

Effect of Functional Ingredients Such As Mushrooms, Sesame Seeds And wheat Gluten Incorporation Levels on the Sensory Acceptability of Chicken Meat Cutlets

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ABSTRACT

The present research has made an efforts to evaluate the quality and shelf life of chicken meat cutlets by incorporating functional ingredients such as mushrooms, sesame seeds and wheat gluten at optimized levels. Mushrooms (0, 5, 10, 15 and 20 per cent levels) sesame seeds (0, 1.0, 1.5, 2.0, 2.5 and 3.0 per cent levels) and wheat gluten (0, 1.0, 1.5, 2.0, 2.5 and 3 per cent levels) in the products for their optimization in formulation of chicken meat cutlets. Fresh mushrooms when incorporated above 15 percent had deteriorative effect on appearance, color, texture, flavor and also on cutlets making property. So 15 percent level was selected. Appearance, color, texture, flavor and overall acceptability scores were maximum at 2.5% level of sesame seed incorporation. Vital wheat gluten was added upto 3 percent there was drastic decrease in texture and flavor scores and also on texture and overall acceptability scores. So 1.5 percent level was selected for incorporation based on these sensory scores. 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 ($-20 \pm 2^{\circ}\text{C}$) for two months after packing in coextruded plastic films (conventional and vacuum packs) to evaluate shelf life of the product. 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 appearance, color, texture, flavor, juiciness and overall acceptability than conventionally packed chicken meat cutlets at the end of 2 months of frozen storage period ($-20 \pm 2^{\circ}\text{C}$).

Keywords: Chicken meat cutlets, Mushroom, Sesame seeds, Wheat gluten, and Coextruded plastic films (Conventional and Vacuum packs)

I. INTRODUCTION

The poultry industry is among the fast growing sectors expanding at a rate of 8% per annum and contributes to 12-15% of the Gross National Product. Poultry is the only industry where modern technology co-exists with the traditional poultry keeping because poultry technology is appropriate, adaptable, accessible, available and affordable both for the rich and the poor.

Average per capita poultry meat consumption in India is expected to increase from 0.69 kg to 1.28 kg by 2020. Overall the study reports that total egg consumption to increase from 34 billion in 2000 to 106 billion in 2020 and the total poultry meat consumption to increase from 687 million to 1674 million tonnes during 2020 (Mohanty and Rajendran 2003).

Punjab has one of the largest (10.8 million) poultry populations among Indian states and is also a major consumer of poultry products. Some prominent players in the poultry processing industry like Al-chemist, Sagri Foods and Chatha Foods have set up state of the art poultry processing units with forward and backward linkages in the state. There has been a dramatic shift in consumer eating habits in recent years. As

consumers have become increasingly more health conscious and chicken meat products containing health promoting functional ingredients with lower fat, salt, cholesterol and calorific contents and without chemical preservatives and synthetic food additives are much sought after.

Lipid oxidation and auto-oxidation are major causes of deterioration and reduced shelf life of meat products. Oxidation of lipids has detrimental effects on color, flavor, texture and nutritive value of meat (Anon 1991). Non meat ingredients such as protein, egg, whey protein and carbohydrates such as starch, cereal flours etc. are often used to improve the texture of meat products (Hongsprabhas and Barbut 1999). These ingredients play a significant role in the modification of functional properties such as emulsification, water and fat binding capacity and textural properties (Gujral *et al* 2002).

Wheat gluten is the water-insoluble protein portion contained within the endosperm of wheat. Gluten can be separated from wheat, with the resulting substance consisting mainly of protein but also containing small amounts of fat, moisture, and ash. These proteins give gluten its characteristic cohesive and elastic properties, which serve to make wheat gluten in its meat

applications. 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).

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). Mushrooms are considered to be healthy because they are low in calories, sodium, fat and cholesterol. Therefore, they can form an important constituent of a diet for people suffering from atherosclerosis . It also contain appreciable amount of dietary fibre and β -glucan, group B vitamins, D and other useful nutrients. β -Glucans, also a component of soluble(SDF) or insoluble dietary fibre (IDF) is present in appreciable amounts in mushrooms.

Sesame (*Sesamum indicum*) is a flowering plant in the genus *Sesamum*. It is widely naturalized in tropical regions around the world and is cultivated for its edible seeds, which grow in pods. Sesame is grown primarily for its oil-rich seeds, which come in a variety of colors, from cream-white to charcoal-black. The small sesame seed is used whole in cooking for its rich nutty flavour . Sesame flavour (through oil and roasted or raw seeds) is also very popular in Korean cuisine, used to marinate meat. The seeds are exceptionally rich in iron, magnesium, manganese, copper, and calcium (90 mg per tablespoon for unhulled seeds, 10 mg for hulled), and contain vitamin B₁ (thiamine) and vitamin E (tocopherol). They contain lignans, including unique content of sesamin, which are phytoestrogens with antioxidant and anti-cancer properties. (Cheung SC *et al* 2007)

II. MATERIAL AND METHODS

1.1 Raw materials

1.1.1 Chicken meat

Frozen minced chicken meat of Republic of Chicken brand (400gms unit), was purchased from their outlet in Ludhiana and stored at $-20\pm 2^{\circ}\text{C}$ in deep freezer, till its use in the preparation of chicken cutlets. The chicken meat was thawed using microwave oven (Batliboi Eddy Co. Model No. ER-5054 D) for 2 minutes at power level 4.

