THE EFFECTS OF PRE AND POST RIGOR MARINADE INJECTION ON SOME QUALITY PARAMETERS OF LONGISSIMUS DORSI MUSCLES

E. E. Fadıloğlu[1*], M. Serdaroğlu[2]

[1]Food Processing Department, Vocational School, Yaşar University, Izmir, Turkey

[2]Food Engineering Department Ege University, Izmir, Turkey

*meltem.serdaroglu@ege.edu.tr @yasar.edu.tr

Abstract –This study was conducted to evaluate the effects of pre and post-rigor marinade injections on some quality parameters of *Longissimus dorsi* muscles. Three marinade formulations were prepared with 2% NaCl (C), 2% NaCl+0.5 M lactic acid (LA) and 2% NaCl+0.5 M sodium lactate (SL). Injection time had significant effect on marinade uptake levels of samples. Marination had no effect on TBA values of all samples. L* values of all cooked samples increased during the storage. Marination process has been found effective on L* values. During the storage there were no significant differences in a* values except post rigor lactic acid injected samples.

Key Words – injection,, marination, pre-rigor, post-rigor, storage, meat quality

I. INTRODUCTION

Several factors influence meat tenderness such as ultimate pH, chilling temperature of carcasses, connective tissue content and enzymatic proteolysis [1]. Marination is based on processing of meat with acidic or alkaline solutions and modification of physical and chemical properties of meat by altering the meat pH from isoelectric point. Therefore, the objective of this study was to evaluate the effects of the pre and post-rigor injection of various marinade solutions (lactic acid, sodium lactate and sodium chloride) on some quality parameters of *Longissimus dorsi* muscles.

II. MATERIALS AND METHODS

Three different marinade solutions were prepared (2% NaCl, 2% NaCl+0.5 M Lactic acid and 2% NaCl+0.5 M Sodium lactate) by using distilled water at 20°C.) was obtained from five beef carcasses. *Longissimus dorsi* muscles were removed form carcasses after 1 and 24 hour of slaughter. Left sides were stored at +4°C for 24 hour before the 24 h injection treatment. Right sides were used for pre-rigor injection after 1 hour after the slaughter. The treatments were: NaCl injected control at 1 h (C1), NaCl+lactic acid injected at 1 h (LA1), NaCl+ Sodium lactate injected at 1 h (SL1) , NaCl injected at 24 h (C24), NaCl+lactic acid injected at 24 h (LA24) or NaCl+ Sodium lactate injected at 24h (SL24). Muscles were stored at +4°C for 6 days and on 0^{th} , 3^{rd}, 6^{th} days of storage marinade up take, color parameters and TBA values were measured [2].

III. RESULTS AND DISCUSSION

Marinade uptake levels were changed between 4.6 to 9.7 % (Table 1). Regardless of marinate formulation, marinade uptake of pre- rigor samples injected with marinade solutions were higher than post- rigor samples ($p<0.01$). TBA values of LA1 and LA24 samples has shown an increase during storage period (Figure 1). L* values have effected differently from marination treatment regardless of storage period . At day 0, the lowest L* value (41.8) was found in pre-rigor samples injected with sodium lactate, the highest L* value (46.3) was found in LA24 samples (Table 2). During the storage the lowest L* value was found in SL1 samples. Marinade formulation had significant effect on a* value of cooked samples. Regardless of injection time in all storage days a values of lactic acid injected samples were lower than other samples. Sawyer *et al*. [3] has investigated the effects of lactic acid concentration and the use of NaCl in marinade formulation to dark meat color and they found that as the lactic acid concentration increased, a* values of the marinated samples b* values of samples changed between 13.5-15.2 on the first day of storage (Table 2). Aktaş and Kaya [4] stated that b* values of cooked beef steak samples decreased when lactic acid concentration increased from 0 to 1.5 %.

Table 1 Marinade uptake %

Sample	Marinade uptake (%)
C1	$6.0^{b} \pm 0.88$
SL1	$9.7^{c} \pm 0.30$
SL24	$9,2^{c} \pm 0.26$
C2	$5.5^{ab} \pm 0.33$
LA1	$4.6^{a} \pm 0.07$
LA24	$5.3^{ab} \pm 0.21$

a–c: With different letters in columns are significantly different ($P < 0.01$).
T1, 2% NaCl; TL1, 2% NaCl+0.5 M Lactic Acid; TSL1,
2% NaCl+ 0.5 M Sodium Lactate

