EFFECT OF LOW PRESSURE SOUS-VIDE COOKING ON COLOR AND WEIGHT CHANGES OF CHICKEN BREAST

B. Rattanarottakun, S. Kerdpiboon*, P. Srikalong and T. Chattiang.

Faculty of Agro-Industry, King Mongkut's Institute of Technology Ladkrabang, Bangkok, 10520, Thailand.

*Corresponding author email: soraya.ke@kmitl.ac.th

I. INTRODUCTION

Chicken is promoted to create a variety of the main dish due to it is easy to digest and rich in protein and calories. It is hence popular for people, especially for children and elderly [1]. Chicken breast is a part of cuts consisting of high protein and low fat. Normally, it is cooked by grilling, boiling and streaming. Grilling, a dried heat cooking, presented chicken breast with dry and less juiciness because of moisture loss during cooking. Moreover, boiling and streaming, as well as moist heat cooking, decreased water holding capacity and nutrients because water and stream diffuse and solute its nutrients [2]. To keep chicken breast in a pouch and boil in a controlled temperature and time could prevent moisture loss and maintain nutrients inside. Sous-vide is a cooking method of food in a pouch under controlled temperature and time and then cooling to 0-3°C [3]. This technique has been widely used in food materials such as meats [4], chicken [5], eggs [6], for example. Due to spending low temperature for a long time during sous-vide process, application of pressure combination with sous-vide process could decrease the processing time and maintain the same quality of sous-vide food. This research applied low pressure sous-vide cooking to the chicken breast. Effect of low pressure conditions during constant sous-vide cooking temperature on weight and color changes were observed.

II. MATERIALS AND METHODS

Sample preparation: Chicken breast fillets were purchased from Charoen Pokphand Food (CPF) (Thailand) Pubic Company Limited, Minburi, Bangkok, Thailand. Sample weight was controlled to 100-120 g/breast. Samples were sliced into 5×10×2 cm, vacuum packed in 18×28 cm LLDPE bag and stored at 4°C prior to low pressure sous-vide cooking process. *Low pressure sous-vide (LPSV) cooking process*: Samples were cooked in a LPSV cooking using controlled temperature of 60°C and pressures of 1, 2 or 3 bar, respectively. After LPSV cooking, samples were cooled in ice bath of 3-4°C for 30 min prior to properties determination. The traditional method of boiling sample at 100°C for 30 min was used as control [2]. *Sous-vide loss*: Samples were weighed before and after cooking in order to calculate sous-vide loss from $\%\text{sous-vide loss} = \frac{W_s}{W_r} \times 100$ [7]. *Color*: Color was measured across the cut surface of the sous-vide cooked at room temperature (25°C) using a Minolta Colorimeter (CR400, Japan) and displayed in terms of *L**, *a** and *b**.

III. RESULTS AND DISCUSSION

Sous-vide loss and Color: Result in figure 1 presented the obtained sous-vide loss (%) of LPSV chicken breast. The boiling sample was found to have highest sous-vide loss compared to others. The LPSV cooked samples using 1 and 3 bar exhibited the lowest sous-vide loss in all cooking time ranges. Thermal treatment initiated certain temperature dependent reaction in the myofibrillar system, which caused denaturation of proteins and redistribution of myofibrillar, resulting in loss of water. Pressure promoted biochemical phenomena dependent on a decrease in volume, but opposed those involving an increase in volume. Moreover, pressure treatment was improved in yield and presumably enhancing the juiciness of the product [8]. All color parameters of samples were significantly with LPSV cooking pressure and time ($p<0.05$). It was found from Table 1 that sample cooked at 1 bar had slightly higher L* values than those cooked at 2 bar and 3 bar ($p<0.05$) due to denaturation of protein or higher moisture content would permit a deeper penetration of light in the tissue [5,9] Moreover, LPSV sample cooked at 3 bar and 2.5 hr. show higher a* value but not significant due to myoglobin degradation. According to [9], the increasing redness of muscle should be globin hemo chrome in which the iron is in the Fe2+ state.

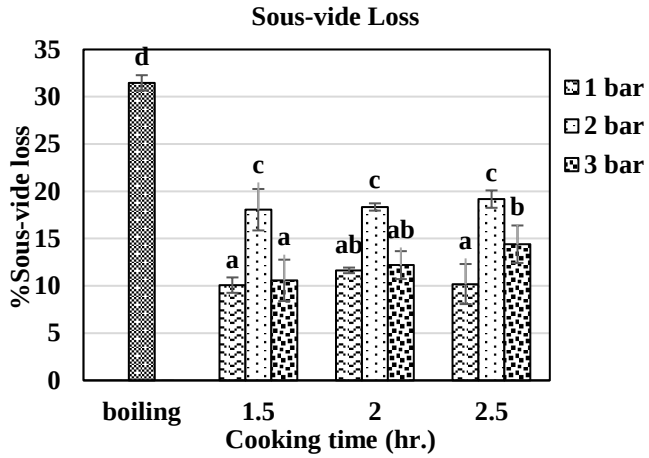

Figure 1.Weight loss (%) of chicken breast after different thermal treatments.

Table 1. Color parameter of breast chicken after different thermal treatments.

Condition	*L**	*a**	*b**
raw	51.21 ± 2.22^{a}	1.35 ± 0.72^{a}	4.31 ± 1.65^{a}
boiling	84.13 ± 1.17^{d}	2.60 ± 0.55^{b}	12.91 ± 1.25^{e}
1 bar, 1.5 hr	81.64 ± 1.94^{c}	2.55 ± 0.99^{b}	11.99 ± 0.59^{de}
1 bar, 2.0 hr	81.62 ± 2.07^{c}	2.80 ± 1.08^{bc}	12.83 ± 1.39^{e}
1 bar, 2.5 hr	83.32 ± 2.05^{cd}	3.17 ± 0.89^{bc}	11.60 ± 1.37^{cde}
2 bar, 1.5 hr	78.14 ± 1.45^{b}	2.98 ± 0.66^{bc}	9.96 ± 1.41^{b}
2 bar, 2.0 hr	77.76 ± 2.00^{b}	3.02 ± 0.92^{bc}	11.73 ± 0.89^{cde}
2 bar, 2.5 hr	78.81 ± 3.10^{b}	3.44 ± 1.20^{bc}	10.37 ± 1.57^{bc}
3 bar, 1.5 hr	79.16 ± 1.71^{b}	2.56 ± 0.80^{b}	10.89 ± 0.78^{bcd}
3 bar, 2.0 hr	78.02 ± 1.00^{b}	3.42 ± 0.41^{bc}	11.01 ± 0.80^{bcd}
3 bar, 2.5 hr	83.34 ± 0.95^{cd}	3.60 ± 0.63^{c}	12.21 ± 2.20^{de}

IV. CONCLUSION

The LPSV cooked samples had lower sous vide loss than the traditional cooking method. Sous-vide combination with pressure under low pressure with subsequent heating showed improvement in yield and less moisture loss to sample compared to traditional method. Moreover, sample after LPSV cooking trended to increase redness to chicken breast.

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