

PHYSICAL AND SENSORY PROPERTIES OF JERKY MADE FROM LAMB, MUTTON AND BEEF

D.S. Sutton¹, L.W. Hand², G.Q. Fitch²

Story in Brief

Jerky was prepared from lamb, mutton and beef using the same formulation and thermal processing schedules. Semimembranosus and adductor muscles for each treatment were crust frozen, sliced, marinated and thermally processed. Sensory evaluation was accomplished by using three groups of consumers. The first group of panelists (n=45) were familiar with the flavor of lamb and mutton, the second group (n=75) was not characterized and the third group (n=23) was given a questionnaire to classify themselves into groups that either liked or disliked like lamb and mutton products. Regardless of the consumer group, there were no significant differences in sensory attributes between lamb, mutton or beef jerky.

(Key Words: Sensory Analysis, Lamb, Mutton, Jerky.)

Introduction

The per capita consumption of lamb decreased 64 % from 1966 to 1983 (USDA, 1967; Field et al., 1983). This led the American Sheep Industry Association to list the development of new lamb products as one of their highest priority needs (SID, 1988)

Several reasons have been suggested for this downward trend in lamb and mutton consumption. Batcher et al. (1962) concluded that flavor was the most important palatability characteristic of cooked lamb. Others listed price, product availability, texture, color, mouth feel and aroma as possible causes for the decrease in lamb consumption (Wasserman and Talley, 1968; Crouse, 1983).

Brewer et. al (1984) suggested that processors may need to take on new market areas and develop new products to combat the decrease in lamb and mutton consumption. Therefore, if a product could be developed to capitalize on the change in American's eating habits toward convenience foods it could aid in changing the current lamb and mutton consumption trend.

¹Graduate Student ²Assistant Professor

Batcher et al. (1962) indicated that people differ in the concept of mutton flavor. Habit, tradition, preference and psychological state have been suggested as reasons for the difference in concepts (Field et al., 1983; Crouse, 1983). Work done by Wasserman and Talley (1968) showed that 55.5% of panelists could not identify lean lamb roast from beef, pork and veal roast. A consumer's perception of expected flavor impacts their buying habits. This perception of lamb flavor may be a reason for the decline in lamb consumption.

The purpose of this study was to develop the technology to produce acceptable lamb and mutton jerky and study the sensory perceptions of categorized consumer panelist.

Materials and Methods

Semimembranous and adductor muscles were removed from beef (control, USDA Choice), lamb (USDA Choice) and mutton carcasses. Muscles were trimmed of excess fat, crust frozen and sliced (.31cm, Slicer Model 1713R, Hobart, Troy, OH). Slices from each treatment were placed in separate containers containing a marinade consisting of 14.3% Worcestershire sauce, 9.40% soy sauce, 3.30% liquid smoke, 0.32% garlic powder, 0.13% onion powder, 0.22% monosodium glutamate, 0.22% pepper, 0.13% sugar, 0.05% sodium erythorbate, and 0.02% sodium nitrite.

The slices were allowed to marinate for 12 hours at 8°C. Strips were individually placed on stainless steel wire racks, cooked and smoked for 3 hours at 54.4°C, increases to 60°C and cooked an additional 3 hours. (Alkar, Lodi, WI). After thermal processing, products were cooled (1 hr, 18°C) and packaged (Fresh pak 500TM, Multivac AGW, Koch Supplies, Kansas City, MO).

Three groups of consumer panelists evaluated samples (5x5 cm) from each treatment. Panelists evaluated the jerky for flavor, texture, off flavor and overall palatability. A 10.5 cm unstructured line scale with faces as anchor points was used for product evaluation. A smiling face served as the favorable response anchor and a frowning face was used for the unfavorable response anchor. Panelist made a vertical mark on the line to indicate their response. The vertical marks were measured to the nearest tenth of a centimeter.

Because consumers perceptions of lamb products impact product evaluation (Field et al., 1983), three groups of consumer panelists were used to evaluate the jerky products. The first group (n=45) were attending the Oklahoma State University Ram Test Sale and were familiar with the flavor of lamb and mutton. The second group were students of an Oklahoma State University class (n=75) and were not classified as to preference. The third

group were students in another Oklahoma State University class (n=23) who were given a questionnaire which classified them into groups that either like or did not like lamb and mutton products. The questionnaire given to the third group of panelist was attached to the sensory response sheet. The consumers responded to five questions that asked "Do you like products made from 1) beef, 2) pork, 3) lamb, 4) mutton and 5) rabbit?". The panelist responded by marking a yes or no box after each question. The panelists were verbally instructed not to answer the question if either they had no preference or had not tasted those products.

Proximate analysis samples were pulverized in a blender (Waring, New Hartford, CT) after being frozen in liquid nitrogen. Proximate analysis (moisture, fat, protein) was determined (AOAC, 1984). Yield analysis was determined by dividing the cooked weight by the sliced weight. Statistical analysis consisted of analysis of variance (Steel and Torrie, 1980) with treatment and consumer group as the main effects.

