

## QUALITY AND SHELF LIFE OF VALUE ADDED CARABEEF LOAVES AT REFRIGERATED TEMPERATURE

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### ABSTRACT

*Value added carabeef loaves were developed with variety meat, offals and non-meat extenders (refined wheat flour-T1 and soya flour-T2) while control loaves were prepared with skeletal meat and refined wheat flour. The loaves were packed aerobically in sterile Pet/Poly packages and subjected to physico-chemical quality, microbial profile and sensory quality analysis. Incorporation of low value meat and offals did not affect the physico-chemical characteristics of the loaves as reflected by the statistical similarity between control and treatment loaves. This is further confirmed by the improved organoleptic acceptability of the treatment loaves over the control loaves. The results of total viable count and yeast and mold count reveal shelf stability of loaves for 14 days. The acceptability of T1 and T2 carabeef loaves over the control loaves concludes that low value meat and offals can be incorporated @ 25% replacement of skeletal meat and soya flour can be used as a binder in the development of value added carabeef loaves which can be stored safely up to 14 days at 4±1 °C under aerobic packaging*

**Key Words:** Value addition, Carabeef loaves, physico-chemical, microbial, organoleptic

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## INTRODUCTION

Utilization of spent buffalo meat in the preparation of comminuted meat products by improved processing technologies is a profitable way of producing value added convenience meat products (Kondaiah, 2004). Good emulsion type meat products such as loaves, nuggets, patties and sausages can be prepared by incorporating certain proportions of low value cuts which are underutilized along with skeletal meat alone in order to reduce their cost of production (Konwar and Hazarika, 2003). Variety meats like head meat, heart, cheek meat, tongue, etc. are low valued portions of the carcass with less palatability attributes but in product preparation they did not diminish the quality of the product (Ahmad and Srivastava, 2007). Addition of binders as functional ingredients in comminuted products provide an optimum emulsifying, water binding and textural properties which in turn improve the appearance, slicing characteristics, yield, flavour and cost of the product.

Buffalo meat having several good attributes such as high protein, low fat and cholesterol content as well as low calories compared to beef and also possessing good functional properties is processed into variety of value added convenience meat products like nuggets (Thomas *et al.*, 2006), sausages (Sachindra *et al.*, 2005), loaves (Devatkal *et al.*, 2004), burgers (Modi *et al.*, 2003) and patties (Suman and Sharma, 2003) and are available at ease through cold storage in retail outlets. The current

work was undertaken to study the effect of incorporation of low value meat such as head meat and the underutilized offal such as heart and tongue along with incorporation of soya flour as a binder in the preparation of value added carabeef loaves and study its shelf life on chiller storage under aerobic packaging.

## MATERIALS AND METHODS

A total six trials of carabeef loaves were prepared with control samples consisting of skeletal meat and refined wheat flour as binder and treatment samples consisting of 25% replacement of skeletal meat with low value meat and offals and incorporation of refined wheat flour and soya flour as binders in treatments based on the preliminary research (Dushyanthan *et al.*, 2008). The formulation of control and treatments were presented in Table 1. Chunks of meat, offals and fat were minced separately in a meat mincer using 4.5 mm sieved plate (OMAS Meat Mincer, Type TS 12, Italy). The minced meat and fat were then chopped in bowl chopper (MADO Adjutant) using three blade cutters. During chopping, the temperature of the emulsion was maintained at 10-12°C by the addition of slushed ice @ 10 per cent. The emulsion was stuffed into a molded container (25 cm x 10 cm x 10 cm) and cooked in a cooking vat at 80°C for 30 minutes, so that internal temperature of 72°C reached in the product. The cooked loaves were packed in sterile Pet/Poly pouches (thickness- 62 µ, oxygen transmission rate -140 to 150 cc/sq. m/24 hrs/atmosphere) and stored at 4±1°C and

subjected to physico-chemical, organoleptic and microbial analysis on weekly intervals for a month period to determine their keeping quality.

The assessment of pH of emulsion and product were done by using a digital pH meter (Bouton *et al.*, 1971). Shear force values (SFV) of cooked sausages were assessed at three different points using Warner Bratzler shear press (Model no. 04347, The G.R W FG. Co., Manhattan, USA) as per the method of Rao *et al.* (1999) and the values were expressed in kg/cm<sup>2</sup>. Thiobarbituric Acid Number (TBA) was measured by a modified method of Strange *et al.* (1977). Tyrosine value (TV) was determined by the modified method of Strange *et al.* (1977) and expressed as mg of tyrosine per 100 g of sample.

