

Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 356

1987

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Recommended Citation

Kastner, Curtis L.; Choi, Y I.; and Kropf, Donald H. (1987) "Characteristics of preblended pork during cooler storage," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. <https://doi.org/10.4148/2378-5977.6196>

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CHARACTERISTICS OF PREBLENDED PORK DURING COOLER STORAGE

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Summary

Five pork carcasses were used to determine the effects of hot boning and various combinations of salt (0, 1.5, or 3.0%) and a phosphate mixture (0 or 0.5%) on bacteria, TBA (measure of fat rancidity), and pH values of preblended pork (preblends). In both HB (hot boned within 2 hr postmortem) and CB (conventionally boned at 24 hr postmortem) preblends, salt increased ($P < .05$) TBA values (indicates increased rancidity) and decreased ($P < .05$) growth of psychrotrophic bacteria, whereas phosphate increased ($P < .05$) pH and decreased TBA values. Salt levels could be reduced from 3.0 to 1.5% in preblends without storage problems, if phosphate (0.5%) was included. Phosphate (mixture pH 7.2) had little influence on microbial growth of preblends during cooler storage.

Introduction

Dietary guidelines indicate that salt consumption should be decreased. This is particularly true for those hypertensive individuals whose condition is aggravated by salt consumption. However, reducing salt in processed meat products may have adverse effects on their shelf life. Before manufacturing frankfurters, processors frequently preblend part of the salt and phosphate with the raw material and store the preblend for various lengths of time before final processing. This study was designed to study the effects of various levels of salt and phosphate and storage time on pork preblended with these ingredients.

Procedures

Five pigs were slaughtered at the Kansas State University Meat Laboratory. One side of each carcass was hot boned within 2 hr postmortem (HB). The other side was conventionally boned after chilling at 2-4 C until 24 hr postmortem (CB). Triceps brachii muscle portions were excised (HB at 2 hr; CB at 24 hr postmortem) and trimmed of exterior fat and connective tissue. Conventionally and hot-boned meat samples were coarsely ground and divided into six subsamples (150 g each). Each subsample was blended with one of six different combinations of salt (3 levels of NaCl; 0, 1.5, or 3%) and a phosphate mixture (2 levels; 0 or 0.5%), using a sterile spatula. Each subsample was placed in a different sterile Stomacher Lab Blender bag and stored in a 4 C cooler for 6 days. Salt was chemical grade NaCl and phosphate was the mixture of sodium acid pyrophosphate (SAPP, pH 4.2), sodium tripolyphosphate (STP, pH 9.8), and sodium hexametaphosphate (SHMP, pH 7.0) at a ratio of 1:5:4, respectively (mixture pH 7.2).

Mesophilic (grow at body temperature) and psychrotrophic (grow at refrigeration temperature) bacteria counts; 2-thiobarbituric acid (TBA) values, which are a measure of fat rancidity; and pH values were determined to evaluate shelf life during cooler storage.

Results and Discussion

Without addition of salt and phosphate, there was no difference ($P > .05$) in pH between HB and CB preblended pork (table 1). The addition of 3.0% salt increased the pH of HB compared to CB. Addition of the phosphate mixture (pH 7.2) increased pH mean values regardless of salt levels. Regardless of salt and phosphate levels, HB preblends had higher ($P < .05$) mesophilic and psychrotrophic bacterial counts than CB preblends, but these differences were not considered practically important and were all in the acceptable range for bacteria counts. For both HB and CB preblends, addition of salt (1.5 or 3.0%) decreased ($P < .05$) psychrotrophic counts, regardless of phosphate levels. Addition of phosphate (0.5%) alone increased ($P < .05$) the mesophilic counts in HB preblends or maintained similar values in CB preblends in the absence of salt. Addition of phosphate (0.5%) with salt (1.5 or 3.0%) decreased ($P < .05$) psychrotrophic counts in both HB and CB preblends, regardless of salt levels. Since a high pH phosphate mixture was used in this study, a consistently significant antimicrobial effect by phosphate was not observed or expected.

