A FINAL REPORT TO THE

CALIFORNIA DRIED PLUM BOARD

EVALUATION OF PLUM INGREDIENTS AS A COMPONENT OF MEAT PRODUCTS

ANTIOXIDANT PROPERTIES OF DRIED PLUM INGREDIENTS IN FRESH AND PRECOOKED PORK SAUSAGE

EXECUTIVE SUMMARY

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ABSTRACT

Fresh pork sausage made with (1) no antioxidant, (2) 3 and 6% dried plum puree (PP), (3) 3 and 6% dried plums and apples puree (DPA) and (4) BHA/BHT were stored raw in chubs at 4°C, or were cooked as patties, divided equally, partially vacuum packaged and divided portions were stored at 4°C and -20°C. Proximate composition was determined for initial raw product, while lipid oxidation, Allo-Kramer shear force and sensory attributes were evaluated after 0, 7, 14, 21 and 28 days for fresh and precooked samples, and after 30, 60 and 90 days for precooked frozen patties. Color was evaluated on raw, fresh samples after 0, 7, 14, 21 and 28 days of storage. Patties from each treatment were evaluated by a consumer sensory panel. The addition of 6% PP reduced cooking yields, and all treatments decreased fat content and moisture in raw and precooked sausages. Protein content was not affected by using PP. The addition of PP and DPA changed internal color attributes of raw pork sausage. **PP used at 3 and 6% levels was as effective as a combination BHA/BHT at 0.02% in retarding lipid oxidation in precooked patties.** TBA values (a measure of lipid oxidation) for PP, DPA and BHA/BHT treatments did not change in raw pork sausage refrigerated for 28 days. Allo-Kramer shear values were slightly higher in raw and precooked samples with 3 and 6% PP. Trained-panel sensory evaluations of cooked pork sausage patties revealed that PP enhanced sweet taste, decreased salt and bitter tastes, and masked cooked pork/brothy, cooked pork fat, spicy/peppery and sage flavors. Warmed-over flavor notes were not affected by storage treatments but cardboard flavor increased after 90 days in precooked-frozen pork sausage. **Consumer panel hedonic scores indicated that patties with 3% PP and DPA were as desirable as the control,** but the patties with 6% of either plum product were less desirable.

INTRODUCTION

Various dried plum puree ingredients have been promoted to aid the retention of juices in precooked meat and poultry products such as hamburgers, ground turkey, sausages and emulsified meats. Tests with dried plum puree in hamburgers designated by the USDA for the school lunch program have shown optimum moisture binding in hamburgers at use levels of 3 to 5%, with student sensory ratings equal to or better than those of hamburger products from the major fast food chains (Decker, 1999). Moisture retention in that study was improved by 15.8% in precooked patties reheated to 102°C and held warm for up to 4 hours. Opportunities also exist for replacing a portion of the fat component in beef patties (Nunes, 1999). Frankfurters prepared with 3.5 to 5% dried plum puree have been shown to have 4 to 8% more moisture than all-beef franks and to retain more moisture (23.7 to 47.1%) when reheated (PruneTec, 1998). A consumer sensory test of over 175 participants showed 79% of consumers rated franks with dried plum puree the same as or better than hot dogs recently consumed by evaluators. Overall flavor was mentioned as the most desired attribute of the dried plum franks.

Nutraceuticals are categorized as foods or food ingredients that provide a health benefit in the diet and have recently gained consumer interest. Recent work at the Agricultural Research Service's Jean Mayer Human Nutrition Research Center on Aging at Tufts University in Boston, MA has suggested that foods with a high ORAC (Oxygen Radical Absorbance Capacity) value (Cao et al., 1995) may reduce the risk of the diseases of aging. Their research has shown that dried plums have the highest ORAC value (5,770) of a group of 22 commonly eaten fruits and vegetables (Table 1) studied (McBride, 1999; Cao et al., 1996; Wang et al., 1996). This antioxidant potential may be useful in retarding lipid oxidation in meat products such as fresh ground or precooked pork sausage that may contain up to 50% fat along with endogenous and added prooxidants, such as iron in the meat and salt used in its formulation, respectively.

Animal fats have predominant amounts of C16 and C18 saturated fatty acids, medium amounts of unsaturated fatty acids and small amounts of odd-numbered acids, but the proportion of these fatty acids vary with species and diet. In general, fats become less saturated in the following species ranking: beef (more saturated) > pork > poultry > fish (less saturated). The relative proportions or profile of fatty acids in representatives of these different species are shown in Table 2.

