isoleucine was (7.75) %, Leucine was (14.45) %,Phenyl Alanine was (7.21) % and Lysine (14.36) %.

FAO/WHO [39] showed that the percentage of Threonine, Valine, Methionine, Isoleucine, Leucine, Phenyl Alanine and Lysine in egge were (7.72,7.72, 4.70 ,1.7,10,7.3,11.7) % respectively. this results wasn,t agree with the current study.

[58] menthioned that the percentage of Threonine,Valine, Isoleucine and Lysine in cow's milk were (14.9 , 22.0 , 19.9 and 26.1) % respectively, while [59] noted that the percentages of these amino acids in cow's milk were (0.46 , 2.20 , 0.83 , 1.99, 3.22, 1.59 and 2.61) %. [60] found that the percentage of these acids in cow's milk were (2.31, 1.75, 3.10, 0.49, 1.65,0.78 and 3.42) % respectively, and [61] explained that the percentage were (8.1, 1.03, 9.6, 10.4, 14.6 , 7.19 and 2.08) % respectively.

Table 2. The percentage of essential amino acids in samples of meat and meat products (%)

Number		1	2	3	4	5	6	7
Essential amino acids		Threonine Thr	Valin Val	Methionine Met	Isoleucine Ile	Leucine Leu	Phenylalanine Phe	Lysine Iys
Meat	Cows	11.31	10.23	6.00	4.55	2.03	1.44	0.86
	Sheep	9.07	19.11	3.85	0.88	3.16	5.90	11.67
	Chicken	5.64	3.31	5.01	9.73	26.55	3.32	5.69
	Fish	50.76	5.20	9.47	27.02	5.57	3.86	7.53
	Shrimp	9.60	3.79	25.4	6.37	65.21	6.67	3.93
Eggs		4.31	2.69	3.32	2.36	5.17	21.52	3.59
Milk	Cows	9.80	18.13	26.21	6.26	6.54	6.55	4.44
	Sheep	4.87	3.35	6.00	9.67	5.44	3.40	6.00
White, soft cheese made from milk	Cows	5.56	2.87	5.12	8.99	4.56	2.93	5.59
	Sheep	4.87	2.76	6.30	9.80	4.99	3.87	5.65
Mushroom		9.14	3.70	3.26	3.31	3.54	5.14	4.48

All results in the table are the rate of repeating.

[59] reported that the percentage of amino acids under study in sheep's milk were (1.62, 2.40, 0.80, 2.07, 3.14, 1.55 and 2.90) % respectively, and [62] found that It's equal to 2.18 %, 3.22 %, 1.38 %, 2.38 %, 5.01 %, 2.23 % and 4.01 % respectively, While it became clear from the results of [61] that those amino acids in sheep's milk were (5.99, 1.15, 9.25, 9.9, 15.4, 6.72 and 1.87) % respectively, and these values are different from the results of the current study.

[49] noted that the five types of soft, white cheese made from cow's milk (Almekaafi cheese, Abu shebik cheese, Galaja cheese, Zriga cheese and Gozelahmeer cheese) contained Threonine rates about (3.35, 3.26, 3.34, 3.69 and 3.41) % and Methionine (2.12, 2.38, 2.39, 2.40 and 2.49) % ,while the percentageof Valine was (6.48, 6.77, 6.24, 5.78 and 6.61) % and Leucine was (8.6, 8.49, 9.02, 9.33 and 8.12 %) and Lysine was increased to (7.95, 8.18, 7.68, 5.87 and 7.69) % respectively, This results was higher than the percentage obtained from the present study, while the percentage of Isoleucine was (4.26, 4.40, 40.92, 4.78 and 4.00) %, and Phenylalanine was (5.09, 5.22, 4.94, 4.85 and 4.83) %, which is less than the percentage of current result.

