

EFFECTS OF LOW-TEMPERATURE LONG-TIME COOKING METHOD ON PEKIN DUCK FILLET

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I. INTRODUCTION

Sous vide is a novel cooking method that raw meat is vacuum-packaged and immersed in an isothermal water bath or steam at a low temperature (60 °C to 70 °C) for an extended time, also known as Low-Temperature Long-Time (LTLT) cooking method. During cooking, meat fluid might be expelled because of the shrinkage of myofibrils [1]. However, it was reported that pork could keep higher water content when cooking temperature was reduced [2]. Although the relationship between structural changes, juiciness, and tenderness is still uncertain, it's interesting to understand the sensory and juiciness quality of duck meat cooked by LTLT. Thus, the objective of this study was to evaluate the effects of LTLT cooking methods on cooking loss, instrumental colour and sensory properties of Pekin duck fillet.

II. MATERIALS AND METHODS

Pekin duck (10 weeks old) carcasses were obtained from a local government-regulated slaughter plant. The breast fillets (pectoralis major, 288.52±12.28 g, N = 72) were collected in 2 h postmortem. The duck breast fillets were vacuum-tumbled with a solution (2% sucrose, 1.8% soy sauce, 1.5% salt, 0.15% spice blends) for 20 min at 15 rpm. After tumbling, the fillets were individually vacuum-packaged and cooked at 60 °C or 70 °C in a water bath for 3, 6, or 10 h. The 3 h of 70 °C LTLT treatment was the control. After cooling in running tap water for 30 min, cooking loss [3], instrumental colour [4] and sensory evaluation [5] of cooked meat samples were analyzed. All data were analyzed using SAS 9.3 using split plot, mixed model procedure, $P < 0.05$ considered as significant.

III. RESULTS AND DISCUSSION

Table 1 shows that the cooking loss was lower ($P < 0.05$) in duck samples cooked with 60 °C than with 70 °C, and that the cooking loss increased ($P < 0.05$) with cooking time. The difference in cooking loss could be due to the shrinkage of myofibrils and perimysium affected by the cooking temperature and time, leading to a decrease in the water-holding capacity [6, 7]. Table 1 also shows that L^* (lightness) and b^* (yellowness) values of duck samples were not different ($P > 0.05$) between two cooking temperatures (60 °C and 70 °C) and between three cooking intervals (3 h, 6 h, and 10 h). On the other hand, a^* values (redness) in the duck samples cooked with 70 °C for 10 h was lowest ($P < 0.05$) compared with other cooked samples. This lowest a^* value might be caused by an increasing in the denaturation and aggregation of myoglobin proteins in samples cooked at higher-temperature and longer-time condition [2]. The hue angle values of the duck samples cooked at 60 °C did not differ with increasing cooking time. Conversely, the lower hue values were observed in the duck samples cooked at 60 °C than those cooked with 70 °C ($P < 0.05$), but also increased with extended cooking time (6h and 10h) at 70 °C ($P < 0.05$). Figure 1 shows that the assessments of sensory evaluation by panelists for the degree of colour and flavour were lower ($P < 0.05$) in 70 °C (6h and 10h) than in 60 °C (6h) samples. On the other hand, tenderness score was higher ($P < 0.05$) in the samples cooked at 60 °C (3 h, 6 h, and 10 h) than at 70 °C (3 h and 6 h). In summary, Figure 1 shows that the duck samples cooked at 60 °C for 3 h and 6 h received better acceptance, flavour, and juiciness compared with other cooking treatments.

Table 1. Changes in cooking loss and colour of Pekin duck fillets cooked at 60 °C or 70 °C Low-temperature long time conditions.

LTLT	Cooking Loss, %	L*	a*	b*	Chroma	Hue
60-3h	19.78 ^a	60.50	14.62 ^b	12.69	19.52	41.06 ^a
60-6h	23.80 ^{ab}	61.98	14.60 ^b	12.62	19.30	40.86 ^a
60-10h	26.36 ^b	60.26	13.37 ^{ab}	12.84	18.55	43.66 ^{ab}
70-3h	25.57 ^b	57.22	14.91 ^b	13.50	19.28	41.82 ^a
70-6h	28.27 ^c	62.44	12.16 ^{ab}	13.67	18.32	48.57 ^b
70-10h	31.92 ^c	60.90	11.72 ^a	13.82	18.28	49.95 ^b
SE	3.786	2.852	1.491	0.575	0.969	3.926
P-value	<0.0001	0.067	0.001	0.113	0.082	<0.0001

SE = Standard Error.

Means in a column ^{a-c} without common superscripts within a measurement are different (P < 0.05).

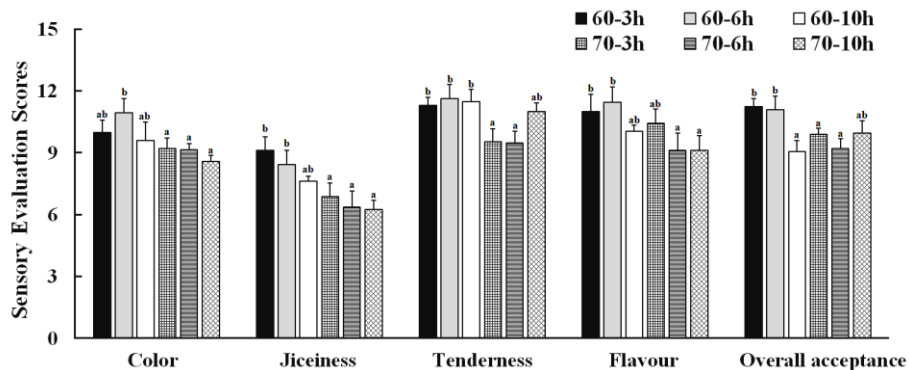


Figure 1. Sensory analysis parameter of Pekin duck fillets cooked at 60 °C or 70 °C Low-temperature long time conditions. ^{a-b}Means with different letters within the same indication differ significantly (P < 0.05).

IV. CONCLUSION

Long-temperature and long-time cooking method resulted in lower cooking loss and higher tenderness of duck breast samples. The condition of cooked at 60 °C for 6 h could be the optimal sous-vide cooking for Pekin duck filets.

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