EMU MEAT QUALITY AND PRODUCT DEVELOPMENT TOWARDS A NICHE MARKET

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Abstract- This study was carried out with an objective to evaluate the emu meat quality, proteome and ultra-structural characteristics and to develop emu meat products and study their acceptability. The results of physico-chemical characteristics, scanning electron microscopy (SEM) and protein characterization using two-dimensional electrophoresis (2-DE) are similar to the earlier reports for meats from other food animals. Sensory evaluation of different emu meat products revealed acceptable scores relative to chicken or goat meat products. Present study revealed the potential of emu meat as a new source of low fat, quality meat proteins with good technological properties and acceptable sensory quality.

I. INTRODUCTION

Emu (*Dromaius novaehollandiae*) meat is perceived and marketed as a healthy alternative to other red meats due to its leanness, low cholesterol content and a favorable fatty acid profile (1, 2). Emu meat has similarities both with poultry and red meats. The post-mortem changes *viz,* time required to reach ultimate pH and post-mortem proteolysis (ageing) in emu meat is very rapid like in other poultry meats. On the other hand, the color and texture characteristics are similar to red meats (2). A good number of sensory studies conducted with emu meat in comparison to beef have rated emu meat on the lower side because of its gamey odour and liver-like/ giblet flavor (3). Information on processing of emu meat into value added meat products and their acceptability is also limited (4).

Due to the fact that emu meat is relatively new and unfamiliar to processors and consumers, it is important to extensively study this meat source and determine proper processing requirements to create a potential market. Present study was conducted to determine the effect of ageing on emu meat quality, ultra-structure and proteome changes using 2-DE. Processing of emu meat into different value added products and the sensory attributes of emu meat were also evaluated relative to other meats.

II. MATERIALS AND METHODS

Emu birds (14-15 months age) were slaughtered at Krishna Emu Products Ltd., Vijayawada, India according to traditional halal method, chilled for 12 hours and later transferred to National Research Centre on Meat, Hyderabad for further experiments. Deboned emu meat cubes were packaged under atmospheric conditions and subjected to ageing at 4 ˚C for 9 days. Emu meat was analyzed for proximate composition, ultra-structural quality (Scanning electron microscopy, SEM). During ageing the samples were also analyzed for pH, water holding capacity (WHC), protein extractability, myofibrillar fragmentation index (MFI), muscle fibre diameter, sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE), and Warner-Bratzler shear force. Proteome changes were also observed using two-dimensional gel electrophoresis (2-DE). Processing technologies for production of value added emu meat products *viz*, emulsion sausages, restructured meat slices and chunked meat curry were optimized using different combination meats and other non-meat ingredients and sensorily evaluated in comparison to other commonly consumed meat products from chicken and goat meat. Experiment was repeated three times on

different occasions and the data were analyzed statistically.

III. RESULTS AND DISCUSSION

Proximate composition of emu meat indicated higher protein and ash content and lower fat, total lipids and cholesterol content compared to the reports for meat from other meat animals (5).The SEM photographs (Fig. 1) revealed orderly arranged muscle fibre bundles with less coarse appearance compared to buffalo meat structure.

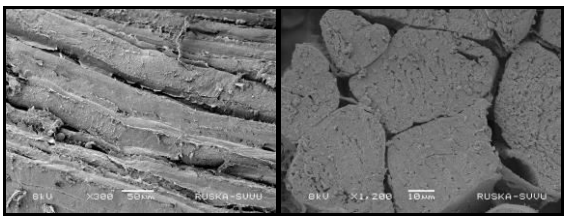

Fig. 1.Scanning electron micrographs of fresh emu meat

Improvement (P<0.05) in WHC, MFI and protein extractability with ageing was observed (Table 1). Lipid oxidation and discoloration as indicated by thiobarbituric acid reactive substances and % metmyoglobin, respectively increased (P<0.05) during ageing of emu meat. Reduction (P<0.05) in Warner-Bratzler shear force values from 59.4±1.36 N on day'0 to 44.5±1.49N on 6th day was observed. Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) analysis revealed the appearance of 30-kDa protein bands, indicating extensive proteolysis on 6th day of aging. Proteome analysis using 2-dimensional gel electrophoresis (2DE) revealed no change (P>0.05) in total number protein spots during different aging period (Fig. 2). However, significant (P<0.01) changes in number of differentially expressed protein spots were observed during ageing.

