



Potential of buffalo meat products

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Buffalo has become an important dairy animal (producing more than 55% of total milk production) complimented by draught and meat functions leading to better prospects of buffaloes as triple purpose animal. Efficient utilization of the buffalo resources including slaughter and meat production for domestic and export market has been considered important to products improve overall efficiency of the species and sustain their production. Considerable proportion of buffalo meat is produced from spent buffaloes which is lean in character and excellent for processing to products. By-products such as carcass trimmings, tripe, heart, tongue and oesophagus meat are available in adequate quantities requiring further processing to products. The potentials of buffalo meat for processing are enormous due to desirable characteristics of buffalo meat for processing and the ever increasing demand for processed meats due to increasing per capita meat consumption in developing countries associated with rising income levels and urbanization.

In the developing countries per capita meat consumption is considerably lower than in the developed

countries. Average consumption of meat in the 1990s was 12 kg per head per year for sub-Saharan Africa, 18 kg/head per year for Asia and 45 kg/head per year for Latin America (FAO, 1998) compared to an average of 76 Kg./head per year in developed countries. Although number of factors affect the long term estimates for per-capita demand for livestock products, the scenario predicted for changes in consumption pattern based on the scenario of economic development has been considered (Bouwman, 1997) and the per-capita demand (kg/year) for all the developing countries would increase from 17 kg in 1989/91 to 25 kg in 2010 and to 30 kg in 2025. The fact that buffalo meat is largely produced under natural conditions of grazing and feeding crop residues without resorting to hormones and growth promoters and minimal level of risks from pesticides and veterinary drugs as compared to developed countries beef production the potential of buffalo meat would be better in meeting the requirement for increased per capita consumption.

Processing characteristics

The prospects of processing meat depends on quality characteristics, which include, in addition to be free from contaminants (pesticides, veterinary drug residues and microbes and their toxins) proper rigor development, pH, colour, tenderness, water holding capacity, compositional quality (less of connective tissue and optimum marbling or fat content), free of objectionable odours, amenable to product development, complementarily with other meats and additives and better keeping quality on storage. Buffalo meat has a number of desirable quality characteristics for developing good quality buffalo meat products.

Functional Properties: Buffalo meat from carcass and head have better functional properties than tripe and heart meat for use in processed meat products (Kondaiah et al., 1986). Use of polyphosphates in meat products formulations significantly improved their quality due to increase in pH and improving functional properties (Kondaiah et al., 1985, Anjaneyulu et al. 1989). Specific effect of phosphate over and above the pH effect in meat system was demonstrated (Anjaneyulu et al., 1990 b). Yield, quality and acceptability of Kababs have been significantly enhanced by addition of polyphosphate

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irrespective of meat handling conditions (Mir Salahuddin et al., 1991).

Pre-blending of buffalo meat with salt and polyphosphate improved its functionality for product processing (Anjaneyulu et al., 1994). Use of sodium ascorbate (500 ppm), alpha tocopheral acetate (10 ppm) and 0.5% sodium tripolyphosphate alone or in combination for pre-blending enhanced functional properties and reduced pigment and lipid oxidation during storage on 4°C (Sahoo and Anjaneyulu, 1997).

The palatability characteristics, shear force values and taste panel scores of buffalo meat and beef obtained from identical age groups have been reported almost similar (Ognjanovic, 1974). Buffalo meat has certain outstanding attributes such as lower intra-muscular fat, cholesterol and calories, higher units of essential amino acids, biological value and iron content (Kondaiah et al, 1988; Anjaneyulu et al 1990^a). Low cholesterol content of buffalo meat has been re-emphasized (Lazar, 2001). The ratio of polyunsaturated fatty acids to saturated fatty acids was reported to be 0.22 and 0.91 for beef and buffalo meat respectively (Sinclair et al., 1982).

No significant differences were observed in the physical characteristics of meat from Friesian and water buffalo male calves slaughtered at 20, 28 and 36 weeks of age and taste panel rated buffalo meat (from animals at 36 weeks of age) cooked in an open pan significantly more tender and juicy (Borghese et al. 1978).

Treatment of tough buffalo meat with cucumis (Fruits of cucumis trigonus Roxb) powder 2% (w/w) and 5% (w/w) crude ginger extract was equally effective as 0.1% papain (w/w) in producing roasted buffalo meat chunks with improved flavour, juiciness, tenderness and overall palatability scores (Naveena, 2002). Buffalo meat pickle of high acceptability and improved tenderness was developed by marination of meat chunks with acetic acid prior to cooking (Khathe, 2002).

