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Highlighting on the Guidelines Standards for the Judging the Acceptability of Salted Intestine

Ahmed Masoud[1], Ebtisam M.A. Mesalam[1], Ahmed M. Mostafa[1], Huda Elsayed[1], Taghreed H. Abbass[1], Amira A. Elokle[1], Marwa E. A. Kholeaf[1], Manal M. Said[1] Mona M. M. Abdelaziz[1], Ghada Salem[1], Omayma M. A. L. Maghraby[1], Said S. E. Shabana[1]., Gehan M. Ouf[1] and Momtaz A. Shahein[2]

[1] *Reference Lab for Safety Analysis of Food of Animal Origin, Animal Health Research Institute (AHRI), Agricultural Research Center (ARC), Giza, Egypt.*

[2] *Virology Department, Animal Health Research Institute (AHRI), Agricultural Research Center (ARC), Giza, Egypt.*

Abstract

THE salted intestine, whether from lamb or cattle, are a widely available in Egyptian markets due to their economic significance, it is necessary to confirm whether or not they are suiTable for human consumption before using as sausage casing. This study was designed to set as guidelines using them in setting an appropriate specification for salted intestine. Therefore, 40 random salted intestine sample collected from Egyptian market and examined for sensory (color, odour and appearance), chemically (pH, total volatile basic nitrogen and thiobarbituric acid) and microbiologically (TBC, *Clostridium perfringes*, *Staphylococcus aureus*, Salmonella and *Bacillus cereus*). The result revealed that 2 samples deteriorated in sensory character including color, odour and appearance. While, the results pH, total volatile basic nitrogen and thiobarbituric acid ranged from (3.65, 4.35 mg/100 g, 0.87mg malonaldehyde/kg) to (8.18, 35.94 mg/100 g, 5.79 malonaldehyde/kg), respectively. In addition, TBC log count ranged from 2.17 to 3.96 cfu/g. while, Clostridium perfringes, *Staphylococcus aureus*, Salmonella and *Bacillus cereus* were not detected in all examined samples. Based on the given results and coincidence with the absence of standard specifications for salted intestines in Egypt, the findings of this study may serve as guidelines for the authorities to issue such standards

Keywords: Guidelines standards, Salted intestine, Total volatile basic nitrogen, Thiobarbituric acid.

Introduction

The small and large intestines of livestock including cattle, sheep, goats, and pigs are widely recognized as natural casings, with variations in their dimensions and quality depending on the animal source [1, 2]. Their use as edible containers for sausages has been documented for millennia [3], and they remain an important raw material in the meat processing sector [4]. To maintain their quality, casings should be carefully defatted, appropriately tied when salted, structurally intact, and free from undesirable putrefied, rancid or sour odour [5].

Traditional salting with NaCl for at least 30 days has been the main preservation procedure for animal casings for many years. Sodium chloride is added either as dry salt or using fully saturated brine (aW 0.75). This treatment is accepted as the industry's standard operating procedure (SOP) for the preservation of animal casings (ENSCA, 2012) and this procedure is listed in the OIE Terrestrial Animal Health Code as the standard treatment for casings to prevent the transmission of bacterial and viral pathogens [6].

Natural casings are possessing permeability to gases and water vapor, have the capacity to absorb smoke, retain desirable flavors, and adjust their size according to the amount of filling. Despite technological advances enabling the production of artificial casings from materials such as collagen,

*Corresponding authors Ebtisam M. A. Mesalam, drebtsammeslam@gmail.com Tel.: 01148209212
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cellulose, and fibrous membranes, natural casings remain the preferred option for products intended to be consumed with an edible wrapping, such as sausages [7]. Traditionally, sausage mixtures were packed into different sections of animal intestines or organs, including the stomach, small and large intestines, or bladder of lambs, cattle, or pigs. Today, sausages and salamis—among the most popular processed meat products—are typically produced from red or poultry meat, minced and combined with suiTable seasonings [8].

Salted animal intestines hold significant economic value in Egypt, due to their use in various food and medical industries and exported to the external markets. They are used in popular meat products like Egyptian sausage and mombar, as well as the restaurant dish "Sameen." [9]

Given their widespread use, ensuring their safety for human consumption is critical. This study was specifically designed to address the current lack of official standards for salted intestines, aiming to provide a reference for authorities to verify compliance and establish proper specifications for this important product.

