



**SUDAN UNIVERSITY OF SCIENCES AND
TECHNOLOGY**



**COLLEGE OF ANIMAL PRODUCTION SCIENCES AND
TECHNOLOGY**

**Study on the quality characteristic of factories and
butchers processed beef sausage**

دراسة خصائص الجودة في السجوك البقري المصنع في المصانع ومحلات

الجزارين

*Dissertation Submitted in partial fulfillment of the
requirement for the degree of BSc. in Animal
Production*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

الإِسْتِهْلَال

قال تعالى بسم الله الرحمن الرحيم (وَخَلَلْنَاَهَا لَمْ يَمُومِنَمَا
رَكُوبُهُمْ وَمِنَهَا يَا كَلُونَ)

صدق الله العظيم

سورة يس الآية (72)

الإهداء

إلى تلك الدعوات الخفية بذلك الصوت الشجى الخافت من وقت السحر إلى وقت السمر إلي:

أمهاتنا وآبائنا فبفضلهم نلنا الشرف وبفضلهم صار النجاح حلو المنال وبكل دعوة صادقة طاهرة صادرة من فؤادهم النقي كانت توفيقاً لنا لننجز فصلاً تلو الآخر حتى إكتمل في ابهى حُلة..

إلى آحباؤنا الذين وقفوا معنا وقفة ترجمت الكثير وبرهنت على احلى شعور فانتظمت بها مشاعرنا لننجز بعدها الكثير..

إلى كل من مد يد العون الينا بعلمنا ومن غير علمنا..

نهديك جميعاً ثمرة جهدنا المتواضع..

الشكر والعرفان

الحمد لله الذي بنعمته تتم الصالحات ها نحن الان في هذه اللحظات
تغمرنا أيما سعادته لاننا وفي ختام مشوارنا الجامعي قد وفقنا الله
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ونشكر بروفيسير/ داؤد الزبير أحمد الذي أشرف على هذا البحث
وكان معنا في كل الخطوات وحرص علي أن يخرج هذا البحث
بهذه الصورة التي بين أيديكم....

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تحليل النتائج و تنسيق الجداول....

الملخص

اجريت هذه الدراسة في الفترة من يناير الى فبراير (2018) في معمل اللحوم في كلية علوم وتكنولوجيا الإنتاج الحيواني بجامعة السودان للعلوم والتكنولوجيا ومعمل الهيئة السودانية للمواصفات والمقاييس لدراسة الخصائص الكيميائية والميكروبيولوجية والحسية للسجوك البقري المأخوذ من مصدرين مختلفين (سجوك المصانع و سجوك الجزائرين).

تم أخذ ست عينات قسمت الى مجموعتين ثلاثة عينات لكل مجموعة وتم إجراء التحليل الكيميائي، الميكروبيولوجي والحسي للعينات.

باستخدام برنامج الحزم التقنيه للعلوم الاجتماعيه (SPSS) تم تحليل النتائج.

أظهرت نتائج التحليل الكيميائي انه لا توجد فروق معنوية في محتوى المادة الجافة، البروتين الخام والدهن في كل العينات.

تم إجراء التحليل الميكروبيولوجي الذي اظهرت نتائجه احتواء احدى عينات السجوك البقري التي تم جلبها من محلات الجزائرين علي تلوث بالسالمونيلا وتلوث خفيف من البكتيريا القولونية (2×10^3) اما بقية العينتين الاخرتين فتحتوي علي تلوث خفيف من البكتيريا القولونية وخالية من بكتريا السالمونيلا.

بالنسبة للعينات التي تم جلبها من المصانع فاطهرت نتائج التحليل الميكروبيولوجي احتواء الثلاثة عينات علي تلوث خفيف من البكتيريا القولونية وخلوها من بكتريا السالمونيلا.

اظهرت نتائج التقييم الحسي فروق معنوية عالية بين العينات المأخوذة من المصدرين المختلفين من ناحية الملمس واللون والعصيرية والنكهة.

Abstract

This study was conducted in meat laboratory in College of Animal Production Science and Technology at Sudan University of Science and Technology and SSMO laboratory from January to February(2018) to study the chemical composition, microbiological and sensory assessment of beef sausage taken from two different sources (Factories and Butcher shops).

Six samples were used in this study we were divided in to two groups and the chemical composition, microbiological and sensory assessment was done.

The collected data was subjected to analysis using Statistical Package for the Social Sciences (SPSS) (1984).

The results of the chemical analysis showed that there was no significant differences in the content of dry matter, crud protein and fat in all samples.

