

Exploring lamb sausage marketability in North Dakota

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The objective of this study was to explore whether lamb sausage could be accepted by consumers with enhancement from unique and flavorful ingredients. We tested whether consumers were accepting of distinct flavor profiles and would be inclined to purchase uniquely seasoned lamb sausage based on each recipe's flavor. We found a minimum of 88% of consumers sampled would be inclined to purchase lamb sausage and that each recipe averaged from a "moderate" to a "like very much" score for overall liking.

Summary

Ground lamb is an underutilized and undervalued product of a lamb carcass. The objective of this study was to use lamb trim in the form of a ground lamb sausage mixed with distinct seasonings and culturally specific spice profiles to assess consumer appeal to target new markets. We introduced a series of 6 unique lamb sausage flavor profiles (Greek, Italian, Moroccan, Sicilian, Irish-style banger, and Mexican Chorizo). In experiment 1, consumers (n = 186) evaluated flavor intensity, amount of flavor, and overall liking, and ranked each based on preference. The response to lamb sausage flavors were rated high using LSMEANS results. Lamb sausage flavors were then ranked, and the order was Greek, Italian, Sicilian, and Moroccan. In the preference ranking test (n=41) in experiment 2, the highest-ranked Greek profile was compared with two new flavors, Irish-style banger and Mexican Chorizo, and results indicated that the ranking was Irish-style banger followed by Greek, and then Mexican Chorizo lamb sausage.

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Introduction

Beyond COVID-19, the current market share of small lamb producers and processors has expanded with new sales of lamb as consumers are increasing lamb consumption (Sartin, 2021). As COVID-19 progressed, North Dakota sheep producers and processors remained diligent to fill the supply chain inefficiencies at retail cases while improving the transparency from producer to consumer. Consequently, to fill the void and/or capitalize on the request for local meat, farmer's markets and producers across the state were providing consumers with either whole lamb carcasses or individual cuts. As a result, the vast majority of producers, processors, and consumers are currently missing out on value-added options for lamb trim produced from fabrication of the carcass. Ground lamb can be made and merchandised, but there are limited options to create unique lamb sausage flavors to increase marketing options. Despite the potential for increasing market share of processed lamb, current available recipes are not easily sourced, creating a lapse in value-added lamb products.

The increased shift of locally and regionally produced food to the marketplace (Pretty, 2020) has resulted in producers and retail chains having to adapt to the perceptions and attitudes from a changing consumer group. For consumers to willingly purchase and consume a product, their perceptions of the product must be positive. This is reinforced by the findings of Pethick et al. (2010), who described the importance of consumer awareness to consistently deliver meat that will satisfy consumer demands for quality and eating experience. By improving the appearance and sensory properties and marketing strengths of lamb, improvements to the current marketplace demand can be achieved.

Procedures

Lamb trim purchased from the NDSU meat lab was mixed and weighed into seven 30-pound batches (Figure 1). Ingredients were measured and mixed by hand and allowed to meld together for 24 hours. Upon refrigeration, the mixed batches were



Figure 1. Scan for Lamb Sausage Recipe Cards which were provided at the conclusion of each consumer sensory panel.

stuffed using a fresh collagen casing and forming links of approximately 6 inches. Sausages were then vacuum packaged and frozen for three weeks until used for taste panel evaluation.

Flavor and preference ranking data were collected from taste panels at the Red River Valley Fair in Fargo, North Dakota, as well as a second taste panel at a sheep producer educational event in Carrington, North Dakota. Panelists scored each lamb sausage for flavor intensity, amount of flavor, and overall flavor liking. Panelists were also asked to indicate “yes” or “no” to if they would purchase the product based on product flavor. The GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, NC) was used to assess consumer acceptance for each questionnaire response. The MEANS procedure was used to generate mean averages for each treatment along with the ANOVA procedure to determine flavor differences.

Results and Discussion

In catering to many consumer taste palates within North Dakota, we aimed to take advantage of the uniqueness of flavor styles in the creation of the value-added lamb sausage tested in this experiment. Consumer acceptance on the flavor intensity, amount of flavor, and overall liking showed significant differences between each treatment

sausage type for each variable along with means for flavor and overall liking. The overall difference in flavor intensity was different for each sausage type (Table 1). Moroccan had the highest flavor intensity at 51.30. The Italian lamb sausage was second. The Sicilian lamb sausage ranked third with a moderate to strong presence of flavor intensity and lastly, consumers found the Greek lamb to have the least flavor. There were also significant differences for the amount of flavor between each recipe. ($P = 0.05$). Moroccan-style sausage had the highest amount of flavor value with the Italian lamb sausage ranked second with a slightly above the median scale descriptor of just-about-right. The Sicilian lamb sausage ranked third, and ranking with the least amount of

flavor was the Greek lamb sausage. However, for overall flavor liking, the Greek and Italian recipes was liked more than the Sicilian and Moroccan.

