PE7.06 Study on palatability preference of beef hot pot in P.R. China 76.00

Yanwei Mao (1) maoyanwei@163.com, X Luo(1), R Liang (1), X Zhang (1)
(1)Shandong Agricultural University, Peoples Republic of China

Abstract: The objective of this paper was to determine the weight of tenderness, flavor and juiciness in eating quality, and evaluate consumer acceptability of shear force and effect of marbling on palatability of hot pot in China. A panel of 120 people evaluated slice made from 6 striploins. The result indicated that the weight of tenderness, flavor and juiciness is respectively 0.38, 0.41 and 0.21 in eating quality of hot pot. Consumer assessed that the beef is tender when shear force value less than 4.39kg. Marbling has significant effect on eating quality, and marbling No.7 is enough to meet consumer's requirement.

Yanwei Mao, College of Food Science and Engineering, Shandong Agriculture University, Shan Dong Taian, 271018, P.R. China, (e-mail: maoyanwei@163.com)
Corresponding author: Tel: +86 0538 8242745; Fax: +86 0538 8242745.
E-mail address: luoxin@sdau.edu.cn

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I. INTRODUCTION

Beef consumption keeps a rapid growth in China at present. As a top grade consumption, hot pot became popular in most cities. Although China has enormous consumer groups, no study was found on consumer preferences and factors influence eating quality of hot pot. The Study of beef consumption around the world focused on steak, roast beef and so on, but seldom was found on eating quality of hot pot. This paper studied the preference of Chinese consumers to hot pot, especially to tenderness and marbling which have important impact on beef eating quality. We hope that this study is able to provide some guidance to beef production, sale and consumption in China.

II. MATERIALS AND METHODS

Intensive feeding *Luxi Yellow Cattle×Limousin* were slaughtered at thirty months old according to standard handling procedures. The carcasses were split with a band saw, and chilled under commercial conditions at 4 °C for 24 h. The pH of each carcass was measured at 24 h post-mortem on the lumbar region with a penetrating electrode (pH-meter METTLER TOLEDO SG2). Six carcass with pH value between 5.4-5.6 were selected, and the pH of carcass were determined between the 12th and 13th ribs at a depth of 4cm. The marbling of carcass were No.1, No7 and No.11(Beef marbling standard Japan, Meat Grading Association). The Striploin was removed from carcass, vacuum pack and aged to seven days. Then fabricated two 4cm-thick steaks for instrument analysis. The residual Striploin were frozen and stored at -18°C until further analysis.

The steaks were heated in a water bath at 75°C to an internal temperature of 70°C. The cooked meats were cooled to room temperature and balanced overnight in a refrigerator (4°C) and sampled by using a 12.7 mm circular core to determine shear force, and muscle fibers must parallel to the longitudinal axis of the sample.

Eight sample cores from each sample were sheared across the length of the core with a Warner-Bratzler shear attachment on the Texture analyzer (TA-XT2i U. K. Stable Micro System).

For consumer test, Striploins were thawed in refrigerator (4°C). When the central temperature raised to -4°C, Striploins were cut into 1mm thick slice along the vertical direction of muscle fibers. Operator put the slice into boiling water, and count time when water boiled again. After 60S, the slice was taken out of water and then sent to consumer test.

In consumer test, Consumer panelists were made up of students and teachers aged from 20 to 50 recruited from the College of Food Science and Engineering, Shandong Agricultural University. 120 panelists were grouped into six groups. The experiment was conducted by one panelist group each time, and was reconducted for six times. Each sample was coding, and presented to each panelist in random.

Panelists were asked to evaluate all six samples using 6-point scales for level of tenderness (1 = extremely tender; 6 = extremely tough), level of beef flavor (1= extremely flavorful or intense; 6 = extremely bland or no flavor), and level of juiciness (1 = extremely juicy; 6 = extremely dry). Every panelist described tenderness of sample as very tender, tender, tough, very tough. The category of the sample was determined by more than 60% panelist. The 0-1 mark method was applied to determine the weight of attribute of tenderness, juiciness and flavor. Panelists compared every two attributes of tenderness, juiciness and flavor and then chose the more important one.

III. RESULTS AND DISCUSSION

This paper applied the 0-1 mark method to determine the weight of attribute. The results showed that the weight of tenderness, flavor, and juiciness is respectively 0.38, 0.41 and 0.21. The formulated composite scores can reflect the palatability of meat, and the composite scores= 38% of Tenderness Score + 41% of Flavor Score +21% of Juiciness Score. In most beef cooking method, tenderness is the most important attribute, but the result of this experiment showed that flavor played an important role. Because the thickness of the beef slice was comparatively thin, the flavor substances dissolved in water more easily and thus reduced flavor. So in hot pot the flavor of beef slice highlighted and the weight of tenderness decreased. The thin slice had a positive effect on tenderness. Boles, J. A., & Shand, P. J concluded that slice thickness had a dramatic affect on tenderness. It is important to keep slices small when manufacturing stir-fry slices, because shear values were increasingly higher as the thickness of the slice increased [1].