The microbiological analysis showed that one of the samples of beef Sausage obtained from the butchers shop was contaminated of salmonella and slightly contaminated with E.coli bacteria (3.2×10^2). The result of the other two samples contain slightly contaminated with E.coli bacteria and free of salmonella bacteria.

For samples collected from the Factory, the results of the microbiological analysis showed that the samples contain slightly contaminated with E. coli bacteria and free of salmonella

The results of sensory evaluation showed high significant difference between samples .

Key words :-

- 1- Beef sausage.
- 2- Quality.
- 3- Safety.
- 4- Nutritive value.

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Chapter one



Introduction

1-1: Introduction:

Meat and meat products are important sources of protein, fat, essential amino acid, minerals, vitamins and other nutrients.

In recent years, much attention has been paid to meat and meat products with physiological function to promote health condition and prevent the risk of diseases. Oxidation of lipid and auto-oxidation are one of the major causes of quality deterioration and reduction of shelf life of meat products. This may produce changes in meat quality characteristics such as color, flavor, odor, texture and even nutritional value. The term sausage is derived from the Latin word "salsus" meaning salt, or literally translated, refers to chopped or minced meat preserved by salting. Sausages are one of the oldest forms of processed foods, their origin being lost in antiquity, it has been reported that sausages were used by the Chinese. It's very popular tasty food worldwide .a popular processed meat product, traditionally consists of chopped meat, water binders, and seasonings stuffed into natural or artificial casings prior to cooking with or without smoke application. Natural casings are made from sheep, hog, and beef intestine, while artificial casings commonly consist of collagen, cellulose, or plastic.

The collective food-borne diseases, in humans, caused by pathogenic bacteria and their toxins are well known world-wide. They are defined by the occurrence of

two cases minimum of digestive symptoms, which's the reason, can bring to the same food-borne, and dominated mainly by diarrhea. The food-borne diseases imposes a substantial economic burden and threatens the public health on society causing an acute morbidity and chronic sequel .World-wide,2.1million adults and 3million children die due to consumption water and contaminated food .

1-2: Food Quality:

Food quality concerned with the quality characteristics of food that is acceptable to consumers. This includes external factors as appearance (size, shape, color, gloss, and consistency), texture, and flavor. Food quality in the United States is enforced by the food safety Act1990.Public analysts carry out scientific analysis on the samples to determine whether the quality is of sufficient standard. Food quality is an important food manufacturing requirement, because food consumers are susceptible to any form of contamination that may occur during the manufacturing process. Many consumers also rely on manufacturing and processing standards, particularly to know what ingredients are present, due to dietary, nutritional requirements (kosher, halal, vegetarian) or medical condition (e.g, diabetes or allergies). Besides ingredient quality, there are also sanitation requirements. It is important to ensure the food processing environment as clean as possible in order to produce the safest possible food for the consumer. Recent example of poor sanitation recently has been the 2006

North American E.coli outbreak that is still under investigation. Food quality also deals with product traceability (e.g., of ingredient, and packaging suppliers), should a recall of the product be required, it's also deals with labeling issues if there is correct ingredient and nutritional information. There are many existing international quality institutes testing food products in order to indicate to all consumers which are higher quality products founded in 1961 in Brussels, the international monde selection quality award is the oldest in evaluating food quality during the degustation's, the products must meet the following selection criteria, required by the Institute: sensory analysis, bacteriological and chemical analysis, the nutrition and health claims, convenience, labelling, packaging, environmental friendliness and innovation .As many consumers rely on manufacturing and processing standards, the institute monde selection takes into account the European food law.

1-3 :Objectives:-

- 1- To study the chemical composition and nutritive value of beef sausage from different sources.
- 2- To determine the level of contamination of beef sausage from different sources.
- 3- To study the organoleptic characteristic of beef sausage from different sources.

Chapter two



Literature Review

2-1:Meat Quality:

Meat quality is a special item of

Product quality, the quality factor may be good or bad. Ecological aspects and animal welfare are parts of production quality but not of meat quality .Ecology and animal welfare may be, however, a part of the appreciation of meat which expresses a subjective evaluation of this food by the consumer and trading people .Appreciation is often mixed with product quality; this lead to confusion.

These statements imply that meat quality can be defined as the comprehensive description of objective characteristics or factors of which it is composed. (Fiems, 1991) .The quality factors are summarized as follows:

- ✓ Nutritional factors.
- ✓ Sensorial factors.
- ✓ Hygienic parameters.
- ✓ Technological characteristics

2-2: Definition of sausage:

Chopped or ground meat that has been blended with spices and other seasonings and usually stuffed in natural or manufactured casing (Sudanese standard metrology organization2002).

