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

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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 diperiksa 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 penghambatan 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, precooked 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 Asiatic 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 repoted 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 affective 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) (CHICHESTER 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 psychrotrops to reach 10^7 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 clhloride 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° and 35°C (LAROCCO 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. Prozen 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 Warring blendor 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 10^7 cells per ml prior to inoculation.

Potassium Sorbate Stock Solutions. Stock solutions of potassium sorbate at the concentrations of 0.02; 0.04; and 0.06g 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 with 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 analised 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 occured after 14 days.

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

Time (days)	Potassium Sorbate, %				Time Means	
	0	0.1	0.2	0.3		
0	4.695	4.570	4.707	4.685	4.669	LSD
7	5.455	5.280	5.015	4.780	5.133	($P < 0.05$) : 0.096
14	5.250	5.100	5.085	4.985	5.105	
21	4.440	4.485	4.295	4.250	4.368	($P < 0.01$) : 0.130
28	4.190	4.270	4.070	4.150	4.170	
35	4.250	4.235	3.900	4.150	4.134	
Sorbate Means	4.713	4.660	4.512	4.500		
	LSD :	($P < 0.05$) : 0.078 ($P < 0.01$) : 0.106				

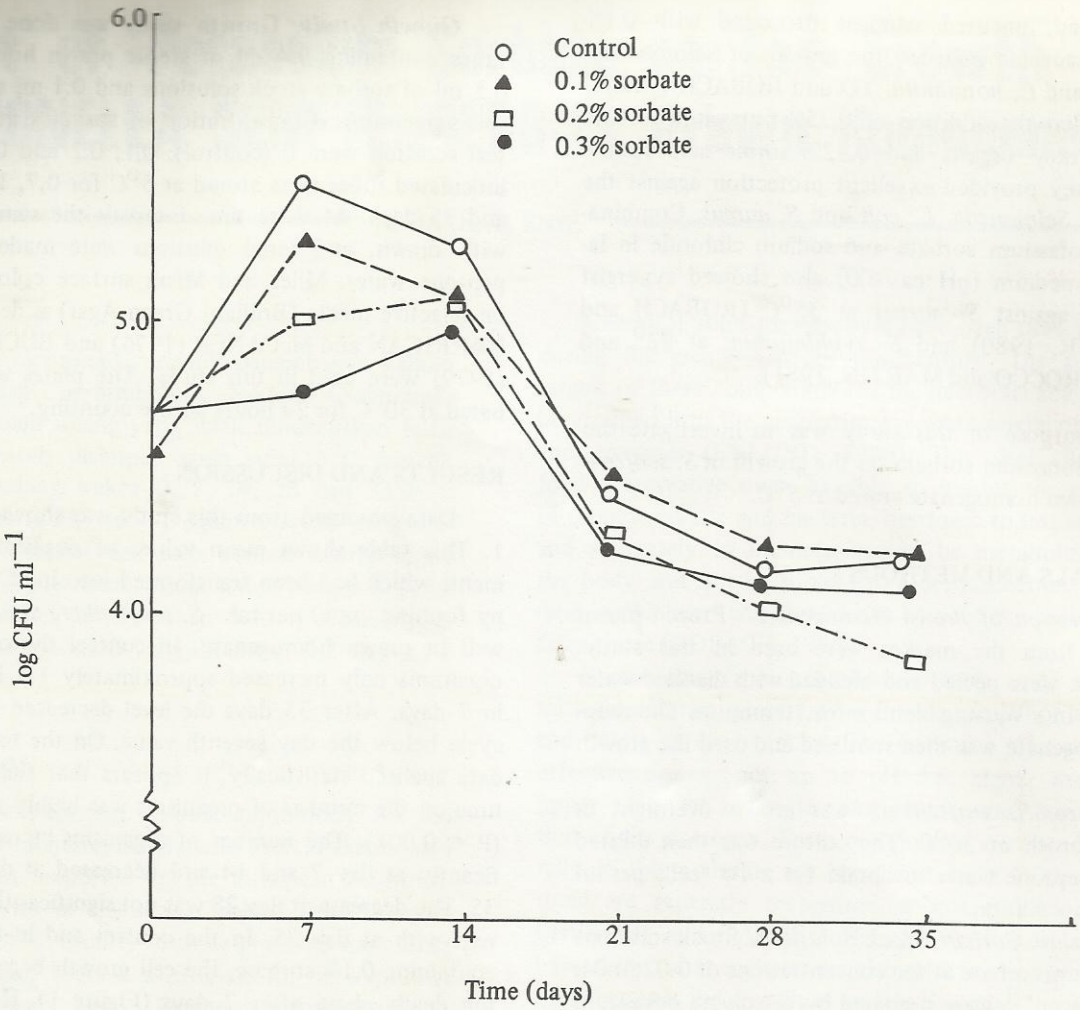

Figure 1. Effect of potassium sorbate on the growth of *S. senftenberg* in prawn homogenate

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.

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Jaringan Industri Kelapa Sawit

Bermula dari empat bibit pohon kelapa sawit (*Elaeis guineensis*) yang ditanam di Kebun Raya Bogor pada tahun 1848, dan penanaman di Deli, Sumatera Utara pada tahun 1859, tanaman ini berkembang menjadi salah satu komoditi yang penting dalam industri hasil pertanian di Indonesia. Tak jauh berbeda dengan "saudara"nya, yakni kelapa (*Cocos nucifera*) yang disebut sebagai "One of Nature's greatest gift to man", maka kelapa sawit juga memberikan beraneka ragam manfaat bagi manusia.

Jaringan industri yang tersaji kali ini memberikan gambaran tentang manfaat kelapa sawit sebagai bahan industri. Terlihat bahwa daging buah (mesocarp), biji, tandan, sayap dan cangkang dari kelapa sawit dapat memberikan kemungkinan yang luas dalam bidang industri baik yang berupa industri makanan, rumah tangga, kosmetik, farmasi, makanan ternak maupun kimia. Pohon Industri seperti terlihat di halaman sebelah.

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