A high quality meat protein fraction named 'beef rimi' was prepared from buffalo meat by a process of grinding, washing, sieving and dewatering (Babji and Osman, 1992). Yield of beef rimi (wet weight basis) was 57.3 and 38.7% from top side and forequarter cuts respectively. Beef rimi obtained from buffalo meat could be a functional raw material, high in myofibrillar protein, low in fat content and has good gelling

properties useful in the manufacture of value added meat products. Washing of buffalo meat with water and EDTA solution (2% pH 4.5) on keeping quality of mince and patties indicated that TBA value was lowest and microbial counts were significantly lower. Patties made from EDTA washed meat were highly acceptable after 20 days refrigerated storage and patties made from water washed meat was comparable to that of patties from unwashed raw meat (Kulkarni et al., 1993).

Effect of processing and storage on fatty acid composition of adult buffalo meat was studied (Kesava Rao and Kowale, 1993) and a significant increase in myristic, palmitic and stearic acids and decrease in oleic and linoleic acid contents was observed on storage. Frozen conditions of handling buffalo meat were relatively better than hot (pre-chilled) or chilled conditions for use of buffalo meat in products based on functional properties (Kondaiah et al., 1986).

Processed meat

Development of processed meat sector is important to provide variety meat products, increase demand and better marketability, utilize different cuts and byproducts gainfully to incorporate non-meat ingredients for quality and economy, to utilize tough meat from spent (aged) animals and to preserve, transport and distribute to cover larger populations. In developing countries hardly any proportion of meat is processed while in developed countries about 70 percent of meat is processed to products for trade. In the developing countries the meat is largely marketed as fresh (unprocessed) meat with in few hours after slaughter, while the meat meant for export is largely frozen stored and exported.

Buffalo meat is largely consumed as buffalo meat curry by water cooking of the chunks in spices and condiments with buffalo fat or vegetable oil. Curry is also made from buffalo meat mince. The traditional products in India also include sheek kabab, shami kabab, boti kabab, buffalo meat fry, liver fry, brain curry, tripe curry etc. Small scale meat product manufacturers produce sausages, salamis, patties, kababs etc. However, researches have developed a number of products including-sausages, patties, kababs, nuggets, blocks, hams, cured and smoked meat products, meat balls, restructured products, cutlets etc.





Cured and Smoked Products

Curing and smoking contributes to attractive colour, flavour and enhances shelf life. These products are popular among consumers. Sodium nitrite level of 150 ppm was found optimum for producing smoked buffalo meat chunks with better colour and flavour (Mathew Thomas, 1992). Incorporation of milk proteins improved the sensory attributes of smoked buffalo meat sausages (Deenathayalan, 1997; Sathu, 2001). Corned beef produced from buffalo meat and beef were indistinguishable in their organoleptic quality while the former was found to have better appearance due to white colour of the fat (Karvir, 1985).

An accelerated method for using of buffalo meat for pastrami manufacture was reported (Ibrahim, 2001). The process states that buffalo lean round muscles were cracked, coated with a curing paste comprising a salt and curing mixture (NaCl , ascorbic acid and NaNO_2), paprika, fenugreek, wheat flour and garlic; subjected to partial drying by heating to 71°C and kept at room temperature for 6 days to complete the curing/ageing process as compared to the traditional control of curing at room temperature followed by drying for less than or equal to 3 week without heating. Heat treated pastrami was found to be of good quality and similar to the traditional control product.

The possibility of using buffalo meat to produce bresaola, a cured, dried meat product commonly made from lean beef was studied and concluded that it is possible to use buffalo meat in the production of bresaola despite buffalo meat bresaola was less tender and darker compared to beef bresaola (Paleari et al. 2000). Buffalo meat has been utilized in the manufacture of Salami sausages in Philippines and traditional sausages in Russia (Kocharli et al. 1984).

Studies from Philippines on development of ham and bacon from buffalo beef (Cara beef) indicated that acceptable quality ham and bacon could be produced from buffalo beef. Although cara beef ham was darker and scored less flavourful and acceptable than post ham (Mamino and Horn, 1996). Cara beef bacon (brisket) received significantly lower general acceptability scores than pork bacon (belly) but, cara beef bacon received acceptable scores (Mercado and Horn, 1996).

