EFFECTS OF PRE-SALTING ON GAME MEAT PRODUCT QUALITY

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Abstract – The present study was carried out to improve game meat quality by pre-salting* treatment. Deer leg meat specimens were obtained from Nagano and Kanagawa prefectures in Japan, subjected to pre-salting and then used for preparing bacon and sausage samples. No effects of pre-salting could be detected in the bacon samples, though flavor was found to have significantly improved. Pre-salted deer sausage samples mixed with wild boar meat were seen to have taken on more acceptable flavor and aroma.

***Pre-salting: Treatment with small amounts of curing agents such as NaCl and nitrite to remove blood residue in meat by osmometry.**

Key Words – game meat, *gibie*, pre-salting.

I. INTRODUCTION

Damage to agricultural foodstuffs by wild animals is increasingly becoming a serious problem year by year in Japan and about 60% of which is caused by deer [4]. The response to this problem has been to diminish the deer population, by allowing these animals to be hunted as a meat source. But problems have been encountered such as the dark color and peculiar odor of deer meat owing to the lack of proper methods of carcass handling post hunting. Pre-salting was conducted in the present study to improve *gibie* (game meat) product quality.

Normally, deer and wild boar meat is frozen for distribution. Methods for curing during thawing have been found to improve meat product yields [1]. In this study, these methods were examined for possible application to game meat processing.

II. MATERIALS AND METHODS

Effects of pre-salting on game meat quality: Dear meat (*Cervus Nippon*) was obtained from a local hunter association which operates in Nagano and Kanagawa prefectures. Pre-salting treatment was conducted to remove blood residue from PS group meat salted on day of the shooting and control group meat that had not been salted on that day. Following storage for 1 week, meat sample TBAR values were measured to determine the degree of oxidation. Subsequent to pre-salting with 1% NaCl and 0.1% curing salt (New Shoso, Chiyoda Kasei, Japan), the samples were washed with water and wiped with cooking-paper. Heme pigment content and TBA values were then measured for the uncooked meat.

Using frozen deer meat with or without pre-salting, bacon samples were prepared with wet-curing to determine cooking loss (loss of meat weight due to cooking), meat yield (final product weight) and pH. Bacon sensory evaluation was carried out using the 1-7 scoring method, with 3 as the most acceptable and -3 as the most unacceptable. Points for evaluation were color, odor, flavor and texture. Twenty one students at the Laboratory of Food Science, Azabu University participated in the conduct of this study.

Pre-salted deer leg meat was also mixed with wild boar meat to prepare sausage samples to be examined by sensory tests, 27 students participating, with attention to color, odor, flavor and texture. The deer, wild boar meat sample ratio was 3:1 (in meat weight). Vegetable oil was used instead of animal fat to eliminate deer meat taste.

Effects of pre-salting on the quality of game meat that had been frozen and then thawed: Frozen wild boar and deer meat samples were thawed and put into 4 groups for bacon sample preparation: 1) dry-curing without pre-salting, 2) dry-curing with pre-salting, 3) wet-curing and 4) thawing in brine (pickle-curing). Thawing was done in a refrigerator maintained at 4°C for 1 night. Pre-salting was carried out as done initially with NaCl and nitrite curing agents. Smoking was followed by heat treatment and the bacon samples were then measured for cooking loss, final weight, pH, color (L*a*b*), color forming ratio [2], residual nitrite and TBA value.

III. RESULTS AND DISCUSSION

Effects of pre-salting on game meat quality: Comparison of the pre-salting (PS) and control groups indicated total heme pigment content with its acetone-HCl medium extract (Absorption maximum: 383 nm) to show essentially the same test values, as 0.32~0.33%. No effect of pre-salting could be detected. TBA value showed 0.130 in the PS group and 0.206 in the control group. No significant difference could be seen between the two groups. Cooking loss was *ca*.30% for each sample. Yield (final weight ratio) was about 90% in all cases. pH was basically the same for both groups, 5.65~5.68. Thus, pre-salting had no significant effect on deer meat quality.

Table 1 shows sensory test scores for dear meat bacon samples. Significant difference could be seen only in the flavor for the two groups. This means pre-salting serves to diminish flavor. Pre-salting is generally conducted to render meat flavor more acceptable and prolong its period of consumption. The meat samples in this study had been handled properly after shooting and bleeding had been carried out better than formerly. The hunters had skillfully shot the deers in the heart, thus obviating the need in this study to remove blood residue by pre-salting and subsequent washing that would take away constituents giving the meat its delicious flavor.

Table1 Sensory test scores for deer meat bacon samples

Item	Non-treated	Pre-salting
Color	0.65	1.00
Odor	0.85	0.75
Flavor	1.45[a]	0.35[b]
Texture	1.00	0.60

[ab]Means within same row with different superscripts differ ($P<0.05$).

All deer and wild boar sausage mixtures showed greater palatability and thus would qualify as greater consumer acceptability (Table 2).

Effects of pre-salting on game meat quality subsequent to freezing and thawing: Final wild boar bacon sample weight was highest with pickle-curing and with wet-curing in the case of deer bacon samples. Dry-curing caused virtually no change in weight, though wet-curing increased weight during curing. Cooking loss tended to increase with the duration of curing

Table 2 Sensory assessment of deer and wild boar sausage sample test scores (27 students)

Item	Preferred	Not preferred
Color	18	9
Odor	26	1
Flavor	27	0
Texture	24	3
Overall palatability	27	0

Color formation was greater for dry-curing without pre-salting, as has been generally observed for both deer and wild boar meat.

Residual nitrite content with dry-curing was somewhat less for wild boar meat with pre-salting than in the unsalted group, but the deer group showed the opposite result, thus indicating pre-salting to have no effect on nitrite content in meat products. The pickle-curing group showed lower nitrite content than with wet-curing (Table 3).

Table 3 Residual nitrite levels in bacon samples (NO_2^- ppm)

Curing method	Wild boar	Deer
Dry without PS[1]	3.8	21.8
Dry with PS	3.3	22.6
Wet	21.3	67.4
Pickle[2]	9.5	61.2

[1]Pre-salting, [2]Thawing in pickle.

Pre-salting diminished color formation and increased TBA values. These findings should have been due to water-washing of meat which would eliminated the particular factors in muscle responsible color formation [3].

IV. CONCLUSIONS

Pre-salting was found to have no effect on heme pigment content or TBA value in deer meat. Deer bacon quality was not affected by pre-salting. Sensory quality differed significantly for pre-salted deer bacon, being less compared to the control, the reason for this possibly being that the constituents responsible for good flavor had been removed by the subsequent water-washing. Deer and wild boar mixed meat sausage showed improved flavor. Flavor and odor were generally rated higher, but darker color was considered unacceptable in some cases. In this study, the deer meat had been fresh and well bled by the hunters, so that no positive effects by pre-salting could be seen. Game meat samples under various conditions should be examined to develop better processing technology.

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