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Predicting Beef Tenderness and Juiciness

H. Henderson*, H. L. Laird*, T. Luckemeyer, R. K. Miller, C. R. Kerth, and K. Adhikari

Texas A&M University, College station, TX, USA

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Objectives

The objective of this study was to predict overall consumer liking (OLike) or Warner-Bratzler shear force (WBSF) using either consumer tenderness (OTend) and juiciness (OJuice), trained descriptive tenderness (Tend) and juiciness (Juice) attributes, or WBSF.

Materials and Methods

Data where consumer sensory, trained meat descriptive tenderness and juiciness attributes, and Warner-Bratzler shear force were used. Study 1 used top loin steaks cooked to 58°C or 80°C utilizing a George Forman grill (191°C) or a flat food-service grill (232°C). A second study used Choice beef top loin steaks cooked to 58 or 80°C on a flat electric grill (176°C). Companion steaks were cooked for WBSF (kg). A third study used 60 top loin steaks cooked on an open hearth electric grill (176°C) and served to a trained meat descriptive attribute panel. For study 1, consumers (n = 80 per city) were recruited in Portland, OR; Olathe, KS; State College, PA and study 2 recruited 120 consumers per city from Olathe, KS; State College, PA; Portland, OR; and Griffin, GA.

Results

Consumer ratings (n = 3228), Warner-Bratzler shear force values, and 400 trained descriptive attribute values (n = 400) were used to develop 13 equations (Table 1) . Equation [1] used Tend ratings to account for 24.6% of the variation in WBSF. Inclusion of Juice and their interaction did not appreciably increase the amount of variation accounted for by Eq. [3] (R^2 = 0.25) compared to Eq. [1]. Equations to predict OLike using Tend, Juice or WBSF had very low R^2. OTend and OJuice were better predictors of OLike (R^2 = 0.500, 0.492, 0.554 for Equations 10, 11, and 12, respectively) than when Juice, Tender or WBSF were used.

Table 1. Regression equations to predict WBSF and OLike using trained descriptive attribute or consumer sensory tenderness and juiciness liking variables.

	B values for Dependent Variables									
		Descriptive Sensory Attributes			Consumer Sensory Attributes			Warner-Bratzler Shear		
Equations Listed By Independent Variables	Intercept	Tend[a]	Juice[a]	Tend x Juice	OTend[a]	OJuice[a]	OTend x OJuice	Force, (kg)	R^2	RMSE[b]
Warner-Bratzler shear force, kg										
1	6.27	-0.32							0.246	0.67
2	3.79		-0.10						0.039	0.76
3	5.02	-0.17	0.11	-0.01					0.251	0.67
4	3.13				-0.07				0.039	0.76
5	3.05					-0.05			0.024	0.76
6	3.06				-0.05	0.01	-0.002		0.037	0.75
Consumer Overall Liking[a]										
7	5.06	0.15							0.008	1.96
8	7.51		-0.08						0.003	1.96
9	8.71	-0.06	-0.40	0.024					0.002	1.95
10	2.86				0.61				0.500	1.39
11	2.66					0.63			0.492	1.40
12	1.89				0.44	0.43	-0.02		0.554	1.32
13	7.63							-0.34	0.017	1.95

[a]Tend=descriptive overall tenderness and Juice = descriptive juiciness where 1=extremely tough or dry and 15=extremely tender and juicy, respectively; OTend = consumer sensory tenderness liking, OJuice = consumer sensory juiciness liking, and OLike = consumer sensory overall liking score where 1=dislike extremely and 9= like extremely, respectively.
[b]RMSE = Root Mean Square Error.

Conclusion

WBSF is more highly related to trained descriptive tenderness ratings then to consumer tenderness liking values. Overall consumer liking is difficult to predict using trained descriptive attribute and WBSF values and is most highly related to consumer sensory liking ratings for tenderness and juiciness. Juiciness ratings, either trained or consumer, did not appreciabilty improve predictability of regression equations to predict either WBSF or consumer overall liking.

