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Technical Factors Affecting to the Dried Buffalo Meat Production

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Abstract.

Buffalo, a triple purpose animal, provides milk, meat and mechanical power to mankind. Buffalo meat is one of the healthiest meats among red meat for human consumption; it is low in calories and cholesterol. Buffalo meat has superior meat processing characteristics due to its chemical composition, structural components and functional abilities. With the purpose of diversification of buffalo meat, we investigated several factors affecting to buffalo meat drying. Filet muscle was selected for this research. We focused on examing steaming & drying time, steaming & drying temperature, additives. Our results showed that the optimal parameters for the dried buffalo meat production were as follow: steaming in 10 minutes at 100^{o}C; sugar 25%, salt 3%; drying in 240 minutes at 65^{0}C. We successfully defined several factors affecting to the dried buffalo meat production. The objective of the present work was to study a strategy which gives value-added to meat from buffalo muscle. Buffalo meat is suitable for development of value-added meat products. It is suggested that salt drying may be a useful method of buffalo meat preservation.

Keywords: Buffalo meat, steaming, drying, additive, production

I. INTRODUCTION

Buffaloes are of two types, riverine buffalo and swamp buffalo. Buffaloes are large-ruminant animals that play an important role in the lives of millions of human beings as a source of milk, meat, draught power, transportation, and on-farm manure in several developing countries.[1] Buffaloes have unique ability to utilise coarse feeds, straws and crop residues converting them into protein rich lean meat. The production of buffalo meat has high growth possibilities and poses a minimal level of risk from pesticides and veterinary drugs when compared to beef production in developed countries. Buffalo meat is dark red in colour; it is because of less intramuscular fat or more pigmentation. The dark meat possesses good binding properties and is preferred in product manufacture. Buffalo meat can be very well used for production of sausage, a ready to eat and ready serve product. The major attractive features of buffalo meat are its dark red colour, good marbling, low connective tissue, desirable texture, high protein, water holding capacity, myofibrillar fragmentation index and emulsifying. The nutritional characteristics of buffalo meat confirmed the very low lipid content, correlated to the lower energy value of the diet fed to the animals.[2] The quality and quantity of buffalo meat depend on many factors, the most important of which are the water buffalo type and breed, age, feeding intensity, management system and environmental conditions.[2] Buffalo meat has higher iron proportions than other species, protein content and low fat values becoming a raw material of high potential for industry. Buffalo product presents healthy physicochemical characteristic respect to beef product, especially in terms of protein, fat and iron contributions against securities.[3] It has almost 2-3 folds cost advantage over mutton and goat meat.[4] Due to its highly nutritious milk, leaner meat and best draught power for wet environments buffalo offers immense potential for the improvement of livelihood.[5] Intensively reared young male buffalo meat showed higher moisture, collagen solubility, sarcomere length, myofibrillar fragmentation index and water holding capacity than meat from other animals. A higher pH, total meat pigments, salt soluble protein, emulsifying capacity and lower collagen solubility were observed in spent male buffalo meat. Spent female buffalo meat had higher fat, total collagen, muscle fibre diameter and shear force value. Sensory evaluation indicated a marked toughness in spent male and female buffalo meat.[4]

Effects of method of drying buffalo meat and storage time on quality were investigated.[6] Chemical-physical characteristics of buffalo (*Bubalus bubalis*) meat subjected to different aging times were evaluated.[7] Quality evaluation of fermented sausages as influenced by different fat levels and temperature of fermentation was studied.[8] Effect of curing, antioxidant treatment, and smoking of buffalo meat on pH, total plate count, sensory characteristics, and shelf life during refrigerated storage was demonstrated.[9] The influence of three cooking methods (boiling, grilling and frying) on the chemical and lipid composition of buffalo meat was evaluated.[10] Processing of buffalo meat nuggets utilizing different binders.[11] The effect of water activity on buffalo sausage quality and storage stability at ambient temperature was undertaken.[12] Development and evaluation of time-temperature integrator for monitoring high temperature thawing of frozen buffalo meat was examined.[13] Incorporation of whey protein concentrate at a level of 1, 2, 3 and 4% in buffalo meat was investigated for production, quality characteristic and shelf life of buffalo meat emulsion sausage.[14]

Buffalo is a good source of meat and has great economic importance. In order to enhance its value, we decided to diversify its product by drying. In this our research, we focused on using air-drying and monitoring the steaming time and temperature, additives, drying time and temperature. These factors would be affected to the dried buffalo meat quality.

