

EFFECT OF MARINATING WITH FRUITS EXTRACTS ON THE QUALITY AND ANTI-OXIDATIVE PEPTIDE OF PORK LOIN

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Abstract – This study was conducted to evaluate the effects of marinating with fruits extracts on the quality and anti-oxidative peptide (carnosine and anserine) of pork loin. Treatments were divided into 6 groups: seasoning sauce and water for 5hr and 10hrs (CON5, CON10), marinated with pineapple for 5hrs and 10hrs (PA5, PA10) and marinated with gold kiwi for 5hrs and 10hrs (GK5, GK10). Meat proteolysis was increased in all treatments when each fruits extracts were added. The pH of PA5 and GK5 was significantly lower than that of other treatments ($p<0.05$). Hardness of pork loin marinated with gold kiwi was significantly low (4.52 ± 0.112) ($p<0.05$). Carnosine content of PA10 appeared significantly low ($p<0.05$). DPPH radical scavenging activity and FRAP of the GK10 were significantly high ($p<0.05$). Therefore, pork loin marinated with fruits extracts, especially gold kiwi for 10 hrs, would be preferred as one of the methods to promote the consumption.

Key Words – Marination, Pork, Pineapple, Gold kiwi

I. INTRODUCTION

Pork is the most popular meat in Korea, and the level of pork meat consumption has increased in recent years.[8] Pork meat consumption per capita in 2005 was 17.8 kg and rose to 19.2 kg in 2012 [6]. However, consumers have had negative preconception about livestock products[3]. In Korea, there is high demand for pork portions containing high fat content such as the belly and Boston butt and decreased preference for the low fat parts such as loin, picnic shoulder, and ham[10]. Therefore, to promote the consumption of cheap pork loin, we need to improve preference of loin

and ham by enhance tenderness and sensory quality through marinating with fruits. The animal protein from beef, chicken, pork and fish contained antioxidant di-peptide. Histidine-di-peptides such as carnosine (β -alanyl-L-histidine) and anserine (N- β -alanyl-3-methyl-L-histidine) are one of functional peptide with antioxidative activity that widely distributed in skeletal muscles, the heart and the central nervous system at very high concentrations (up to 20 mM)[9].

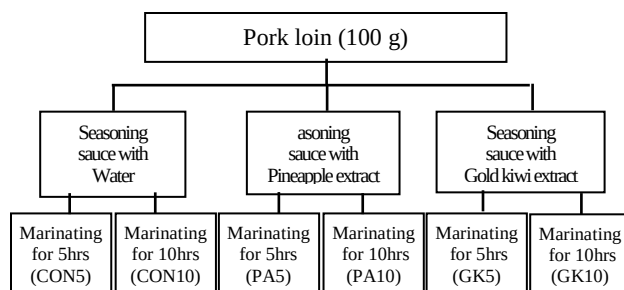
The meat industry has implemented marinating technology to help satisfy the psychological need of consumers to broaden their choice of foods and to maintain its market share. Marination of meat with brine solutions containing proteolytic enzymes from fruit extracts, such as ficin from fig, papain from papaya fruit and bromelain from pineapple have been used to hydrolyze and tenderize meat[4].

Therefore, the aim of this study was to evaluate the effects of marinating with fruits extracts on the quality and antioxidative peptides of pork loin.

II. MATERIALS AND METHODS

The pork loin of crossbred pigs (Landrace $\times$ Yorkshire $\times$ Duroc (LYD)) marinated with seasoning sauce added water, pineapple and gold kiwi sauce for 5 hrs and 10 hrs. Each fruit without peels was ground using a blender. The fruits extracts were used as a fruits sauce. The seasoning sauce, fruit extracts added to 100 g pork loin at 7 and 15% (w/w), respectively. And total water ratio was adjusted to 12%. The sample preparation procedure is shown in Figure 1.