These differences also coincided with preference. Within the preference ranking tests, the Sicilian and Moroccan were less preferred than the Italian and Greek lamb sausage (Table 2). The most popular lamb sausage at the Red River Valley Fair was Greek and therefore was utilized in the proceeding experiment. In experiment 2, the preference ranking test of Greek and Mexican Chorizo were similarly less preferred than the Irish-style lamb banger (Table 3). Another key takeaway is that the amount of flavor and overall flavor liking were influenced by the stronger flavors of the Moroccan lamb sausage, which

Table 2. Preference ranking analysis using a One-way ANOVA ($n=179$ /treatment) of four lamb sausage recipes (Greek, Italian, Sicilian, and Moroccan).

Treatment	MEANS ²	P-value	TUKEY'S HSD
Greek and Italian	2.26	0.76	0.0335 ^b
Greek and Moroccan	2.47	0.0002	0.4693 ^a
Greek and Sicilian	2.51	<0.0001	0.5363 ^a
Italian and Moroccan	2.49	0.0002	0.4358 ^a
Italian and Sicilian	2.53	<0.0001	0.5028 ^a
Moroccan and Sicilian	2.74	0.58	0.0670 ^b

Lamb sausages were prepared and tested at the Red River Valley Fair, Fargo, North Dakota.

*Treatment represents; lamb sausage recipes (Greek, Italian, Moroccan, and Sicilian).

¹Values within the same Tukey's Honest Significant Difference (HSD) row without a common superscript differ at ($P < 0.05$).

²Means were calculated based on preference ranking score indicated by a 1 = First; 2 = Second; 3 = Third; and 4 = Fourth preferred lamb sausage.

Table 1. Least square means from a consumer taste panel using line affective magnitude (LAM) scaling and Just-About-Right (JAR) tests on consumer panelists ($n = 186$ /treatment) at random.

Treatment	Flavor Intensity			Amount of Flavor			Overall Flavor Liking		
	MEANS	SEM	P-value	MEANS	SEM	P-value	MEANS	SEM	P-value
Greek	24.45 ^d	1.25	<0.0001	46.29 ^c	1.06	<0.0001	80.47 ^a	1.42	<0.0001
Italian	39.27 ^b	1.25	<0.0001	53.67 ^d	1.06	<0.0001	79.24 ^a	1.42	<0.0001
Moroccan	51.30 ^a	1.25	<0.0001	59.95 ^a	1.06	<0.0001	74.22 ^b	1.42	<0.0001
Sicilian	29.74 ^c	1.25	<0.0001	49.58 ^b	1.06	<0.0001	75.79 ^b	1.42	<0.0001

Analysis was performed on consumer panelists liking of amount of flavor, flavor intensity, and overall liking from four lamb sausage recipes (Greek, Italian, Moroccan, and Sicilian) prepared and tested at the Red River Valley Fair in Fargo, North Dakota.

¹Least squares means (MEANS) within the same column without a common superscript differ ($P < 0.05$).

²MEANS reflect panelists answers recorded in millimeters (mm).

³SEM (largest) of the least squares means.

may have resulted in the least overall liking and could cause consumers to be less willing to purchase. Alternatively, the more balanced, neutral, and calmer spice profile of the Greek lamb sausage is perhaps why the recipe was the most preferred in overall liking, reinforcing consumer palate differences. The results for the final consumer response of ‘Would you purchase?’ question from experiment 1 can be found in Figure 2 with Italian ranking first followed by Greek and then Sicilian and lastly, Moroccan.

The use of consumer taste panels to develop distinct and unique flavor profiles showed many consumers are eager to welcome new products. In these experiments, we tested consumer acceptance and likeability of lamb sausage, and through the utilization of popular flavor profiles from around the globe, were able to determine if a value-added marketing approach for local producers and processors was feasible. Similar to the findings above, the opportunities to spark consumer interest and increase financial gain for sheep producers may be achieved as the general public does seem to like distinct and culturally diverse lamb sausage flavors.

Literature Cited

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Table 3. Preference ranking analysis using a One-way ANOVA ($n=41$ /treatment) of three lamb sausage recipes (Greek, Irish-style banger, and Mexican Chorizo).

Treatment	MEANS ²	P-value	TUKEY’S HSD
Greek and Irish	1.87	0.01	0.4634 ^a
Greek and Mexican chorizo	2.18	0.34	0.1707 ^b
Irish and Mexican chorizo	1.95	<0.001	0.6341 ^a

Lamb sausages were prepared and tested at the North Dakota sheep producer meeting in Carrington, North Dakota.

*Treatment represents; lamb sausage recipes (Greek, Irish-style banger, and Mexican Chorizo).

¹Values within the same Tukey’s Honest Significant Difference (HSD) row without a common superscript differ at ($P < 0.05$).

²Means were calculated based on preference ranking score indicated by a 1 = First; 2 = Second; and 3 = Third preferred lamb sausage.



Figure 2. Consumer ($n=176$) panelist response to ‘Would you purchase?’ question asked proceeding sampling each lamb sausage sample.