

PALATABILITY TRAITS OF EMU MEAT

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Background

The U.S. has a rapidly emerging emu industry, with a flock population exceeding 500,000 birds which are raised in at least 43 states (Ford, 1994). As the emu industry moves from a breeder market to a commercial market it becomes imperative to determine the characteristics of the products that can be obtained from the bird. Oil rendered from the bird can be used in cosmetics and pharmaceuticals, the feathers for fashion, the hide for leather and the flesh can be consumed as a meat source. Little scientific data exists on any of the products thus it is the focus of this work to examine the sensory quality of various cuts of emu meat obtained from breeder quality or non-breeder quality birds and to determine the effects of end-point cooking temperature on the sensory characteristics of the meat.

Methods

Meat. Thirty yearling emus obtained from two emu marketing cooperatives were slaughtered at the Meat Laboratory, Texas Tech University, a U.S.D.A. inspected facility. Emus stunned with a captive bolt, were killed by exsanguination, and plucked and skinned by hand. Carcasses were trimmed of external fat, eviscerated, rinsed, and chilled at 3°C for 24 hr. Carcasses were halved and then fabricated into boneless cuts according to AQIS (1994). Cuts were weighed, vacuum packaged and frozen (-20°C) until subsequent sensory analysis in 8 to 10 wk.

Sensory Studies. Three phases were conducted in which unseasoned meat thawed (3°C) overnight was trimmed to about 1.5 cm thickness to be broiled to a specified end-point temperature on a Farberware Open Hearth Grill (Farberware, NY). Steaks were trimmed of as much external fat and connective tissue as possible prior to cooking. Cooking losses were determined and steaks were cut into 1 x 1 x 1 cm samples that were identified with 3-digit random numbers. Samples were placed in warm sand pans and served to 8 to 11 trained panelists that consisted of faculty, staff and students. Panelists stationed in individual booths under red lights were asked to evaluate samples for tenderness, juiciness, meat flavor intensity and off-flavor intensity (1 = extremely tough, dry, bland; 8 = extremely tender, juicy, intense). Deionized water was provided to cleanse panelists palates between samples. Warner-Bratzler shear (WBS) values were determined by averaging the shear values of five 1-cm diameter cores obtained across steaks that had been chilled at 3°C overnight.

Study Designs.

Phase one - Inside drums and full rumps (both right and left) obtained from nine breeder quality (BQ) birds were cooked to one of three internal end-point cooking temperatures (60°, 66°, or 75°C) in a 2 (muscle) x 3 (cooking temperature) factorial design. Panelists evaluated the six treatments per session for a total of six replications.

Phase two - Inside drums and full rumps (both right and left) obtained from either five BQ or five non-breeder quality (NBQ) birds were cooked to an internal end-point temperature of 66°C. Breeder quality birds had no obvious conformational defects while NBQ birds had defects such as humped backs, splayed legs, or deformed necks. All of the birds were in good health. The study was analyzed as a 2 (muscle) x 2 (BQ vs. NBQ) factorial. Panelists were served four samples representative of each treatment in each session for a total of ten replications.

Phase three - Fan filets, flat filets, mid drums, outside drums and rounds (right side only) obtained from five BQ birds were cooked to 66°C. Additionally, 1.5-cm thick U.S.D.A. Choice ribeye steaks were prepared along with the emu meat for a total of six treatments. Panelists at each session evaluated each of the six treatments. A total of five sessions were conducted.

Statistical Analysis. Data were analyzed using GLM program in SAS. If no interactions were present between main effects, least square means were separated by least significant differences.

Results and Discussion

Phase one. Panelists rated the meat as having a moderately intense meat-like flavor (6.2) regardless of the cooking temperature or muscle (inside drum or full rump). For both cuts of meat as cooking temperature increased toughness, as indicated by Warner-Bratzler shear values, dryness and cooking losses increased (Table 1). Trained panelists were unable to discern tenderness differences on the inside drum, however.

Table 1. Least square means of palatability traits of inside drums and full rumps obtained from breeder quality emus cooked to 60, 66 or 75°C.

Treatment Cut/temperature	Tenderness ¹	Juiciness ¹	Warner-Bratzler shear (kg)	Cooking losses (%)
Inside drum				
60°C	5.4 ^a	6.3 ^b	5.2 ^a	28.60 ^a
66°C	5.2 ^a	5.4 ^a	6.1 ^b	29.22 ^a
75°C	5.0 ^a	5.2 ^a	8.2 ^c	42.82 ^b
Full rump				
60°C	5.8 ^c	6.4 ^c	5.5 ^a	27.21 ^a
66°C	4.9 ^b	5.2 ^b	7.1 ^b	32.65 ^b
75°C	3.7 ^a	3.5 ^a	8.0 ^c	38.74 ^c

¹1 = Extremely tough and dry; 8 = extremely tender and juicy.

a,b,c Means within a muscle and a column with different superscripts are different (P<0.05).