Figure 1. Sample preparation procedure



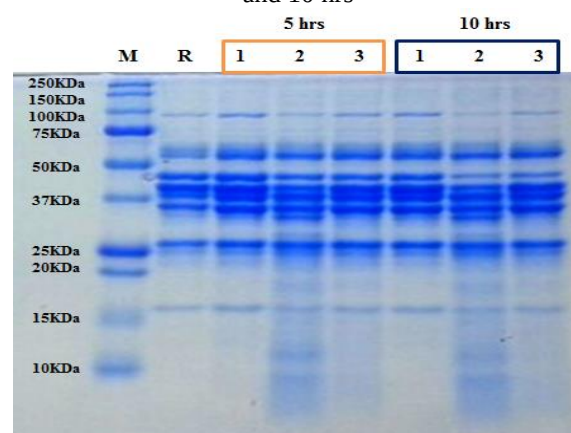
SDS-PAGE was carried out according to the revised method in Laemmli et al[7]. Samples were separated according to their molecular weights on 12% separating gels and 5% stacking gels. The separated protein bands were identified by comparison to a standard Prosi prestained protein marker (GenDEPOT, USA). The pH values were measured with a pH meter (Orion 230A, USA). Briefly, a 10 g pork loin was homogenized with 90ml of distilled water to the homogenizer (PolyTron®PT-2500E, Kinematica). Texture profile analysis (TPA) was performed directly on specific and consistent dimension of sample at ambient temperature with a Texture Analyzer TA 1 (LLOYD instruments, USA) using a cylindrical 75 mm diameter probe and a 30 kg load cell. Measurements were conducted at a pre-test speed of 1.0 mm/s, a post-test speed of 3.0 mm/s, a test speed of 3.0 mm/s, and 5 g trigger force. In Sensory evaluation, twelve panelists were requested to evaluate the sample presented in randomized order with 3-digit code for color, juiciness, tenderness and overall acceptability, on a nine-point hedonic scale (1 = dislike extremely, 5 = neither like nor dislike, 9 = like extremely). Di-peptide content was analyzed in according to the revised method in Gil-Agusti et al[5]. DPPH radical scavenging activity was estimated according to the method of Blois[2] with slight modification. FRAP (ferric reducing antioxidant power) was determined by method of Benzie and Strain[1]. The activity was provided as μM trolox equivalent. All data were analyzed by SAS software (ver. 9.2 SAS Institute Inc., USA).

III. RESULTS AND DISCUSSION

Representative protein patterns by SDS-PAGE for the samples mixed with different fruit extracts was shown in Figure 2. We confirmed that the intensity of the protein bands was reduced. It can

be seen that proteolysis of pork loin was increased in all treatments when each fruit extract was added. After fruit sauce treatment, pork protein was degraded to smaller size of peptide. This may due to enzymes in the fruit sauce.

Figure 2. SDS-PAGE profile of pork loin protein after marinating with water, pineapple and gold kiwi for 5 and 10 hrs



¹⁾ M, standards marker; R, raw meat; 5hrs 1, CON5; 5hrs 2, PA5; 5hrs 3, GK5; 10hrs 1, CON10; 10hrs 2, PA10; 10hrs 3, GK10;

The changes of pH values of marinated pork loin were shown in Table 1. In every treatments, the low pH level was shown compared to control ($p < 0.05$). This may due to the low pH value of fruits extracts itself

Table 1. Effect of a marination on the pH of pork loin

Treatments ¹⁾	pH
CON5	5.46±0.010 ^B
PA5	5.34±0.013 ^D
GK5	5.37±0.007 ^{CD}
CON10	5.86±0.006 ^A
PA10	5.40±0.003 ^C
GK10	5.48±0.020 ^B

^{A-D} Means± S.E. within same column with different superscript letters differ significantly at $p < 0.05$.

¹⁾ CON5, marinated by seasoning sauce with water and aged for 5hrs; PA5, marinated by seasoning sauce with 7% pineapple and aged for 5hrs; GK5, marinated by seasoning sauce with 7% gold kiwi and aged for 5hrs; CON10, marinated by seasoning sauce with water and aged for 10hrs; PA10, marinated by seasoning sauce with 7% pineapple and aged for 10hrs; GK10, marinated by seasoning sauce with 7% gold kiwi and aged for 10hrs.

The hardness of marinated pork loin were shown in Table 2. Hardness of a marinated pork loin was significantly lower compared to control ($p<0.05$), and hardness of GK10 showed the lowest value (4.52 ± 0.112).

Table 2. Effect of a marination on the hardness of pork loin

Treatments ¹⁾	Hardness (kgf)
CON5	7.07 ± 0.649^A
PA5	6.71 ± 0.234^A
GK5	5.47 ± 0.168^B
CON10	6.54 ± 0.250^A
PA10	4.81 ± 0.180^B
GK10	4.52 ± 0.112^B

^{A-C} Means $\pm$ S.E. within same column with different superscript letters differ significantly at $p<0.05$.

¹⁾ Refer to Table 1

The sensory properties of marinated pork loin are presented in Table 3. The color scores of all treatments were not significantly different. Except CON5, juiciness, tenderness and overall acceptability of other treatments showed no significant difference.

