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THE EFFECT OF POTASSIUM SORBATE ON THE MICROBIOLOGICAL QUALITY OF COOKING BUTTER

(With One Table)

By

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تأثير إضافة سوربات البوتاسيـــــوم على التقييم الميكروبيولوجـــــي للزبـــد

مصطفى خليل ، توفيق البسيونى ، أحمد عبد الحميد ، شعبان هاشـــم

حفظت عينات من الزبد بعد إضافة سوربات البوتاسيوم بتركيزات ١ر٠ ، ٢ر٠٪ عند درجات حرارة مختلفة وذلك لمعرفة تأثيرها على نمو بعض الميكروبات التى قد تؤدى الى فساد المنتج · كما حفظت بعض العينات بدون إضافة عند درجات الحرارة كضوابط للتجربة وقد تبين من الفحص أن سوربات البوتاسيوم بتركيز ٢ر٠٪ لها تأثير فعال على الخمائر والفطريات وكذلك الميكروبات القولونية وظهر هذا جلياً عند درجة التجميد · أما عند إضافة السوربات بتركيز ١ر٠٪ لوحظ إستمرار وجود معظم الميكروبات طوال مدة الحفظ وقد إنتهى البحث إلى إمكانية إضافة سوربات البوتاسيوم إلى الزبد وحفظها عند درجة التجميد وذلك لتبيط الميكروبات التى قد تؤدى إلى فساد الزبد وبالتالى تؤثر على صحة المستهلك · كما تناول البحث أهمية تطبيق الإشتراطات الصحية فى تصنيع وتداول هذا المنتج ·

SUMMARY

Cooking butter samples treated with pot. sorbate (0, 0.1 and 0.3%) were analyzed weekly for microbiological quality after storage at 22, 5 and - 18°C.

Less growth of microorganisms was observed in butter as the sorbate was increased from 0.1 to 0.3%, irrespective of storage temp.

Addition of 0.3% sorbate reduced aerobic plate and psychrotrophic counts, while coliforms declined to undetectable levels in all samples. No viable cells of yeast and mold were recovered after 6, 6 and 4 weeks storage at 22, 5 and - 18°C, respectively. The 0.1% concentration did not prevent growth of some microorganisms even at refrigeration temperatures.

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INTRODUCTION

Sorbic acid and potassium sorbate are both generally recognized as safe (GRAS) and have been widely used as food preservatives for over 40 years. Use levels range from 100-300 ppm, depending on the product involved (LIEWEN and MARTH, 1985).

The practical applications of potassium sorbate as a food preservative include dairy products, bakery products, friut, vegetable products and other food products (certain meat and fish products, mayonnaise, margarine and salad dressing).

Some workers (SMITH and ROLLIN, 1954; MOUSTAFA and COLLINS, 1969; JHA and SINGH, 1976; KAUL, et al. 1979; SOFOS and BUSTA, 1981 and NAGAH SAAD, et al. 1978) have reported the inhibitory action of pot. sorbate on growth of microorganisms in different dairy products. In 1982, amendments to Japanese regulations of food additives, allowing use of pot. sorbate and sorbic acid in cheese manufacture (IWAIDA, et al. 1982).

Cooking butter is one of the most popular varieties of butter in Egypt. It is mostly a home industry, and can be consumed fresh but usually is heated to obtain ghee. Consequently, cantamination of cooking butter during manufacture by different microorganisms is possible especially when hygienic measures are inadequqte.

MARSHALL, et al. (1985) stated that if butter has been contaminated in the manufacturing process, and if conditions such as poor dispersion of water and high temperature favor microbial growth, spoilage may occur. They suggested that psychrotrophic bacteria are prominent in this type of deterioration. Moreover, JAY (1978) and KAUL, et al. (1979) have reported that spoilage of butter is generally due to mold growth.

From the fact that several outbreaks of food poisoning associated with consumption of butter have occurred (National Center for Disease Control, 1970 and MARTH, 1985) cooking butter if contaminated, may be a major cause of foodborne illness. Therefore, the object of this study was to determine whether or not treating of cooking butter with sorbate would affect its microbial content.

MATERIAL and METHODS

A sample of cooking butter (3 kgs) was obtained from Assiut City market and was divided into three equal parts (A, B and C).

To samples A and B, 0.1 and 0.3% potassium sorbate were added, respectively, while sample C was kept as control. Each sample was divided into 3 subsamples which were kept at 22°C, 5°C and - 18°C, respectively. Test and control (without sorbate) samples were analyzed initially then weekly up to 6 weeks, to determine:

a) Aerobic count: using standard plate count agar (Oxoid).
b) Coliform count: using violet red bile agar (Oxoid).
c) Yeast and Mold count: using potato dextrose agar (Oxoid).
d) Psychotrophic count: using standard plate count agar.