The experimental results showed that consumers can differentiate differences in beef tenderness (results in table 1), and that low shear force samples were considered better in tenderness. Compared with the experiment of steak, consumers had a low sensitivity of tenderness in hot pot. Consumer can differentiate very tender from tender in steak, while can't detect the difference in hot pot. The reason may be that the slice thickness of beef had a positive impact on tenderness.

Destefanis, G. et al. studied the relationship between beef consumer tenderness perception and Warner-Bratzler shear force, he scaled WBs into three categories at last, category 1: >5.38kg, tough; category 2: 4.37-5.37kg, intermediate; categories 3: <4.36kg, tender [2]. The result of this paper had some similarity to G. Destefanis's result. This indicated that the similar sensory about shear force acceptation had existed between different countries.Consumer evaluation results indicated that marbling have significant impact ($p < 0.05$) on tenderness, flavor and juiciness. But in all the three eating quality of tenderness, flavor and juiciness, there were no significant difference between Marbling grade No.11 and No.7. The result means Chinese consumer can't detect palatability difference between marbling No.11 and No.7. So there is no meaning to invest too much money to produce beef of marbling grade No.11. Meanwhile reasonable content of fat, particularly saturated fat, could decrease the crisis of cancer, obesity and heart disease to people.

Though most literature suggested that marbling just had little effect on tenderness, the result of this paper showed that meat marbling No.11 and No7 were more tender. Perhaps the deposited of intramuscular fat disrupted the structure of the endomysium and diluted the fibers, which resulted in more tender meat. Webb, .E.C., & O'Neill, H.A. reported that WBs values indicated that tenderness improved with increasing marbling group, though consumer can't detect differences in tenderness [4]. Jeremiah et al. assessed that Intramuscular fat affected tenderness indirectly, and affected juiciness and flavor directly, and accounted for 12-14% of the variation in all palatability traits [3].

Marbling affected flavor and juiciness, the reason may be that fat was the precursors of flavor. Fat and it's substances stimulated salivary gland produce Saliva, resulted in juiciness. Webb, .E.C.,&O'Neill, H.A. concluded that the reduction of fat content in meat may adversely affect the eating satisfaction, and that less saturated fat may also influence the palatability and flavor of meat [4].

IV.CONCLUSION

As the most popular beef consumptive method in P.R. China, hot pot is worth studying. The result showed that the weight of tenderness, flavor, juiciness were respectively 0.38, 0.41 and 0.21 in eating quality of hot pot. This means the attribute of flavor is most important, and producer must ensure the content of fat at an adequate level to satisfy consumers. Consumers assessed that when shear force valued less than 4.39kg, the meat is tender. When shear force arrived at 6.11kg, the meat is tough. So shear force of beef products for hot pot must be kept under 6.11kg. Marbling have significant effect on eating quality, but marbling No.7 can meet consumer's requirement. So investment of too much money to produce higher level of marbling beef not only means waste, but may harm consumer's health in China.

Chinese beef industry has just started. There are lots of problems cry for solution. Producer must introduce advanced technology to improve the quality of beef, and grasp the need of Chinese consumer. Suit is best.

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Table 1 Effect of shear force on hot pot tenderness and consumer preference

Samples	Shear force/ kg/D-1.27cm	Sensory evaluation	Consumer descriptive
Sample 1	3.00±0.42a	2.00±1.07a	tender
Sample 2	3.32±0.63a	2.80±1.08a	tender
Sample3	4.39±0.28ab	2.20±1.37a	Tender
Sample 4	5.23±0.34b	4.06±0.96c	Tough
Sample 5	6.11±0.71c	4.20±1.52c	Tough
Sample 6	7.20±1.54d	5.73±0.59d	Very tough

Different letters indicate significant differences ($P < 0.05$) between values within the same trait.

Table.2 Effect of marbling on hot pot Palatability

Marbling grade	tenderness	Flavor	Juiciness	composite scores
NO.11	2.00±1.07a	2.26±1.16a	1.93±1.03a	2.09
NO.7	2.20±1.37a	1.73±0.79a	2.66±1.29a	2.10
NO.2	4.06±0.96b	3.73±0.96b	3.99±1.03b	3.91

Different letters indicate significant differences ($P < 0.05$) between values within the same trait