Results and Discussion

Table 1 presents the final product composition of the jerky product. These products were different ($P < .05$) for moisture, fat and protein. The lamb and mutton products had a much higher fat contents than did the beef. Much of the off-flavor associated with lamb products can be attributed to fat (Pearson et al. 1973), therefore, these products could be objectionable to consumers. The yield was not different ($P > .05$) among treatments (mean 37.30%, SE. 0.024).

Table 2 shows consumer panel means and standard errors for mutton, lamb, and beef jerky. There were no ($P > .05$) treatment differences in regards to treatment for any of the sensory parameters. The consumer panelists, regardless of stratified group, found no differences between lamb, mutton or beef jerky for any of the sensory parameters measured. This occurred even though there were differences in fat content that might influence panelist ratings. This is similar to Wasserman and Tally (1968) who found that panelist

Table 1. Means of the chemical composition from each treatment.

	Lamb	Mutton	Beef
Moisture %	26.52(3.40)a	25.44(2.66)b	23.90(0.95)c
Fat %	9.10(0.03)a	11.76(1.21)b	4.30(1.04)c
Protein%	54.00(2.33)a	51.51(1.48)b	59.24(0.97)c

^a Means within the same row with different superscripts are different ($P < .05$). Standard errors are in parenthesis.

Table 2. Consumer panel means and standard errors for mutton, lamb, and beef jerky.

Trait ^a	Mutton	Lamb	Beef
Flavor	5.91(0.23)b	5.39(0.24)b	5.88(0.22)b
Texture	6.37(0.24)b	5.57(0.24)b	5.48(0.23)b
Off flavor	5.72(0.27)b	5.27(0.25)b	5.81(0.26)b
Overall palatability	5.96(0.23)b	5.56(0.24)b	5.69(0.23)b

^a Sensory parameter: an unstructured 10.5 cm line scale used for 143 panelists.

^b Means in the same row with the different superscripts are different ($P < .05$). Standard errors are in parenthesis.

could only identify lean lamb roast from pork, beef and veal roast 44.5 percent of the time. Bartholomew and Osuala (1986) also showed no difference for mutton jerky when compared to beef jerky using a consumer panel.

Since the consumer groups were classified as to their likes and dislikes of lamb and mutton products, this study indicates that 1) consumer perceptions did not influence their sensory evaluation responses and 2) lamb and mutton jerky can be produced as an acceptable product. Therefore, it is possible to produce acceptable lamb and mutton jerky products. However, the consumer's perception of lamb and mutton would have to be overcome initially.

Literature Cited

- AOAC. 1984. "Official methods of analysis." 14th ed. Association of Official Analytic Chemists, Washington, D.C.
- Bartholomew, D.T. and C.I. Osuala, 1986. Acceptability of flavor, texture, and appearance in mutton processed meat products made by smoking, curing, spicing, adding starter cultures, and modifying fat source. *J. Food Sci.* 51:1560.
- Batcher, O.M. et al. 1962. Quality of raw and cooked lamb meat as related to fatness and age of animal. *Food Technol.* 16:102.
- Brewer, M.S. et al. 1984. Quality of chunked and formed lamb roast. *J. Food Sci.* 49:1376.
- Crouse, J.D. 1983. The effects of breed, sex, slaughter weight, and age on lamb flavor. *Food Technol.* 22:264

Field, R.A. et al. 1983. The effects of diet on lamb flavor. Food Technol. 37:258.

Pearson, A.M. et al. 1973. Observations on the contribution of fat and lean to the aroma of cooked beef and lamb. J. Anim. Sci. 36:511

Sheep Industry Development Program, Inc. (SID). 1988. American sheep industry research and education priorities. Sheep Industry Development Program, Inc., Denver, CO.

Steel, R.G.D. and J.H. Torrie 1980. Principles and Procedures of Statistics. 2nd ed. McGraw-Hill Book Co., New York, NY.

USDA. 1967. National Food Situation. U.S. Department of Agriculture NFS-120, No. 14, Washington, D.C.

Wasserman, A.E. and F. Talley 1968. Organoleptic identification of roasted beef, veal, lamb and pork as affected by fat. J. Food Sci. 33:219.

Literature Cited

AOAC 1988. Official methods of analysis. 15th ed. Association of Official Analytical Chemists, Washington, D.C.

Beal, J.W. and J.L. Smith. 1980. A comparison of flavor, texture, and appearance in cooked roasts prepared with different levels of cooking. J. Food Sci. 45:1000-1004.

Beal, J.W. et al. 1981. Quality of raw and cooked lamb meat as related to carcass and age of animal. Food Technol. 35:112.

Beal, J.W. et al. 1984. Quality of cooked and frozen lamb meat. J. Food Sci. 49:1000-1004.

Beal, J.W. et al. 1985. The effect of yearling weight and age on lamb flavor. Food Technol. 39:100-104.