Material and Methods

Collection and preparation of samples

Forty random salted intestine samples were collected from butcher shops and street vendors in sterilized containers and examined in Reference Lab for Safety Analysis of Food of Animal Origin, Animal Health Research Institute. Before the examination, under a sterilized condition the salts were firstly removed.

Sensory evaluation [10].

Sensory attributes (color, odour and appearance) were examined following the scheme adopted by ISO, 16779:2015 using the 5-point assessment score according to the following scheme: 1= very bad, 2= bad, 3 = accepted, 4= very good and 5= excellent.

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Microbiological examination:

Preparation of test samples, including the initial suspension and decimal dilutions for microbiological analysis, was performed in accordance with ISO 6887-1:2017 [11]. As follows

Total bacterial Count (TBC)

Enumeration was carried out on Plate Count Agar (PCA, Oxoid) with incubation at 30 °C for 72 h [12].

Clostridium perfringens

Prepared samples were plated on Cycloserine agar (Oxoid) and incubated at 35 °C for 48 h under anaerobic conditions [13].

Coagulase positive Staphylococci

Detection was conducted using Baird Parker agar (Oxoid) incubated at 34–38 °C for 24–48 h [14].

Salmonella spp

Isolation was achieved on Xylose Lysine Deoxycholate agar (XLD, Oxoid), incubated at 37 °C and examined after 24 h [15].

Bacillus cereus

Detection was performed on Mannitol Egg Yolk Polymyxin (MYP) agar incubated at 30 °C and examined after 24 h [16].

Chemical examination:

pH measurement

Determined using a pH meter (Jenway 3310) [17].

Total volatile basic nitrogen (TVB-N)

We used distillation method by mental apparatus according to the Egyptian Standard Method [18].

Thiobarbituric acid values (TBA)

Measured following the method described by ES (2006) [19]. We used distillation method and the filtrate treated by TBA reagent.

Results and Discussion

There are no enough studies on salted intestine that help us in the statistical and technical analysis of the results especially in chemical criteria. The basic processing of natural casings involves the removal of fecal material and washing. The casings may then be wet packed in saturated brine or packed dry with crystalline salt. Natural casings are decontaminated in two of the process steps. Bacterial reduction in casings involves two main steps: the initial physical removal of microorganisms through washing, followed by their inactivation under the influence of high salt concentrations. The extent of natural contamination, the effectiveness of washing and sanitation practices, together with the storage temperature in salt, are critical factors that influence the hygienic status of salted intestine.

Results in Table 1 and Fig.1 regarding sensory characters, revealed that 38 salted intestine samples were accepted and retaining its natural properties in terms of shape, color, smell, appearance and tissue cohesion while two samples were unaccepted. All Egyptian standard for meat products should be accepted in sensory characters.

From results revealed in Table 2 $\log_{10}$ cfu of total aerobic plate count was ranged from 2.17 to 3.96 cfu/g with mean value 2.81 ± 0.08. In addition, 30 samples were between 2 and 3 log count while 10 samples were higher 3 log. The obtained results were in agreement with those reported by Tăpăloagă *et al.* 2016 [2] who indicated that bacterial contamination levels may fluctuate depending on the specific stage of processing during the conversion of animal intestines into sausage casings, with initial counts around ~10^5 CFU/g and decreasing to approximately 10^2 CFU/g after salting. In addition, it is worth noting that national legislation does not define any specific microbiological criteria for natural salted casings. The results of the current study were within the permissible limit of European Natural Sausage Casings Association (ENSCA) who recommended that the total aerobic count of salted intestine should be <10^5 cfu. [21].

In addition, *Clostridium perfringes*, *Staphylococcus aureus*, *Salmonella* and *Bacillus cereus* were not detected in all examined samples. Preservation of natural casing using dry or wet salts is regarded as sufficient to in activate or destroy pathogenic spore and non-spore-forming bacteria. These results were nearly similar to results demonstrated by [22], [21], [23], [24] and [25].