[63] found that the Threonine, Methionine, Valine, Leucine, Isoleucine, Phenylalanine and Lysine in the cheese made from sheep's milk were (0.27, 5.01, 0.90, 0.43, 6.64, 3.23 and 0.74) % respectively, which is incompatible with the current results.
The essential amino percentages in meat and meat products of the current study varied with the percentages mentioned in other studies and researches depending on the types of meat and meat products proteins. And the differences in the results may be regarding to the types of animals, breeds, nutrition, part taken from the carcasses of animals and other [53].

3.4. The percentage of non-essential amino acids in meat and meat products:
Table (3) showed that there was seven non-essential amino acid (%) in samples of meat and meat products.

The percentage of Aspartic acid in mushrooms was (2.52) %, it was noted that the percentage was less than a percentage that estimated in the shrimp meat, which was the highestvalue and followed by cow's milk, eggs, fish and cheese made from sheep's milk, but it was higher than the percentage on each of the cow's meat, sheep's meat, chickens, sheep's milk and both types of cheese. The results showed that the percentage of Glutamine acid in mushrooms was (14.53) %, this percentage was lower than in cow's milk, which contained the highest percentage, but it was higher thanit's content on cow's meat, sheep's meat, chicken, fish, shrimp, eggs, sheep's milk and both types of cheese. It found from the results that the percentage of Glycine in mushroom was (24.13) %, it was noted that thispercentage higher than the percentage estimated in the red and white meat and it's products except shrimp.
Also, it was found that the percentage of Arginine in mushroom was (12.01) %, which is less than the percentage estimated in lamb, but it was on the highest percentage in the other types of meat and it's products. The study found that the percentage of Alanine in mushroom was (4.44) %, it was noted that this percentage was less than the percentage that were estimated in the types of meat, while the presence of this acid in mushrooms by more than the level in chicken and other meat products.
The results showed that Proline in mushrooms was (3.45) %, which was low compared with the percentage that was estimated in the cow's milk, the highest percentage was reported in lamb, fish, shrimp and sheep's milk, but itwas surpassed in of cow's meat, chicken, shrimp, eggs, cheese made from both types of milk. The content of Tyrosine was (5.80) %, it was observed that this percentage less than the percentage estimated in the cow's milk, which was the highest value, followed by shrimp and lamb meat, but it surpassed in both types of meat, chickens, fish, eggs, sheep's milk and cheese made from both types of milk.

[54] explained that the types of mushrooms (B. aestivalis, B. aereus, B. appendiculatus, B. badius and B. crocipodius) were contained the following amino acids Aspartic acid (13.90 , 11.2, 9.6 , 9.2 and 20.2) %, Glutamine (1.8, 3.2, 4.2, 1.6, and 2.2) %, Glycine (0.6, 1.1, 1.6, 0.8 and 0.6) %, Arginine (2.1, 0.9, 0.8, 1.2 and 0.8) %, Alanine (3.6, 0.9, 1.5, 2.2 and 1.4) %, Proline (3.4, 2.7, 3.8, 5.1 and 1.4) %, Tyrosine (0.7, 0.9, 0.8, 0.6 and 0.8) % respectively. These percentages to increase or decrease on it's values when compared with there percentages in mushroom under study.

[12] reported that the percentage of these acids in the mushroom (P. citrinopileatus) was (1.82, 3.07, 0.84, 1.01, 0.86, 0.33 and 0.58) % respectively. [64] found that the species of mushroom (Lentinussajor-caju, Lentinus conatus, Lentinus torulosus, Lentinus cladopus and Lentinus squarrosulus) contained five essential amino acids (Glutamine, Arginine, Alanine, Proline and Tyrosine) the percentages of these amino acids were as followed (0.33, 0.28, 0.25, 0.31 and 0.37) % , (0.25, 0.27, 0.29, 0.24 and 0.21) % , (0.12 , 0.13, 0.15, 0.11 and 0.09) %, (0.03, 0.01, 0. 04, 0.04 and 0.06) % , (0.16, 0.19, 0.21, 0.24 and 0.19) % respectively. These percentages were less than what was reported in this study.

