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Functional Foods, Nutrition, Nutraceuticales & Bioactive Development of Chicken Meat Cutlets Incorporating Functional Ingredients

Kanchan Kumari

Department of Food Science & Technology Punjab Agricultural University (PAU) Ludhiana-141004 (Punjab), India.

Abstract

The objective of this study was to evaluate the quality and shelf life of chicken meat cutlets by incorporating functional ingredients like mushrooms, sesame seeds and wheat gluten at optimized levels. Mushrooms (0, 5, 10, 15 and 20 per cent levels) sesame seeds (0, 1.5, 2.5, 3.5 and 4.5 per cent levels) and wheat gluten (0, 0.5, 1.0, 1.5 and 2 per cent levels) in the products for their optimization in formulation of chicken meat cutlets. On the basis of sensory evaluation, best levels of mushrooms (15.0 per cent) sesame seeds (2.5 per cent) and wheat gluten (1.5 per cent) were incorporated in the chicken meat cutlets and stored under frozen (-20± 2°C) for two months after packing in coextruded plastic films (conventional and vacuum packs) to evaluate shelf life of the product. It was observed that MSW (mushroom, sesame seeds and wheat gluten) chicken meat cutlets had significantly ($p \leq 0.05$) higher moisture ,ash, fat ,protein, crude fiber, cooking yield, sensory attributes, lower free fatty acids, peroxide value, lower shrinkage and shear force in comparisons to control samples. Non - significant changes ($p \leq 0.05$) in pH and total viable count (TVC) were observed. The chicken meat cutlets containing functional ingredients had significantly ($p \leq 0.05$) higher acceptability than control chicken meat cutlets. Vacuum packed chicken meat cutlets had significantly ($p \leq 0.05$) higher moisture, lower free fatty acid content, lower peroxide value and higher scores for overall acceptability than conventionally packed chicken meat cutlets at the end of 2 months of frozen storage period (-20± 2°C).

Keywords: Chicken meat cutlets, Mushroom, Sesame seeds, Wheat gluten, Shelf life, Total viable count.

1. Introduction

The poultry sector in India has transformed itself from backyard farming to modern industrial scale units, with well-organized production, processing and marketing systems. India is fifth largest poultry meat producer in the world producing 2.49 million metric tons of poultry meat annually (www.fao.org).The poultry industry is among the fast growing sectors expanding at a rate of 8 per cent per annum and contributes to 12-15 per cent of the Gross National Product (Anonymous 2011). The population of broilers has been increasing at a rate of 8 to 10 percent per annum. The country produces about 489 million broilers annually (www.indianbudget.nic.in). The average per capita poultry meat consumption has increased from 0.69 kilograms to 1.9 kilograms between 2000 to 2007 (Yadav 2009).

Mushrooms have been broadly used as food or food ingredient in various food products for a longtime. This fungus is cultivated on decayed organic material and produce edible portion on the surface of the substrate. Dry matter of mushrooms contain more than 25% protein, less than 3% crude fat and almost 50% of total carbohydrate (Kotwaliwale *et al* 2007). Wheat gluten is the water-insoluble protein portion contained within the endosperm of wheat. It can either act as a binder, extender or restructurer for meat products (e.g., turkey, beef, pork or lamb) or as an ingredient in the production of simulated or imitation meats (e.g., hamburger, sausage or crab analogs). Sesame (*Sesamum indicum*) is a flowering plant in the genus *Sesamum.* The seeds are incredibly rich sources of many essential minerals. Calcium, iron, manganese, zinc, magnesium, selenium, and copper are especially concentrated in sesame seeds. Many of these minerals have vital role in bone mineralization, red blood cell production, enzyme synthesis, hormone production, as well as regulation of cardiac and skeletal muscle activities Just a hand full of sesame a day provides enough recommended levels of phenolic anti-oxidants, minerals, vitamins and protein. (www.nutrition-and-you.com)

2. Materials and Methods

2.1 Raw materials

Frozen minced chicken meat of Republic of Chicken brand (400gms unit), was purchased from their outlet in Ludhiana and stored at -20±2°C in deep freezer, till its use in the preparation of chicken cutlets. The button mushrooms (Agaricus bisporus) in shrink packages (200gms) was purchased from the local market. Sesame seeds was procured from the local market and roasted under low flame for 2 minutes. Wheat gluten of edible food quality was procured from DKSH India Private Limited, New Delhi. A pre-standardized formulation of dry spices was prepared. Cinnamon, coriander, cumin powders of MDH brand and black pepper and red pepper of Catch

brand were procured from the local Ludhiana market for the preparation of dry spice mix. Green Curry Stuff (GCS) was prepared by blending onion paste, garlic paste and ginger paste (2:1:1 respectively). Peas were taken out from pods and coarsely grinded using pestle and mortar for their incorporation in the cutlets. Coriander leaves were manually cut into pieces with the help of knife. Potatoes were washed, boiled and mashed manually for their incorporation into chicken meat cutlets.

