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SENSORY AND SHEAR FORCE EVALUATIONS OF FOODSERVICE TENDERLOIN STEAKS (*M. PSOAS MAJOR*) SOURCED FROM DIFFERENT MARKET CLASSES OF US DOMESTIC AND IMPORTED BEEF

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I. INTRODUCTION

In the United States (US), the beef tenderloin (*M. psoas major*) is a highly sought-after portion of the beef carcass and is among the most tender beef cuts [1]. Yet, tenderloins are also one of the highest-priced subprimals and steaks in the US marketplace. Consequently, foodservice establishments often seek alternative cuts with consumer acceptance ratings comparable to USDA Choice and USDA Prime but at a lower price point. This creates opportunities for establishments to find more cost-effective sources for consumers. Potential alternatives for US foodservice beef tenderloin supply could include USDA Select quality grade, grass- and grain-finished cows, and import markets such as those from Australia and Uruguay. Interestingly, Australian consumers value many of the same palatability traits as Americans, with taste and tenderness being the most important factors [2], indicating that acceptable consumer eating experiences may be sourced from import markets. It is of interest to determine if incorporating additional beef tenderloin sources into foodservice markets could provide a more cost-effective tenderloin option. Therefore, the objectives of this study were to evaluate six different sources of tenderloin steaks and to determine the effect of source on consumer sensory ratings and objective tenderness measurements.

II. MATERIALS AND METHODS

Tenderloins were sourced from six carcass types: (1) USDA Choice carcasses, (2) USDA Select carcasses, (3) white-fat cow carcasses, (4) yellow-fat cow carcasses, (5) Uruguayan carcasses, and (6) Australian carcasses. Twenty-seven IMPS 190A tenderloins were collected from each of the six different sources (n = 162). Each tenderloin was cut into 6 steaks (n = 162 steaks per source). Three steaks were used for sensory evaluation, two steaks were used for Warner-Bratzler Shear (WBS) force testing, and one steak was held in reserve. Steaks for sensory analysis and WBS force were cooked on a Star International Commercial Flat-Top Grill (Max Model 536TGF; St. Louis MO, USA) preheated for 30 minutes to a surface temperature of approximately 177 °C. After placing on the grill, steaks were flipped when internal temperature reached 35 °C and then cooked to a final temperature of 70 °C. Internal steak temperatures were monitored using digital thermometer probes (ThermoWorks ThermoPop, American Fork, UT, USA). Consumers evaluated sensory steaks for juiciness like/dislike, flavor like/dislike, tenderness like/dislike, and overall like/dislike. For steaks destined for WBS force, three 1.27 cm-diameter cores were taken from each steak, parallel to the muscle fibers, using a hand-held coring device. Cores were sheared once, perpendicular to the muscle fibers, on a United Testing Machine (United SSTM-500; Huntington Beach, CA, USA) at a cross-head speed of 200 mm/min using a 10-kg load cell, and a 1.02 cm thick V-shaped blade with a 60° angle and a half-round peak. Average Newtons required to slice the three cores from each steak was calculated. Data were analyzed by carcass type utilizing JMP Pro (v. 15.2.1; SAS Institute, Cary, NC, USA). The Fit Model Standard Least Squares function was used for one-way analysis of variance, and mean comparisons were conducted using Student's t test at an alpha of $P < 0.05$.

III. RESULTS AND DISCUSSION

Australian and white-fat cow steaks were ranked highest ($P < 0.05$) overall, and received among the highest ratings for tenderness, juiciness, and flavor like/dislike. Uruguayan steaks received the lowest or among the lowest ratings for overall like/dislike, tenderness like/dislike, flavor like/dislike, and juiciness like/dislike, with flavor like/dislike being most likely to have the largest impact on overall like/dislike. Findings of flavor like/dislike ratings for USDA Choice and USDA Select steaks did not differ ($P > 0.05$), supporting Legako, Brooks, O'Quinn, Hagan, Polkinghorne, Farmer and Miller [3] who reported that consumers ranked USDA Choice and USDA Select graded cuts from the *M. psoas major* to be similar in flavor. These overall findings may be attributed to Australia's use of the Meat Standards Australia system, which collects a variety of physical and chemical carcass factors, aiming to provide consumers with a guaranteed quality eating experience [4]. Furthermore, white-fat cow steaks may have performed so well due to the improved meat quality characteristics that would be associated if the tenderloins were sourced from cattle of dairy influence, though in the current study the breed source of cow tenderloins is unknown.