FAO / WHO organization [39] and [55] reported that the percentages of Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine in the cow's meat were (3.2, 11.7, 3.3, 3.2, 4.6, 28.4 and 10) %, (7.9, 10.2, 4.3, 3.6, 4.6, 6.0 and 1.9) % respectively, while the USDA [17] reported that the percentages wes (14.5, 6, 5, 1.4, 1, 2.5 and 5.3) % respectively, [56] found that the percentages in the cow's meat were (2.82, 7.81, 20.18, 8.66, 6.93, 2.13 and 8.7) % respectively, while [57] pointed out that the percentages were (5.4, 8.6, 5.0, 0.2, 1.7 , 1.7 and 0.2) % respectively.

USDA [17] showed that the percentages of (Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine) estimated in sheep's meat were (4.8, 11.9, 6.2, 6.2, 11.9, 8.66 and 2.36) % respectively. [56] found that the percentages of these acids were (2.92, 7.65, 18.00, 9.95 and 6.50) % respectively.
The percentages of (Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine) estimated in chicken meat were (14.6, 27.2, 11.4, 11.5, 11.0, 7.8 and 5.82) % respectively,[16]. While [63] reported that that the percentages of these acids were (8.72, 13.98, 6, 6.8, 5.87, 4.13 and 3.50) % respectively. But [56] said that the percentage of these amino acids in chicken meat was (2.70, 7.11, 19.20, 9.27, 6.11, 7.43 and 2.40) % respectively. [57] showed that the percentages were (4.2, 6.8, 2.5, 2.7, 3. 2 , 1.8 and 1.8) % respectively.

The percentage of (Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine) in Kabline fish were (12.0, 13.6, 7.1, 8.3, 7.9, 4.5 and 5.0)% respectively, And in the Herring fish were (20.0, 30.0, 11.0, 12.0, 12.0, 10.0 and 3.0) % respectively [17]. [57] said that percentage of in fish were (5.9, 9.0, 3.4, 3.9, 3.7, 2.3 and 2.1) % respectively.

[37] explained that the percentage of Aspartic acid, Glutamine acid, Glycine, Arginine, Alanine, Proline and Tyrosine were (8.9 and 7.92) %, (11.45 and 8.66) %,(3.42 and 4.03) % , (5.63 and 5.82) %, (4.14 and 3.19) % , (2.63 and 1.63) % and (2.89 and 2.70) % respectively, in the marine shrimp Penaeus semisulcatus and river shrimp Macrobrochium rosenbergii.
FAO / WHO organizations [39] and USDA organizations [17] explained that that the percentage of (Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine) egg were (11.7 and 6.4) %, (3.2 and 8) % , (2.2 and 3.9) % ,(4.9 and 36.4) % , (2.4 and 7.10) % , (10 and 7.2) % and (7.3 and 4.76)% respectively.

[59] showed that the percentage of (Aspartic, Glutamine, Glycine, Arginine, Proline and Alanine) in cow's milk were (2.50, 6.89, 0.70, 1.19, 1.13 and 1.39) % respectively. But it was found that the percentage of these acids in cow's milk was (3.80, 3.67, 6.34, 19.21, 0.43 and 2.97) % respectively [59], While [61] explained that the percentage of these acids in cow's milk was (7.92, 1.39, 3.38, 7.22, 3.82 and 17.9) % respectively.

