EFFECT OF ENERGY SOURCE AND ANIMAL AGE ON FLAVOR INTENSITY OF SHEEP MEAT

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Abstract – The objectives were to determine the effects of diet and animal age on flavor intensity of sheep meat using a consumer taste panel. Ewe lambs (n=16), yearling ewes (n-16) and mature ewes (n=16) were used in a completely randomized block design. Sheep were offered a diet consisting of alfalfa pellets or whole shelled corn (WSC) ad libitum. Off-flavor intensity scores of loins were greater ($P < 0.05$) for mature ewes when compared with yearlings and lambs. Ground shoulder patty lamb flavor and off-flavor intensity scores were greater ($P < 0.05$) from sheep offered alfalfa pellets when compared with WSC. In conclusion, lamb flavor and off-flavor intensity increase with increasing animal age and by offering alfalfa pellets when compared with WSC.

Key Words – lamb flavor, mutton, off-flavor

I.   INTRODUCTION

The American Lamb Industry Roadmap Project [1] suggests the American sheep industry focus on improving product characteristics to ensure consumers consistently experience a premier lamb product. The 2015 National Lamb Quality Audit [2] identified consumer eating satisfaction, most commonly defined as lamb flavor, as the most important quality attribute used when purchasing lamb. American lamb flavor has been recognized as a threat to the American sheep industry, whereas imported lambs was recognized for having a more consistent flavor [2]. Volatile compounds, skatole and branched chain fatty acids, are associated with mutton-like flavors and can be diet and age dependent [3]. The objectives of the present study were to investigate the effects of diet and animal age on lamb flavor intensity of sheep meat. Based on the previous literature, we hypothesized the alfalfa pellet diet when compared with the WSC diet and increased animal age would increase flavor intensity of sheep meat.

II.   MATERIALS AND METHODS

Ewe lambs (n=16), yearling ewes (n-16) and mature ewes (n=16) were used in a completely randomized block design with a 3×2 factorial arrangement of treatments. Sheep were offered ad libitum access to diets consisting of 90% alfalfa pellets and 10% supplement or 85% whole shelled corn (WSC) and 15% supplement. Lambs were offered feed for 101 ± 20 days and were 176 ± 20 days of age at slaughter. Yearling ewes were offered feed for 64 ± 4 days and were 421 ± 12 days of age at slaughter. Mature ewes were offered feed for 72 ± 12 days and age at slaughter ranged from 3 to 9 years.

Sheep carcasses were fabricated after one day of chilling at 0-4°C and the *Longissimus dorsi* and a ground boneless shoulder were vacuum sealed and frozen for taste panel sensory analysis. Before cooking, the ground shoulder was made into 2.5 cm thick patties. Taste panel samples were prepared on a clam style George Foreman grill. Loin samples were removed at an internal temperature of 65°C and shoulder patties were removed at an internal temperature of 71°C.

The taste panel included staff and graduate students within the Department of Animal Sciences. Taste panelists were asked to rate the lamb flavor intensity and off-flavor intensity on a scale from 0 to 100, with 0 being a very mild flavor and 100 being a very intense flavor.

Statistical analysis was performed using the GLIMMIX procedure in SAS. Data required a natural log transformation to achieve normality. Diets offered, animal age, and diet × animal age interaction were included in the model as fixed effects, and the random effects of pen (nested within diet × animal age) and taste panelist evaluator. A significance of fixed effects was established at ($P < 0.05$).

III.   RESULTS AND DISCUSSION

Log transformed data results are shown in Table 1 and back transformed results to the original 0 to 100 scale are shown in Table 2. No significant diet × age interactions were found for lamb and off-flavor intensities from the loin and shoulder patties from sheep. Loin off-flavor intensity scores were greater ($P < 0.05$) from mature ewes when compared with yearling ewes and ewe lambs. Lamb flavor and off-flavor intensity of the shoulder patty was greater ($P < 0.05$) from sheep offered the alfalfa pellet diet when compared with sheep offered the WSC diet. Numerically, greater lamb flavor and off-flavor intensities were from sheep offered alfalfa pellets when compared with WSC and from mature ewes when compared with ewe lambs. As there was also a tendency for greater ($P = 0.16$) lamb flavor intensity in shoulder patties from yearling and mature ewes compared with ewe lambs.

The results suggest the need for a classification system to identify and segregate sheep meat flavor intensity to allow consumers to choose the lamb flavor intensity that they find most desirable. The energy source offered during the finishing phase prior to slaughter can be used as a management tool to selectively produce sheep meat with lesser or greater lamb flavor intensities as desired by consumer demand. Different sheep meat cuts also need to be considered as flavor intensities appear to differ.

Table 1. Flavor intensity of the loin and shoulder patty samples from ewes of different ages and offered two energy sources

Item	Diet [1] WSC	Alfalfa	SEM [2]	Age Lamb	Yearling	Mature	SEM [2]
Natural log transformation							
Longissimus dorsi							
Lamb flavor intensity	3.51	3.55	0.110	3.47	3.51	3.61	0.115
Off-flavor intensity	0.3	0.57	0.439	0.09 [d]	0.12 [d]	1.08 [c]	0.455
Ground shoulder patty							
Lamb flavor intensity	3.46 [b]	3.67 [a]	0.103	3.45	3.63	3.62	0.110
Off-flavor intensity	-0.08 [b]	0.53 [a]	0.506	-0.05	0.29	0.43	0.522
Back transformation [3]							
Longissimus dorsi							
Lamb flavor intensity	33.55	34.77	---	32.21	33.45	36.97	---
Off-flavor intensity	1.34	1.76	---	1.10 [d]	1.12 [d]	2.95 [c]	---
Ground shoulder patty							
Lamb flavor intensity	31.78 [b]	39.19 [a]	---	31.37	37.62	37.25	---
Off-flavor intensity	0.92 [b]	1.70 [a]	---	0.62	1.26	1.54	---

[a, b] Diet means within a row without a common superscript letter differ ($P < 0.05$).

[c, d] Age means within a row without a common superscript letter differ ($P < 0.05$).

[1] WSC = whole shelled corn diet and Alfalfa = alfalfa pellet diet.

[2] The reported standard error of the mean is the greatest between the treatment levels.

[3] The back transformation is on a 0-100 scale, where 0 = very mild, and 100 = very intense.

IV.   CONCLUSION

Flavor intensity differences due to energy source, animal age, and cut of meat may provide the American lamb industry the opportunity to provide consumers with a high quality meat product that satisfies their expectation of desirable lamb flavor intensity.

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