Additionally, the results of consumer preference for white-fat cow steaks possibly support Boleman, Miller, Buyck, Cross and Savell [5], who reported that increased time on feed resulted in lower overall values for WBS force. This could explain the high tenderness value we observed in the white-fat cow steaks. For WBS, Australian, white-fat cow, and yellow-fat cow steaks received among the lowest ($P < 0.05$) values, whereas USDA Select and Uruguayan steaks received among the highest values ($P < 0.05$).

Table 1. Least squares means and SEM for sensory panel ratings[1] ($n = 84$ per source) and Warner-Bratzler Shear (WBS) force ($n = 54$ per source) of steaks[2] stratified by source[3]

Source[2]	Overall like/dislike	Tenderness like/dislike	Flavor like/dislike	Juiciness like/dislike	WBS, N
USDA Choice	6.7^{b}	7.3^{a}	6.5^{ab}	5.8^{b}	16.5^{bc}
USDA Select	6.1^{c}	6.8^{bc}	6.0^{b}	5.7^{b}	17.6^{ab}
White-fat cow	7.2^{a}	7.5^{a}	6.8^{a}	7.2^{a}	15.0^{d}
Yellow-fat cow	6.5^{bc}	6.7^{c}	6.2^{b}	6.9^{a}	15.2^{cd}
Australian	6.9^{ab}	7.3^{ab}	6.8^{a}	6.8^{a}	16.0^{cd}
Uruguayan	5.6^{d}	6.7^{c}	5.3^{c}	6.1^{b}	17.8^{a}
SEM	0.1	0.1	0.1	0.1	0.4
P-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

[a-d]Least squares means in the same column without common superscript letters differ ($P < 0.05$)

[1]Sensory panel ratings: overall like/dislike (9 = like extremely; 1 = dislike extremely), tenderness like/dislike (9 = like extremely; 1 = dislike extremely), flavor like/dislike (9 = like extremely; 1 = dislike extremely), and juiciness like/dislike (9 = like extremely; 1 = dislike extremely).

[2]Number of steaks, 84 per source for sensory panel ratings and 54 per source per source for WBS.

[3]Steak sources: (1) USDA Choice [6], (2) USDA Select [6], (3) white-fat cow (industry term used to describe products primarily from dairy cows where high-concentrate feeding results in external fat that is generally white in appearance and carcasses are similar in quality to USDA Select or higher), (4) yellow-fat cow (industry term used to describe products primarily from beef cows where forage-based feeding results in external fat that is generally yellow in appearance and carcasses are similar to USDA Utility or USDA Cutter), (5) Uruguayan (imported products from the country of Uruguay where the cattle are primarily forage-finished), and (6) Australian (imported products from the country of Australia where the cattle are primarily forage-finished).

IV. CONCLUSION

This study identified potential alternative sources for foodservice tenderloins that may be more cost effective, without having to sacrifice consumer acceptability. The emphasis consumers place on tenderness resulted in tenderloins from white-fat cow carcasses ranking higher among palatability traits across all four sensory factors evaluated. Consumers also found tenderloins from Australian cattle to have no differences, or improved palatability traits, when compared to USDA Choice tenderloins. Results from this study indicate white-fat cow and Australian carcasses could both serve as potential sources of tenderloins at potential lower-costs for US foodservice establishments without sacrificing a consumer's eating experience.

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