Phase two. As in the phase one, the intensity of the meat-like flavor was similar for the inside drum and the full rump (6.1, moderately intense meat-like flavor). The meat from the BQ birds had a more intense meat-like flavor than did the meat from the NBQ birds (6.3 vs. 6.0, respectively). Bird quality had no significant effect on off-flavor ratings, but the inside drum received more intense off-flavor ratings than did the full rump (5.0 vs. 4.2, respectively). Of 264 total responses, 28.8% of the responses indicated that the meat had no off-flavors and 60.6% of the responses indicated the meat had a moderately bland to slightly intense gamey flavor. Cooking losses averaged 34.56% for both cuts of meat regardless of bird quality and as one would expect from the cooking loss data no differences in juiciness were noted by the panelists. According to the trained panelists, the inside drum from BQ birds was more tender than the full rump (5.8-moderately tender vs. 5.0-slightly tender, respectively). These results were confirmed by significant differences in WBS values. The relative tenderness of the muscles from NBQ birds was opposite of that found in BQ birds. The full rump of NBQ birds was rated more tender than the inside drum; however, a significant difference was not noted in WBS values.

Phase three. Fan fillets, flat fillets, mid drums and the ribeye steaks had similar tenderness (moderately to very tender), juiciness (slightly to moderately juicy) and meat-flavor intensity scores (moderately intense) except that the flat fillet was perceived as being somewhat more juicy and more flavorful (Table 2). The round produced the toughest meat with the outside drum having tenderness characteristics intermediate to the round and the first group of cuts mentioned. Off-flavor intensity varied considerably among the cuts of meat with "gamey" chosen as the most frequent descriptor. Off-flavor intensity varied from moderately bland (beef, outside drum, fan fillet) to slightly intense (flat fillet). Since all steaks were cooked to a similar degree of doneness, cooking losses were similar among the cuts averaging 30.07%.

Table 2. Sensory characteristics of beef ribeye steaks and various cuts of emu meat cooked to 66°C.

Cut	Tenderness ¹	Juiciness ¹	Meat flavor intensity ¹	Off-flavor intensity ¹	Warner-Bratzler shear (kg)
Fan fillet	6.8a	4.9b	5.9ab	3.4b	4.1a
Flat fillet	6.3ab	6.0a	6.4a	5.4a	3.6a
Mid drum	5.9bc	5.2ab	5.9ab	3.7ab	3.9a
Outside drum	5.2cd	5.6ab	5.8ab	3.1b	4.8a
Round	4.5d	5.6ab	5.9ab	4.0ab	6.2b
Beef ribeye	6.5ab	5.7ab	5.5ab	2.7b	3.8a

¹1 = Extremely tough, dry, bland; 8 = extremely tender, juicy, intense.

a,b,c Means within a column with different superscripts are significantly different (P<0.05).

Conclusions

Broiled emu fan fillet, flat fillet and mid drum had sensory characteristics very similar to broiled U.S.D.A. Choice ribeye beef steak. Emu meat like any other meat was susceptible to overcooking although the full rump appears to be more susceptible to overcooking than the inside drum. Cooking to higher end-point cooking temperatures caused increased cooking losses, decreased juiciness and tenderness. To maintain juiciness and tenderness cooking emu meat to a rare or medium degree of doneness was preferable. For consumers that prefer well done meat however, the inside drum may be the emu steak of choice since its eating quality seems to be less affected by the higher cooking temperatures. The fan fillet was the most tender and juicy of the cuts tested while the round was the toughest and driest. By utilizing this information the emu industry can determine which cuts to market as steaks suitable for grilling or broiling. Cuts which are unsuitable for steaks can be subjected to other cooking methods such as braising or stewing or can be used in further processed products such as ground emu, sausage, or jerky. Some of the emu meat had a very bland to moderately intense gamey flavor that may or may not be desirable to consumers. If this meat had been prepared with some seasoning it is likely that the gamey flavor would not be detectable since the intensity of the flavor was generally low. Meat from BQ and NBQ birds had similar palatability traits which should allow the emu industry to process the NBQ birds for meat without compromising the quality of the meat that will be available to consumers.

Pertinent Literature

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