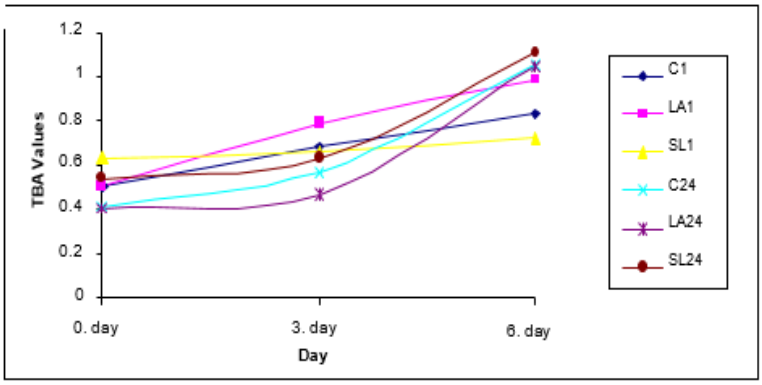

Figure 1. TBA values of marinated samples during storage

Sawyer *et al.* [3] indicated that b* values of cooked dark slices of beef samples decreased when lactic acid concentration increased from 1% to 2%.

Table 2. Color values of marinated uncooked samples

	L* value			a* value			b* value		
Sample	0^{th} day	3^{rd} day	6^{th} day	0^{th} day	3^{rd} day	6^{th} day	0.day	3^{rd} day	6^{th} day
C1	$42.0^{bx} \pm 0.54$	$43.0^{bx} \pm 0.23$	$42.4^{bx} \pm 0.59$	$6.4^{cy} \pm 0.19$	$6.1^{cxy} \pm 0.28$	$6.2^{cy} \pm 0.21$	$14.3^{by} \pm 0.13$	$14.8^{by} \pm 0.15$	$13.5^{ax} \pm 0.68$
LA1	$45.5^{dx} \pm 0.66$	$45.9^{dx} \pm 0.28$	$46.2^{dx} \pm 0.17$	$4.9^{ay} \pm 0.13$	$4.8^{axy} \pm 0.07$	$4.4^{ay} \pm 0.11$	$14.8^{by} \pm 0.25$	$14.4^{by} \pm 0.40$	$13.7^{ax} \pm 0.01$
SL1	$41.8^{ax} \pm 0.80$	$39.6^{ay} \pm 0.52$	$40.6^{ay} \pm 0.52$	$5.8^{cy} \pm 0.13$	$5.8^{cxy} \pm 0.31$	$5.9^{cy} \pm 0.23$	$13.5^{ay} \pm 0.25$	$13.7^{ay} \pm 0.39$	$13.1^{ax} \pm 0.61$
C2	$44.4^{dx} \pm 0.31$	$48.3^{ey} \pm 0.34$	$48.0^{ey} \pm 0.21$	$6.4^{cx} \pm 0.33$	$6.0^{cxy} \pm 0.31$	$5.1^{cx} \pm 0.10$	$15.2^{by} \pm 0.35$	$14.7^{by} \pm 0.42$	$13.9^{ax} \pm 0.42$
LA24	$46.3^{dx} \pm 0.37$	$44.9^{cy} \pm 0.47$	$46.1^{cx} \pm 0.71$	$5.9^{by} \pm 0.02$	$5.1^{bx} \pm 0.49$	$4.6^{bx} \pm 0.61$	$15.1^{by} \pm 0.48$	$14.4^{by} \pm 0.48$	$13.7^{ax} \pm 0.63$
SL24	$43.3^{cx} \pm 0.33$	$44.5^{cx} \pm 0.61$	$44.8^{cx} \pm 0.18$	$5.6^{cy} \pm 0.57$	$5.9^{cxy} \pm 0.25$	$6.1^{cx} \pm 0.33$	$14.9^{by} \pm 0.26$	$14.6^{by} \pm 0.12$	$13.6^{ax} \pm 0.30$

a-e: With different letters in columns are significantly different ($P < 0.01$).x-z: With different letters in rows are significantly different ($P < 0.01$).

IV.CONCLUSION

Pre-rigor marinade injection resulted higher marinade absorption. Marinade solutions that includes lactic acid has accelerated the lipid oxidation. Marinade solutions that includes sodium lactate retarded the lipid oxidation in pre rigor meat. Marinade application including lactic acid has shown highest L* value.

REFERENCES

1. Burke, R. M. & Monahan, F. J. (2003). The tenderization of shin beef using a citrus juice marinade. Meat Science 63: 161-168.
2.Tarladgis, B. G., Watt, B. W., & Younathan, M. T. (1960). A distillation method for the quantitative determination of the malonaldehyde in rancid foods. Journal of American Oil Chemistry Society, 37(1), 44–48
3.Sawyer, J. T., Apple, J. K., Johnson, Z. B. (2008). The impact of lactic acid concentration and sodium chloride on pH, water-holding capacity and cooked color of injection-enhanced dark-cutting beef. Meat Science 79: 317-325.
4.Aktaş, N., Kaya, M. (2001). The influence of marinating with weak organic acids and salts on the intramuscular connective tissue and sensory properties of beef. European Food Research and Technology 213: 88-94.

,