Lipid oxidation is a major cause of deterioration in the quality of stored meat and meat products, and can be accelerated by several factors such as increasing degree of unsaturation, higher levels of polyunsaturated fatty acids, oxygen, heat, UV light, metal ions, oxidation of meat/heme pigments, and oxidative enzymes. Lipid oxidation results when double bonds in unsaturated (particularly the polyunsaturated) fatty acids react with molecular oxygen via a series of free radical chain reactions to produce breakdown products such as short chain acids, aldehydes and ketones (Fennema, 1996). Some of these compounds contribute to "warmed-over flavor" (WOF) in pre-cooked sausages. Whole-muscle ham is less susceptible to lipid oxidation and WOF development because of its lower fat content (in comparison to fresh pork sausage), and the presence of alkaline phosphates (metal ion chelator), spices (with antioxidant properties), sodium nitrite and sodium erythorbate. Similarly, roast beef is relatively low in fat content and contains alkaline phosphate in the brine, which retards lipid and pigment (myoglobin) oxidation.

Oxidation of lipids not only produces rancid flavors in foods but can decrease their nutritional quality and safety by the formation of secondary products after cooking and processing. Oxidative rancidity development in meat is distinguished between "normal oxidation" by the oxidation of the triacyglycerol fraction, and rapid oxidation, which is attributed mainly to the oxidation of phospholipids, and referred to as "warmed-over flavor" or WOF. In some non-meat foods, normal oxidation occurs during long-term storage, while the development of WOF takes place in meat after cooking, and varies at different stages of lipid oxidation. Rancidity due to lipid oxidation also occurs readily in uncooked meat when muscle membranes are broken by mechanical manipulation and processing. Lipid oxidation in meat is also associated with deterioration of the desirable beef flavor by the formation of other flavors described as cardboardy or painty (Frankel, 1998). Precooked, uncured meat products are more susceptible to lipid oxidation and WOF development because fewer materials with antioxidant properties are added as ingredients. Therefore, additives that exhibit antioxidant properties and retard WOF would be very desirable to enhance their flavor shelf-life.

Antioxidants such as butylated hydroxy anisole (BHA) and butylated hydroxy toluene (BHT) or their combination may be incorporated into uncured, ground or sausage products (fresh pork sausage, brown and serve sausages, fresh Italian sausages, pre-grilled beef patties, pizza toppings, meat balls and meat fillings), but are not typically used in brine pumped products. The Code of Federal Regulations (USDA, 1999) allows use of up to 0.01% (based on the product fat content) of a single antioxidant, or 0.02% if two are used in combination. The maximum fat content for fresh ground sausage is 50%, 35% for fresh Italian sausage and 30% for most other sausages. Thus, <u>sausage products (especially precooked pork sausage) have the greatest potential for oxidative rancidity due to their high fat content,</u> fairly high level of salt and higher amounts of polyunsaturated fatty acids in comparison to the more saturated fat in ground beef. For this reason, fresh and precooked pork sausage were selected as a model to study the antioxidant effects of dried plum ingredients in a meat system.

OBJECTIVES

The overall objective of part I of the study was to evaluate the antioxidant properties of dried plum ingredients in a pork sausage model to:

1) Compare the antioxidant effectiveness of different levels of dried plum ingredients to that of a combination of butylated hydroxy anisole (BHA) and butylated hydroxy toluene (BHT) in fresh and precooked stored pork sausage patties.
2) Determine the sensory acceptability and level of lipid oxidation or warmed-over flavor (WOF) in precooked pork sausage with various levels of dried plum ingredients