Microbial characteristics such as Total Viable Count (TVC) and Yeast and Mold Count (YMC) were evaluated as per the standard protocols (APHA, 1984) and expressed as log<sub>10</sub> CFU/g. Sensory characteristics were assessed using 9 point hedonic scale by trained panelist for appearance, flavour, tenderness, juiciness and overall acceptability. The data obtained in this study were analyzed statistically by SPS software, analysis of variance and least significant variable by DUNCAN test as per the procedure outlined by Snedecor and Cochran (1984).

## RESULTS AND DISCUSSION

The mean  $\pm$  SE values of physico-chemical, microbial and organoleptic

characteristics for control and treatment loaves stored at 4 $\pm$ 1°C are presented in Tables 2, 3 and 4 respectively.

### Physico-Chemical Quality

Incorporation of low value meat and offal in T1 loaves and soya as binder in addition to low value meat and offal in T2 loaves did not mark statistically significant changes in the pH values compared to the control loaves as observed by Ahmad *et al.* (2012) and the increase in pH during storage was also not significant as observed by Ahmad and Srivatsava (2007). Significant changes in shear force value (SFV) was observed in both the treatment loaves over the control loaves which was evident on the 7th day of chiller storage. The increased SFV in T2 loaves is due to higher binding capacity of soy protein. However, increase in shear force values was observed during storage as observed by Muthulakshmi *et al.* (2009) which may be due to ageing and hence toughness. Fat oxidation were not affected by the low value meat and offal (T1) and soya flour (T2) and hence, TBA values were found to be comparable between treatment loaves and control. With storage, significant increase was noticed only in control loaves. The increase in TBA during storage may be due to the reason of increase lipid oxidation and production of volatile metabolites in presence of oxygen in aerobic packaging (Muthulakshmi *et al.*, 2009). Significant ( $P \leq 0.05$ ) proteolytic changes were recorded on the 7th day ( $P \leq 0.01$ ) due to incorporation of low value meat and offal and was observed to increase significantly with storage. The increase in TV during storage could be due

to the breakdown/cleavage of protein during storage as observed by Babu *et al.* (2002) and Muthulakshmi *et al.* (2009). However, the lower values of TV in treatment loaves over control gives affirmation that incorporation of variety meats could be encouraged.

### Organoleptic Quality

Incorporation of low value meat, offal and soya did not affect the appearance and juiciness but the flavour was found to be significantly higher in both the treatments compared to the control and the tenderness scores was found to be influenced by the incorporation of soya flour in T2 loaves. Both the treatment loaves were found to be acceptable than the control loaves. However, significant to highly significant decrease in all the organoleptic scores was observed with storage period which may be due to

the biochemical changes in the product i.e., breakdown of proteins, fat and other components as opined by Rajkumar *et al.* (2004) and Kalaikannan *et al.* (2007). The acceptability of the treatment loaves for 14 days of chiller storage proves that addition of offal and low value meat has not changed the organoleptic qualities.

### Microbial Quality

The treatment loaves recorded statistically similar values to that of control reflecting that incorporation of low value meat and offals and soya flour did not affect the microbial quality of the loaves. However, highly significant increase in all the microbial counts were observed with storage as observed by Muthulakshmi *et al.* (2009) and Thomas *et al.* (2006).

**Table 1. Formulation of value added carabeef loaves**

Ingredients	Control	Treatment 1	Treatment 2
Carabeef	90 %	90%	90%
Low value meat (Head meat): offal (Heart: Tongue) (50:25:25)	-	75:25	75:25
Fat: Oil (50:50)	10%	10%	10%
Salt	1.5%	1.5%	1.5%
Sodium tripolyphosphate	0.3%	0.3%	0.3%
Sodium nitrite	0.012%	0.012%	0.012%
Spice mix	1.8%	1.8%	1.8%
Condiments (Onion:Garlic) (3:1)	4%	4%	4%
Refined wheat flour	5%	7%	-
Soya flour	-	-	3%

**Table 2. Mean±SE and ANOVA of physico-chemical characteristics of value added carabeef loaves on chiller storage**

pH					Shear force value			
	0th day	7th day	14th day	F value	0th day	7th day	14th day	F value
Control	6.09±0.07	6.14±0.02	6.16±0.09	0.27	0.51±0.02	a0.52±0.05	0.65±0.06	2.55
T1	6.10±0.07	6.15±0.02	6.16±0.09	0.28	0.55±0.04	b0.68±0.05	0.86±0.18	2.60
T2	6.08±0.05	6.10±0.04	6.10±0.08	0.04	0.54±0.11	ab0.63±0.05	0.85±0.12	2.74
<b>F value</b>	<b>0.03</b>	<b>1.18</b>	<b>1.09</b>		<b>0.09</b>	<b>4.35*</b>	<b>0.84</b>	
Thiobarbituric acid number					Tyrosine value			
	0th day	7th day	14th day	F value	0th day	7th day	14th day	F value
Control	0.07A±0.01	0.10B±0.01	0.16C±0.01	15.46**	2.85A±0.23	b3.99B±0.09	4.28C±0.16	20.16**
T1	0.06±0.01	0.08±0.01	0.13±0.15	3.08	2.75A±0.14	a3.19B±0.11	3.67C±0.29	5.45*
T2	0.06±0.03	0.08±0.01	0.09±0.01	1.75	2.81A±0.28	b3.91B±0.19	4.16C±0.19	10.28**
<b>F value</b>	<b>0.65</b>	<b>1.91</b>	<b>2.06</b>		<b>0.05</b>	<b>10.41**</b>	<b>2.10</b>	

