BENHA UNIVERSITY
FACULTY OF VETERINARY MEDICINE
BENHA VETERINARY MEDICAL JOURNAL

CHEMICAL PROFILE OF BEEF BURGER AND BEEF LUNCHEON

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A B S T R A C T

This study was conducted to evaluate the chemical profile of beef meat products (beef burger and beef luncheon). A total of 50 random samples of beef meat products were collected from different supermarkets located in El- Menoufia governorate, (25of each). The samples were taken as intact units and transferred immediately in an icebox to the laboratory in order to investigate their chemical criteria. The obtained results indicated that the mean values of moisture content (%) in the examined samples of beef burger and beef luncheon were 61.28 ± 0.17 and 58.76 ± 0.14, respectively. The mean values of protein contents (%) in the examined beef burger and beef luncheon samples were 15.22 ± 0.18 and 10.03± 0.12 and the misbranded samples were 16% and 44%, respectively. The mean values of fat contents (%) in the examined beef burger and beef luncheon samples were 19.80 ± 0.19 and 19.25±0.21, respectively. Therefore, the percentages of the misbranded samples of such meat products were 24 % and 48%, respectively. The mean values of ash content (%) in the examined beef burger and beef luncheon samples were 3.36 ± 0.07 and 4.29 ± 0.10,respectively. Application of the keeping quality tests declared that the average values of pH, TVN (mg%) and TBA (mg%) in the examined samples of meat products were 5.97 ± 0.02, 10.15 ± 0.32 & 0.11 ± 0.01 for beef burger and 5.86 ± 0.01, 9.88 ± 0.26 and 0.08 ± 0.01 for beef luncheon, respectively. Concerning the essential amino acids in beef burger, they had the highest content of glutamic acid (13.82%), valine (10.64%), arginine (9.51%), hydroxyproline (3.04%) and tryptophan (2.01%). Beef luncheon had the highest content only of aspartic acid (10.06%), lysine (5.26%) and tyrosine (8.72%). Regarding, the essential fatty acids of the examined beef burger, the total unsaturated fatty acids constituted 43.6%, however, total saturated ones were represented by 56.4% and the ratio between them was 0.77. Regarding the examined samples of beef luncheon, the total unsaturated fatty acids were 41.5%, however, the total saturated fatty acids were 58.5% and the ratio between them were 0.71, respectively.

KEY WORDS: Beef meat products, chemical profile.

(BVMJ 23(1):109-115 ; 2012**)**

1. INTRODUCTION

The modern technology in different fields gives chance for the meat processors to produce new products in different shapes, easily handled, stored and rapidly used .The need for meat products have many tasks includes new flavor, preservation and of low calories. The quality of raw material, as well as the additives used in the final products are very important for public health. Therefore, the use of low quality ingredients in the processing yields low quality meat products [19]. Combination of meat items with other ingredients can be used to make beef burger. The quality and price of the finished product that is desired will largely control the selection of used meat .But, it is important to have at least 25% of lean meat such as beef carcasses in the formula. This helps to bind the ground meats in an emulsion and lock in the moisture which otherwise would render out during the cooking process [16]. For luncheon, the variations in protein and fat content are expected and may be attributed to the difference in meat cuts and in particular

the amount of lean portion or fatty portion use. The ash content is influenced by type of meat used, spices as well as binder and filler used [8]. Technological developments in meat processing, preservation and handling have give consumers a much greater choice over the foods they can buy. Consequently, consumers have become more selective and more considered about the quality of the product, which became a more significant factor in marketing meat products [9]. Amino acid composition of meat products can play a significant role in meat identification; the ratios of amino acids Arginine, Histidine and lysine for the investigated species of animals have been obtained. These ratios do not depend on age or weight of the animal [11]. The chemical and nutritional composition of each meat product is greatly varied from one product to another as it contains different kinds of tissues and sometimes a mixture of meat of various organs [14]. It is of great importance to mention that amino acids and fatty acids fractionations can successfully be used for detection of meat adulteration by other animal tissues [1].Therefore; the chemical analysis is applied to ensure compliance with legal and compositional standards of some meat products including luncheon and beef burger as following:

Nutritional criteria: Determination of moisture content, Determination of protein content, determination of fat content, Determination of ash content.