II. MATERIAL & METHOD

2.1 Material

The collected buffalo meat must be hygienic without any disease, contamination. Natural color, none-rancidity were highly appreciated to select buffalo meat for examination.

2.2 Research method

2.2.1 Examination of steaming time for buffalo meat

In this experiment, we examined different time (5, 10, 15 minutes) in steaming. Steamed samples were evaluated on appearance, tenderness of its products

2.2.2 Examination of sugar and salt used for buffalo meat soaking

By fixing content of some minor additives such as five-spice powder (0.5%), garlic (2.0%), alcohol (5.0%), sasame (5%), sorbitol (3.0%), annato (2%). Then we studied different sugar (20, 25, 30%) and salt (2, 3, 4%) contents so that the best sensory characteristics of dried buffalo meat.

2.2.3 Examination of drying time and temperature for buffalo meat

Different time duration (200, 220, 240 minutes) and temperature (60, 65, 70^{o}C) were investigated to ensure the best dried buffalo meat quality. Evaluation the effectiveness of drying were based on physico-biochemical characteristics (lipid, protein, moisture and microbial total plate count) and sensory estimation (taste, structure, appearance)

2.3 Statistical analysis

Data were statistically summarized by Microsoft Excel.

III. RESULT & DISCUSSION

3.1 Effect of steaming temperature on sensory evaluation

By comparing different steaming times, we noticed the treated T_1 (5 minutes) having fishy smell, sticky structure, dark dried buffalo meat; the treated T_3 (15 minutes) having tough struture with little additive absorption. Sample T_2 (10 minutes) gave us the best dried buffalo meat so we choose this value for further experiments.

Buffalo meat has moisture (74.2%), protein (20.4%), fat (1.4%), ash (1.0%) and water soluble proteins (5.1%), salt soluble protein (7.2%), non protein nitrogen (0.37%) and hydroxyproline (0.12%) of LD muscle from male buffalo. Buffalo meat products are darker in colour owing to their higher myoglobin content compared to other livestock species.[15] The normal ultimate pH of buffalo meat varies from 5.4 to 5.8.[16]

3.2 Effect of additive soaking to sensory evaluation

From table 2, we saw M_1N_3; M_2N_1; M_2N_2; M_3N_2 mostly prefered so we decided to take these samples for re-evaluation. From table 3, After evaluation by 7 members, we saw the difference among samples. Sample treated by M_2N_2 (sugar 25%, salt 3%) was highly appreciated so we selected this value for further experiments.

Table 1. Sensory evaluation of steaming time on the dried buffalo meat

Steaming time	Score of specialist					Total score	Average score
	1	2	3	4	5		
T_1= 5 minutes	2	1	3	3	1	10	2.0±0.02
T_2= 10 minutes	**3**	**3**	**4**	**3**	**4**	**17**	**3.4±0.03**
T_3= 15 minutes	2	3	2	3	3	13	2.6±0.00

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 2. Sensory evaluation of additive soaking on the dried buffalo meat (9 members)

Number	Sample	Average score
1	M_1N_1 (20% sugar: 2% salt)	2.25±0.02
2	M_1N_2 (20% sugar: 3% salt)	2.81±0.01
3	M_1N_3 (20% sugar: 4% salt)	3.04±0.03
4	M_2N_1 (25% sugar: 2% salt)	3.59±0.00
5	**M_2N_2 (25% sugar: 3% salt)**	**4.24**±0.01
6	M_2N_3 (25% sugar: 4% salt)	2.52±0.03
7	M_3N_1 (30% sugar: 2% salt)	2.53±0.02
8	M_3N_2 (30% sugar: 3% salt)	3.01±0.01
9	M_3N_3 (30% sugar: 4% salt)	2.73±0.01

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 3. Sensory evaluation of additive soaking on the dried buffalo meat (7 members)

Number	Sample	Average score
1	M_1N_3 (20% sugar: 4% salt)	3.2±0.02
2	M_2N_1 (25% sugar: 2% salt)	3.2±0.01
3	**M_2N_2 (25% sugar: 3% salt)**	**4.3**±0.02
4	M_3N_2 (30% sugar: 3% salt)	3.6±0.03

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Treatment of buffalo meat with NACL and tetra sodium pyrophosphate significantly increased pH, water holding capacity, emulsifying capacity and decreased cooking loss.[17] 3 % acetic lactic acid combination can be used as decontaminate and preservative without affecting the colour and odour of buffalo meat.[18] A study was conducted on the effect on certain quality parameters by adding of sodium chloride (2.5%) and tetrasodium pyrophosphate (1%) to hot minced buffalo meat in chilled and frozen conditions. These treatments significantly increased pH, water holding capacity and emulsifying capacity and decreased cooking loss. Salt additions had a greater effect in improving emulsifying capacity of buffalo meat.[19]

3.3 Effect of drying temperature and time to the dried buffalo quality

After evaluation by 7 members, we saw the difference among samples. Sample treated by G_2t_3 (65^{0}C, 240

minutes) was highly appreciated so we selected this value for buffalo meat drying.

