Effect of Potassium Sorbate on The Growth of SALMONELLA SENFTENBERG in Prawn Homogenate

A. BASRAH ENIE

ABSTRAK
Penelitian mengenai pengaruh penambahan kalium sorbat terhadap pertumbuhan bakteri (Salmonella senftenberg) dalam udang yang telah dihancurkan telah dilakukan. Contoh disimpan pada suhu 5°C dan di- periksa pada selang waktu 0, 7, 14, 28 dan 35 hari. Jumlah bakteri (CFU ml⁻¹) dalam contoh yang mengandung 0,1% sorbat dan pada contoh kontrol tidak ada perbedaan yang nyata. Akan tetapi pengaruh peng- hambatan terhadap pertumbuhan bakteri secara nyata dapat dilihat pada contoh yang ditambah 0,2 atau 0,3% sorbat.

INTRODUCTION
Prawns are important export commodity for the countries like Indonesia, Bangladesh, India, Pakistan and Japan. They are exported to the European countries, the United States or Canada as peeled, breaded, pre- cooked and frozen. Quality of these products sometimes was very low and become a problem for the exporters as their products are rejected by the importing countries. For example, the U.S. Food and Drug Administration recently initiated blocklisting (automatic detention) of all shipments of prawn imported from a number of Asian countries because records showed increasing violations due to adulteration, decomposition or Salmonella contamination (D’AOUST et al., 1980).

Prawns generally enter the kitchen as frozen product which will be cooked before being consumed. Any Salmonella organisms might be present are generally killed by cooking procedure. However, if these bacteria were on the surfaces of the product, food contact surfaces could become contaminated and in turn could contaminate foods not receiving further heat treatment before consumption.

The incidence of Salmonella food poisoning is always reported and increased year after year. For example, in the United Kingdom (SHEARD, 1981) Salmonella is the number one causative agent of food poisoning. Salmonella serotypes form almost 70% of the total cases reported. These serotypes were isolated from poultry and poultry products, meat and meat products, shellfish and prawns.

Chemical food preservatives have been used widely during the greater part of this century. The possible targets of these compounds for the microbial action can be grouped into the cellular membrane, genetic material and enzymes (EKLUND, 1980). The ideal chemical food preservative must be able to inhibit the growth of moulds, yeasts and bacteria, nontoxic to test animals and ultimately to humans, should be metabolized by the body and not be subject to a detoxification procedure in the liver, and should not be a residue buildup in fatty tissue (ROBACH, 1980).

Sorbic acid (a monocarboxylic fatty acid) and its salts are effective preservatives for the control of moulds and yeasts in various food. The optimum pH range for effectiveness extends up to pH 6.5, higher than the upper range of benzoates and propionates, but below that of the parabens. These compounds are found naturally in the mountain ash berry and under FDA regulations are generally recognized as safe (GRAS) (CHICESTER and TANNER JR., 1968). Recent studies have shown that sorbates are also effective antimicrobial agents against the growth of certain bacteria.

Studies by DE’BEVERE and VOETS (1972) demonstrated that the addition of 0.135 or 0.4% of potassium sorbate decreased the numbers of spoilage organisms in prepacked cod fillets stored at 0°C. CUNNINGHAM (1979) reported that a 10% potassium sorbate dip can extend the shelf life of fresh broiler parts stored at 4°C. Shelf life of whole broilers were also extended by dipping in a 5% solution of potassium sorbate for one minute before stored at 3°C (TO and ROBACH, 1980a). ROBACH et al. (1980) demonstrated that under commercial storage conditions of 4°C, the addition of 0.12% sorbic acid to the sliced turkey breast luncheon meat extend the time of psychrotrophs to reach 10⁷ cells g⁻¹ from 15 days in the control to 42 days in the treated product.