Keeping quality indices: Determination of Hydrogen ion concentration (pH), Determination of Total Volatile Basic Nitrogen (TVB-N) and Determination of Thiobarbituric Acid number (TBA). Amino acids and Fatty acids fractionations

2. MATERIALS AND METHODS

2.1. *Collection of samples*:

A total of 50 random samples of some meat products represented by beef burger and beef luncheon (25 of each) were collected from different supermarkets in El-Menoufia governorate. All collected samples were aseptically transferred in an insulated ice box to the laboratory without undue delay to determine their chemical profiles. Accordingly, the collected samples of meat products were subjected to the following examinations**:**

2.2. *Nutritional criteria*:

Determination of moisture, protein, fat and ash were done content according to AOAC [4].

2.3. *Keeping quality indices*:

Determination of pH according to Pearson [21]. Determination of Total Volatile Nitrogen (TVN) according to *FAO* [10]. Determination of Thiobarbituric acid number (TBA) according to *Vyncke* [25].

2.4. *Amino acid profile*:

The technique recommended by Mabbott [17] for fractionation of amino acids was applied by Gas Liquid Chromatography (GLC).

2.5. *Fatty acid profile*:

According to AOAC [4] after extraction of fat from meat according to Aura *et al*. [5], and the Methylation of fatty acid was determined according to [3]. Separation of fatty acid methyles according to Vogel [25]

3. RESULTS AND DISCUSSION

Meat products are highly demanded due to high biological value, reasonable price, and agreeable taste and easy during serving. Meat products are considered as excellent source of high quality protein, minerals and vitamins **[14].**

3.1. *Nutritional criteria*:

3.1.1. *Moisture*

Results achieved in table (1) revealed that the moisture % in the examined meat product samples was 61.28±0.17 for beef burger and 58.76 ± 0.14 for beef luncheon.

The variation in the moisture content of the examined samples is influenced by the variable amount of lean meat added [15] or may be attributed to the use of sodium chloride or addition of water which is added to facilitate the chopping of meat and the mixing of the ingredients. Water or ice added to the meat mass provides considerable functional qualities through chills the meat during the chopping or mixing operations to prevent over heating. This is accomplished by lowering the initial temperatures and by lubricating the meat mass to impart fluidity to the emulsion .Added water aids in dissolving sodium chloride and curing salts to give better distribution in the mass, or meat mixture that aids in proper filling of the casings; Texture and tenderness of the finished sausages are markedly affected by the added water content [20].

3.1.2. *Protein content*

Regarding the results recorded in table (1) it is evident that the mean value of protein % in the examined beef burger was 15.22±0.18%. The labeled limit of protein in beef burger was >15% and the misbranded samples were 16% concerning beef luncheon, the protein content was 10.03± 0.12%, the labeled limit < 10% and the misbranded samples were 44%.

Meat Protein is of high biological value, it can supply the human beings body by all essential and non essential amino acids [22] Therefore, the shortage in the protein content of some meat products may be attributed to the use of improper meat cuts and/or the use of meat trimmings in preparation or substitution with non meat components, since meat proteins are relatively more expensive than non meat components [14].

3.1.3. *Fat content*

Table (1) indicated that the fat mean value in the examined samples of beef burger was 19.80±0.19% , the labeled limit was >20% and the misbranded samples were 24%.,.Moreover, the examined samples of beef luncheon had fat content was 19.25±0.21%, the labeled limit was < 20% and the misbranded samples were 48%. The variations in the fat content of meat products may be attributed to the differences in meat cuts as brisket meat of high fat content (35-40%) and fatty portions used or due to using of improper formulation such products or the addition of foreign fat which are the main cause of much fat in the final product [18].

3.1.4. *Ash content*

Regarding the results recorded in table (1) the mean ash % in the examined meat product samples was 3.36± 0.07% for beef burger and 4.29± 0.10% for beef luncheon.

Table 1 Statistical analytical results of the nutritional criteria of the examined meat product samples (n=25).

Meat Products	Moisture	Ash	Mean value of Fat	Fat Misbranded samples		Mean value of Protein	Protein Misbranded samples	
	Mean ± S.E*	Mean ±S.E		No.	%		No.	%
Beef burger	61.28 ±0.17	3.36 ±0.07	19.80± 0.19	6	24	15.22±0.18	4	16
Luncheon	58.76±0.14	4.29±0.10	19.25±0.21	12	48	10.03± 0.12	11	44

Labled protein limit for beef burger >15%%and for luncheon <10%Labled fat limit for beef burger >20% and for luncheon< 20%.

