DETECTION OF NITRITES IN DIFFERENT KINDS OF CHEESE
AND THEIR EFFECT ON THE BACTERIOLOGICAL STATMENTS

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Abstract

Eighty random samples of cheese (Kareesh, Damietta, Romy and Edam cheese) were collected from different localities in Cairo, Giza and Kafr El Sheba Governorates. Samples were examined for nitrates concentrations and total bacterial contamination. Results showed that nitrates concentration ranged from 0.0 : 9.8 ± 4.6 mg/kg, while, the total bacterial count ranged from 300 ± 16.33 to 22590 ± 925.33 C.F.U. There was a negative correlation between nitrates and total bacterial count in Kareesh and Romy cheese. It appears necessary to examine all types of cheese before selling to confirm a good hygienic quality.

INTRODUCTION

Nitrates and nitrates are used as food additives. Nitrates are added to milk for the production of semi-solid and mould ripened cheese at levels of 150-200 mg/L potassium nitrate.

Due to the potential risk of formation of carcinogenic N-nitrosocompounds in the consumer’s body, several attempts were made to reduce the use of these compounds as food additives (Poulsen, 1980). Peters et al. (1994) recorded a relation between the intake of nitrite compounds and risk of leukemia among children up to 10 years age in Los Angeles country. Moreover, Dardir (1996) concluded that prolonged ingestion of sodium nitrite has been shown to be a cause of methemoglobinemia, especially, in infants and also the possible induction of cancer, especially stomach and oesophageal cancer. Nitrates from food are observed in the intestines, while, about 80% of these are eliminated in the urine. Infants up to the age of one year are more susceptible to the content of nitrates in food. The potential toxicity of nitrates is an immediate negative manifestation of their toxicity (Vondrakova, 1982). Addition of nitrates to cheese is illegal in Egypt, but sodium nitrates is used in certain European cheese (Italy) to prevent spoilage by clostridium trybuticum at levels of 100 mg/kg sodium nitrate and 10 mg/kg sodium nitrite (Tompkin, 1983).
Our investigations aimed to determine the levels of nitrates and total bacterial contamination in certain kinds of cheese sold in different markets in Cairo, Giza and Kalibbia governorates. Sustained monitoring was performed to indicate the sanitary conditions under which the food was produced or processed and to eliminate the levels of nitrates used as food preservatives added during production and processing of cheese.

MATERIALS AND METHODS

Eighty random samples of cheese (20 each of Damietta, Kariesh, Edam, Romy cheese) were collected from different localities in Cairo, Giza, Kalibbia Governorates. Collected samples were packed in an insulated ice box and forwarded to the laboratory as quickly as possible to be immediately examined or kept in a refrigerator until examined. Each sample from different kinds of cheese was thoroughly mashed in a sterile stomacher bags by stomaching and subjected to the following examinations:


Statistical analysis

Mean as well as standard deviation and correlation coefficient were calculated according to method described by Selvin (1996).

RESULTS AND DISCUSSION

Table 1. Levels of nitrates in the examined cheese samples.

<table>
<thead>
<tr>
<th>Type of cheese</th>
<th>No. of samples</th>
<th>No. of +ve samples</th>
<th>Percentage of +ve samples</th>
<th>Average conc. of nitrates (mg/kg)</th>
<th>Mean ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kariesh</td>
<td>20</td>
<td>12</td>
<td>60%</td>
<td>0.0 : 11.89</td>
<td>9.8 ± 4.6</td>
</tr>
<tr>
<td>Damietta</td>
<td>20</td>
<td>8</td>
<td>40%</td>
<td>0.0 : 42.41</td>
<td>7.12 ± 4.2</td>
</tr>
<tr>
<td>Romy</td>
<td>20</td>
<td>9</td>
<td>45%</td>
<td>0.0 : 12.29</td>
<td>3.74 ± 1.57</td>
</tr>
<tr>
<td>Edam</td>
<td>20</td>
<td>0</td>
<td>0%</td>
<td>-ve</td>
<td>-ve</td>
</tr>
</tbody>
</table>
Table 2. Total bacterial count of examined cheese samples.

<table>
<thead>
<tr>
<th>Type of cheese</th>
<th>No. of samples</th>
<th>Average total bacterial count (C.F.U.)</th>
<th>Mean ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kariosh</td>
<td>20</td>
<td>19X10^3 : 29X10^3</td>
<td>25100 ± 1361.78</td>
</tr>
<tr>
<td>Damietta</td>
<td>20</td>
<td>2 X10^2 : 5X10^3</td>
<td>1240 ± 420</td>
</tr>
<tr>
<td>Romy</td>
<td>20</td>
<td>18X10^2 : 9.5X10^4</td>
<td>25590 ± 9256.33</td>
</tr>
<tr>
<td>Edam</td>
<td>20</td>
<td>3X10^2 : 4X10^2</td>
<td>360 ± 16.33</td>
</tr>
</tbody>
</table>

Data expressed as mean ± S.E.

Table 3. Relation between nitrates and total bacterial counts of examined cheese samples.