For TBA results, without addition of salt, there was no difference ($P > .05$) between HB and CB preblends regardless of phosphate level. When salt was added, HB preblends had higher ($P < .05$) TBA values than CB counterparts, regardless of phosphate levels. In both HB and CB preblends, addition of salt (1.5 or 3.0%) increased ($P < .05$) TBA values regardless of phosphate levels, but addition of phosphate (0.5%) decreased ($P < .05$) these values when salt was added.

No differences ($P > .05$) existed between HB and CB mesophilic and psychrotrophic bacterial counts and TBA values regardless of the length of storage (table 2). Except for day 2, pH values of HB were higher than those of CB counterparts. For both HB and CB, TBA values increased dramatically after day 2 of cooler storage.

Few differences existed between 3.0 and 1.5% salt, regardless of phosphate level (0 or 0.5%) or day of storage, indicating that the salt level could be reduced from 3.0 to 1.5% salt without experiencing shelf-life problems.

Table 1. Mean Values for pH, Mesophilic and Psychrotrophic Counts, and TBA of Preblended Pork by Boning Method and Salt (S) and Phosphate (P) Treatment^h

Treatment	pH value ^c		Mesophilic count ^{ac}		Psychrotrophic count ^{ac}		TBA ^{bc}	
	HB ⁱ	CB ⁱ	HB	CB	HB	CB	HB	CB
S 0 ,P 0	5.59 ^g	5.55 ^e	4.05 ^e	3.36 ^e	2.03 ^d	1.65 ^d	0.428 ^g	0.162 ^f
S 1.5 ,P 0	5.60 ^g	5.58 ^e	3.88 ^f	3.48 ^d	1.88 ^e	1.55 ^e	1.846 ^e	1.407 ^d
S 3.0 ,P 0	5.68 ^f	5.58 ^e	4.14 ^d	3.27 ^f	1.68 ^f	1.59 ^e	2.593 ^d	1.683 ^d
S 0 ,P 0.5	5.78 ^e	5.76 ^d	4.15 ^d	3.36 ^e	1.94 ^e	1.68 ^d	0.278 ^g	0.082 ^f
S 1.5 ,P 0.5	5.80 ^e	5.79 ^d	4.05 ^e	3.37 ^e	1.75 ^f	1.44 ^f	1.348 ^f	0.554 ^e
S 3.0 ,P 0.5	5.84 ^d	5.78 ^d	3.93 ^f	3.34 ^e	1.59 ^g	1.38 ^f	1.749 ^e	0.789 ^e

^aLog₁₀ organisms per g of preblends.

^bMg of malonaldehyde per 1000 g of preblends.

^cMean values of HB and CB samples, underscored by a common line, are not different (P>.05).

^{defg}Mean values in the same column bearing common superscript letters are not different (P>.05).

^hData combined from 4 sampling periods (0, 2, 4 and 6 days of cooler storage).

ⁱHB - hot boned within 2 hr postmortem.

ⁱCB - conventionally boned at 24 hr postmortem.

Table 2. Mean Values for pH, Mesophilic and Psychrotrophic Counts, and TBA of Preblended Pork by Boning Method during 6-Day Cooler Storage^d

Storage time (days)	pH value ^c		Mesophilic count ^{ac}		Psychrotrophic count ^{ac}		TBA ^{bc}	
	HB ^e	CB ^e	HB	CB	HB	CB	HB	CB
0	5.68	5.63	<u>4.12</u>	<u>3.40</u>	<u>1.90</u>	<u>1.62</u>	<u>0.36</u>	<u>0.11</u>
2	<u>5.72</u>	<u>5.71</u>	<u>4.06</u>	<u>3.34</u>	<u>1.79</u>	<u>1.46</u>	<u>0.92</u>	<u>0.38</u>
4	5.73	5.68	<u>3.96</u>	<u>3.33</u>	<u>1.78</u>	<u>1.46</u>	1.99	0.94
6	5.73	5.69	<u>3.97</u>	<u>3.38</u>	<u>1.77</u>	<u>1.64</u>	<u>2.23</u>	<u>1.69</u>

^aLog₁₀ organisms per g of preblends.

^bMg of malonaldehyde per 1000 g of preblends.

^cMean values of HB and CB samples, underscored by a common line, are not different (P>0.05).

^dData combined from 6 treatments.

^eHB - hot boned within 2 hr postmortem.

^eCB - conventionally boned at 24 hr postmortem.