CURING OF MEAT BATTER WITH PLASMA-TREATED JUICE OF *RED PERILLA*

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I. INTRODUCTION

Nitrite is an essential additive for cured meat products. It not only imparts cured color and unique flavors to the meat but also inhibits lipid oxidation and the growth of microorganisms, including *Clostridium botulinum* [1]. Recently, there has been a growing interest in natural nitrite sources due to the increasingly negative perception of synthetic food additives. Natural nitrite additives are usually produced from the juice of natural plants containing nitrate, which is a precursor of nitrite. Therefore, plants that do not contain nitrate cannot be used for the production of natural nitrite sources. Plasma is an ionized gas containing reactive oxygen and nitrogen species [1]. *Red. Perilla* is widely cultivated as naturalized edible plant throughout the Southeast and East Asia. The extract has the biological activity that influences the lipid oxidation and microbial. Previous studies documented the generation of nitrite in plant extracts after plasma treatment and suggested that the natural nitrite sources could be produced from plants, regardless of the existence of nitrate in that plant [2]. In this context, the present study investigates the effect of plasma-treated juice of *Red Perilla* as a nitrite source in meat batter.

II. MATERIALS AND METHODS

The juice of *Red Perilla* was treated with atmospheric pressure plasma according to the method described by Jung et al. [2]. This freeze-dried juice of *Red Perilla* (PTP) had 9,133 mg/kg of nitrite. Sodium nitrite (SN) and celery powder (CP) containing 3,200 mg/kg of nitrite were purchased from the local market. Meat batter containing ground pork (80%), pork back fat (10%), water (5%), ice (5%), sodium chloride (1.5%), sodium pyrophosphate (0.3%), and L-ascorbic acid (0.03%) was cured with SN, CP, or PTP to achieve a nitrite level of 70 ppm. The meat batter without any nitrite source was used as a negative control (NC). The meat batters were cooked for 30 min at 85 °C until the internal temperature reached 75 °C. The color and amount of nitrosyl hemochrome and malondialdehyde in the cooked meat batter were evaluated according to the method described by Lee et al [1].

III. RESULTS AND DISCUSSION

The addition of nitrite to cured meat products generates nitrosyl-hemochrome, which results in increased redness, but decreased yellowness and lightness as compared to meat products without nitrite [3]. In the present study, the nitrosyl hemochrome content in the NC was found to be significantly lower ($p<0.05$) than that in PTP, SN, and CP (Table 1, $p>0.05$). However, PTP showed lower CIE L* and a* values and a higher CIE b* value than did PC and CP ($p<0.05$). These results might be a consequence of the color of *Red Perilla* [3]. The malondialdehyde content in SN was similar to that in NC ($p>0.05$). However, malondialdehyde content in CP and PTP was similar but lower than that in NC. This result indicated that lipid oxidation in cooked meat batters was inhibited by CP and PTP. In addition, the antioxidative activity in PTP was similar to that in CP, although the amount of PTP added to meat batter (7.7 g/kg) was lower than that of CP (21.8 g/kg). This phenomenon result might be related to the high antioxidative activity of PTP [3].

Table 1. Nitrosyl-hemochrome (%) content and CIE L*, a*, and b* values of cooked meat batter without curing, and meat batter cured with sodium nitrite, celery powder, and powder of plasma-treated juice of *Red Perilla* (PTP)

Treatments	Nitrosyl-hemochrome (%)	L*	a*	b*
Negative control	15.41^{c}	74.00^{a}	1.50^{d}	14.81^{b}
Sodium nitrite	32.94^{b}	70.54^{b}	7.54^{a}	11.71^{d}
Celery powder	42.97^{a}	71.01^{b}	6.85^{b}	13.02^{c}
PTP	37.33^{ab}	58.76^{c}	4.29^{c}	21.77^{a}
SEM^{x}	2.366	0.360	0.164	0.106

^{x}Standard error of the least-square mean (n = 12).

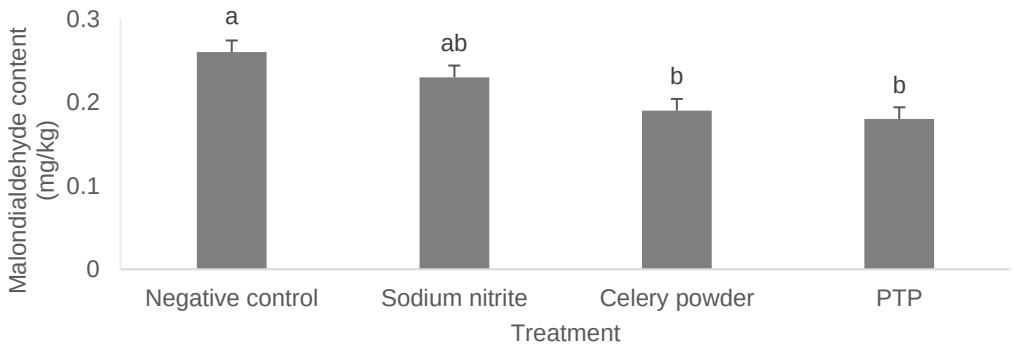

Fig. 1. Malondialdehyde content (mg/kg) of cooked meat batter without curing, and meat batter cured with sodium nitrite, celery powder, and powder of plasma treated juice of *Red Perilla* (PTP).

IV. CONCLUSION

Cooked meat batter that was cured with PTP had a color similar to that of the meat cured by SN or CP. In addition, lipid oxidation of cooked meat batter was effectively inhibited by PTP. This result clearly demonstrated the utility of PTP as a natural nitrite source for curing meat products.

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