MATERIALS AND METHODS

Fresh Pork Sausage Manufacturing

Six, 50 lb batches of fresh pork sausage were formulated to contain 30-32% fat and one of six antioxidant treatments: control (no antioxidant treatment), 3 and 6% dried plum puree (Sunsweet Growers Inc., Yuba City, CA), 3 and 6% dried plums and apples puree (Sunsweet Growers Inc., Yuba City, CA), and BHA/BHT (TENOX®, Eastman Chemical Co., Kingsport, TN) combination (0.02% based on fat content). Processing was performed at the Rosenthal Meat Science and Technology Center at Texas A&M University. Fresh, well-chilled pork lean trim and fat trim was purchased and coarse ground through a 1.27 cm (0.5 inch) plate. Lean and fat trim were then analyzed for percent fat, and combined to achieve a formulation containing 30-32% fat. Appropriate amounts of fat and lean trim were weighed and mixed with 226.8g (8 oz.) of spice blend (AC Legg™, Birmingham, AL), 3.0% water, and appropriate antioxidant treatment. The mixture was then blended 5 minutes in a paddle mixer/grinder (Hollymatic® GMG 180A, Hollymatic Corp., Countryside, IL) and reground through a 0.635 cm (0.25

inch) plate. The sausage was vacuum stuffed (Risco™ Model RS1040C, Nev Solomon Enterprises, Italy) and packaged into 908g (2 lb) plastic chubs (Poly Tubes 20-30-01 CP, Harbro Packaging Co., Chicago, IL). Ten chubs of pork sausage from each antioxidant treatment assigned to the fresh treatment, were stored at 4°C for 0, 7, 14, 21, and 28 days. A total of 1,008, 1 cm thick patties (168 patties per treatment) were then sliced from the remaining chubs and used in the precooked portion of the study. Patties to be cooked were arranged on a foil covered baking sheet, placed in a convection oven (Hobart Corp., Troy, OH) and cooked for 9 minutes at 148.9°C to an internal temperature of 71.1°C as monitored with Type T thermocouples (Omega Model HH21, Omega Engineering, Inc., Stamford, CT). Patties were allowed to cool (~ 60.1°C) and then partially vacuum packaged (20 mm Hg). Twenty-one patties were assigned to each package, 13 for TBA and Allo-Kramer analysis and eight patties for sensory testing. Five vacuum packages of precooked pork sausage patties from each antioxidant treatment that were assigned to the precooked, refrigerated treatment, were stored at 4°C for 0, 7, 14, 21, and 28 days. Three vacuum packages of precooked pork sausage patties from each antioxidant treatment that were assigned to the precooked, frozen treatment, were stored at -20°C for 30, 60, and 90 days. A total of three replications of each treatment were performed.

SUMMARY AND CONCLUSIONS

The most significant observation of this study was that dried plum puree (PP) used at 3 and 6% levels was as effective as BHA/BHT in retarding lipid oxidation of precooked pork sausage patties. TBA values of raw pork sausage with PP, a dried plums and apple puree (DPA) or BHA/BHT did not change with storage time, over 28 days at 4°C. All treatments increased moisture and decreased the fat content of raw and precooked pork sausages. Percent protein was not affected. Results of objective color evaluations showed that the addition of PP and DPA changed the internal color attributes of raw pork sausage to a small degree by darkening the samples, slightly diluting internal redness and increasing yellowness. The slight darkening in overall color was likely due to pigments in the dried plum purees and may actually be beneficial as customers associate a darker color with leaner products. Kramer shear values were slightly higher in raw and precooked pork sausage with the addition of 3% and 6% PP. Thus, inclusion of PP may produce a slightly firmer product.

Trained panel sensory evaluations indicated that dried plum purees decreased pork and spice flavor notes incrementally, but DPA did so with less intensity than PP. Salt and bitter tastes were higher in the control and BHA/BHT treatment, while PP and DPA enhanced a sweet taste and may mask cooked pork/brothy, cooked pork fat, spicy/peppery and sage flavors in cooked pork sausages. Consumer sensory evaluations indicated that pork sausage patties with 3% PP or DPA were liked as well as the control. Refrigerated pork patties cooked at weekly intervals over 28 days storage were slightly less tender, but precooked patties refrigerated or frozen were not different. Refrigerated storage of raw pork sausage for 28 days does not appear to increase lipid oxidation. However, precooking with subsequent refrigerated and frozen storage accelerated lipid oxidation. Due to the effects of PP and DPA the intensities of flavor notes associated with "warmed-over-flavor" (WOF) and lipid oxidation, such as cardboard, painty and fishy flavor notes, were not influenced by storage treatments, except that cardboard intensity increased by day 90 in precooked-frozen pork sausage.

In conclusion, 3 and 6% levels of PP were as effective as a combination of BHA/BHT (0.02%) in retarding lipid oxidation in precooked pork sausage patties held under refrigerated (4°C) or frozen (-20°C) storage. Overall, 3% levels of PP and DPA were as acceptable to consumers as the control, but 6% levels were less acceptable.