Table 4. Sensory evaluation of drying temperature and time on the dried buffalo meat (7 members)

Number	Sample	Average score
1	X_1T_1 (60°C: 200 minutes)	2.18±0.02
2	X_1T_2 (60°C: 220 minutes)	2.87±0.01
3	X_1T_3 (60°C: 240 minutes)	2.76±0.03
4	X_2T_1 (65°C: 200 minutes)	2.76±0.01
5	X_2T_2 (65°C: 220 minutes)	2.35±0.02
6	**X_2T_3 (65°C: 240 minutes)**	**3.94**±0.01
7	X_3T_1 (70°C: 200 minutes)	2.33±0.02
8	X_3T_2 (70°C: 220 minutes)	2.64±0.01
9	X_3T_3 (70°C: 24±0 minutes)	2.62±0.02

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Buffalo meat has increased tenderness compared to beef owing to its higher calpain activity in early post-morten.[20] Post-mortem treatments can appreciably improve tenderness and other market- oriented quality attributes of meat. Prolonged storage of buffalo meat in refrigerators significantly increased the tenderness. The tenderness of buffalo meat increased significantly with postmortem aging.[21]

Effects of method of drying beef and buffalo meat and storage time on quality were investigated. Six treatments were applied: drying beef with salt (B_1), drying beef without salt (B_2), drying beef with salt and spices (B_3), drying buffalo meat with salt (B_4), without salt (B_5) and with salt and spices (B_6). Taste and smell of all samples were acceptable up to 120 days of storage. The dry matter (DM), protein, ether extract (EE) and ash content decreased with storage time. The initial DM, crude protein (CP), EE and ash content of the samples were 92.1-95.2%, 77.0-78.6%, 5.0-6.5%, 8.0-12.8%, respectively. After 120 days of storage DM, CP, EE and ash content of the samples ranged from 87.8-89.1%, 72.9-74.0%, 5.0-5.9%, 7.4-9.7%, respectively. CP and EE percentage in beef was higher than buffalo meat, but beef contained less DM and ash. At the end of storage beef dried with salt contained highest protein (74.0%) and buffalo meat dried without salt contained lowest protein (73.0%). There was a significant ($p<0.05$ to 0.01) effect of drying method, salt and spices in beef and buffalo meat. With the elapse of storage time quality of meat degraded significantly ($p<0.05$ to 0.01). The degradation was lower in beef dried with salt than in beef dried without salt beef or beef dried with salt and spices, and buffalo meat.[6]

IV. CONCLUSION

Buffalo is one species being seen today as a saviour animal to meet man's increased requirements of food. Buffalo meat is a popular protein source in developing countries. Buffalo meat has gained importance in the recent years of its domestic usage and export potential. Buffalo meat is comparable to beef in many of its physicochemical, nutritional and functional properties and sensory attributes. The major attractive features of buffalo meat are its dark red colour, good marbling, low connective tissue, desirable texture, high protein, water holding capacity, myofibrillar fragmentation index and emulsifying capacity. We successfully defined several factors affecting to the dried buffalo meat production. The objective of the present work was to study a strategy which gives value-added to meat from buffalo muscle. Buffalo production makes an important contribution to economic development, rural livelihood, poverty alleviation, and meets the fast-growing demand for animal protein requirement.