2-3: Chemicals composition:

2-4-1: Moisture:

Siham (2016) found the moisture% in beef sausage as 74.3% while Khaled (2004) recorded the moisture % in beef sausage as 74.8% similarly Wafa Abakar (2013) found the moisture % in beef sausage as 68% and Wafaabidsayed (2014) scored the moisture% in beef sausage as 69.1%

2-4-2: crude protein:

Siham (2016) reported the crude protein% in beef sausage as 18.53% similarly Khaled (2004) found the crude protein in beef sausage as 20.1% whereas Egbal (2007) record the crude protein in beef sausage as 20.2 while Wafa Abakar (2013) noted that the crude protein in beef sausage as 15% and Wafa Abidsayed (2014) found the crude protein in beef sausage as 12.6%.

2-4-3: fat:

Siham (2016) reported the fat% in beef sausage as 3.45% while Khaled (2004) found the fat percent in beef sausage as 2.88% and wafa Abakar (2013) reported the fat percent in beef sausage as 4.5% whereas wafa Abidsayed (2014) found the ether extract in beef sausage as 15.23%.

2-4: Nutritive value of meat:

The nutritive value of meat is attributed to its protein, fat, carbohydrates, vitamins and minerals content (Mahassin, 2008). Meat is an excellent source of many nutrients, especially protein, B vitamins, iron and Zinc. As a nutrient food, meat provides major nutritive contributions to the diet relative to the amount of calories it contains (Boyle, 1994).

2-5: Microbiology contamination:

Bacteria grow best between 40° f to 140° f. When cooking or cooling meat (for cooked sausage), make sure the product temperature passes through this range quickly. During meat processing, cooked sausage should have a final internal temperature of 160° f as this effectively kills all organisms pathogenic. Pans of water can be placed near the sausage to provide humidity and prevent over drying (Meat Sense and Meat Sense, 2004).

2-5-1: E.coli:

It is often present on undercooked minced beef and unpasteurized milk (Peter 2007). The presence of E.coli in high numbers indicates the presence of organisms originating from fecal source. This is due to improper slaughtering techniques, contaminated surfaces and/or handling of the meat by infected food handlers (Nel et al; 2004). *Escherichia coli* O157:H7 is a bacterial contaminant of sausage and other meat products that can

cause serious diarrheal illness, sometimes resulting in complications

2-5-2: Salmonella:

Main sources of salmonella are poultry, and meat, unpasteurized milk and raw egg products .Food can be contaminated by improper handling and poor hygiene. Salmonella is most commonly causes two types of food – borne human disease. First, salmonellosis is most commonly caused by salmonella. enteritidis (World Health Organization, 1995; D A oust, 2000). Secondly, salmonella.enterica subsp. Typhoid fever or paratyphoid fever, respectively (Anon, 1992c).

2-6: Sensory Evaluation:

The most important sensory attributes of this type of snake food (comminuted, seasoned, beef, dried under laboratory condition at temperature of $55\pm 2^{\circ}\text{C}$) are texture, color and flavor, determined by the selection of the raw material and the effect of numerous technological factors (Albright et al, 2000).

Chapter three



Materials and method

3-1: Location:

This study was conducted in the SSMO laboratory and meat laboratory in College of Animal Production Science and Technology at Sudan University of Science and Technology from January to February 2018.

3-2: Materials:

- 1- Sample of beef sausage.
- 2- Food scans equipment.
- 3- Drying oven.
- 4- Sensitive balance.
- 5- petri dish for bacterial count.
- 6- Cooking oven.

3-3: Methods:-

3-3-1: Samples Collection:

Six samples of beef sausage was randomly collected from meat processing factories and butchers shop and transported to SSMO and meat laboratory for microbial assessment according to (ISO 65 79 -2017 for salmonella and ISO 166 49 par2 2001 for E coli), organoleptic characteristic and chemical compotation Using (Food Scan analyzer which designed to measure raw materials, intermediate and finished products with a minimum of sample preparation the organoleptic characteristic were done in meat science laboratory.

3-4: Statistical analyses:

The data presented as mean \pm standard deviation was subjected to one way analysis of variance (ANOVA) ($p < 0.05$) to assess whether chemical composition and microbial contamination varied significantly between samples. All statistical calculations were performed with SPSS 17, Gomez and Gomez (1984).

Chapter four



Results

Results:

Results of chemical composition, Organoleptic Characteristic and microbial assessment of beef sausage from different sources were presented in this chapter in tables (1-3).

