

# TENDERNESS OF SIRLOIN BEEF AFFECTED BY SOUS-VIDE COOKING

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**Abstract – The effect of sous-vide cooking conditions on tenderness of local Thai beef was studied. Sirloins of local Thai beef were prepared and sous-vide cooked using different cooking temperatures of 60, 70 or 80°C and cooking times of 6, 12, 18, 24, 30 or 36 h. Shear force perpendicular to the direction of muscle fiber was measured. Results were found that cooking temperatures and cooking times induced higher shear force values compared to raw sample. Among cooked samples, it was found that sous-vide cooking temperatures and times affected shear force value. At the same cooking temperature of 60, 70 or 80°C, samples had the highest shear force value at cooking time of 18, 18 or 12 h, respectively and trended to decrease shear force value after cooking time increased.**

**Key Words –Local Thai beef, Shear force, Sous-vide, Tenderness**

## I. INTRODUCTION

Tenderness is one of the most important attribute and influence on consumer preferences [1]. However, there are factors affecting the textural property of meat and beef such as species, feeding, preparation and processing, for example [2]. Local Thai beef, *Bos indicus* genotype, is rich in protein and nutrients [3]. Its texture is tough and this limits the application for preparation of valuated beef menu. Application of vacuumized beef in pouches and heat under controlled cooking conditions called sous-vide could improve its texture. However, cooking temperatures and times affected muscle fibers changes due to protein denature, shrink and release water from muscle [4,5]. Thus, the objective of this research was to study effect of different time and temperature cooking on changes in shear force of sirloin from local Thai beef.

## II. MATERIAL AND METHODS

**Beef preparation:** Sirloin beef muscles from local Thai beef were purchased from Huatake market, Bangkok province, Thailand. Samples were retained blood before trimming fat and connective tissue and sliced into 7×7×7 cm. The samples were sealed in plastic bag and stored at 4°C until sous-vide cooking.

**Sous-vide process:** Samples were vacuum packed into LLDPE bag with size of 15×23 cm and then sous-vide cooked using water bath at temperatures of 60, 70 or 80°C for 6, 12, 18, 24, 30 or 36 h [6]. After that samples were cooled at 4°C for 30 min prior to properties determination.

**Shear force:** Samples were cut into dimension of 3×1×1 cm. Shear force perpendicular to the direction of muscle fiber was measured using a Warner-Bratzler shear force (WBSF) by texture analyzer (TA-XT plus, England) [4]. The maximum force (N) required to shear the sample was measured.

## III. RESULTS AND DISCUSSION

**Shear force:** WBSF provides a criterion for meat tenderness assessment [7]. Cooking temperatures and cooking times affected shear force values of cooked samples. Shear force of sirloin beef is about 16.3-22.3 N (not listed). All of the cooked samples were significantly ( $P<0.05$ ) higher shear force values compared to raw samples (Fig. 1b) because of viscous flow in the fluid-filled channels between fibers and fiber bundles [4]. Among cooked samples, sous-vide cooking temperatures and times affected shear force value. During heating, connective tissue was changed in its structure from a viscoelastic to an elastic material [5]. At the same cooking temperature of 60, 70 or 80°C, samples had the highest shear force value at cooking time of 18, 18 or 12 h, respectively and then slightly decreased after cooking time increased. Results were supported by the previous research [6] found that image structure of muscle fiber at these conditions was firm and this might be because of protein denature and then it is complex and aggregated [5]. Then connective tissues are shrunk and solubilized [8, 9] and induces shear force value decrease (Fig. 1).

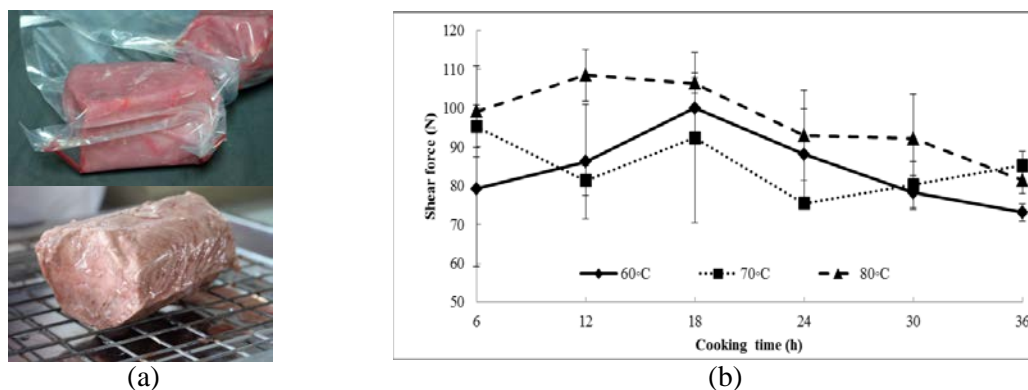


Figure 1. Sirloin and sous-vide cooked sirloin beef (a) and shear force value of cooked sirloin beef at 60°C, 70°C and 80°C for 6-36 h (b).

#### IV. CONCLUSION

Temperature and time in sous-vide process affected tenderness of sirloin beef. It had a large effect on shear force value of cooked sirloin beef compared to raw sample. At the same cooking temperature of 60, 70 or 80°C, samples had the highest shear force value at cooking time of 18, 18 or 12 h, respectively and trended to decrease shear force value after cooking time increased.

#### ACKNOWLEDGEMENT

The authors express their sincere appreciation to King Mongkut's Institute of Technology Ladkrabang (KMITL), Thailand for supporting the study financially.

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