EXHIBITS

Table 1. ORAC Values of Fruits and Vegetables with Antioxidant Potential

	ORAC Value*/100g
Fruits	
Dried Plums……………………………..	5,770
Raisins……………………………….…..	2,830
Blueberries………………………………	2,400
Blackberries…………………………...	2,036
Strawberries…………………………...	1,540
Raspberries………………………………	1,220
Plums…………………………………….	949
Oranges………………………………….	750
Red Grapes……………………………....	739
Cherries………………………………….	670
Kiwi Fruit………………………………..	602
Grapefruit, Pink………………………....	483
Vegetables	
Kale……………………………………....	1770
Spinach……………………………….….	1260
Brussels Sprouts………………………..	980
Broccoli Flowers………………………....	890
Beets………………………………….….	840
Red Bell Pepper………………………….	710
Onion…………………………………..…	450
Corn……………………………………....	400
Eggplant………………………………….	390

*ORAC (Oxygen Radical Absorbance Capacity) measures a food's ability to subdue oxygen free radicals by comparing its absorption of peroxyl or hydroxyl radicals to that of Trolox, a water-soluble vitamin E analog.

Source: USDA Human Nutrition Research Center on Aging at Tufts University, Boston.

Table 2. Fatty Acid Composition of Meat Tissues from Porcine, Bovine, Poultry and Fish Species (composite of boneless meat tissues).

Fat Component	Bovine	Porcine	Poultry	Fish
Saturated Fatty Acids (%)				
Lauric, C_{12}	0.050	0.050	0.010	0.009
Myristic, C_{14}	0.740	0.440	0.020	0.011
Palmitic, C_{16}	5.780	7.650	0.530	0.156
Stearic, C_{18}	2.930	4.200	0.220	0.051
Total	9.500	12.340	0.780	0.227
Unsaturated Fatty Acids (%)				
Palmitoleic, $C_{16:1}$	1.150	0.990	0.120	0.025
Oleic, $C_{18:1}$	9.120	14.660	0.760	0.108
Linoleic, $C_{18:2}$	0.620	3.300	0.550	0.008
Linolenic, $C_{18:3}$	0.240	0.290	0.020	0.012
Arachidonic acid, $C_{20:4}$	0.050	0.110	0.080	0.028
Eicopentaenoic acid (EPA), $C_{20:5}$	0.010	_	0.010	0.037
Docosahexaenoic acid (DHA), $C_{22:6}$	_	_	0.030	0.181
Total	11.190	19.350	1.570	0.399

Source: USDA Nutrient Database for Standard Reference, Release 13 (1999).

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Table 3. Physical and chemical attribute least square mean values for pork sausage with dried plum puree treatments.