Microorganisms were enumerated by a pour plate technique in accordance with procedures in Standand Methods for Examination of Dairy Products (1985).

RESULTS

The obtained results are recorded in Table (1).

DISCUSSION

The results indicate that the addition of 0.3% pot. sorbate to butter sample (B) resulted in great inhibition of coliforms, yeast and mold growth (Table 1). No viable coliforms could be recovered upon examination of that butter after the 5th week of storage at 22°C and 5°C and after the 2nd week at - 18°C, respectively. On the other hand, yeast and mold count was declined to undetectable levels at the end of 6 weeks of storage at 22°C and 5°C and after 4 weeks at - 18°C, respectively. These results are in line with reports indicating that pot. sortate reduced coliforms and mold growth in butter (KAUL, et al. 1979 and ZAVYALOVA, 1983).

The aerobic plate count and psychrotrophic count in the same sample were also reduced, irrespective of storage temp. (Table 1).

These results agree with those reported by WYATT and GUY (1981) who found that the refrigeration temperature had a great influence on the bacteriostatic action of sorbates.

When 0.1% pot-sorbate was added to butter (sample A), the growth of coliforms was considerably diminshed from the initial level (10^5/g.) to $6.3x10^2$ and $1x10^2$ coliform organism/g. after 6 weeks of storage at 22°C and 5°C, respectively. At - 18°C, no coliforms were found after 5 weeks.

The yeast and mold counts were also reduced in butter containing 0.1% sorbate from $1.5x10^7$ /g. to $3x10^3$, $6x10^1$ and $2.0x10^1$ when stored at 22°C, 5°C and - 18°C, respectively. Nearly similar findings have been reported by KAUL, et al. (1979), However, they found that addition of 0.1% pot. sorbate resulted in inhibition of mold growth at the end of 4 weeks at 5°C and - 18°C. In the present investigation, 0.1% concent did not prevent growth of some yeast and mold in all samples. This may be due to the higher initial yeast and mold populations in the present samples.

It is evident from Table (1) that the effect of 0.1% sorbate was less pronounced on psychrotrophic count in butter stored at 5°C or - 18°C. The same trend was observed by GILLILAND and EWELL (1983) who found that pot. sorbate in concentrations

of 0.1 and 0.2% had small inhibitory effect on growth of psychrotrophic bacteria in raw milk stored at 5°C.

As regards control butter sample (C) stored at 22°C, the coliforms, yeast and mold counts continued to increase with storage time. At 5°C, an increase in psychrotrophic populations was observed. In addition, there was a steady decline of coliforms, yeast and mold growth at 5°C and - 18°C throughout storage period.

It is clear from the present work that potassium sorbate can be used for predicting the stability of stored butter. The data indicate that use of 0.3% pot. sorbate in preserving cooking butter should provide adequate protection against microorganisms when the product is kept at deep freezing temperatures.

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Table (1)

Effect of different concentrations of pot. sorbate on microbial counts in cooking butter stored at different temperatures