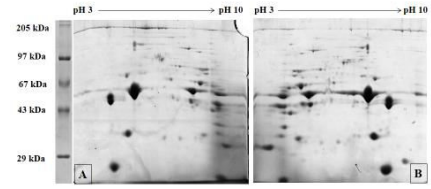

Fig. 2. Two-DE photographs of emu meat proteins during ageing; A. 0'day, B. 6'day

Table 1. Effect of ageing on physico-chemical and histological quality of emu meat

Parameters	0 day	3 day	6 day	9 day
pH	5.50 ± 0.01^{bc}	5.59 ± 0.01^{abc}	5.66 ± 0.04^{a}	5.47 ± 0.04^{c}
Water-holding capacity (%)	15.3 ± 0.88^{b}	14.6 ± 0.67^{b}	15.3 ± 0.67^{b}	20.3 ± 0.88^{a}
Myofibrillar fragmentation index	77.6± 1.45^{ab}	73.3 ± 1.76^{c}	75.3 ± 0.67^{bc}	81.0 ± 0.58^{a}
Muscle fibre diameter (μ)	49.3± 0.73^{c}	56.3 ± 0.28^{a}	52.4 ± 0.24^{b}	56.8± 0.95^{a}
Myoglobin (mg/g tissue)	4.53 ± 0.10^{b}	4.98 ± 0.73^{b}	3.08 ± 0.04^{a}	3.22 ± 0.19^{a}
Metmyoglobin (%)	7.16 ± 0.39^{b}	36.2 ± 7.05^{a}	48.7 ± 7.62^{a}	55.9 ± 9.24^{a}
TBARS* (mg malonaldehyde /kg sample)	0.09± 0.00^{d}	0.37± 0.05^{c}	0.85± 0.09^{b}	1.23± 0.12^{a}
Warner-Bratzler shear force (Newtons)	59.4± 1.36^{a}	----------	44.5± 1.49^{b}	--------

Note: *Means ± SE bearing same superscripts row-wise do not differ significantly (P>0.05); *TBARS, Thiobarbituric acid reactive substances (n = 3)*

Sensory evaluation of emu meat emulsion sausages, restructured emu meat slices and chunked emu meat curry by experienced panel members revealed lower scores (P>0.05) relative to similar products from chicken and goat meat (6). Emu meat products scored less for

appearance and juiciness because of the dark color of the emu meat and significantly lower fat content (<0.5%) which makes the product dry. However, combination products prepared with emu meat and chicken (upto 30% substitution) resulted in acceptable scores similar to only chicken or goat meat products. Chunked emu meat products scored equally for texture/tenderness similar to other meats. Emu meat or its products did not give any gamey flavor or exotic taste during sensory evaluation.

IV. CONCLUSION

Present study indicates the quality changes and improvement in tenderness of emu meat during aging at 4 ˚C under atmospheric conditions. Eventhough, emu meat products are sensorily acceptable, processing of emu meat into value added meat products requires different strategies to create sustainable consumer demand.

REFERENCES

1. Sales, J., Horbanczuk, J. Dingle, J., Coleman, R. & Sensik, S. (1999).Carcase characteristics of emus (*Dromaius novaehollandiae*). British Poultry Science, 40: 145-147.
2. Naveena, B.M. & Kiran, M. (2014). Emu meat: New source of healthier meat towardsniche market. Food Reviews International, 30: 1-14.
3. Andrews, L., Gillespie, J. & Schupp, A. (2000). Ratite meat sensory scores compared with beef. Journal of Food Quality, 351-359.
4. Hoffman, L.C. (2008). Value adding and processing of ratite meat: A review. Australian Journal of Experimental Agriculture, 48: 1270−1275.
5. Pegg, R. B., Amarowicz, R. & Code, W. E. (2006). Nutritional characteristics of emu (*Dromaiusnovaehollandiae*) meat and its value-added products. Food Chemistry, 97: 193-202.
6. Naveena, B.M., Sen, A.R., Muthukumar, M., Girish, P.S., Praveen Kumar, Y. & Kiran, M. (2013).Carcass characteristics, composition, phyico-chemical, microbial and sensory attributes of emu meat. British Poultry Science, 54: 329-336.