REFERENCE

1. B.M. Naveena M. Kiran. Buffalo meat quality, composition, and processing characteristics: Contribution to the global economy and nutritional security. *Animal Frontiers* 4(4); 2014: 18–24.
2. Badpa Abdolghafour and Ahmad Saghir. Buffalo: a potential animal for quality meat production-a review. *Livestock Research International* 2(2); 2014: 19-29.
3. Eyas AM, Anjaneyulu ASR, Sathu T, Thomas R and Kondaiah N. Effect of different binders on the quality of enrobed buffalo meat cutlets and their shelf life at refrigeration storage (4 ± 1 ºC). *Meat Science* 75; 2007: 451-459.
4. G. Kandeepan, S.K. Mendiratta, V. Shukla and M.R. Vishnuraj. Processing characteristics of buffalo meat- a review. *Journal of Meat Science and Technology* 1(1); 2013: 01-11.
5. Pasha TN and Hayat Z. Present situation and future perspective of buffalo production in Asia. *The Journal of Animal and Plant Sciences* 22(93); 2012: 250- 256.
6. Malek, M., Hossain, M., Islam, R., & Akhter, S. Methods of drying beef and buffalo meat on meat quality. *Bangladesh Veterinarian*, *26*(1); 2009: 31-38.
7. Patrícia Aparecida Cardoso da Luz, André Mendes Jorge, Caroline de Lima Francisco, Juliana Lolli Malagoli de Mello, Carolina Toledo Santos and Cristiana Andrighetto. Chemical-physical characteristics of buffalo (*Bubalus bubalis*) meat subjected to different aging times. *Acta Scientiarum. Animal Sciences* 39(4); 2017: 419-428.
8. Saghir Ahmad and Qasim Nawab. Quality evaluation of fermented sausages as influenced by different fat levels and temperature of fermentation. *Journal of Meat Science and Technology* 2(3); 2014: 51-62.
9. S. Ahmad, A. Anzar, A.K. Srivastava, P.K. Srivastava. Effect of curing, antioxidant treatment, and smoking of buffalo meat on ph, total plate count, sensory characteristics, and shelf life during refrigerated storage. *International Journal of Food Properties* 8(1); 2005: 139-150.
10. M. Juárez, S. Failla, A. Ficco, F. Pena, C. Avilés, O. Polvillo. Buffalo meat composition as affected by different cooking methods. *Food and Bioproducts Processing* 2(1); 2009: 8-15.
11. K. Dushyanthan, R. Narendra Babu, C. Vasanthi and V. Venkataramanujam. Processing o fbuffalo meat nuggets utilizing different binders. *Tamilnadu J. Veterinary & Animal Sciences* 4(2); 2008: 77-83.
12. S. Sureshkumar , V. Venkataramanujam , K. Dushyanthan and A. Kalaikannan. Effect of water activity on the physico-chemical, microbiological and sensory qualities of buffalo meat sausage stored under ambient temperature. *American Journal of Food Technology* 1; 2006: 166-172.
13. Vishnuraj Mangalathu Rajan, Kandeepan Gurunathan, Vivek Shukla. Development and evaluation of time-temperature integrator for monitoring high temperature thawing of frozen buffalo meat. *Turkish Journal of Veterinary and Animal Sciences* 41; 2017: 496-505.
14. Badpa Abdolghafour, Ahmad Saghir. Effect of whey protein concentrate on quality and shelf life of buffalo meat emulsion sausage. *Scholars Journal of Agriculture and Veterinary Sciences* 1(4); 2014: 201-210.
15. Lazar V. We like buffalo. *Meat Processing* 40; 2001: 80- 85.
16. Kandeepan G and Biswas S. Effect of domestic refrigeration on keeping quality of buffalo meat. *Journal of Food Technology* 5(1); 2007: 29-35.

17. Anjaneyulu ASR, Sharma N and Kondaiah N. Evaluation of salt, polyphosphates and their blends at different levels on physicochemical properties of buffalo meat and patties. *Meat Science* 1989; 25: 293-306.
18. Surve AN, Sherikar AT, Bhilegaonkar KN and Karkare UD. Preservative effect of combinations of acetic acid with lactic or propionic acid on buffalo meat stored at refrigeration temperature. *Meat Science* 29; 1991: 309-322.
19. Kondaiah N, Anjaneyulu ASR, Kesava Rao V and Sharma N. Effect of different handling conditions on quality of minced buffalo meat. *Indian Journal of Animal Sciences* 56(6); 1986: 677-679.
20. Neath KE, DelBamio AN, Lapitan R M, Herrera JRV, Cruz LC, Fujihara T, Muroya S, Chikuni K, Hirataya M and Kanai Y. Difference in tendeness and pH decline between water buffalo meat and beef during post-mortem aging. *Meat Science* 75; 2007: 499-505.
21. Maltin CA, Sinclair KD, Warriss PD, Grant CM, Porter AD, Delday MI, and Warkup CC. The effects of age at slaughter, genotype and finishing system on the biochemical properties, muscle fibre type characteristics and eating quality of bull beef from suckled calves. *Animal Science* 66(2); 1998: 341-348.