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Beefrimi, A Surimi-Like Product From Indian Buffalo Meat

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Malaysia imports about 80% of its red meat requirement from India. Meat from India are mostly from buffalo animals, cheap but often tough in texture. The toughness of buffalo meat is due to old animals and lower quality meat cuts derived from quarters and lower primal cu Although Indian meat is suitable for stew and curry type dishes, its use in the processed meat industry is limited. One way to remove the connect tissue which contributes to toughness is by grinding and washing using ice water as is practice in the production of surimi from fish. Mc Keith al. (1988) produced surimi-like materials from beef, pork and beef by-products that have good functional characteristics. Park et. al (1988) repor beef and pork meat to be good sources for producing surimi-like materials. It is possible to exploit the use of spent milking cows as potential r materials for the production of surimi like material. Babji and Johina (1990a) used spent hen (layers) to produce a surimi-like material called Aya Recently, Babji and Johina (1990b) demonstrated that taste panelists were not able to detect real differences in the appearance, color, tenderness overall acceptance of chicken sausages made from either broiler meat or spent hen ayami.

This study used low quality Indian buffalo meat to produce a surimi-like material, named Beefrimi. It is felt that with the removal of exc fat, connective tissue and undesirable water soluble components, beefrimi that is obtained could be used as an excellent source of meat protein develop further processed meat products in Malaysia. Further more, with imported Indian meat prices being far cheaper than locally produced b a large scale production of beefrimi could result in more production of the various types of value added processed meat, currently lacking, expansive since most of them are imported. The objectives of this study were to evaluate yield from two lower carcass cuts i.e. Topside (TS) Forequarter (FQ) buffalo meat imported from India. The beefrimi obtained was evaluated for gel strength, tenderness, changes in proxim composition and compared with the original buffalo meat from the same primal cuts.

MATERIALS AND METHODS

Preperation of Beefrimi

Topside (TS) and Forequarter (FQ) cuts buffalo meat from Allana, India was obtained through a local importer. The frozen meat w chopped into 1 1/2" cubes, then grind through a 4 mm grinder plate three times, with meat temperature ranging about -5 to 0°C. The minced m is then washed with 5 volumes of ice water containing 0.2% salt. The homogenate was blended in a silent cutter for 3 minutes then filtered thro a cheese cloth, before being pressed to squeeze out excess water. Washing was repeated using 0.3% salt brine wash. The beefrimi obtained w mixed with 3% sugar and 0.2% phosphate in a silent cutter, shaped into blocks, packed in plastic bags and frozen in a chest freezer at -18°C. (Fig 1).

Preperation of Gelated Hot Dog Product

Frozen blocks of buffalo meat (TS) and FQ, Beefrimi (TS) and Beefrimi (FQ) were thawed in a cold room (3-5°C) overnight. The blo were cut in 3/4" cubes, then mixed with a basic mixture of local hot dog recipe, consisting of texture soy protein, beef fat, Non fat dry milk, s nitrate, sugar, beef flavor, liquid smoke and spices. The meat batch was chopped in a silent cutter for 10 minutes, after which it is stuffed i Walsfoder sausage casing, 60 mm diameter (for folding test) and in Teepack Wienie Pak casing, 20 mm diameter (for other tests). This was repea for all the three types of materials. The hot dog products obtained were divided further into two batches, one cooked in a convection oven until internal temperature reached 70°C and the other batch boiled in hot water for 15 minutes until the internal temperature reached 70°C. They were cooled, and stored at -18°C until ready for analyses.

Physical Measurements

The shear force of the gelated hot dog products was measured using a Shimadzu Autograph model AGS-500A attached with a Warner Bratzler meat shear. The autograph was fitted with a 100 kg compression load cell with instrument settings at; cross-head speed- 100mm/min; chart speed - 200 mm/min; and load cell setting - 10kg. The sampel size was 30mm long with a diameter of 20 mm. The shear force was obtained from five samples/treatment and the mean automatically calculated on the print out. The gel strength was measured using the folding test method (Kudo et. al. 1973). Gelated products of 60mm diameter and 2.5mm thickness were folded twice and further and their strength evaluated as follows:

Sample condition	Grade
Intact after 4 folds	AA
Slight breakage after 4 folds	A
Slight breakage after 2 folds	B
Breakage but still attached after 2 folds	C
Breaks completely after 2 folds	D

Chemical Evaluations

The proximate composition was determined using the procedures in AOAC (1980) for protein, fat, moisture and ash.