In addition, from results revealed in Table 3 and Fig. 2 pH values was ranged from 3.65 to 8.18 with mean value 5.83 ± 0.17. In addition, the pH value in Egyptian standard of frozen meat ranged from 5.6 to 6.2 [26]. Eleven samples were below 5.6 while 19 samples the pH values ranged from 5.6 to 6.2 and 10 samples higher than 6.2. Moreover, the total volatile basic nitrogen was ranged from 4.35 to 35.94 with mean value 14.39 ± 1.41mg/ 100g. The TVB-N value in Egyptian standard of frozen meat should not exceed 20 mg/ 100g [26]. Thus, 17 samples were below 10 mg/100g while 14 samples the TVB-N values ranged from 10 to 20. Moreover, 5 samples were between 20 to 30 mg /100g and 4 samples higher than 30 mg/ 100g.

In addition, TBA values was ranged from 0.87 to 5.79 with mean value 2.43 ± 0.195 mg malonaldehyde /kg. In addition, 2 samples were below 1mg malonaldehyde/kg while 26 samples the TBA values ranged from 1 to 2.5 and 12 samples were higher than 2.5 mg malonaldehyde /kg. The TBA value in Egyptian standard of frozen meat should not exceed 0.9 mg malonaldehyde/ kg [26].

Conclusion

The absence of specific standards for the fitness of salted intestines to be used as meat product casing for human consumption, the findings of this study may serve as a guide for food safety authorities to establish a product specification based on the research results.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical of approval

This study did not involve human participants or live animals. Salted intestines were obtained from authorized sources. The experimental procedures were conducted in the laboratories of [AHRI] in accordance with institutional guidelines for research on food of animal origin.

TABLE1. Sensory evaluation of salted intestine samples:

Sensory category	No. of sample analyzed	Min.	Max.	Mean ±SE	Un accepted samples	
					No.	%
Color	40	1	4	3.68 ± 0.11	2	5
Odour	40	1	4	3.75 ±0.11	2	5
Appearance	40	1	4	3.86 ±0.11	2	5

TABLE 2. Total aerobic plate count (log/g) in examined samples:

Test item	No. of sample analyzed	Min.	Max.	Mean ±SE	Accepted samples	
					No.	%
Total aerobic plate count	40	2.17	3.96	2.81 ± 0.08	40	100*

*% of samples not exceed the the permissible limit of European Natural Sausage Casings Association (ENSCA) (<105 cfu)

TABLE 3. Chemical assessment of salted intestine samples (PH, TVB-N, TBA):

Test name	N0. of sample analyzed	Min.	Max.	Mean ±SE	Un accepted samples	
					No.	%
TVB-N*	40	4.35	35.94	14.39 ± 1.41	9	22.5***
TBA**	40	0.87	5.76	2.43 ±0.195	39	97.5 ****
ph	40	3.65	8.18	5.83 ±0.17	21	52.5*****

***** Total volatile basic nitrogen (mg / 100g) , ** thiobarbituric acid (mg malonaldehyde /kg), ******* % of examined samples exceed 20 mg /100gm ******** % of examined samples exceed 0.9 mg malonaldehyde /kg. , ********* % of examined samples below 5.6 or above 6.2

