Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jls.htm
2014 Vol. 4 (4) October-December, pp.149-152/Sabhadinde
Research Article

PHYSICO-CHEMICAL CHARACTERISTICS OF CHICKEN SAUSAGE DURING REFRIGERATED STORAGE

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ABSTRACT
A study to compare the effectiveness of Wheat Fiber (WF), Skim milk Powder(SMP), Isolated Soy Protein (ISP) and Sodium tripoly-phosphate (STPP) for preparation of Chicken sausage with 72 per cent meat and low value meat (Chicken Meat and Chicken Skin in Ratio of 40: 32) was carried out. Sausages were prepared with 2.25 per cent level of WF, SMP and ISP and 0.5 per cent of STPP and were subjected to physico-chemical characteristics viz., pH, shear force, and TBARS and TV to study the keeping quality at refrigerated storage (-4± 4C) for 30 days. Inclusion of 40 per cent low value meat had not much effect compared to full meat sausages. The results revealed that during storage there was a highly significant ($P<0.01$) decrease in pH, shear force, and increase in TBARS and TV with the increase in storage days in both the treatments. Sausages prepared with 2 per cent WF, SMP, ISP each and 0.5 per cent STPP were acceptable upto 25 days of refrigerated storage (-4±4C). Sausages with potato flour or Tapioca Starch had higher values of TBARS and hence using of WF, SMP, ISP, and STPP considered more acceptable compared to Potato Flour and Tapioca Starch incorporated sausages.

Keywords: *Chicken Sausage, Wheat Fiber, Skim Milk Powder, Isolated Soy Protein, Sensory Evaluation, Microbial Analysis, Refrigerated Storage*

INTRODUCTION
Slaughter of Bird produces a considerable amount of edible byproducts (Chicken Breast, Chicken leg, MDM, Chicken Skin, Heart etc.) with high biological value and low palatability attributes. Comminuted meat products offer an attractive avenue for utilization of these low value cuts and edible offals by replacing a certain proportion of meat to reduce their cost of production. However products prepared with these low value cuts and offals have poor cooking yield and emulsion stability because of its poor emulsifying and water binding capacity. These shortfalls can be rectified by addition of binders such as Wheat Fiber and Isolated Soy Protein, especially those of plant origin to compensate when a nutritionally equivalent meat source of low cost and reduced functionality is used (Gunter Heinz and Peter Hautzinger 2007). Wheat Fiber has long been used by meat processors in the form of flour and several workers have tried Isolated Soy Protein as a binder and Fat emulsifyer for preparing sausages and other meat products. However little evidence is available about the use of Wheat FIber and Isolated Soy Protein in Chicken sausages made with low value meat. With this viewpoint, the present study was undertaken to compare the effectiveness of Wheat Fiber and Isolated Soy Protein binder in chicken sausage with 40 per cent lean meat and 30 per cent low value (Chicken Skin) meat under refrigerated condition (-4±4C) over a period of 30 days.

MATERIALS AND METHODS
Chicken Deboned meat and chicken skin were collected after slaughter, cleaned and were packed in polyethylene bags separately and frozen below –24C until use. Commercially available Wheat Fiber and Isolated Soy Protein and Skim Milk Powder use for the Improving taste and binding capacity and Fat emulsifying capacity of Chicken Sausage. Sodium Nitrite is used as preservative in chicken sausage and it added during curing of meat.

Preparation of Sausages
Frozen meat, (Deboned meat, heart, and skin) and fat were tempered at 40C and were cut into small pieces and minced using stuffing grinder has orifice diameters up to 98 mm. It is driven by a built-in

single-phase electrical motor (250 V) and available as both a table and floor model. Lean meat was minced twice in order to remove additional connective tissues. The minced meat lean meat along with (STPP-0.5 per cent, Salt-2 per cent and Sodium nitrite-120 ppm) and kept for curing under a chilling storage for 68-12 hrs (below -2 C).

In the same way, The chicken skin minced using 4 mm blade along with Deoiled soy flakes- 5 per cent, and additional Fat- 5 per cent and kept under -18 C for 10-12 hrs. The cured lean meat were chopped in a bowl chopper for 1 minute and skin emulsion (30 per cent) were added and chopped for another 2 minutes then spice mix at 1.5% level , Green condiments at 2.5 percent (Onion: Garlic –3:1) and added water in the form ice at 20 % level were added and chopped for few minutes.
At the final step WF, SMP, ISP was added at 2% each and chopped for another 1.5 min. From this emulsion samples were taken for pH and emulsion stability.

Emulsion was then stuffed in Cellulose casing of 19 mm diameter, using a manual sausage stuffer or continuous stuffer and linked manually. Stuffed sausages were kept in refrigerator (-4±4C) for 1 hour to ensure proper setting.

Sausages were then cooked in smoke house at 85-95 C for 40 minutes and relative humidity at 95-100 % for 20 min. This smoke house having combine operation of Smoking, Cooking, and Cooling so as to reach core temperature of 72±30C.

The sausages prepared were cooled and peeled off the cellulose casing and kept in refrigerator (-4 ± 1C). Samples were drawn at 5 days interval and were analyzed for pH by following the method described by Trout *et al.*, (1992) using a digital pH meter (Cyberscan PH 510, Merck).

