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Histamine Contents of Some Commercial Vegetable Pickles

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Abstract: Histamine contents of some pickles were aimed to determine in this survey, and 50 samples of vegetable pickles (of 28 as mixed, 6 as hot pepper and 7 as cucumber pickles) were collected from market in Van city. Histamine determination was done by fluorometric method. It was found that the levels of histamine for all pickles were changed between 16.54 and 74.91 mg kg^{-1} (average 30.73 mg kg^{-1}). The maximum value (74.91 mg kg^{-1}) was obtained from a sample of hot pepper pickles. All values are below the level of 1000 mg kg^{-1}, which is the minimal level for clinical symptoms of toxicity.

Key words: Histamine, pickles, food poisoning

Introduction

Histamine is one of the biogenic amines formed mainly by microbial decarboxylation of amino acids in numerous foods such as fish, cheese, wine, and fermented products (Bakirci, 2000). Beside of histamine; tyramine, tryptamine, putrescine, cadaverine, spermidine and spermine are formed in such foods, as well.

In fact, histamine is a normal substance of the body and has some important functions. Normally, if the regulating mechanism of histamine is insufficient or if excessive amount of histamine is taken with foods or the function of histamine metabolism is disordered by the inhibitors (many commonly used drugs and alcohol etc.), then, histamine toxication may happen (Joosten, 1988; Fox *et al*., 1996). Flushing of the face and neck are symptoms of histamine toxication, followed by an intense, throbbing headache. Other symptoms include dizziness, itching, faintness, burning of the mouth and throat, and the inability to swallow. A numbers of microorganisms can produce histamine. *M. morganii, Proteus* spp., and a *Klebsiella* spp. are considered as strong histamine formers in fishes while *H. alvei* and *Proteus* spp. are weak formers (Jay, 1992).

Biogenic amines are naturally found in vegetables and fruits while it is formed as the result of fermentation in cheese, wine and sauerkraut. Taylor *et al.* (1978) reported that ingestion of 70-1000 mg of histamine in a single meal is necessary to elicit any symptoms of toxicity. An exceeding level of histamine of 10 mg% is connected with product quality (Jay, 1992). In Turkish Food Codex, 200 mg kg^{-1} of histamine is accepted as a defect indicator for fishes, and 10 mg kg^{-1} for wines. No limitation is indicated for fermented products in the codex.

Different foods may have different levels of histamine. Çakli and Taskaya (1995) reported the contents of histamine in some foods as the following: 2.3 for beef, 8.6 for chicken meat, 7.27 for Hungarian red wine, 73.15 for Sardine, as mg kg^{-1}. Taylor *et al.* (1978) researched histamine contents of 50 sauerkraut samples obtained from retail markets, and found that histamine contents were at the range of 0.91 mg $100g^{-1}$ to 13.0 mg $100g^{-1}$, which was lower than 1000 mg kg^{-1}, food poisoning level.

Mean histamine levels of Kashar and Tulum cheeses produced in Turkey were reported as 54.5 mg $100g^{-1}$ and 23.3 mg $100g^{-1}$ respectively, and 30% of Kashar samples had more than 70mg 100 g^{-1} of histamine (Nizamlioglu, 1990). Durlu-Özkaya and Tunail (2000) obtained that a range of 2.92-218.0 mg $100g^{-1}$ histamine was available in Beyaz cheese samples taken from Ankara retail markets.

The histamine database has been established as a pilot project for the NFID (The National Food Intolerance Databank) in Germany by collecting German manufacturers and international publications, based on 1000 brand food products (Diel *et al*., 1997).

Recently no report was observed on histamine contents of pickles in Turkey. In this study, it was aimed to determine histamine contents of fermented pickles sold in Van retail markets, and to determine the incidence of samples containing abnormally high quantities of histamine.

Materials and Methods

Three kinds of fermented pickle samples were obtained from various retail markets in Van in Turkey, and they were as the mixed pickle (including a mixture of mainly cucumber, cabbage, carrot, hot pepper, green tomatoes and etc. at different ratios), hot-pepper pickle and cucumber pickle. The samples were taken from the open containers kept in market type of refrigerator in the markets. The 41 pickle samples were collected for histamine analysis.

Histamine analysis was done using fluorometric method as described by Lerke and Bell (1976). The

Table 1: Histamine contents of the pickles (mg kg^{-1})

Kinds of pickles	n	Minimum	Maximum	Mean ± SD
Mixed	28	16.54	57.89	28.87 ± 8.66
Hot pepper	6	19.78	74.91	34.72 ± 20.39
Cucumber	7	26.66	44.72	34.73 ± 5.81
General	41	16.54	74.91	30.73 ± 10.74

[n]Number of the pickle samples analyzed

samples were homogenized for analysis by Ultra-Turrax homogenizator. 10±0.1 g of homogenized sample was taken and 90 ml of 10 % trichloroacetic acid was added. The content was homogenized for another 1-2 min and filtered. The column prepared with 1 g amberlit CG-50 (Type I 100-200 mesh) suspended with 50 ml acetate buffer (pH: 4.6±1) and stand for 24 h. Then, 0.2 ml of the filtrate and standard solutions was pipetted into a 50 ml beaker and 20 ml buffer solution was added. The mixture was pored into the column. After the mixture passed through the column, the column was washed with 100 ml buffer solution before 18 ml 0.2 N HCl was eluted and diluted to 20 ml. 2 ml of the eluate was taken into a 30 ml beaker, and 1ml of 1 NaOH and 0.1 ml fresh prepared o-phthalaldehide (% 0.1) were added. After 3.5 min of reaction time, 2 ml 0.7 N HCl was added and mixed. The formed fluorescence was read at 450 nm and 366 nm using a fluorometer (Luminescence spectrometer LS 50B). The curve was obtained by fluorometer automatically using standard solutions. The results were stated as mg kg^{-1}.

Results and Discussion

Histamine contents of the pickles are presented in Table 1. The average histamine content for all pickle samples was found as 30.73 mg kg^{-1}. Average histamine contents of hot pepper and cucumber were almost the same. However, maximum histamine content was found in hot pepper pickles while the minimum was obtained from the mixed pickles.

The general average value was lower than those of histamine content of 50 sauerkraut samples (5.06 mg $100g^{-1}$) reported by Taylor *et al.* (1978). Kalaè *et al.* (1999) found histamine levels above 10 mg kg^{-1} in only 19% of sauerkraut samples, but with maximum value of 229 mg kg^{-1}. Künsch *et al.* (1989) recommended maximal level of histamine as 10 mg kg^{-1} for good quality sauerkraut.

The histamine contents of the pickles investigated in this survey are below the level of 1000 mg kg^{-1}, which is the minimal level for clinical symptoms of toxicity. However, if the quality level as recommended by Künsch *et al.* (1989) for sauerkraut is considered, the histamine values of all samples in this survey are above 10mg kg^{-1}. In this case, some suggestions by Künsch *et al.* (1989) should be taken into consideration. First, the initial temperature of fermentation should be run between 15-20°C, and second pasteurization should be applied when pH value reaches 4.0-3.8. Also, using *L. plantarum* and Microsil (containing *L. plantarum, L. casei, E. faecium*, and *Pediococcus* spp.) may reduce biogenic amin formation (Kalaè *et al.*, 2000).

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