PE7.30   Palatability Grading Discriminant Analysis with Sensory properties of Hanwoo beef evaluated by Korean Consumers 318.00

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Abstract The objective of this study was to investigate the palatability grade and sensory variables using discriminant analysis based on sensory evaluation data of 3,976 Korean consumers for Hanwoo beef. Sensory variables were tenderness, juiciness, flavor-likeness and the palatability grade was the satisfactory level for Hanwoo beef samples cooked with boiling, roasting and grilling. 10 cuts (short plate, top sirloin, striploin, loin, chuck tender, eye of round, chuck roll, bottom round, top round and brisket) were obtained from sixty Hanwoo bull and steers and each cut was prepared the same manner depending on cooking method for sensory test. The weightings formulated from the principal component analysis for tenderness, juiciness and flavor-likeness are 0.51, 0.17 and 0.29, respectively. Therefore, tenderness was the most decisive contributor, followed by flavor and juiciness for Korean consumers. The palatability grade had 4 categories (unsatisfactory, satisfactory, very satisfactory, extremely satisfactory) and the palatability grade cut points were estimated as 50, 70, 84 based on PS3 (palatability scores with tenderness, juiciness, flavor-likeness) in the discriminant analysis. Index terms : palatability grade, discriminant analysis, consumer testing, sensory evaluation

I. INTRODUCTION

Beef palatability was important factor for consumer satisfaction. Consumer willingness to pay more for higher quality beef has been reported[4]. The eating quality of beef has been evaluated in a number of consumer studies [6,9]. They reported that tenderness, juiciness and flavour were highly correlated with overall acceptability and that IMF.

In Korea, beef quality was evaluated by the carcass grading system based on meat color, fat color, texture, and maturity of loin muscle and intramuscular fat contents and there were 5 quality grades such as 1++, 1+, 1, 2, 3. According to the statistics data of 2007, 47.3% Hanwoo produced high quality grade beef (above grade 1) when compared to the other breed [1]. MSA(Meat Standard Australia) grading system in Australia was developed using the sensory results from consumer testing and MQ4(meat quality scores with tenderness, juiciness, flavor-likeness, overall acceptability) as the numeric measure from statistical analyses to describe palatability of beef[12].

II. MATERIALS AND METHOD

Animals, treatment, and sample preparation A total of 60 Korean Hanwoo steers (26-32months old, Korean quality grade 1++, 1+ , 1, 2) and 10 Korean Hanwoo bulls (24-26months old, Korean quality grade 3) were slaughtered at the National Institute of Animal Science (NIAS), Suwon(Table 1). On the following day, 10 cuts (short plate, top sirloin, striploin, loin, chuck tender, eye of round, chuck roll, bottom round, top round and brisket) were selected and prepared from each carcasses, vacuum packaged and stored at 2 ¢J for 0, 7, 14 days. After aging, 50 x 70 x 25 mm steaks were cut across the fiber direction. To prepare Korean-style roasted and boiled beef strips, frozen meat blocks were tempered at 4 ¢XC and sliced into 75 x 20 x 4 mm, parallel to the fiber direction. The sensory samples were vacuum-packed separately and stored at -20„aC until analysis. Sensory evaluation of grill, Korean style roast and boil cooking samples The Korean¡Vstyle thin slice roast cooking was performed by using the methods described by [2].

The beef strips were cooked by placing these on the tin plate equipped with a water jacket (ca. 245-255oC). Beef strips were boiled at 100 oC for 2 minutes to cook for Korean traditional ¡¥boil dish¡¦[2]. The sensory testing for grill was also performed according to the method described[3], which beef samples were grilled at 220-230oC by using a double surface Panini Griller for 5 min to achieve a medium degree of doneness (approximately 70oC). The cooked strips were immediately served to each panelist for evaluation. Consumers were asked to score the samples for tenderness, juiciness, flavor, and overall liking. Scoring was done on a single sheet using four 100 mm line scale with 20 mm gradients marked. The four lines for sensory traits were anchored with the following words: tenderness = very tough (0) to very tender (100); juiciness = very dry (0) to very juicy (100); flavor = dislike extremely (0) to like extremely (100). The consumers evaluated the satisfactory level for each tested sample based on the previous three sensory traits as unsatisfactory, satisfactory, very satisfactory, extremely satisfactory. Consumers to test beef samples were recruited from 4 regions (Seoul, Kyunggi, Honam and Youngnam) based on the quarter sampling of population numbers. Statistical analysis Data were analyzed by using the SAS program[11]. PS3, the palatability scores from tenderness, juiciness and flavor-likeness, were obtained using principal component analysis[5]. The linear discriminant analysis for grade with PS3 was performed using the grade as a group variable and PS3 as a discriminant variable[9]. I.

III. RESULTS AND DISCUSSION

PS3 was obtained using principal component analysis such as¡iPS3 = 0.51*tenderness + 0.19* juiciness + 0.30*flavor-likeness¡jwhich gives the largest variation among the linear component of tenderness, flavor and juiciness. Among the scaled weightings for tenderness, juiciness and flavor as determinants of satisfactory level, tenderness was the most decisive contributor, followed by flavor and juiciness. This was consistent with the previous studies that identified tenderness as the most important factor to consumer preference in Australia [12], America[7]and EU[8]. The statistical discriminant analysis was conducted with PS3 for palatability grade (Table 2). The linear discriminant function is estimated to separate each group (Table 3). The resubstitution error rate of

misclassification is 0.3504. The grade cut point of 1, 2, 3 and 4 was estimated as 50, 70, 84 based on PS3 in the discriminant analysis. The cut point for consumer acceptability is determined by correlating PS3 scores with the two product categories of ¡¥unsatisfactory¡¦ and ¡¥satisfactory¡¦ and the cut point was at least 50. Fig. 1-(a) showed the distribution of PS3 indicating each grade in each bar. As PS3 increases, higher grades are more. Fig. 1-(b) provides the estimated density plot in which PS3 increases, higher grade has more probability. The estimated posterior probability curves are in Fig. 2-(b). The smaller PS3, the higher probability is given for lower grade.

IV. CONCLUSION

Tenderness was the most critical factor to decide Korean consumer¡¦s palatability when Hanwoo beef was cooked and served with three cooking methods. Four palatability grading levels were established by palatability scores with tenderness, juiciness and flavor-likeness (PS3) using discriminant analysis. Based on the result of this study, the palatability grading system reflected on the consumer¡¦s sensory testing can be developed with further research such as regression analysis with PS3.

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