Means bearing different superscripts (ABC along rows (days), abc along columns (binders)) differ significantly ( $P<0.05$ \*,  $P<0.01$ \*\*)

**Table 3. Mean±SE and ANOVA of microbial quality traits of value added carabeef loaves on chiller storage**

Total Viable Count					Yeast and mold count			
	0th day	7th day	14th day	F value	0th day	7th day	14th day	F value
Control	2.70A±0.01	3.94B±0.03	b4.17B± 0.06	75.73**	3.04A±0.05	3.84B±0.07	3.93B±0.09	48.90**
T1	2.71A±0.05	3.98B±0.04	c4.60C± 0.30	77.70**	2.90A±0.16	3.79B±0.12	3.93B±0.27	39.91**
T2	2.57A±0.05	3.70B±0.08	a3.57B± 0.27	19.46**	2.78A±0.01	3.75B±0.10	3.85B±0.26	51.77**
<b>F value</b>	<b>0.75</b>	<b>1.77</b>	<b>13.36**</b>		<b>2.00</b>	<b>0.29</b>	<b>0.49</b>	

Means bearing different superscripts (ABC along rows (days), abc along columns (binders)) differ significantly ( $P<0.05$ \*,  $P<0.01$ \*\*)

**Table 4. Mean±SE and ANOVA of organoleptic traits of value added carabeef loaves on chiller storage**

Appearance				Flavour				
	0th day	7th day	14th day	F value	0th day	7th day	14th day	F value
Control	8.82B±0.17	8.42B±0.21	7.42A±0.21	19.16**	a7.67B±0.25	a6.99A±0.21	7.03A±0.51	5.32*
T1	8.83C±0.41	8.39B±0.22	7.67A±0.18	18.93**	a7.67A±0.13	a6.99A±0.37	7.03B±0.29	5.31*
T2	8.78B±0.31	8.58B±0.98	7.75A±0.44	9.48**	b8.90C±0.93	b8.18B±0.31	7.47A±0.30	12.15**
<b>F value</b>	<b>0.03</b>	<b>0.33</b>	<b>1.28</b>		<b>61.12**</b>	<b>21.37**</b>	<b>0.32</b>	
Tenderness				Juiciness				
	0th day	7th day	14th day	F value	0th day	7th day	14th day	F value
Control	a7.67B±0.25	a7.27A±0.33	ab6.94A±0.41	7.45**	7.83B±0.27	7.07A±0.32	7.11A±0.21	3.79*
T1	a7.67B±0.29	a6.97A±0.33	a6.55A±0.42	9.67**	7.83B±0.35	7.07A±0.33	7.11A±0.37	10.19**
T2	b8.76B±0.40	c8.14B±0.55	b7.27A±0.54	8.63**	8.95B±0.31	8.38B±0.99	6.92A±0.51	17.99**
<b>F value</b>	<b>25.85**</b>	<b>6.40**</b>	<b>0.99</b>		<b>54.37</b>	<b>0.45</b>	<b>0.18</b>	
Overall Acceptability								
	0th day	7th day	14th day	F value				
Control	a7.33B±0.16	a7.05AB±0.33	6.93A±0.34	4.72*				
T1	a7.33B±0.35	a6.77A±0.48	6.53A±0.36	3.36*				
T2	b8.69B±0.38	b8.23B±0.40	7.08A±0.38	3.63*				
<b>F value</b>	<b>52.44**</b>	<b>35.51**</b>	<b>2.22</b>					

## CONCLUSION

The results of the physico-chemical analysis reveals that incorporation of low value meat and offals did not affect the pH, SFV, TBA and TV on the day of preparation and only slight statistical changes were observed during storage on the 7th day of chiller storage which may be due to the incorporation of low value meat and offals. Organoleptic analysis further confirms the acceptability of the product with incorporation of low value meat, offals and soy flour as binder similar to the control loaves. The microbial quality analysis confirms the safety of the product for consumption till 14 days of chiller storage. Based on the above observations, it could be reported that value addition of the carabeef loaves could be done by incorporating low value meat, offals and addition of soy flour and could be safe for consumption till 14 days on chiller storage.

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