

Tenderness Of Top Blade Beef Affected By Sous-Vide Cooking (#196)

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Introduction

The sous-vide cooking technique can be considered as a variant of cook and chill catering technology receiving great attention both from chefs and researchers in the last 10 years. The purpose of the method is to prevent the oxidation by reducing the contact of free oxygen in the air with foods and to protect the quality of the food. Beef top blade muscle, also known as Infraspinatus muscle is cross-cut from the top blade subprime. It is a tenderer and cheaper part in the beef. However, top blade cuts have a problem that it has a seam of connective tissue running through the center and every section of steak has a piece of this tough strip in the middle. Collagen is composed of triple helical structure that formed at low temperature, but dissociates above the melting point. Thermal denaturation of collagen at high temperature results in the formation of gelatin. Collagen gelation will transform tough texture into tender texture. However, tenderness is the most important quality trait determinant of consumer acceptability of meat. The objective of this research was to study effect of different time and temperature of sous-vide cooking on changes in tenderness of beef top blade muscle.

Methods

Beef preparation: Top blade beef cuts were purchased from Costco, Taichung, Taiwan. Samples were sliced into thickness of 5 cm, sealed in plastic bag, and stored at 4 °C until sous-vide cooking.

Sous-vide process: Samples were vacuum packed into Ny₁₅ PE₂₀ and LL₇₀ bag with size of 18×34 cm bag and then sous-vide cooked using water bath (B602D, Firstek, Taiwan) at temperatures of 50 °C and 56 °C for 0, 4, 8, 16 and 32h. After that samples were cooled at icy-water bath (4 °C) for 30 min prior to chemico-physical characteristics properties determination.

Tenderness: Samples were cut into blocks approximately 2.0 cm × 1.0 cm × 1.0 cm, perpendicular to the longitudinal orientation of the muscle fibers. Warner-Bratzler shear force (WBSF) and Texture Profile Analysis (TPA) test by texture analyzer (TA-XT plus, England) were performed.

Results

Shear force values of cooked samples were affected by cooking temperatures and cooking times. In 56 °C, cooked samples had significantly ($P < 0.05$) lower shear force values as cooking time increased; however, in 50 °C, no significant differences in shear force were found among cooking times. Longer cooking time tends to decreasing hardness of cooked samples. In 32h cooking time, significantly ($P < 0.05$) lower shear force and hardness values were found in 56 °C cooking temperature treatment. Stronger beef

aroma was detected as cooking time increased. No significant differences in overall acceptability were founded in samples cooked to 56 °C; however, in 50 °C treatment, overall acceptability increased as cooking times increased. Changes in meat tenderness during cooking are associated with heat-induced alteration of myofibrillar proteins and connective tissue. Results were supported by the previous research that heat (in conjunction with the moist in-pack environment) solubilizes the connective tissue leading to meat tenderization, while denaturation of myofibrillar proteins leads to meat toughening. In the 40–50 °C temperature range toughness as measured by the shear value increased. This was attributed to denaturation of the myofibrillar proteins, primarily of the actomyosin complex.

Conclusion

Tenderness of beef was affected both by time and temperature in sous-vide process. Samples cooked at higher cooking temperature had lower shear force and hardness value. At the same cooking temperature, samples with longer cooking time had lower shear force and hardness. Samples cooked to 32h, demonstrated higher beef aroma and overall acceptability. In this study, sous-vide cooking at 56 °C, 32h could be a good recommendation for top blade beef muscle. Toughness problem of top blade beef was improved significantly. Future study on sensory evaluation to determine the acceptance of consumers was suggested.

Notes

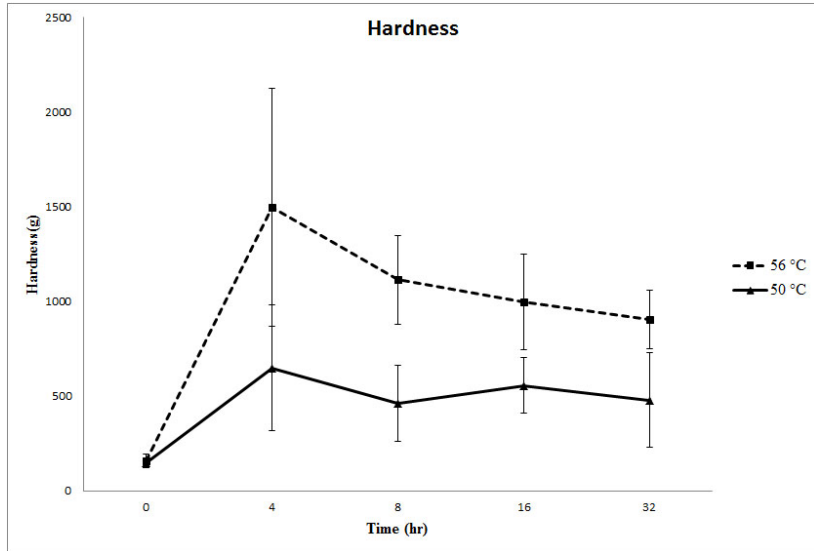


Figure 2. Hardness
Percentage of hardness of top blade beef after sous-vidé cooking at 50 °C or 56 °C for 0-32 h.

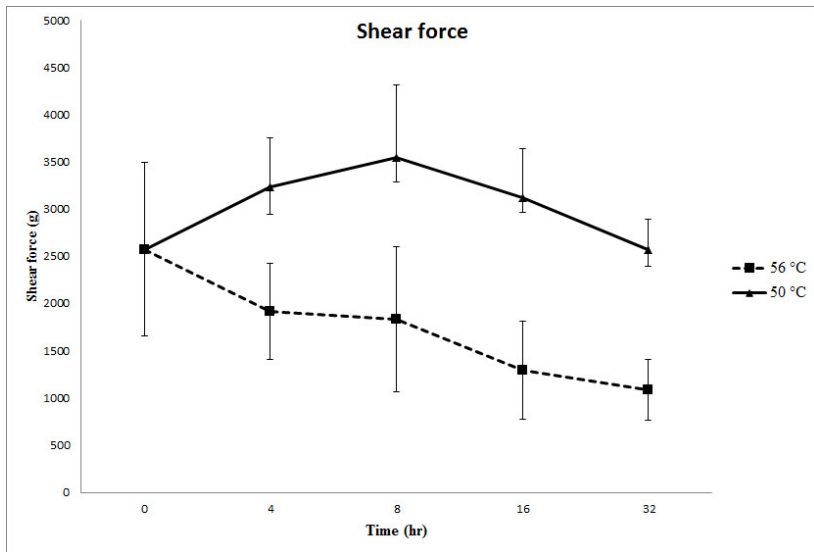


Figure 1. Shear force
Percentage of shear force of top blade beef after sous-vidé cooking at 50 °C or 56 °C for 0-32 h.

Notes