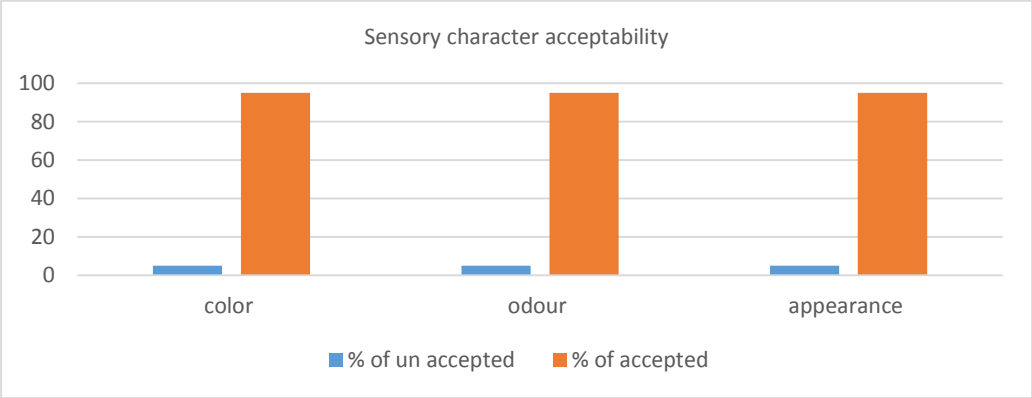

Fig.1. Acceptability of sensory character in the examined salted intestine

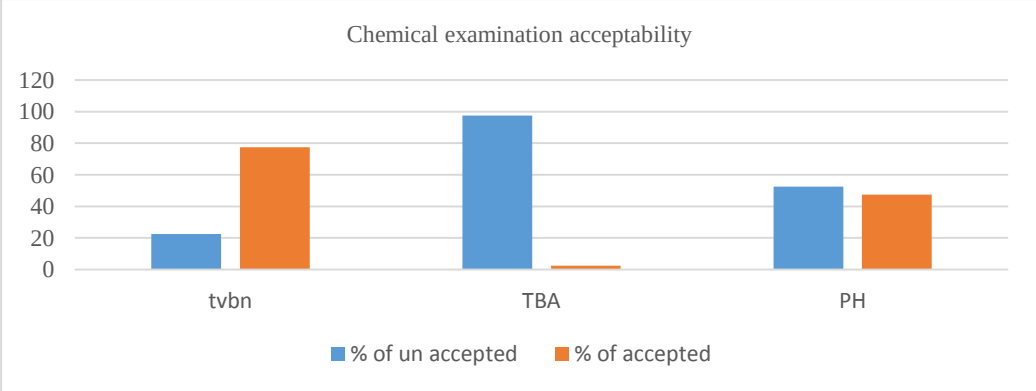

Fig. 2. Acceptability of chemical character in the examined salted intestine:

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القاء الضوء علي المعايير الارشادية للحكم علي صلاحية الامعاء المملحة

احمد مسعود سيد مسعود[1]، ابتسام مسلم عبدالفتاح[1]، احمد محمد مصطفي[1]، هدي السيد عبدالمجيد[1]، تغريد حمدي عباس[1]، اميرة احمد فايق[1]، مروة عزت عبدالمجيد خليف[1]، منال مراد سعيد[1]، مني ممتاز عبدالعزيز[1]، غادة سعدالدين ابراهيم سالم[1]، اميمة محمد الطاهر لبيب مغربي[1]، السيد صلاح السيد شبانة[1]، جيهان محمود محمود عوف[1] و ممتاز عبدالهادي شاهين[2]

[1] المعمل المرجعي لفحوص صلاحية الاغذية ذات الاصل الحيواني، معهد بحوث الصحة الحيوانية، مركز البحوث الزراعية، مصر.

[2] قسم الفيروسات، معهد بحوث الصحة الحيوانية، مركز البحوث الزراعية، مصر.

الملخص

تهدف هذه الدراسة إلى تقييم تأثير بدائل الفوسفات الصناعية الطبيعية (البكتين ومسحوق البرقوق) على جودة وفترة صلاحية برجر اللحم البقري أثناء التخزين المبرد لمدة 14 يومًا. تم إعداد أربع معاملات: معاملة ضابطة تحتوي على 0.2% فوسفات، ومعاملة تحتوي على 1.2% مسحوق برقوق و0.25% بكتين، ومعاملة تحتوي على 1.2% مسحوق برقوق فقط، وأخرى تحتوي على 0.25% بكتين فقط. خضعت العينات للتحليل كل يومين لقياس الأس الهيدروجيني (pH)، وقيمة الثيوباربيتيوريك (TBA)، والنيتروجين القاعدي الكلي المتطاير (TVBN)، وقدرة الاحتفاظ بالماء (WHC)، وفقدان الطهي، إضافةً إلى التقييم البكتريولوجي. أظهرت النتائج أن معاملة البكتين مع مسحوق البرقوق سجلت انخفاضًا ملحوظًا في قيم TBA وTVBN، مع تحسن واضح في WHC وانخفاض فقدان الطهي، فضلًا عن كفاءة أعلى في الحد من النمو الميكروبي مقارنةً بالمعاملة الضابطة. وتؤكد هذه النتائج أن دمج البكتين مع مسحوق البرقوق يُعد بديلًا طبيعيًا واعدًا للفوسفات الصناعي، حيث يسهم في تحسين الخصائص الوظيفية وسلامة منتجات اللحوم، مع توافقه مع توجهات المستهلك نحو المنتجات ذات الملصقات النظيفة.

الكلمات الدالة: المعايير الارشادية ، الامعاء المملحة ، المركبات النيتروجينية المتطايرة.