Food grade sodium alginate, calcium carbonate, sodium nitrite, sodium nitrate was procured from the local market. Refined Groundnut oil (Fortune) and Iodized salt (Tata) were used in the formulation.Co-extruded plastic film (200 guage) suitable for conventional and vacuum packaging under freezing conditions was used for the packaging of chicken meat cutlets.

2.2 Preparation of cutlets

The chicken meat mince, salt and sodium nitrite were mixed in Hobart mixer Model N-50 for five minutes. Mushrooms (15 per cent), sesame seeds (2.5 per cent) and wheat gluten (1.5 per cent) were added followed by dry spices mix and other additives as per the formulation to form uniform batter. After uniform mixing of all the ingredients, the batter was moulded into cutlets with the help of oval shaped metallic moulds 10 cm long and 6.5 cm maximum width. The cutlets (approximately 80gm each) were precooked in hot air oven at 200°C for 12 minutes (Fig 1). The precooked cutlets were removed from the moulds and packed conventionally using heat sealer (Ambala Associates) and under vacuum using vacuum packaging machine (Teknik Industrial Traders, Ambala city Model D2Q400-2D) in co-extruded plastic films. The packed cutlets were frozen stored at (-20± 2°C) in commercial freezer upto two months.

2.3 Organoleptic analysis

Sensory evaluation for appearance, color, texture, flavor, juiciness and overall acceptability was carried out by a panel of minimum ten semi trained judges on nine point hedonic scale.

2.4 Cooking methods

The chicken meat cutlets were cooked in hot air oven at 200^0C for 25 minutes to achieve an internal temperature of 80ºC. A container of water was placed inside the oven to maintain high humidity throughout the cooking process. The sides of cutlets were turned once in the middle of cooking process i.e. after an interval of 12.5 minutes.

3. Results and Discussion

3.1 Proximate composition of minced chicken meat, mushrooms, sesame seeds and wheat gluten

Data embodied in Table 1 represents the proximate composition of raw materials like chicken meat, mushrooms, sesame seeds and wheat gluten used in the preparation of chicken meat cutlets.

Table 1: Proximate Composition of raw materials (n=3).

Raw materials	**Moisture(%)**	**Protein (%)**	**Fat (%)**	**Ash (%)**	**Fibre(%)**
Chicken	72.24 ± 0.01	18.92 ± 0.01	6.41 ± 0.04	1.22 ± 0.02	0.17±0.05
Mushrooms	89.33±0.07	2.67 ± 0.12	0.21 ± 0.01	0.53 ± 0.02	5.78±0.04
Sesame seeds	3.82±0.01	19.63±0.03	48.47 ± 0.08	3.41 ± 0.04	3.23±0.09
Wheat Gluten	6.49 ± 0.06	86.79 ± 0.03	0.83 ± 0.03	0.55 ± 0.02	0.02±0.01

3.2 Standardization of product formulation

The recipe of chicken meat cutlets was standardized by consulting literature and by taking the opinion of taste panel members during product standardization. Trials were conducted using different levels of salt, spices and different levels of mushrooms, sesame seeds and wheat gluten for the standardization of the recipe. The standardization process also helped in the training of the taste panel members. After standardizing of the recipe, the trials were conducted incorporating mushrooms (0, 5.0, 10.0, 15.0 and 20.0 per cent levels), sesame seeds (0, 1.0, 1.5, 2.0 , 2.5 and 3 per cent levels) and wheat gluten (0, 1.0, 1.5. 2.0, 2.5 and 3 per cent levels) as functional ingredients. Based on results of sensory evaluation of the products, best levels of mushrooms (15.0 per cent), sesame seeds (2.5 per cent) and wheat gluten (1.5 per cent) were selected for incorporation in final products i.e. chicken meat cutlets, used for conducting frozen storage studies.

Table 2: proximate composition parameter of both control and chicken meat cutlets containing functional ingredients.

Chicken meat Cutlets	**Moisture**	**Protein**	**Fat**	**Ash**	**Crude fiber**	**Free fatty acids**	**Peroxide value**
Control	69.37± 0.08	16.48±0.01	11.55±0.18	2.24±0.07	1.52±0.03	0.4±0.01	0.03±0.01
Containing functional ingredients	70.01± 0.05	17.34±0.01	12.70±0.04	2.38±0.03	2.44±0.07	0.12±0.01	0.00±0.00

4. Conclusion

It was concluded that good quality chicken meat cutlets can be produced by incorporating health promoting functional ingredients like mushrooms, sesame seeds and wheat gluten at 10 per cent, 2.5 per cent and 1.5 per cent levels respectively. The organoleptic quality of chicken meat cutlets containing functional ingredients was found higher than that of control samples. The quality and overall acceptability of vacuum packaged chicken meat cutlets was higher than conventional packaged chicken meat cutlets. Development of chicken meat cutlets by incorporation of functional ingredients like mushrooms, sesame seeds and wheat gluten increased the nutritional value by increasing protein and fibre content. In addition it enhanced the physical quality of the formulated cutlets by increasing the water holding capacity, and decreasing the cooking loss. The chicken meat cutlets containing mushrooms, sesame seeds and wheat gluten were acceptable up to two months of frozen storage period (-20±2ºC).

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