<table>
<thead>
<tr>
<th>Type of cheese</th>
<th>T.B.C.</th>
<th>Nitrile Conc. (mg/kg)</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kariosh</td>
<td>25100 ± 1361.78</td>
<td>9.8 ± 4.6</td>
<td>-0.474</td>
</tr>
<tr>
<td>Damietta</td>
<td>1240 ± 420</td>
<td>7.12 ± 4.20</td>
<td>+0.344</td>
</tr>
<tr>
<td>Romy</td>
<td>25590 ± 9256.33</td>
<td>3.74 ± 1.54</td>
<td>-0.04364</td>
</tr>
<tr>
<td>Edam</td>
<td>360 ± 16.33</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The areal monitoring of the occurrence of nitrates content in pooled samples of cheese recorded in Table 1, revealed that Kariosh cheese showed the highest percentage of +ve samples for nitrates (12 +ve samples out of 20 examined samples with a percentage of 60%). Concentration of nitrates in Kariosh cheese ranged from 0.0 : 11.89 mg/kg with a mean of 9.8 ± 4.6 mg/kg. No amount of nitrates could be detected in Edam cheese (0.0%). In Damietta cheese, 6 +ve samples out of 20 examined samples were recorded with a percentage of 40%. Concentration of nitrates ranged from 0.0 : 42.41 mg/kg with a mean of 7.12 ± 4.2 mg/kg. Moreover, the examination of Romy cheese revealed 9 +ve out of 20 examined samples with a percentage of 45%, and nitrates concentration was 0.0 : 12.29 mg/kg with a mean of 3.74 ± 1.57 mg/kg cheese.

Damietta and Kariosh cheese are famous locally produced soft cheese in Egypt in which raw milk is used in their manufacture. Raw milk could be contaminated with nitrates from food of dairy animals resulting in increased content of nitrates in the body, blood and milk of the animals (Wozniak and Wojton, 1996). Addition of potassium and
sodium nitrates used as food preservatives, explain the detection of nitrites in these products (Palma and Northolt, 1988). Moreover, nitrites content of examined samples of Romy cheese may be attributed to heavily using of nitrites in the manufacture of hard cheese to overcome the growth of butyric acid and fermenting microorganisms during ripening and processing stage (Makiewicz and Hiller, 1989).

Bacteriological examination of cheese tested samples (Table 2) showed that Romy and Kariesz cheese represented the highest total bacterial count "T.B.C." (1800 : 95000 C.F.U.) with a mean of 25590 ± 9256.33 and 19000 : 29000, 25100 ± 1361.78, respectively. Moreover, Damietta cheese recorded 200 : 5000 C.F.U. with a mean of 1240 ± 420, while, the T.B.C. in Edam cheese showed the lowest number (300:400 C.F.U.) with a mean of 360 (16.33). Bacterial contamination of cheese may be attributed to the previous contamination of milk by different types of bacteria either before or during process of manufacturing (Ternstrom et al., 1993).

Statistical analysis of results revealed a correlation between nitrites and T.B.C. in different types of cheese as recorded in Table 3, where, Kariesz and Romy cheese showed --ve correlation for each examined sample. Gouda (1988) recorded that nitrites improved the keeping quality of cheese. Damietta cheese showed a +ve correlation between nitrites and T.B.C. Pluta et al. (1989) reported that nitrites content are increased with the increasing of the number of coliforme bacteria when the milk used to produce the cheese was heavily contaminated with these bacteria. In such case, the advantages effect of nitrites on each quality was apparent. Edam cheese showed no remarkable contamination of nitrites as they are decreased during the coagulation and pressing stages of cheese. Similar results were reported by Przybylowski et al. (1987).

As regards the indicators of nitrites and T.B.C. contamination of the most kinds of cheese, it appears necessary to examine all types of cheese before selling or consuming to confirm the good hygienic quality and safety.
REFERENCES


التعريف على أملاح النيترات في أنواع البين ومدى تأثيرها على التلوث البكتيري

مايسه ثابت ونور كامل

مراحيق بحوث صحة الحيوان - مركز البحوث الزراعية - وزارة الزراعة - الدقى - جيزة - مصر

تناول هذا البحث فحص عدد 88 عينة من 4 أنواع مختلفة من البين (فريش، روي، بوني وروستي ووجودة). جمعت العينات من أسلاك عشوائية في مدارس القاهرة والجيزة والقليوبية. وقد تم فحص هذه العينات لوجود النيترات بالإضافة إلى التلوث البكتيري. وقد وجد أن نسبة النيترات تراوح بين 0.001 إلى 2.4 جرام النيترات لكل كيلوغرام حناء. وكانت نتائج التلوث البكتيري 23.32±0.05. وقد وجدت علاقة سلبية بين نسبة النيترات والتلوث البكتيري في البين الفريش والروسي مع وجود علاقة طردية بينهما في حالة البين الدقي. وكانت في البين البوني والروستي، بنسبة لوجود النيترات، لذلك يجب فحص الأمراض المرضية من البين جيدا قبل بيعها واستهلاكها والوقاية من الأضرار الصحية ومدى خطورة وجود النيترات في أنواع البين المختلفة على صحة الإنسان.