The growth of food poisoning organisms, i.e. Escherichia coli, Clostridium botulinum, Staphylococcus aureus and Salmonella can be retarded by the addition of sorbates. Dipping in 5% solution of potassium sorbate reduce the growth of Salmonella and S. aureus inoculated into the broiler carcasses stored at 3°C (TO and ROBACH, 1980a). TOMPKIN et al. (1974) reported

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that cooked, uncured sausages produced with 0.1% potassium sorbate retarded the growth of Salmonellae, *S. aureus* and *C. botulinum*. TO and ROBACH (1980a) reported that the addition of 0.25% potassium sorbate to the turkey breasts and 0.12% sorbic acid to the sliced turkey provided excellent protection against the growth of *Salmonella, E. coli* and *S. aureus*. Combination of potassium sorbate and sodium chloride in laboratory medium (pH ca. 6.0) also showed synergist inhibition against *S. aureus* at 35°C (ROBACH and STATELER, 1980) and *S. typhimurium* at 22°C and 35°C (LAROCCH and MARTIN, 1981).

The purpose of this study was to investigate the effect of potassium sorbate on the growth of *S. senftenberg* in prawn homogenate stored at 5°C.

**MATERIALS AND METHODS**

**Preparation of Prawn Homogenate.** Frozen prawn obtained from the market were used in this study. The prawn were peeled and blended with distilled water (1:7 w/v) in a Waring blender for 10 minutes The soup-like homogenate was then sterilised and used the growth study.

**Culture.** *S. senftenberg* was grown overnight in nutrient broth at 30°C. The culture was then diluted in 0.1% peptone water to obtain 1.4 x 10⁷ cells per ml prior to inoculation.

**Potassium Sorbate Stock Solutions.** Stock solutions of potassium sorbate at the concentrations of 0.02; 0.04; and 0.06 g ml⁻¹ were prepared by dissolving potassium sorbate in distilled water, filter sterilised and stored in sterile stoppered flasks before used.

**Growth Study.** Growth study was done in sterile tubes containing 9.4 ml of sterile prawn homogenate, 0.5 ml of sorbate stock solutions and 0.1 ml of diluted cell suspensions. Concentration of sorbates in the final test solution were 0 (control); 0.1; 0.2 and 0.3%. The inoculated tubes were stored at 5°C for 0, 7, 14, 21, 28 and 35 days. At these time intervals the samples were drawn, and serial dilutions were made in 0.1% peptone water. Miles and Misra surface colony count on selective media (Brilliant Green Agar) as described in HARRIGAN and MCCANCE (1976) and BUCKLE et al. (1979) were used in this study. The plates were incubated at 30°C for 24 hours before counting.

**RESULTS AND DISCUSSION**

Data obtained from this study was shown in Table 1. This table shows mean values of duplicate experiments which had been transformed into log CFU (colony forming units) per ml. *S. senftenberg* was not grow well in prawn homogenate. In control the number of organisms only increased approximately 1.5 log cycle in 7 days. After 35 days the level decreased to 2.5 log cycle below the day seventh value. On the basis of the data analysed statistically, it appears that the effect of time on the number of organisms was highly significant (P < 0.001). The number of organisms increased significantly at day 7 and 14 and decreased at day 21 and 35. The decrease at day 28 was not significantly different with at day 35. In the control and in the sample containing 0.1% sorbate, the cell growth began to enter the death phase after 7 days (Figure 1). However, in the samples containing 0.2 and 0.3% sorbate the death phase occurred after 14 days.

<table>
<thead>
<tr>
<th>Time (days)</th>
<th>Potassium 0</th>
<th>Sorbate 0.1</th>
<th>Sorbate 0.2</th>
<th>Sorbate 0.3</th>
<th>Time Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.695</td>
<td>4.570</td>
<td>4.707</td>
<td>4.685</td>
<td>4.669</td>
</tr>
<tr>
<td>7</td>
<td>5.455</td>
<td>5.280</td>
<td>5.015</td>
<td>4.780</td>
<td>5.133 (P &lt; 0.05) : 0.096</td>
</tr>
<tr>
<td>14</td>
<td>5.250</td>
<td>5.100</td>
<td>5.085</td>
<td>4.985</td>
<td>5.105</td>
</tr>
<tr>
<td>21</td>
<td>4.440</td>
<td>4.485</td>
<td>4.295</td>
<td>4.250</td>
<td>4.368 (P &lt; 0.01) : 0.130</td>
</tr>
<tr>
<td>28</td>
<td>4.190</td>
<td>4.270</td>
<td>4.070</td>
<td>4.150</td>
<td>4.170</td>
</tr>
</tbody>
</table>