Table 3.The percentage of non-essential amino acids in samples of meat and meat products (%)

Number		1	2	3	4	5	6	7
Non-essential amino acids		Aspartic acid Asp	Glutamic acid Glu	Glycine Gly	Arginine Arg	Alanine Ala	Proline Pro	Tyrosine Tyr
Meat	Cows	0.76	0.59	3.00	5.98	7.02	3.13	2.78
	Sheep	0.65	14.17	4.47	12.96	4.81	5.93	5.84
	Chicken	0.30	4.60	12.16	6.87	4.27	3.37	4.39
	Fish	2.86	2.00	5.80	3.58	37.43	5.54	3.81
	Shrimp	26.61	3.41	24.48	6.51	28.28	3.48	7.40
Eggs		6.20	8.74	2.06	3.24	3.59	2.16	2.40
Milk	Cows	22.96	35.8	4.95	6.15	3.44	7.01	31.33
	Sheep	1.54	3.99	12.09	5.86	4.27	3.62	4.47
White, soft cheese made from milk	Cows	0.45	3.87	11.13	5.98	4.18	3.34	3.95
	Sheep	2.65	4.87	12.08	6.79	3.62	2.74	4.44
Mushroom		2.52	14.53	24.13	12.01	4.44	3.45	5.80

All results in the table are the rate of repeating.

The percentage of Aspartic and Glutamine in sheep's milk were (5.92 and 2.62) % [65], Also, [59] said that the percentage of (Aspartic, Glutamine, Glycine, Arginine, Alanine and Proline) in sheep's milk were (2.10, 6.26, 0.50, 10.19, 1.18 and 3.68) %, [66] found that the percentages of in sheep's milk were (4.31, 11.26, 0.94, 1.45, 1.91 and 5.32) % respectively.
[61] showed that the sheep's milk contained Aspartic, Glutamine, Arginine, Alanine and Tyrosine about (9.41, 1.17, 4.96, 9.77 and 4.26) % respectively.

[49] found that the five types of white, soft cheese made of cow's milk (Almekaafi cheese, Abu shebik cheese, Galaja cheese, Zriga cheese and Gozelahmeer cheese) contained Aspartic, Glutamine, Glycine, Arginine, Alanine, Proline and Tyrosine in percentages as followed:(5.9, 6 0.31, 5.82, 4.73 and 5.6) %, (3.43, 3.36, 3.15, 4.78 and 3.76) % , (2.91, 2.89, 2.96, 2.89 and 2.85) %, (10.76, 9.75, 9.92, 13.51 and 9.94) %, (4.49, 5.22, 4.94, 4.52 and 4.83) % respectively. [62] found that the Aspartic, Glutamine, Glycine, Alanine, Proline and Tyrosine in the cheese made from sheep's milk were (2.84, 1.01, 0.19, 0.86, 3.39 and 1.03) % respectively. While the percentages of Aspartic and Glutamine raised to (16.8 - 39.5) % and (13.3- 27.0) % respectively in the cheese made from sheep's milk [65].

The non-essential amino percentages in meat and meat products of the current study varied with the percentages mentioned in other studies and researches depending on the types of meat and meat products proteins. And the differences in the results may be regarding the types of animals, breeds, nutrition, the part taken from the carcasses of animals and other [53].

3.5.The percentages of semi-essential amino acids in meat and meat products:

Table (4) represented the semi-essential amino acid percentages in samples of meat and meat products (%).There were two amino acids only.

Mushroom contained a percentages of Serine (7.91) %, it was noted that this percentages less than a percentage estimated in the fish, which was the highest valueand followed by cow's milk, shrimp and cheese madefrom cow's milk, but it was higher than the percentages of Serine in cow's meat, sheep's meat, chicken, eggs, sheep's milk and cheese made from it.

The percentage of Histidine mushroom was (11.22) %, this percentage was less than the percentage that estimated in the cow's milk, which was the highest value, then followed by shrimp and fish, but it surpassed incow's meat, sheep's meat, chicken, eggs, sheep's milk and cheese made from it and from cow's milk.

Various types of mushroom such as (B. aureus, B. crocipodius, B. edulis, B. granulatus, B. impolitus, Boletu ssp, B. scaber and B. versipellis) contained Serine and Histidine as followed: (2.3, 3.1, 0.8, 0.7, 1.2, 1.1, 2.3 and 0.9)% respectively for Serine and (0.8, 0.6, 1.3,1.7, 0.8, 1.4, 0.6, 0.7, 1.8 and 0.9)% respectively for Histidine [54]. [12] reported that the percentage of Serine and Histidine in mushroom P. citrinopileatus were (1.03 %) and (0.51 %) respectively.