Treatment[1]	Control			3%PP			6%PP			3%DPA			6%DPA			BHA/BHT		
	F[2]	**PC[2]**	**Frz[2]**	**F**	**PC**	**Frz**	**F**	**PC**	**Frz**	**F**	**PC**	**Frz**	**F**	**PC**	**Frz**	**F**	**PC**	**Frz**
Raw																		
Moisture (%)[3]	49.56^{c}	---	---	51.05^{b}	---	---	51.43^{b}	---	---	53.17^{a}	---	---	53.01^{a}	---	---	52.43^{ab}	---	---
Fat (%)[3]	34.27^{a}	---	---	31.26^{b}	---	---	29.58^{bc}	---	---	29.45^{bc}	---	---	29.26^{c}	---	---	30.52^{bc}	---	---
Protein (%)[3]	14.75	---	---	14.83	---	---	14.33	---	---	15.17	---	---	14.33	---	---	15.17	---	---
Internal L*[3]	63.63^{a}	---	---	61.75^{b}	---	---	58.28^{c}	---	---	64.21^{a}	---	---	62.46^{b}	---	---	64.26^{a}	---	---
Internal a*[3]	12.59^{a}	---	---	11.22^{c}	---	---	10.63^{d}	---	---	11.96^{b}	---	---	12.15^{ab}	---	---	13.02^{a}	---	---
Internal b*[3]	13.82^{d}	---	---	15.51^{b}	---	---	16.56^{a}	---	---	14.64^{c}	---	---	14.81^{c}	---	---	15.12^{bc}	---	---
Surface L*[3]	63.58^{a}	---	---	59.89^{c}	---	---	55.47^{d}	---	---	63.42^{a}	---	---	61.49^{b}	---	---	63.15^{a}	---	---
Surface a*[3]	8.23	---	---	7.74	---	---	8.30	---	---	8.08	---	---	8.30	---	---	8.33	---	---
Surface b*[3]	15.67^{c}	---	---	17.22^{a}	---	---	17.62^{a}	---	---	16.19^{b}	---	---	15.86^{bc}	---	---	16.60^{b}	---	---
Fresh Cooked																		
Cook Yield (%)[3]	80.35^{a}	---	---	78.65^{a}	---	---	75.14^{b}	---	---	79.30^{a}	---	---	78.75^{a}	---	---	81.56^{a}	---	---
Raw, Precooked, and Precooked - Frozen																		
TBA_{Dry}[3,4]	0.28^{f}	1.00^{cd}	1.98^{a}	0.29^{f}	0.44^{f}	0.95^{d}	0.31^{f}	0.34^{f}	0.46^{f}	0.27^{f}	1.29^{b}	1.46^{b}	0.29^{f}	0.72^{e}	1.86^{a}	0.29^{f}	0.39^{f}	1.05^{cd}
TBA_{Fat}[3,4]	0.39^{f}	1.52^{c}	2.83^{a}	0.44^{f}	0.73^{e}	1.51^{c}	0.39^{ef}	0.53^{ef}	0.71^{ef}	0.42^{f}	2.13^{b}	2.29^{b}	0.46^{ef}	1.17^{d}	2.96^{a}	0.45^{f}	0.61^{ef}	1.61^{c}
Fresh Cooked, Precooked, and Precooked - Frozen																		
AK Shear (kg)[3]	2.55^{c}	1.85^{d}	3.00^{a}	3.00^{a}	1.90^{d}	2.95^{ab}	3.02^{a}	1.95^{d}	2.95^{ab}	2.70^{bc}	1.78^{dc}	2.86^{ab}	2.62^{bc}	1.74^{de}	2.81^{b}	2.50^{c}	1.82^{d}	2.95^{ab}

[abcdef] Mean values with like superscripts across rows are not significantly different (P>0.05).
[1]PP = Dried plum puree, DPA = Dried plum and apple puree, BHA/BHT = butylated hydroxy anisole/butylated hydroxy toluene.
[2]F = Fresh, PC = Precooked, Frz = Precooked and Frozen
[3]SEM = Internal L* = 0.29; Internal a* = 0.16; Internal b* = 0.15; Surface L* = 0.34; Surface a* = 0.21; Surface b* = 0.19; Cook Yield % = 1.25; TBA_{Dry} = (F, PC = 0.06, Frz = 0.08); TBA_{Fat} = (F, PC = 0.10, Frz = 0.13); Moisture (%) = (C, 3%PP, 6%PP, 3%DPA, BHA/BHT = 0.53, 6%DPA = 0.55); Fat (%) =(C, 3%PP, 6%PP, 3%DPA, BHA/BHT = 0.70, 6%DPA = 0.73); Protein (%) = (C = 0.50, 3%PP, 6%PP, 3%DPA, 6%DPA, BHA/BHT = 0.41); AK Shear = (F, PC = 0.06; Frz = 0.08)
[4]mg malonaldehyde/1000g dry matters (TBA_{Dry}) or fat (TBA_{Fat}); fresh samples were raw.

Table 4. Sensory attribute[1] combined least square mean values for dried plum puree treatments of cooked pork sausage.