Table 3. Effect of a marination on the sensory characteristics

Treatments ¹⁾	Color
CON5	7.57 ± 0.202^A
PA5	7.00 ± 0.535^A
GK5	7.29 ± 0.286^A
CON10	6.86 ± 0.261^A
PA10	6.57 ± 0.369^A
GK10	6.57 ± 0.369^A
Treatments	Juiciness
CON5	4.71 ± 0.680^B
PA5	6.14 ± 0.340^{AB}
GK5	6.86 ± 0.508^A
CON10	6.14 ± 0.261^{AB}
PA10	5.86 ± 0.553^{AB}
GK10	6.43 ± 0.369^A
Treatments	Tenderness

CON5	4.57 ± 0.812^B
PA5	6.43 ± 0.269^A
GK5	7.14 ± 0.404^A
CON10	6.29 ± 0.286^A
PA10	6.57 ± 0.369^A
GK10	6.71 ± 0.522^A

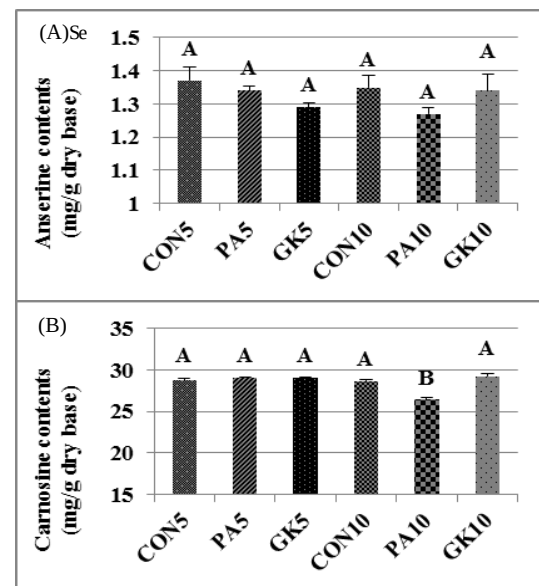
Treatments ¹⁾	Overall acceptability
CON5	5.86 ± 0.404^A
PA5	7.00 ± 0.488^A
GK5	6.86 ± 0.595^A
CON10	6.43 ± 0.369^A
PA10	6.43 ± 0.429^A
GK10	6.93 ± 0.352^A

^{A-B} Means $\pm$ S.E. within same column with different superscript letters differ significantly at $p<0.05$.

¹⁾ Refer to Table 1

Anserine and carnosine content of marinated pork loin was shown in Figure 3.

Figure 3. Anserine (A) and carnosine (B) contents (mg/g dry base) of pork loin after marinating with pineapple extract and gold kiwi extract for 5 and 10 hrs

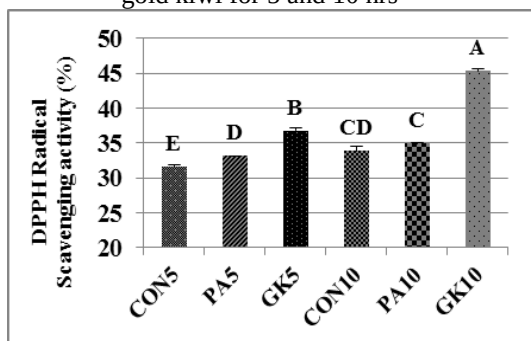


^{A-B} Values of bar with different letters among treatments differ significantly at $p < 0.05$.

¹⁾ Refer to Table 1

DPPH radical scavenging activity, FRAP of marinated pork were shown in Figure 4 and 5, respectively. DPPH radical scavenging activities and FRAP of the GK10 were significantly higher than other treatment and showed at 45.39% and 33 μ M TE, respectively ($p < 0.05$). Gold Kiwi is rich in vitamin C and has higher antioxidant activity.

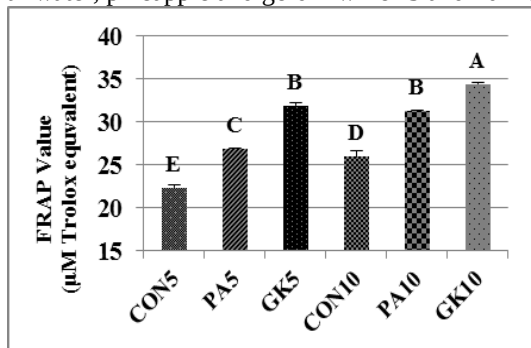
Figure 4. DPPH radical scavenging activity(%) of pork loin after marinating with water, pineapple and gold kiwi for 5 and 10 hrs



A-E Values of bar with different letters among treatments differ significantly at $p < 0.05$.

¹⁾ Refer to Table 1

Figure 5. FRAP(μ M TE) of pork loin after marinating with water, pineapple and gold kiwi for 5 and 10 hrs



A-E Values of bar with different letters among treatments differ significantly at $p < 0.05$.

¹⁾ Refer to Table 1

IV. CONCLUSION

The previous other studies focused on only quality characteristics of meat after marination. From this study, pork loin marinated with fruits extracts, especially gold kiwi extracts for 10 hrs, would be preferred by consumers due to increasing tenderness and antioxidant activity. Accordingly, it is thought that it can be used as a basic data of antioxidant activity of marinated pork loin.

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