Indicated in the report of [39], [17], [55], [56] and [57] reported that the percentage of Serine in the cow's meat was (36.4, 7.6, 4.2, 4.06 and 2.6) % respectively, and the percentage of Histidine was (7.2, 1.4, 1.1, 5.89 and 3.9) % respectively. Also, USDA organization [17] found that the percentage of Serine and Histidine in sheep's meat was (6.2, 6.2) % respectively. [55] showed that the percentage in the sheep's meat was (4.16 and 6.24) % respectively. It was noted that the percentage of Serine and Histidine in chicken was (6.72 %) and (3.5 %) respectively [17]. While [64] mentioned that the percentage was (4.01 %) and (4.21 %) respectively, in the chicken. [56] pointed out that the percentage of Serine and Histidine was (3.81 % and 7.29 %) respectively, for chicken. While [57] reported that the percentage of Serine and Histidine in chicken was (1.7 % and 1.1 %) respectively.

In the eggs, FAO / WHO [39] and USDA [17] reported that the percentage of Serine was (33 % and 9.28 %) respectively, and Histidine (36.4 % and 2.1 %) respectively .

USDA Organization[17] indicated that the percentage of Serine in Kabline fish and Herring fish were 5.7 % and 8.0 %, and the percentage of Histidine were (3.3 % and 5.0 %) respectively. but [57] found that the percentage of serine and histidine in fish were (2.7 % and 1.9 %) respectively.

[37] reported that the percentage of Serine and Histidine in the marine shrimp Penaeus semisulcatus and river shrimp Macrobrochium rosenbergii were (3.11 and 2.45) % and (1.65 and 3.92) % respectively.

[59] and [60] showed that the cow's milk contained the percentage of Serine and Histidine about (1.79 and 5.87 %) respectively, and (0.89 and 3.80)% respectively.

[61] found that the percentage of Serine and Histidine in the cow's milk were (5.06 % and 3.88 %) respectively, and in the sheep's milk were (4.33 % and 4.16 %) respectively.

Also, the percentage of Serine and Histidine in sheep's milk reported by [59] who found that the percentage of serine and histidine were (1.81% and 0.89 %) respectively, and [65] who showed that the percentage of Serine and Histidine were (2.25 % and 1.61 %) respectively.

[49] noted that the percentage of Serine and Histidine in five types of white, soft cheese made from cow's milk (Almekaafi cheese, Abu shebik cheese, Galajacheese, Zriga cheese and Gozelahmeer cheese) were (4.78, 4.69, 4.56, 4.71 and 4.49) % and (2.54, 2.70, 2.58, 2.69 and 2.72) % respectively, While [62] found that the percentage of Serine and Histidine in white, soft cheese made from sheep's milk was (0.6 % and 0.66 %) respectively.

The semi-essential amino percentages in meat and meat products of the current study varied with the percentages mentioned in other studies and researches depending on the types of meat and meat products

proteins. And the differences in the results may be regarding the types of animals, breeds, nutrition, the part taken from the carcasses of animals and other [53].

Table 4. The percentages of semi-essential amino acids in samples of meat and meat products (%)

semi-essential amino acids		Seine Ser	Histadine His
Meat	Cows	2.09	0.78
	Sheep	3.88	10.87
	Chicken	7.30	1.15
	Carp	47.74	48.67
	Shrimps	33.95	52.97
Eggs		4.56	1.19
Milk	Cows	37.87	54.98
	Sheep	6.87	0.99
White, soft cheese made from milk	Cows	8.00	1.14
	Sheep	7.14	0.96
Mushroom		7.91	11.22

- All results in the table are the rate of repeating.

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