BIOGENIC AMINE CONTENT OF TURKISH SOUDJOUCK (SUCUK) SAMPLES

Serap Cosansu, Kamuran Ayhan
Department of Food Engineering, Faculty of Agriculture, University of Ankara, Ankara-TURKEY

Background

Biogenic amines are organic base compounds occurring in foods such as fish, fishery products, wine, cheese, beer and other fermented foods (1-9). They occur in these products from decarboxylation of amino acids or transamination of aldehydes and ketones or formed by bacteria, including starter culture (10-14). The estimation of biogenic amine amounts is important because of their toxicity and the usage of spoilage indicators (5,6,8,9,14). Hernandez-Jover et al (1997a,b) reported that the toxic levels of some biogenic amines are 100 mg histamine/kg of foods and 100-800 mg of tyramine/kg and 30 mg of β-phenylethylamine/kg of foods and suggested that putrescine and cadaverine were histamine/tyramine potentiators. However, they did not recommend toxicity limits (9,14). There are several studies concerning the levels of biogenic amines in meat and meat products (1,5,6,9,13,18). Soudjouck is a fermented meat product which is consumed commonly in Turkey (10).

Objectives

The aim of this study was obtained to provide some data on the presence of biogenic amines in Turkish soudjouck samples purchased from markets in Ankara. In addition to biogenic amines, microbial analyses were also carried out.

Materials and Methods

Seventeen samples of Turkish soudjoucks were randomly purchased from local markets in Ankara. Biogenic amine extraction from the samples, their dansylation and quantitation were determined by a liquid chromatographic method as described by Eerola et al (1993) (19) and Butikofer et al (1990) (20). Microbiological analyses were performed using standard procedures (23).

Results and Discussion

It was found that all the samples have been contained considerable level of some biogenic amines. The concentration of biogenic amine of the samples fluctuated greatly. Despite this variability, tyramine (TYR), putrescine (PUT) and spermidine (SPD) were the predominant biogenic amines (Table 1). TYR was present in 11 samples, which were 64.70%, and PUT and SPD 52.94%, 41.17% respectively.

Table 1. Concentration of biogenic amines (mg/kg) in Turkish soudjouck samples.

Samples No	TRY	PHA	PUT	CAD	HIT	TYR	SPM	SPD	Total BA
1	16.70	2.70	150.74	514.24	22.76	62.11		234.97	1004.22
2	42.88		9.35		12.80		337.53		402.56
3								284.87	284.87
4				8.00		12.08		228.01	248.09
5			4.04					238.74	242.78
6				6.83		198.14			204.97
7	4.63			8.28		8.15		169.85	190.91
8	3.11	56.77	20.45			83.87	25.91		190.11
9		59.19				19.81		62.52	141.52
10	4.46		44.10	71.42	6.01	7.09			133.08
11		1.80	63.89			23.88		49.62	139.19
12			7.61				118.60		126.21
13	6.52	114.55							121.07
14		101.53				18.48			120.01
15						106.08			106.08
16			3.28			92.11			95.39
17			17.18						17.18

Although there are no legal limits for the values of biogenic amines, in some samples higher values were detected than suggested limits (Table 1). As for example, the highest level of cadaverine (CAD) was detected in one sample with 514.24 mg/kg, which the suggested limit was 100 mg/kg by Stratton et al (1990) (4). TYR level was detected as 198.14 mg/kg in one sample which was higher than recommended limit Hernandez-Jover et al (1997b) (14). Several authors have showed that TYR and PUT are usually major amines in meat products (5, 9, 10, 14, 15, 21).

On the other hand, Hernandez-Jover et al (1997a) emphasized that Spermine (SPM) and SPD were the only amines always detected in meat and meat products (9). They also showed SPM contents decreased during ripening fuet sausage production but SPD level of the samples remained relatively constant. Additionally, they indicated that ripening with or without starter culture does not influence these amines, while their origin is meat itself (14). The concentration of SPD tested samples was ranged from 49.62 mg/kg to 356.50 mg/kg and SPM was between 25.91 mg/kg and 337.53 mg/kg in the samples. The high amount of Phenylethylamine (PHA) was found in four samples (Table 1). This concentration has been reported, as toxic level is 30 mg/kg in foods by Hernandez-Jover et al (1997b) (14). The histamine (HIT) level in the tested samples was lower (maximum 22.76 mg/kg) than toxic limits 100 mg/kg foods reported by Hernandez-Jover et al (1997b) (14). These authors could not find HIT in fuet sausages. However, Maijala et al (1995b) (6) determined the low level of HIT in dry sausages and Vidal-Carou et al (1990) (21) detected considerable level of HIT in some Spanish ripened meat products. All the amines were well separated on reverse-phase HPLC. The order of elution was TRY, PHA, PUT, CAD, HIT, TYR, SPM and SPD (Figure 1) and the chromatogram for amines extracted from a soudjouck sample are shown in figure 2.