Table 2 Statistical analytical results of keeping quality indices of the examined meat product samples (n=25).

	pH	TVBN	TBA
	Mean ± S.E*	Mean ± S.E*	Mean ± S.E*
Beef burger	5.97 ± 0.02	10.15±0.32	0.11± 0.01
Beef Luncheon	5.86 ± 0.01	9.88± 0.26	0.08± 0.01

The ash content in meat products not only depend on muscle minerals but also on the curing salt added [13].

3.2. *Keeping quality indices*

3.2.1. *Hydrogen ion concentration (pH):*

Results given in Table (2) declared that the mean pH value was 5.97± 0.02, for beef burger and 5.86± 0.01% for beef luncheon. In this respect, the pH value of meat and meat products under any condition shouldn't exceed 6.4, otherwise it must be considered as unfit for human consumption [23]. So, the ideal pH for meat is between 5.8 and 6.3 [19].

3.2.2. *Total Volatile Nitrogen (TVN mg/100g).*

The data recorded in table (2) indicated that the mean value of TVN value was 10.15 ± 0.32 mg% for beef burger and 9.88± 0.26 mg% for beef luncheon. Generally, the product quality of processed meat is directly attributed to the quality of raw materials. Meat for further processing has already been frozen, amplifying the effects of further freezing, storage and thawing. Additional ingredients are usually added which affect the quality, shelf-life and over all acceptability of these products and the physicochemical reactions occurring during the freezing process [6].

3.2.3. *Thiobarbituric Acid number (TBA mg MD/kg).*

The recorded data in table (2) showed that mean TBA values (mg %) was 0.11 ± 0.01 for beef burger and 0.08 ± 0.01 for beef luncheon.

It is of great importance to mention that TBA values may be considered as a useful quality index for the assessment of rancidity during the storage of food rich in unsaturated fatty acids which do not appear clear in determination [12].

Table 3. Average of amino acids and fatty acids fractionation in the examined meat product samples.

Amino acids	Meat product		fatty acids	Meat product	
	Beef Burger	Luncheon		Beef Burger	Luncheon
Alanine	5.37	2.97	C 8:0	2.7	3.0
Arginine	9.51	4.25	C 10:0	4.5	4.2
Aspartic acid	3.16	10.06	C 12:0	3.6	3.9
Cystein	2.44	4.74	C 14:0	4.2	4.7
Glutamic acid	13.82	9.37	C 16:0	27.5	27.0
Glycine	6.90	6.98	C 18:0	8.8	9.8
Hydroxyproline	3.04	2.85	C 18:1	10.1	11.5
Leucine	9.15	11.53	C 18:2	2.6	3.7
Lysine	4.73	5.26	C 20:0	5.1	6.9
Methionine	6.38	7.57	C 20:1	5.0	4.0
Phenylalanine	2.56	3.91	C 20:4	-	-
Proline	1.41	6.48	C 22:1	3.9	2.9
Serine	6.25	4.04	C 22:5	4.2	3.0
Thyronine	2.67	2.99	C 22:6	17.8	16.4
Tryptophan	2.01	1.56	TU	43.6	41.5
Tyrosine	3.19	8.72	TS	56.4	58.5
Valine	10.64	5.33	TU / TS	0.77	0.71

TU: Total unsaturated fatty acid, TS: Total saturated fatty acid

3. 3. *Amino acid profile*:
Table (3) revealed that the amino acid profile in the examined samples of meat products showed that, there are marked differences between the examined samples in the amino acid composition. However, beef burger had the highest content of glutamic acid (13.82%), valine (10.64%), arginine (9.51%), hydroxyproline (3.04%) and tryptophan (2.01%) than the other examined samples. In the same time luncheon had the highest content only of aspartic acid (10.06%), lysine (5.26%) and tyrosine (8.72%). The differences in the amino acid contents may be attributed to the use of different meat cuts and the use of muscles rich in collagen in the formulation as hydroxyproline amino acid which is the major component of the collagen protein. Bovine meat protein tended to have a lower percentage of the amino acid proline than other red meats, and higher values for tryptophan, aspartic acid and tyrosine [7]. The amino acid profile is an important parameter because some amino acids cannot be synthesized by human and must be obtained from diet. Meat is rich in so-called essential amino acids as lysine, leucine, isoleucine, and sulfur-containing amino acids which considered as a high quality protein .Generally, 95-100% of protein from meat and meat products are highly digestible [2].