RESULTS AND DISCUSSION

Processing of buffalo meat from topside (TS) and forequarter (FQ) into beefrimi resulted in yields of 57.3% and 38.7% respectively. Table 1 showed the effects of grinding and washing on the yield at various intervals. A minimum of three times grinding was necessary to seperate most of the connective tissues from the original Indian buffalo meat. The forequarter is a cheaper cut compared to the topside and as observed in the results, the FQ yield was only 60% compared to the TS yield of 80.4% after the third grind. Washing with 0.2% salt in ice water removed some fat and water soluble components. The second washing with 0.3% salt in ice water removed most of the fat and water soluble components. The low yield from FQ is due to much higher connective tissue and fat present in such type of meat, especially from Indian Buffaloes. Mc Keith et. al. (1988) using different method in processing obtained yield data of 45% for beef and Pork; 38% for beef heart; 18% for beef tongue, 10% for beef cheek meat and 7.5% for beef weasand meat. Mc Keith et. al. (1988) contributed the yield differences to be due partly to the differences in the connective tissue contents of the starting materials. The yield obtained from our study compares favourably to Mc Keith et. al. (1988) group as well as that by Lee (1986) who obtained 23.8% surimi from fish as raw material. Table 2 showed the shear force measured in kilogram force for various gelated hot dog samples made from buffalo TS and FQ as well as beefrimi TS and FQ. The two cooking methods were used because they are common methods of cooking in Malaysia. Samples cooked using the conventional oven showed higher shear force for all types of samples compared to boiling. This is due mainly to the hardening of the surface layer in contact with the oven plates. The forces required to shear beefrimi hot dogs from FQ and TS were much higher when compared to a buffalo FQ and TS. This is probably due to the higher gelation property of beefrimi hot dog compared to the original buffalo FQ and TS made hot dogs. The higher shear force readings with beefrimi samples does not mean that the samples are tough, but on the other hand indicates their strong gelling property, which was visually obvious. The washing step played an important role in concentrating the actomyosin, thus increasing gelling property (Sumpeno Putro, 1989). Gelation strength of the products is measured using the folding test method as recommended by Kudo et. al. (1973). The beefrimi hot dogs from both FQ and TS had slight breakage after 4 folds, scoring grade A, whereas the buffalo FQ and TS hot dogs had slight breakage after 2 folds, scoring grade B. The proximate analyses results are shown in Table 3. In general beefrimi hot dog contained more moisture than buffalo meat hot dog and boiled hot dog had higher moisture content compared to those cooked in the conventional oven. Beefrimi hot dog contained higher protein, and lower fat compared to buffalo meat hot dog. This is an important nutrition consideration in beefrimi where its protein content has been concentrated and its fatty components washed out during the processing. Lee (1986) reported the separation of water soluble components, fats and pigments, the concentration of actomyosin proteins and the fine texture characteristic of surimi like material as a result of processing. The real changes in proximate composition in this study is clearly shown in buffalo meat, beefrimi

TS and beefrimi FQ. Protein content increased by 1-2%, fat content is reduced significantly from 18-19% to 1-2% and moisture content increas
by about 14-17%.

SUMMARY

Beefrimi, a high quality functional material with high protein, low fat and good gelling property, can be obtained from lower quality Ind
buffalo meat. It can be used in the manufacture of further processed meat products such as hot dog, which has higher protein content and lower f
content. This type of product will find better acceptance in today's market, where health and nutrition considerations are considered importan

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BEEFRIMI (BEEF-LIKE SURIMI) PRODUCTION

FROZEN INDIA MEAT

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MINCED X3
(PLATE 4mm)

↓

ICE WATER + 0.2% SALT → WASHING STRAINING/SQUEEZING (X2) → DEWATERING

↓

CRYOPROTECTANT
(SILENT CUTTER)

↓

PACKAGING

↓

FROZEN
(-18°C)

FIGURE 1

Table 1 : Yield of beefrimi from Buffalo Topside and Forequarter after grinding and washing

	Buffalo Topside %	Buffalo Forequarter %
Original weight	100	100
After 1st Grinding	96.5	88.9
After 2nd Grinding	89.3*	72.2
After 3rd Grinding	80.4	60.0
After 1st Washing	72.4	49.4
After 2nd Washing	57.3	38.7

Table 2 : Shear force (kilogram force) of Hot dogs made from buffalo TS and FQ and Beefrimi TS and FQ, cooked by boiling and oven heating.

Cooking Treatment	Sample	Shear force (kgf).
	Buffalo TS	30.5±(0.2)
Boiled Hot dog	Beefrimi TS	35.6±(3.2)
	Buffalo FQ	38.0±(2.4)
	Beefrimi FQ	48.5±(2.4)
Oven heated Hot dog	Buffalo TS	37.7±(4.9)
	Beefrimi TS	46.9±(1.8)
	Buffalo FQ	45.8±(0.9)
	Beefrimi FQ	55.1±(8.1)

Table 3 : Proximate analyses of Hot dogs manufactured from buffalo TS and FQ and beefrimi TS and FQ and the raw materials

Cooking Method	Samples	Protein	Fat g/100g	Moisture	Ash
Raw materials	Buffalo FQ & TS Mix	15.3	18.8	64.9	0
	Beefrimi TS	16.3	1.53	82.6	<0.1
	Beefrimi FQ	17.3	1.9	78.9	<0.1
Hot dog (Boiled)	Buffalo TS	15.7	14.9	67.8	1.6
	Beefrimi TS	16.4	12.9	63.7	1.9
	Buffalo FQ	15.8	13.8	67.9	1.9
	Beefrimi FQ	16.8	12.5	68.8	1.7
Hot dog (Oven heated)	Buffalo TS	15.1	15.2	63.9	3.3
	Beefrimi TS	16.0	13.1	66.9	3.0
	Buffalo FQ	15.2	14.9	64.5	3.1
	Beefrimi FQ	17.8	12.8	66.3	2.6

FOLDING TEST

Folding test* score of Frankfurter made from Buffalo TS and FQ and Beefrimi TS and FQ, cooked by boiling and oven heating respectively.

Cooking Treatment	Sample	Folding Test Score
Boiled (Frankfurter)	Buffalo TS	B
	Beefrimi TS	A
	Buffalo FQ	B
	Beefrimi FQ	A
Oven heated (Frankfurter)	Buffalo TS	B
	Beefrimi TS	A
	Buffalo FQ	B
	Beefrimi FQ	A

* Folding test was carried out using the method of Kudo et. al. (1973)