

THE EFFECT OF USING SORBIC ACID ON THE SHELF LIFE OF CHILLED TURKEY MEAT

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SUMMARY : The use of sorbic acid on inhibiting bacterial growth on shrink packed turkey breast and thighs was investigated. The thighs and breasts of 16 freshly slaughtered turkeys were de-boned and dipped in 0.5 % sorbic acid solution and then shrink packed. At the beginning and at the end of 10 days storage at 4°C the turkey parts were analyzed for bacterial growth and TBA values. The results were indicate that the use of 0.5 % sorbic acid solution slowed down the bacterial growth at statistically significant level. The TBA values slightly increased during storage.

INTRODUCTION : Increasing the shelf life and decreasing bacterial growth of stored fresh meat is a common problem. It is accepted that the shelf life of meats can be extended by spraying with organic solutions of acetic acid, lactic acid, citric acid and ascorbic acid (Anderson and Marshall, 1990).

Three common factors that effect the antimicrobial action of organic acids are: (1) the pH, for example the pH of the meat surface must be less then 5.5, (2) the extent of dissociation of the acid and (3) specificity of the acid molecule; the longer chain saturated organic acid are highly effective inhibitors of both gram positive and gram negative bacteria (Baird-Parker, 1980).

According to Unda et. al (1990) the surface treatment with potassium sorbate, phosphate, sodium chloride, sodium acetate solution is very effective in extending the microbiological shelf life of vacuum packed steaks kept under 2-4 °C. The relatively short shelf life of refrigerated fresh poultry is a serious problem to the meat industry. The value of sorbates for the preservation of poultry products has been studied (Robach et.al, 1980; To and Robach, 1980; Elliot et.al, 1985; Undo et.al, 1990).

The purpose of this study is to determine the effectiveness of 0.5 % sorbic acid on the microbial growth and oxidative rancidity of shrink packed turkey breasts and thighs stored at 4°C.

MATERIALS AND METHODS : The 16 turkeys were obtained alive from a commercial turkey farm and slaughtered in our pilot plant. Following evisceration, carcasses were washed under running cold water. The breasts and thighs were dissected by hand. Each breast was de-boned, cut in half and allocated to experimental and control groups laterally. The procedure was followed for the thighs also. The control specimens were stored in a plastic container in shrink fashion. The experimental specimens were dipped in the 0.5 % sorbic acid solution and then packaged in similar fashion to that of the control specimens. Both of these groups were stored in the same area under same conditions at 4°C for 10 days.

The contents of each package were tested for bacterial growth and TBA before and after storage period under sterile conditions. Total viable counts were studied using standard PCA, incubating the plates at 37°C for 48 hours. Lipid oxidation of the samples were analyzed by thiobarbutiric acid value (TBA) method of Tarladgis et.al (1960).

Statistical methods: Analysis of variance was utilized.

RESULT AND DISCUSSION : Between the initial total viable counts of turkey breast and thighs, no significant differences were found. Each part had 10^4 cells/g. In Figure 1, the effect of sorbic acid treatment on total viable counts is seen. After 10 days of storage at 4°C , the breast which were dipped in the 0.5 % sorbic acid solution had total viable counts 10^5 cells/g while the control group had 10^6 cells/g. This difference was found to be statically considerable (Table 1). In the sorbic acid treated group, total viable counts did not change significantly during the time period of 10 days. Similarly, the turkey thighs dipped into sorbic acid had a viable count of 10^5 cells/g and the control group had 10^6 cells/g.

This observed difference between counts was found significant. In contrast with the results of sorbic acid treated breasts, treated thighs showed an important increase in total viable counts during the period of 10 days ($p < 0.05$).

Robach et.al (1980) stated that the use of sorbate can control the microbial growth in cooked, raw and vacuum-packed poultry stored at 4°C and a minimum sorbate concentration of 0.1 % was necessary for good results. The minimum and maximum TBA values of control and sorbic acid treated groups are given in Table 2. TBA values for breasts and thighs were different initially ($p < 0.05$). Since thigh meat usually contains more fat and has more lypolytic activity, lipid oxidation in thighs is higher than in breasts (Mountney, 1976).