Treatment	Control	3% PP	6% PP	3% DPA	6% DPA	BHA/BHT	SEM
Sensory - Flavors							
Cooked Pork/Brothy	7.59[a]	6.37[c]	5.87[d]	7.15[b]	6.56[c]	7.49[a]	0.09
Cooked Pork Fat	3.31[a]	3.12[b]	2.94[c]	3.27[a]	3.09[b]	3.22[ab]	0.05
Spicy/Peppery	3.92[ab]	3.35[c]	3.20[c]	3.77[b]	3.66[b]	4.04[a]	0.08
Soured	0.05	0.02	0.05	0.04	0.05	0.04	0.01
Cardboard	0.05	0.01	0.01	0.05	0.02	0.01	0.02
Painty	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fishy	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prune/Plum	0.28[d]	2.12[b]	3.62[a]	0.80[c]	2.13[b]	0.27[d]	0.09
Sage Flavor	3.08[a]	2.58[c]	2.42[c]	2.91[ab]	2.75[b]	3.02[a]	0.06
Brown/Burnt	0.08	0.05	0.05	0.02	0.03	0.07	0.03
Vinegar	0.26	0.37	0.25	0.37	0.29	0.22	0.07
Sensory – Feeling Factors							
Metallic	2.00	1.97	1.95	2.03	1.99	2.00	0.03
Astringent	2.48[ab]	2.39[b]	2.25[c]	2.45[ab]	2.44[ab]	2.54[a]	0.04
Sensory – Tastes							
Salt	5.88[a]	4.72[c]	4.29[d]	5.43[b]	4.78[c]	5.76[a]	0.11
Sour	2.10	2.23	2.24	2.19	2.16	2.09	0.05
Bitter	1.87[ab]	1.75[b]	1.71[b]	1.84[ab]	1.83[ab]	1.90[a]	0.05
Sweet	1.62[d]	2.28[b]	2.72[a]	1.86[c]	2.25[b]	1.59[d]	0.06
Sensory – Mouthfeel							
Pepper Burn	3.08[a]	2.62[b]	2.46[b]	2.94[a]	2.94[a]	3.11[a]	0.08
Sensory – Textures							
Juiciness	4.72	4.62	4.61	4.69	4.68	4.66	0.05
Denseness	4.63	4.53	4.47	4.59	4.55	4.64	0.05
Fracturability	3.94	3.93	3.77	4.14	3.86	3.92	0.09
Springiness	5.69[a]	5.47[b]	5.08[c]	5.61[ab]	5.46[b]	5.68[a]	0.06
Hardness	4.51[a]	4.45[ab]	4.32[b]	4.55[a]	4.47[a]	4.59[a]	0.05
Cohesiveness	5.17	5.18	5.10	5.21	5.15	5.19	0.05
Sensory – Aftertastes							
Sage	2.22[a]	1.91[bc]	1.78[c]	1.99[b]	2.03[b]	2.11[ab]	0.06
Pepper	2.71[a]	2.35[c]	2.19[c]	2.52[b]	2.59[ab]	2.69[a]	0.06
Salt	2.01[a]	1.39[c]	1.18[d]	1.70[b]	1.36[cd]	1.91[a]	0.07
Sweet	0.08[b]	0.23[ab]	0.34[a]	0.14[b]	0.23[ab]	0.06[b]	0.04
Prune	0.07[d]	1.02[b]	1.78[a]	0.30[c]	1.07[b]	0.11[d]	0.06
Sour	0.11	0.28	0.21	0.27	0.22	0.15	0.05

[abcd] Mean values with like superscripts across rows are not significantly different (P>0.05).
[1]Based on a 0-15 point scale = 16 points, where 0 = absence of an attribute, 15 = extremely intense.

Table 5. Consumer sensory attribute[1] combined least square mean values for dried plum puree treatments.

Treatment	Control	3% PP	6% PP	3% DPA	6% DPA	BHA/BHT
Overall Like/Dislike[2]	3.97^{bc}	3.96^{bc}	5.15^{a}	3.98^{bc}	4.39^{b}	3.60^{c}
Flavor Overall Like/Dislike[2]	3.84^{c}	4.08^{bc}	5.12^{a}	3.91^{c}	4.44^{b}	3.57^{c}
Flavor Intensity [2]	4.43	4.41	4.83	4.64	4.61	4.52
Texture Overall Like/Dislike[2]	3.55	3.54	3.81	3.23	3.67	3.21
Level of Tenderness[2]	3.55^{ab}	3.54^{ab}	3.81^{a}	3.23^{b}	3.67^{a}	3.21^{b}
Level of Juiciness[2]	3.70	3.77	4.08	3.77	3.80	3.48

[abc] Mean values with like superscripts across rows are not significantly different (P>0.05).
[1]Scale = 9 point, where 1 = like extremely or extremely intense/tender/juicy, 9 = dislike extremely or extremely bland/tough/dry.
[2]SEM = Overall Like/Dislike = 0.18; Flavor Overall Like/Dislike = 0.18; Flavor Intensity = 0.18; Texture Overall Like/Dislike = 0.19; Level of Tenderness = 0.15; Level of Juiciness = 0.15