Microbiological counts are presented in Table 2 fluctuated greatly among the samples. The numbers of APC are differed from 3.98-7.89 log CFU/g. In this study, the highest *Enterobacteriaceae* counts were found in two samples with 3.47 log CFU/g and 3.20 log CFU/g where as the level of SPD as 169.85 mg/kg and 228.01 mg/kg respectively. However, the count of *Enterobacteriaceae* was found as 1.00 log CFU/g in some samples. This can be explained as a consequence of the conditions such as pH, a_w, and high concentration of salt during ripening of the samples. There was the only sample No 1 which contained all the biogenic amines except SPM and represented the highest total BA level as well (Table 1 and Table 2).

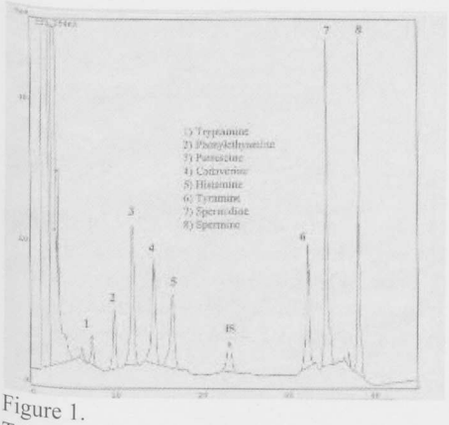

Figure 1.

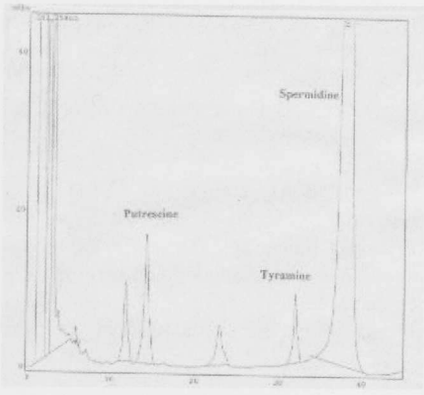

Figure 2.

Table 2. Microbial counts (log CFU/g) of the samples

Samples No	APC	LAB	ENT	Enterococci	Staphylo-cocci	Yeasts
1	7.09	7.00	<1.00	2.78	5.00	2.90
2	4.49	2.79	<1.00	<1.00	<1.00	<1.00
3	4.00	4.45	<1.00	<1.00	1.00	<1.00
4	4.00	4.45	3.20	<1.00	1.00	<1.00
5	7.55	6.00	<1.00	5.06	6.40	4.74
6	3.98	3.80	<1.00	2.50	<1.00	<1.00
7	6.70	6.54	3.47	3.87	3.98	3.49
8	6.86	3.00	<1.00	<1.00	3.42	<1.00
9	7.00	6.96	<1.00	3.00	<1.00	3.86
10	5.19	6.30	<1.00	2.50	<1.00	<1.00
11	7.89	7.45	2.20	4.79	4.30	4.20
12	6.07	6.49	1.00	1.00	2.56	<1.00
13	7.17	6.72	<1.00	4.30	<1.00	<1.00
14	6.90	7.00	<1.00	3.87	5.13	4.52
15	4.25	2.45	<1.00	<1.00	<1.00	<1.00
16	4.65	5.51	1.00	2.50	<1.00	<1.00
17	7.05	5.09	<1.00	4.52	4.00	<1.00

Edwards et al (1987) reported that PUT concentration increased with total viable bacteria counts (APC) but CAD increased only high level of *Enterobacteriaceae* were present. Additionally, Hernandez-Jover et al (1997a) concluded that the formation of these amines produced during the manufacture of ripened products. They also reported that the high background flora naturally present on the starting meat has a great influence on the biogenic amine formation (9). We have found similar results in one of our study in which the major biogenic amines produced by *Enterobacteriaceae* are PUT, CAD and TYR both in culture medium and meat products (22).

Concerning the LAB counts of the samples, the lowest counts were found in the samples No 8, 2, 6 and 15 which can be explained by the lactic acid fermentation which has not been completed yet. Because the samples were collected randomly, it is not known that the manufacturers used the starters or not. On the other hand, the levels of some biogenic amines of these samples such as TYR, SPD and PHA were detected very high (Table 1).

Hernandez-Jover et al (1997a) concluded that the same system of manufacturing could give products having variable levels of amines during the production of ripened meat products. They followed the amine levels in different batches of the same meat product of the same commercial brand, wide fluctuations were observed in TYR, PUT, CAD contents in some Spanish meat products. In this study, No 9 and No 11 were produced without using starter cultures in the same pilot factory and in controlled conditions at different period of time. According to the results, the formation of biogenic amines obtained in the different level and types in both samples. It was also detected different microbiological counts at two of samples (Table 1 and Table 2).

It is obvious that there are many effects on the formation of biogenic amines in meat and meat products. For example, quality of raw materials, especially the contaminant lactic acid bacteria, processing time and temperature, even incorrect starter culture addition, the amount free amino acids, presence of microorganisms are capable to produce decarboxylase as well as differences between manufacturers. Therefore, in order to produce the products consisting of the low level of biogenic amines all these factors should be taken into consideration.

Pertinent Literature

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