4-1: Chemical composition of beef sausage from different sources:

Table 1: Show the average dry matter, Crude Protein and Fat percent of beef sausage for factory and butcher shops:

| Chemical source | DM | CP | fat |
|--------------------|------------|-------------|-----------|
| Factory | 29.20±.20 | 18.40±.38 | 8.49±.38 |
| Butchers shop | 30.98±6.54 | 16.64±50.58 | 14.34±8 |
| Sig | NS | NS | NS |

From table1 results show the average dry matter percent of beef sausage as 29.20 ± 2.20 and 30.98 ± 6.54 for factory and butcher source respectively, also show the average crude protein percent of beef sausage as 18.40 ± 3.38 and 46.64 ± 50.58 for factory and butcher sausage respectively and show the average fat percent of beef sausage as 11.83 ± 3.38 and 14.34 ± 8 for factory and butcher sausage respectively.

4-2: Microbial assessment of beef sausage for factory and butcher shops:

Table 2: Show the microbial assessment of beef sausage for factory and butcher shops:

| Source | Test Result | |
|---------------|--------------------------|----------------------|
| | Salmonella (c.f.u/mg) | E.coli (c.f.u/mg) |
| Factory | | |
| 1 | Not detected | 1.0×10 |
| 2 | Not detected | 1.5×10^2 |
| 3 | Not detected | 1.4×10 |
| Butcher shops | | |
| 1 | Not detected | 2.3×10^2 |
| 2 | Detected | 3.2×10^2 |
| 3 | Not detected | 6.0×10 |

As show in table 2.The contamination of samples showed only one sample was contamination with salmonella, while the other five samples were free of salmonella, while all samples was slightly contamination with E.coli.

4-3: Sensory evaluation of beef sausage for factory and butcher shops:

Table 3: Show the average of Organoleptic Characteristic of beef sausage for factory and butcher shops:

| Source | Organoleptic characteristic | | | | |
|---------|-----------------------------|----------|------------|-----------|----------|
| | Texture | Color | Tenderness | Juiciness | Aroma |
| Factory | 1.86±.05 | 1.96±.15 | 1.96±.11 | 2.20±.26 | 2.10±.40 |
| Butcher | 2.93±.11 | 3.63±.11 | 3.40±.10 | 3.90±.17 | 3.66±.23 |
| Sig | ** | ** | ** | ** | ** |

result as in table 3 show the revealed organoleptic characteristics of beef sausage from different sources as texture, $1.86 \pm .05$ and $2.93 \pm .11$ for factory and butcher source respectively, color, $1.96 \pm .15$ and $3.63 \pm .11$ for factory and butcher source respectively, tenderness 1.96 ± 0.11 and 3.40 ± 0.10 for factory and butcher source

respectively. Juiciness, as $2.20 \pm .26$ and $3.90 \pm .17$ for factory and butcher source respectively aroma, $2.10 \pm .40$ and $3.66 \pm .23$ for factory and butcher.

Chapter five



Discussion

5-1 Chemical composition:

5-1-1: dry matter:

From the results the dry matter percentage of beef sausage from factory's and butcher shops was 29.2 % and 30.98% respectively this result was higher than that reported by siham (2016) as 25.7% , Khaled (2004) as 25.8% and similar to that reported by Wafa Abidsayed (2014) as 30.9 but lower than that reported by Wafa Abakar (2013) as 32%.

5-1-2: crude protein:

Result of this study showed the crude protein percentage of beef sausage from factory and butcher shops as 18.46% and 16.64% respectively this result was lower than that reported by siham(2016) as 18.53% ,Khaled (2004) as 20.1% and Egbal (2007) as 20.2% while higher than that reported by WafaAbakar (2013) as 15% and WafaAbidsayed (2014) as 12.6%.

5-1-3: fat:

From the result of this study fat percentage of beef sausage from factory and butcher shops was 8.49 % and 14.34 % respectively this result was higher than that reported by siham(2016) as 3.45% , Khaled (2004) as 2.88% , Egbal (2007) as 4.67% and WafaAbakar (2013) as 4.5% while lower than that reported by WafaAbidsayed (2014) as 15.23%.

5-2 Microbiology contamination:

Result of this study agreed with Sudanese standards of microbiological limits for Red meat and Meat products (2008) which reported that, fresh sausage should be free of salmonella and contamination with E.coli not exceed 13.8×10 , except one sample from butcher shop disagreed with it.

5-3 Sensory Evaluation:

The result of this study showed high significant different of beef sausage from different sources (factory and butcher shop), this result confirmed with the fact that consumer prefer factory beef sausage more than butcher shop sausage.

Conclusion:

This study was concluded that the samples collected from factories were safety and free of contamination.

Recommends:

We recommend the continuation of studies in this field.

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