PE7.02 Chewiness and Hardness, Defined in ISO5492:1992, are Distinguished in Beef Longissimus Muscle Cooked at Four Different End-point Temperatures 44.00

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Abstract \ texture profiling for beef longissimus muscle cooked to four end-point temperatures was conducted using ISO5492:1992 texture terms in Japanese to develop objective sensory evaluation terms for beef texture other than ”tenderness”, which has not been commonly defined. Longissimus muscle harvested from three Holstein steers that were cooked 45, 60, 72, and 92 ˚C end-point temperatures were evaluated by a trained panel. Correspondence analysis indicated that the “chewiness” and ”hardness” defined in ISO5492 were distinguished. Changes in the “chewiness” and ”hardness” qualities during cooking were different from each other. These findings suggest that both “chewiness” and “hardness” as defined in ISO5492:1992 should be evaluated simultaneously to determine the sensory texture of beef.

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Index Terms \ beef, texture, sensory evaluation, ISO5492:1992

I.INTRODUCTION

TEXTURE is an important chatasteristic of the sensory properties of beef or other muscle foods. Tenderness, in particular, is generally considered the most important sensory characteristics of beef [1]. In previous meat texture studies, the meanings of “tenderness” has not been defined commonly and scientifically, however. To objectively investigate the meat texture, meat sensory texture terms should be standardized and scientifically defined. On the other hand, 32 textural words classified into 8 attributes were presented in ISO5492:1992 for sensory texture studies [2]. The ISO5492:1992 includes not only “tender” but also ”soft” and other words with simple definitions. Under the international standard, “tender” and ”soft” are classified into different attributes such as “chewiness” and “hardness”, respectively. In the present study, we tried to profile the texture of beef according to ISO5492:1992 using correspondence analysis using beef samples at 4 different cooking end-point temperatures., and found that ”chewiness” and “hardness” are distinguished under our experimental condition.

II.MATERIALS AND METHODS

A. Samples

Longissimus muscle harvested from three Holstein steers fed at Hakodate Farm (Hakodate, Hokkaido, Japan). Muscles were conditioned for 2 weeks after slaughter, and vacuum packed and stored at -40C before sensory experiments.

B. Sensory panel

Research scientists of the animal products division of the National Institute of Livestock and Grassland Science were recruited as the sensory panel. Panelists were trained by lecture about ISO5492:1992 texture words and the definitions of those words. The numbers of panelists were 17 (10 males and 7 females).

C. Sample preparation

Samples were formed into 2~2~2cm cubes, and subjected to heat treatment. End-point temperatures were 45, 60, 72, and 92 ˚C. Heat treatment was carried out by a steam convection oven, model SSC-10DCNU (Maruzen Co., LTD., Tokyo), and kept at 45-48 ˚C, 60-63 ˚C, 72-75 ˚C, and 92- 95 ˚C for the end-point 45, 60, 72, and 92 ˚C, respectively. Samples were chilled in ice-cold water immediately after heat treatment, and kept for 10 minutes. These samples were applied to the sensory study at room temperature.

D. Sensory test

During the sensory evaluation, each panel member was placed in an individual booth illuminated by red lightning. Thirty texture items for solid foods were selected from ISO5492:1992 [2], two Japanese onomatopoeias for meat texture were selected from an onomatopoeia list [3,4]. Another 6 typical texture words were also presented as evaluation items without any definition. For the sensory test, two samples each were presented to each panelist at each end-point temperature, thus each panelist tested a total of eight samples in each trial. Panelists tested each sample and chose the terms that were suitable for the texture of the samples.

E. Statistical analysis

Statistical analysis was performed using the SAS system (version 9.12, SAS Institute, Cary, NC). Correspondence analysis was used for the frequency of selection of each texture word by using the CORRESP procedure of SAS.