TBA values increased in all groups during the storage period ($p < 0.05$). Compared to the other groups, sorbic acid treated breasts developed lower TBA values in the same storage conditions (Fig.2). The results indicated that, since thighs showed more development of rancidity because of its high fat content, the 0.5 % sorbic solution was not effective on the inhibition of rancidity on thighs. On the other hand, this solution is found to be effective on breast meat.

Previous study have also indicated similar results on the effectiveness of sorbic acid on refrigerated and frozen turkey meat (Dawson et.al, 1978; Uebersax et.al, 1978).

CONCLUSION : It was concluded that the application of 0.5 % sorbic acid on turkey breast and thigh had a significant inhibitive effect on total viable counts in both parts of turkey. Lipid oxidation could not be controlled in thigh meat by the use of sorbic acid but in breast meat, control of lipid oxidation was achieved. Further studies should be directed to the achievement of full control in both total viable counts and lipid oxidation.

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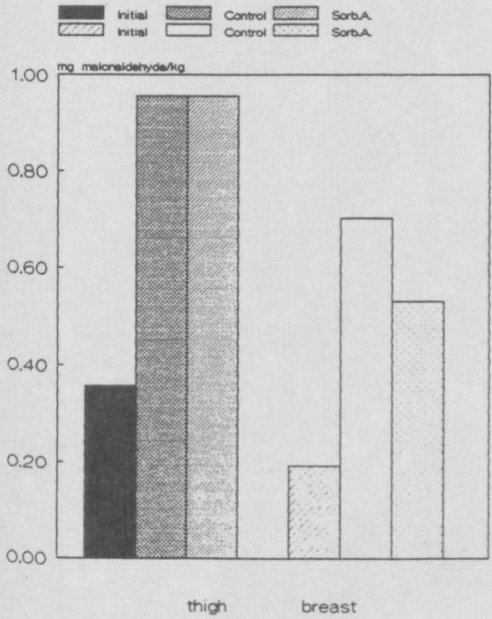


Figure 1 : TBA values of shrink packed turkey breast and thighs stored at 4 °C.

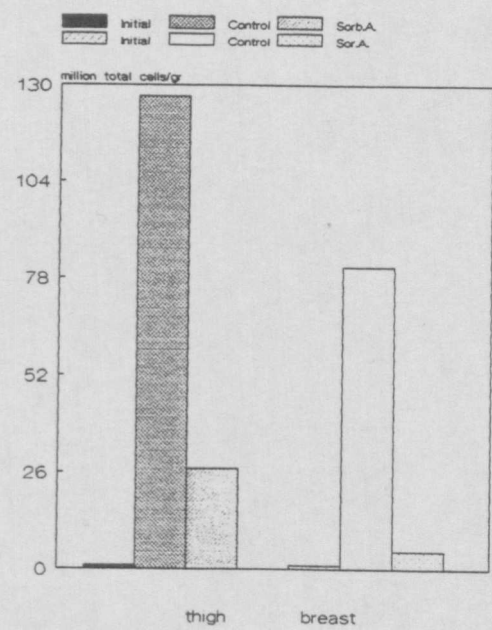


Figure 2 : Effect of sorbic acid on the total viable counts of shrink packed turkey breast and thighs stored at 4 °C.

Table 1: Total viable counts of shrink packed turkey breast and thighs stored at 4 °C. (cells/gr)

		10 th day of storage		
		Initial	Control	sorb.ac.treated
Thigh	Range	22-64 * 10 ⁴	18-297 * 10 ⁶	13-820 * 10 ⁵
	Mean	39 * 10 ⁴	127 * 10 ⁶	270 * 10 ⁵
Breast	Range	6-151 * 10 ⁴	8-195 * 10 ⁶	2-190 * 10 ⁵
	Mean	43 * 10 ⁴	81 * 10 ⁶	49 * 10 ⁵

Table 2: TBA values of shrink packed turkey breast and thighs stored at 4 °C. (mg malonaldehyde/kg)

		10 th day of storage		
		Initial	Control	sorb.ac.treated
Thigh	Range	0.11-0.94	0.39-2.03	0.31-1.87
	Mean	0.358	0.956	0.956
Breast	Range	0.08-0.47	0.27-1.4	0.08-1.17
	Mean	0.192	0.702	0.531