3. 4. *Fatty acid profile*
It is obvious from the results given in table (3) that the fatty acid contents (%) in the examined samples of beef burger were 2.7 for C8:0, 4.5 for C10:0, 3.6 for C12:0, 4.2 for C14:0 and 27.5 for C16:0, 8.8 for C18:0, 10.1 for C18:1, 2.6 for C18:2, 5.1 for C20:0, 5.0 for C20:1, 3.9 for C22:1, 4.2 for C22:5 and 17.8 for C22:6. Generally, total unsaturated fatty acids constituted 43.6%, however, total saturated ones were represented by 56.4% and the ratio between them was 0.77. Regarding the examined samples of beef luncheon, the total unsaturated fatty acids were 41.5%, however, the total saturated fatty acids were 58.5% and the ratios between them were 0.71, respectively. Calculation of specific fatty acid ratios in fats from different animal species allows revealing the distinctive features. For example, the high proportion of fatty acids with C16:0 (Palmitic) and C18:0 (Stearic) are characteristic for bovine meat [11].

4. REFERENCES

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مجلة بنها للعلوم الطبية البيطرية
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الوجهة الكيميائية للبيف برجر واللانشون

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الملخص العربي

يعتبر لحم الأبقارمصدر جيد للبروتين الحيواني عالي القيمة الغذائية ،كما أنه يحتوي علي نسبة من الدهن ذو الجودة العالية اذا ما توفرت له عليقة جيدة. لذلك فقد تم دراسة الخصائص الكيميائية لمنتجات لحوم الأبقار لما لها من أهمية علي المستوي الغذائى للإنسان وقد تم فحص 50 عينة من منتجات لحوم الأبقار ممثلة فى البيف برجر واللانشون بواقع 25 عينة لكل منتج وقد تم قياس نسبة البروتين ، نسبة الدهن ، نسبة الرطوبة، نسبة الرماد ، نسبة تركيز أيون الهيدروجين ، نسبة تركيز النيتروجين القلوي المتصاعد و نسبة حمض الثيوباربتيورك. وقد وجد أن نسبة البروتين والدهن و الرطوبة والرماد فى البيف برجر كالتالى15.22، 19.80 ،61.28، 3.63 واللانشون 10.03، 19.25، 58.76، 4.29 على التوالى. وبالنسبة للخصائص الكيميائية لمنتجات لحوم الأبقار كانت نسبة تركيز أيون الهيدروجين والنيتروجين القلوى المتصاعد وحمض الثيوبابتيوريك فى البيف برجر 5.97، 10.15،0.11 و اللانشون 5.86، 9.88، 0.08 على التوالى. وبدراسة كمية ونوع الأحماض الأمينية الموجودة بها وكذلك كمية ونوع الأحماض الدهنية الموجودة بها فقد لوحظ أن البيف برجر تمثل بألانين (5.37)، وأرجنين (9.51)، أسبارتيك أسيد(3.16)، سيستين (2.44)، جلوتاميك أسيد(13.82)، جليسين(6.90)، هيدروكسي برولين (3.04)، ليسوسين (9.15)، ليسين (4.73)، ميثايونين (6.38)، فينيل ألانين (2.56)، برولين (1.41)، سيرين (6.25)، ثيرونين (2.67)، تريبتوفان (2.01)، تيروسين (3.19)، فالين (10.64). اللانشون ألانين (2.97)، أرجنين (4.25)، أسبارتيك أسيد (10.06)، سيستين (4.74)، جلوتاميك أسيد (9.37)، جليسين (6.98)، هيدروكسي برولين (2.85)، ليوسين (11.53)، ليسين (5.26)، ميثايونين (7.57)، فينيل ألانين (3.91)، برولين (6.48)، سيرين (4.04)، ثيرونين (2.99)، تريبتوفان (1.56)، و تيروسين (8.72)، فالين (5.33). بالنسبة للاحماض الدهنية وجد أن هناك نسب مختلفة من الأحماض الدهنية وتتفاوت هذة النسب على حسب نوع كل منتج .أما بالنسبة للأحماض الدهنية الغير مشبعة فى البيف برجر و اللأنشون وكانت 43.6% و41.5% فى حين كانت نسب الأحماض الدهنية المشبعة 56.4% و58.5% وكانت النسبة الأحماض الدهنية الغير مشبعة الى الاحماض الدهنية المشبعة هى 0.77% و 0.71% على التوالى . وقد تم مناقشة الاهمية الصحية للوجهة الكيميائية للبيف برجر واللانشون وتأثيرها على صحة المستهلك

(مجلة بنها للعلوم الطبية البيطرية: عدد 23 (1)، يونيو 2012: 109-115)