III. RESULTS AND DISCUSSION

The result of correspondence analysis for the LT muscle is presented in Fig. 1. The proportion of each factor was 72.69%, 22.29%, and 4.03% for factors 1, 2, and 3, respectively. The intensity of "chewiness" increased along the axis of factor 2. The intensity of "hardness" increased along the axis of factor 1. Thus, "hardness" and "chewiness" are divided by the sensory panel for cooked beef LT muscles. The "moisture" intensity decreased along the axis of factor 1, which has trend similar to that of "hardness". These results for the LT, ST, and PM muscles indicate that "chewiness" and "hardness" were not parallel. We posit that "chewiness" and "hardness", which are scientifically defined in ISO5492, were useful terms for the sensory assessment of meat texture characteristics. In addition, cooking treatment at 60 ˚C increased the correspondence score of factor 2 as compared to samples treated at 45 ˚C. Samples treated at 72 ˚C were similar in scores of factor 2, but had increased scores of factor 1. Cooking treatment at 92 ˚C decreased the score of factor 1 and increased the score of factor 2. Our results indicate that "chewiness" and "hardness" should be differentiated in investigations of changes in beef texture during cooking.

IV. CONCLUSION

In the present study, we indicated that ISO5492 "chewiness" and "hardness" were differentiated in texture of beef longissimus muscle, and that the changes in "chewiness" and "hardness" during cooking were different.

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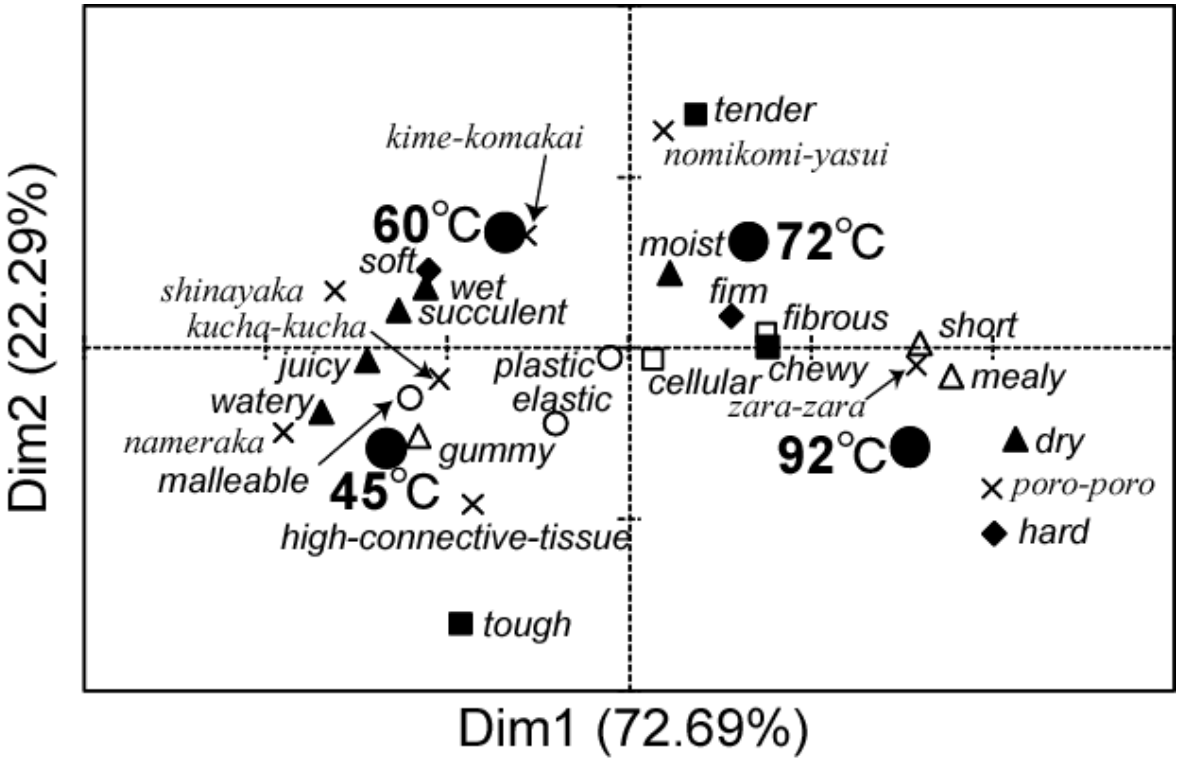

Fig. 1 Correspondence analysis of texture terms for beef longossimus (LT) muscle cooked at 45, 60, 72, and 92 ˚C. Plot for each end-point temperature was the mean value of the correspondence scores of three beef cattle.

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