Shear force was determined using Warner Bratzler Shear press and recorded as per (Rao *et al.*, 1999),

TBARS was determined using method of Tarladgis *et al.*, (1960) and expressed as mg of malanoldehyde/ Kg of sample, Tyrosine Value (TV) was determined by the modified method of Strange *et al.*, (1977) over a period of 30 days. Data generated from each trial was analyzed by following standard procedure described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Results (Table 1) revealed that the pH of sausages and the interaction between treatments and storage days showed a highly significant ($P<0.01$) difference between treatments with sausages with ISP having higher value.

There was a rise in pH from day 0 to day 20 and day 25 in Wheat fiber, ISP incorporated sausages respectively. Thereafter there was a drop in pH values in both treatments (Rao *et al.*, 1999).

A highly significant ($P<0.01$) and higher shear force value was observed in sausages prepared using ISP. This may be due to the fact that Wheat Fiber in flour favors formation of strong heat induced structure through swelling of starch granules embedded in protein matrix (Skerde, 1989).

Upon storage there was a reduction in shear values in both the treatments, which may be due to disintegration of protein matrix that embeds the gel structures of starches.

There was a progressive increase ($P<0.01$) in TBARS number between treatment, between storage and interaction between storage period and treatment.

There was a progressive increase in both treatments during storage, which is in concurrence with Drerup *et al.*, (1981) and Bentley *et al.*, (1987) and is a reflection of the advance in oxidative changes in pork sausage during storage.

Tyrosine value showed a linear and highly significant ($P<0.01$) increase with the increase in storage days in both the treatments.

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Table 1: Mean ± S.E for physico-chemical (Shear force value, pH, TBARS, and Tryosine Value) of chicken sausage with 2 percent of Wheat fiber, Isolated Soy Protein and Skim Milk Powder each during Refrigerated storage at -4 ± 4 C

	Storage Days							Mean
Parameter	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**± S.E**
pH								
Wheat Fiber	6.26± 0.01	6.24±0.01	6.21±0.01	6.19±0.01	6.16±0.01	6.12±0.01	6.10±0.01	6.18±0.01
Isolated Soy Protein	7.64±0.01	7.60±0.01	7.55±0.01	7.48±0.01	7.43±0.01	7.36±0.01	7.30±0.01	7.48±0.01
Days mean ± S.E	6.95±0.01	6.92±0.01	6.88±0.01	6.84±0.01	6.79±0.01	6.74±0.01	6.70±0.01	
Shear Force Value								
Wheat Fiber	0.52±0.03	0.51±0.04	0.50±0.07	0.50±0.08	0.49±0.11	0.47±0.12	0.46±0.07	0.49±0.07
Isolated Soy Protein	0.62±0.12	0.61±0.08	0.60±0.09	0.58±0.07	0.58±0.06	0.57±0.05	0.55±0.08	0.58±0.08
Days mean ± S.E	0.57±0.08	0.56±0.06	0.55±0.08	0.54±0.08	0.54±0.08	0.52±0.08	0.51±0.07	
TBARS (mg of malanoldehyde/Kg)								
Wheat Fiber	0.28±0.05	0.35±0.06	0.48±0.08	0.54±0.06	0.59±0.07	0.65±0.09	0.69±0.08	0.51±0.07
Isolated Soy Protein	0.32±0.06	0.34±0.09	0.48±0.16	0.52±0.08	0.60±0.08	0.72±0.08	0.86±0.08	0.55±0.09
Days mean ± S.E	0.30±0.06	0.35±0.07	0.48±0.12	0.53±0.07	0.60±0.07	0.69±0.08	0.78±0.08	
Tyrosine Value (mg of malanoldehyde/Kg)								
Wheat Fiber	1.32±0.10	2.18±0.10	3.32±0.20	5.56±0.17	7.16±0.08	10.45±0.06	16.84±0.32	6.69±0.15
Isolated Soy Protein	3.12±0.04	4.24±0.06	5.28±0.09	7.13±0.15	9.86±0.17	11.62±0.08	18.16±0.38	8.48±0.14
Days mean ± S.E	2.22±0.07	3.21±0.08	5.30±0.15	6.34±0.16	8.51±0.12	11.03±0.07	17.50±0.35	

ISP incorporated sausages had higher values compared to Genetically Modified starch containing sausages and might be due to the fact that ISP has a higher protein (95%) content and its breakdown must have boosted the value.

Conclusion

Sausages incorporated with WF and ISP were economical in terms of cost involved compared to that of genetically modified starch(GMS) incorporated sausages, but in spite of economical reasons since lipid oxidation and protein degradation are the major components which determine the keeping quality and shelf life of the meat products, sausages with ISP had values lower than that of GMS incorporated sausages it is concluded that sausages with 2 per cent WF and 2 per cent ISP is considered superior for preparing chicken sausages with 40 per cent lean meat and 30 per cent low value meat (chiken skin) compared to that of sausages incorporated with genetically modified starch(GMS). Sausages prepared with both WF and ISP were acceptable till 25 days at (-4 ± 4 C).

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