Emulsion / Chunk Products

Buffalo meat sausages of acceptable quality were developed using buffalo meat and byproducts (Krishnan and Sharma, 1990). Incorporation of dried ginger was suggested in place of green ginger rhizome (0.5%) alone or in combination with onion and garlic to prevent undesirable soft texture in buffalo meat patties (Anjaneyulu, 1988).

Pati et al (1992) suggested addition of fat premix (equal proportion of meat, fat and whole egg liquid) in the formulation instead of fat to facilitate better fat dispersion and emulsification and to improve palatability of buffalo meat patties. Production of low fat (10%) ground (3 mm plate) patties with added water (12%), sodium alginate (0.1%) and Carageenan (0.75%) was reported (Suman, 2001). In the process for development of low fat (<6%) buffalo meat sausages, formulation with preformed gel of hydrocolloid (0.9%) and whey protein concentrate (6%) and added fat at 4% was found comparable with that of control sausages. A process for shelf stable buffalo meat chunks and ready to eat spiced cutlets applying hurdle technology (desorbing meat in infusion solution to reduce water activity) was investigated (Malik, 1999). Retort Pouch processing (F value of 12.13 min) of buffalo meat blocks with acceptable keeping quality of 90 days at 30°C was reported (Devadason, 2000). Intermittent vacuum tumbling for 18 hours reported to be appropriate for production restructured buffalo meat blocks (Keerthi, 1998).

In a comparable study of meat from 2-6 years old buffaloes with cattle of 3-4 years old in Thailand, it was observed that meat from buffalo and cattle was similar in composition and buffalo meat could be used as fresh meat or processed products (meat Jerkey and fermented sausage) without any major difference from cattle beef. Differences between meat of 2 years old and 6 years old buffaloes were small (Uriyapongson et al. 1996). Restructured blocks, nuggets and rolls were produced using meat from male buffalo calves, and rolls made from chunks has better juiciness, texture and overall acceptability than that of emulsion (Anjaneyulu et al., 1995). However, restructured products from adult buffaloes were relatively less palatable. Addition of whey protein concentrate along with polyphosphate markedly improved the emulsion stability, product





yield and sensory attributes of restructured buffalo meat nuggets (Anjaneyulu et al., 1998).

Highly acceptable enrobed buffalo meat cutlets have been produced in incorporating buffalo meat emulsion at 20% level replacing cooked meat in the formulation. Enrobing of buffalo meat cutlets with whole egg liquid battering and breading with bread crumbs significantly reduced shrinkage and enhanced sensory attributes and shelf life (Eyas, 2001).

Microwave cooking of buffalo meat shami kabab, boti kabab and patties was reported to result improved colour and tenderness scores compared to hot air oven but flavour was better in the latter method due to excessive heating effect. Further curing and polyphosphate treatment reduced cooking loss and improved tenderness (Hoda et al. 2002). A snack product of moderate to very acceptable quality was developed from buffalo tripe (rumen meat) treating tripe with 5% trisodium phosphate for 30 min and using 50% corn flour and extrusion process (Anna Anandh, 2001).

Conclusions

With expected increase in per capita meat consumption among developing countries where buffalo meat finds high acceptability there would be increase in consumption of buffalo meat as buffalo meat would be a better alternative to meet the growing requirement for animal protein because of the quality aspects of buffalo meat and increasing buffalo production prospects as a triple purpose animal. The following aspects of buffalo meat processing and utilization need research and development efforts:

1. Development of high value products from tender buffalo meat from buffalo calves.
2. Development of high acceptability sausage type products using buffalo lean meat trimmings and pork fat trimmings in view of the growing demand for such products from domestic and export market in south-asian countries.
3. Use of fat pre-mix and pre-blending technologies for producing better quality buffalo meat products.
4. Incorporation of chicken meat and byproducts for production of better quality buffalo meat products.
5. Development of retort pouched shelf stable buffalo meat products for better distribution.
6. Popularizing processed buffalo meat products with Indian spices and condiments in the domestic and

export market.

7. Keeping quality studies on buffalo meat and products to determine the spoilage pattern and factors involved.

8. Salvaging buffalo calves from early death and growing them to optimum slaughter weights to produce high quality buffalo meat and byproducts.

9. Improving hygiene in buffalo slaughter houses, avoiding floor slaughter, overcrowded slaughter and providing basic amenities.

10. Promoting rural abattoirs for buffaloes to cope up with animal welfare issues and producing hygienic meat for the urban consumers.

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