Storage temp.	Time (weeks)	0.1% pot. sorbate (A)				0.3% pot.sorbate (B)				Control (C)			
		APC	CC	YMC	Ps.C	APC	CC	YMC	Ps.C	APC	CC	YMC	Ps.C
22 °C	0	$3.5x10^6$	$1.0x10^5$	$1.5x10^7$	$4.0x10^5$	$3.5x10^6$	$1.0x10^5$	$1.5x10^7$	$4.0x10^5$	$3.5x10^6$	$1.0x10^5$	$1.5x10^7$	$4.0x10^5$
	1	$7.0x10^6$	$6.5x10^4$	$1.8x10^6$	$2.0x10^5$	$1.4x10^6$	$1.4x10^4$	$2.0x10^5$	$1.5x10^5$	$1.0x10^7$	$5.0x10^5$	$2.6x10^7$	$2.2x10^6$
	2	$5.0x10^6$	$3.0x10^4$	$3.0x10^6$	$2.0x10^5$	$3.0x10^5$	$4.2x10^3$	$8.0x10^4$	$3.0x10^3$	$5.3x10^7$	$2.4x10^6$	$3.2x10^7$	$6.5x10^6$
	3	$9.0x10^5$	$1.0x10^4$	$6.0x10^5$	$5.0x10^4$	$2.0x10^5$	$3.8x10^2$	$6.0x10^4$	$2.0x10^4$	$1.6x10^7$	$3.8x10^6$	$5.0x10^7$	$2.5x10^6$
	4	$3.6x10^5$	$5.0x10^3$	$3.0x10^4$	$6.0x10^3$	$1.0x10^5$	$2.4x10^1$	$7.0x10^3$	$1.2x10^3$	$2.1x10^6$	$7.0x10^6$	$6.5x10^7$	$8.0x10^5$
	5	$7.5x10^4$	$3.1x10^3$	$4.0x10^3$	$2.0x10^3$	$6.3x10^4$	-	$1.0x10^2$	$1.0x10^3$	$2.5x10^6$	$1.0x10^6$	$9.4x10^7$	$2.0x10^5$
	6	$8.0x10^4$	$6.3x10^2$	$3.0x10^3$	$1.0x10^3$	$3.0x10^4$	-	-	$5.0x10^2$	$5.0x10^6$	$2.3x10^6$	$1.0x10^8$	$2.0x10^4$
5 °C	1	$5.2x10^6$	$3.0x10^4$	$2.3x10^6$	$2.0x10^6$	$4.0x10^6$	$2.0x10^4$	$2.5x10^6$	$3.0x10^5$	$6.0x10^6$	$5.0x10^4$	$2.3x10^7$	$1.0x10^6$
	2	$7.1x10^6$	$6.1x10^3$	$1.3x10^6$	$6.0x10^5$	$2.3x10^6$	$5.0x10^2$	$6.8x10^5$	$8.0x10^4$	$3.6x10^7$	$1.0x10^4$	$1.2x10^7$	$2.0x10^6$
	3	$8.0x10^7$	$3.2x10^3$	$7.0x10^5$	$3.2x10^5$	$3.5x10^7$	$8.1x10^1$	$7.0x10^4$	$5.0x10^4$	$1.2x10^8$	$5.1x10^3$	$5.0x10^6$	$3.0x10^7$
	4	$2.5x10^7$	$9.5x10^2$	$5.5x10^4$	$1.2x10^5$	$5.0x10^6$	$2.3x10^1$	$9.0x10^3$	$1.0x10^4$	$7.5x10^7$	$3.0x10^3$	$7.4x10^6$	$5.0x10^7$
	5	$4.0x10^6$	$3.2x10^2$	$2.8x10^3$	$2.0x10^4$	$1.7x10^6$	-	$2.0x10^2$	$6.0x10^3$	$1.0x10^7$	$5.0x10^2$	$3.0x10^5$	$1.2x10^6$
	6	$6.0x10^4$	$1.0x10^2$	$6.0x10^1$	$2.0x10^4$	$1.0x10^4$	-	-	$3.0x10^3$	$1.0x10^6$	$4.0x10^3$	$2.1x10^5$	$2.0x10^5$
-18 °C	1	$7.0x10^5$	$9.0x10^3$	$6.8x10^5$	$3.5x10^5$	$3.0x10^5$	$3.0x10^2$	$3.0x10^4$	$2.1x10^5$	$1.5x10^6$	$1.0x10^4$	$2.0x10^5$	$5.5x10^5$
	2	$1.0x10^6$	$9.0x10^2$	$1.3x10^5$	$1.2x10^5$	$1.0x10^5$	-	$1.9x10^4$	$3.0x10^4$	$1.4x10^6$	$4.0x10^3$	$1.3x10^6$	$1.9x10^5$
	3	$6.0x10^5$	$6.0x10^2$	$1.5x10^5$	$1.4x10^4$	$4.0x10^4$	-	$3.0x10^2$	$2.5x10^3$	$8.0x10^5$	$5.0x10^3$	$1.0x10^5$	$9.0x10^4$
	4	$1.5x10^5$	$3.2x10^1$	$7.0x10^3$	$2.5x10^4$	$2.5x10^4$	-	-	$1.0x10^4$	$2.5x10^5$	$1.6x10^3$	$4.0x10^4$	$7.6x10^4$
	5	$1.0x10^5$	-	$4.0x10^2$	$1.3x10^4$	$3.0x10^4$	-	-	$6.5x10^2$	$2.2x10^5$	$3.0x10^2$	$2.7x10^4$	$3.2x10^4$
	6	$1.0x10^4$	-	$2.0x10^1$	$1.0x10^4$	$1.5x10^4$	-	-	$1.1x10^2$	$2.0x10^5$	$5.0x10^3$	$3.0x10^4$	$2.0x10^4$

APC = Aerobic plate count ; CC = Coliform count

YMC = Yeast and Mold count, Ps.C = Psychrotrophic count