Table 1. Effect of potassium sorbate and time on *Salmonella* count (Two-Way Table of Treatment Means), log CFU ml⁻¹.

Sorbate Means

<table>
<thead>
<tr>
<th>Sorbate Means</th>
<th>4.713</th>
<th>4.660</th>
<th>4.512</th>
<th>4.500</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSD :</td>
<td>(P &lt; 0.05) : 0.078</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(P &lt; 0.01) : 0.106</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Statistical analysis is also revealed that the effect of sorbate on the growth of *S. senftenberg* was highly significant (P < 0.001) and the interaction between sorbate concentrations and time intervals were significant at P < 0.01. No significant difference in number of organisms between control and sample containing 0.1% sorbate. However, significant inhibition effect on the growth of *S. senftenberg* was noted in the sample containing 0.2 or 0.3% sorbate.

Results of this study was agreed with the previous studies by TO and ROBACH (1980b) and LaROCCO and MARTIN (1981) that the addition of potassium sorbate at the level of more than 0.2% is effective in controlling microbial growth.

ACKNOWLEDGMENTS

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REFERENCES


To, E.C. and Robach, M.C. "Potassium Sorbate Dip as a Method of Extending Shelf-life and Inhibiting the Growth of *Salmonella* and *Staphylococcus aureus* on Fresh, Whole Broilers". *Poultry Sci.* 59 (1980 a) : 726 – 730.


POHON INDUSTRI KELAPA SAWIT

PETANIAN

Gambar

JARINGAN PENGOLAHAN INDUSTRI KELAPA SAWIT

KONSUMEN

a
b
c
d
e

Minyak goreng

Olein

Salad oil

Refined oil

Margarine

Stearin

Shortening

Minyak padat

Sabun

Asam lemak

Garam

asam lemak

Gliserin

Industri Makanan/rumah tangga

Industri Makanan

Industri Makanan

Industri Makanan

Industri Makanan

Rumah tangga/industri Pariwisata

Industri Kosmetik

Industri Farmasi

Industri Kimia

Bahan Bakar (rakyat)

Industri Makanan Ternak

Industri Bahan Bineunan

Bahanbakar/pabrik

Industri Makanan/rumah tangga

Industri Makanan

Industri Makanan/rumah tangga

Industri Makanan

Industri Makanan Ternak

Bahan Bakar

[Industri

Industri pharams]

- Industri Lingkungan

- Industri Kimia

- Industri Makanan

- Industri Obat Nyamuk

- Industri Makanan Ternak

- Industri Pupuk

KELAPA SAWIT

Mesocarp

Daging buah

Crude Pala Oil

C.P.O

Sludge

Padatan

Serat/sabut

Pengisi bahan bangunan

Inti

Minyak

Margarine

Salad Oil

Bungkil

Bricket

Karbon aktif

Asap Cair

Asam organik

Tempurung

Arang

Tandan, suap
dan cangkang

Bahan Organik

Tanduk, suap pada dan cangkang

Bahan Organik

Keterangan tercemer pada masukan yang diperlukan,

a. Berbagai permesinan

b. Penggunaan
c. Bahan kimia pengolong
d. Periklanan
e. Lain-lain (jasa)

Makin jauh pengolahan kehilan makin tinggi diversifikasi, makin tinggi keterkaitan dengan produk industri lain.

- Industri Makanan

- Industri Farmasi

- Industri Kimia

- Industri Makanan

- Industri Makanan Ternak

- Industri Pupuk