1.1.2 Mushrooms

The button mushrooms (*Agaricus bisporus*) in shrink packages (200gms) was purchased from the local market. The mushrooms were ground in

food processor to form paste (Kenstar Karishma Multi Processor, Model no.MF0808) before its incorporation into the batter for the preparation of chicken meat cutlets.

1.1.3 Sesame seeds

Sesame seeds was procured from the local market and roasted under low flame for 2 minutes. After roasting they are incorporated into the batter for the preparation of chicken meat cutlets.

1.1.4 Wheat gluten

Wheat gluten of edible food quality was procured from DKSH India Private Limited, New Delhi.

1.1.5 Spice mix and Additives

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.

Table :1 Dry Spice Mix (120g)

Ingredients	Quantity (g)
Black pepper	20
Cumin	40
Coriander	40
Cinnamon	12
Red pepper	8

1.1.6 Green Curry Stuff (GCS)

For the preparation of Green Curry Stuff Onion, Peas, Coriander, Potatoes were purchased from the local market. Ginger and Garlic paste of Smith and Jones brand was also obtained from local market. Onions were washed, peeled and paste was prepared using food processor (Kenstar Karishma Multi Processor, Model no. MF0808). 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.

1.1.7 Packaging material

Co-extruded plastic film (200 gauge) suitable for conventional and vacuum packaging under freezing conditions was used for the packaging of chicken meat cutlets.

1.2 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 and spices for the standardization of the recipe. The standardized recipe of chicken meat cutlets is given in Table. The standardization process also helped in the training of the taste panel members.

After standardizing the of recipe, the trials were conducted incorporating mushrooms (0, 5, 10, 15 and 20 % levels), sesame seeds (0, 1.5, 2.5, 3.5 and 4.5 % levels) and wheat gluten (0, 0.5, 1.0, 1.5 and 2 % 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%), sesame seeds (2.5%) and wheat gluten (1.5%) were selected for incorporation in the final product i.e. chicken meat cutlets. The chicken meat cutlets were used for the analysis of proximate composition, cooking characteristics, organoleptic and microbiological quality at interval of 15 days upto 2 months of frozen storage.

1.3 Preparation of cutlets

The chicken meat mince, salt and sodium nitrite were mixed in Hobart mixer Model N-50 for five minutes. Mushrooms (15%), sesame seeds (2.5%) and wheat gluten (1.5%) 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. 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.

1.4 Organoleptic analysis

Sensory evaluation for appearance, color, texture, flavor, juiciness and overall acceptability was carried out as per score card given in (appendix-1) by a panel of minimum ten semi trained judges on nine point hedonic scale.

1.5 Cooking methods

The chicken meat cutlets were cooked in hot air oven at 200°C for 25 minutes to achieve an internal temperature of 80°C. 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.

1.6 Organoleptic evaluation

The products were organoleptically evaluated on the day of preparation and at every 15 days interval during storage period. A ten member semi-trained sensory panel was selected from the faculty members of PAU and PG students. Nine-point Hedonic scale was used for evaluation of cutlets for appearance, color, flavor, texture, juiciness and overall acceptability (Larmond 1970) (Appendix-1).

II. RESULTS AND DISCUSSION

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

Data embodied in Table 5 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 2 : 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

4.2 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, 4.0, 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 3: Effect of mushrooms incorporation levels on the sensory quality of chicken meat cutlets (n=9)

Level of mushrooms (%)	Appearance	Color	Texture	Flavor	Overall acceptability
0	7.26±0.06	7.01 ± 0.14	7.35 ± 0.07	7.19 ± 0.06	7.20
5	7.36±0.07	7.16 ± 0.17	7.63 ± 0.05	7.49 ± 0.09	7.41
10	7.42±0.09	7.35 ± 0.11	7.85 ± 0.04	7.62 ± 0.12	7.56
15	7.68±0.08	7.53 ± 0.13	8.03 ± 0.05	7.91 ± 0.1	7.79
20	7.38±0.09	7.46 ± 0.08	7.88 ± 0.12	7.61 ± 0.07	7.58
C.D.(p≤0.05)	0.22	0.37	0.20	0.25	0.31

* C.D. = Critical Difference

Fresh mushrooms when incorporated above 15 percent had deteriorative effect on appearance,

color, texture, flavor and also on cutlets making property. So 15 percent level was selected

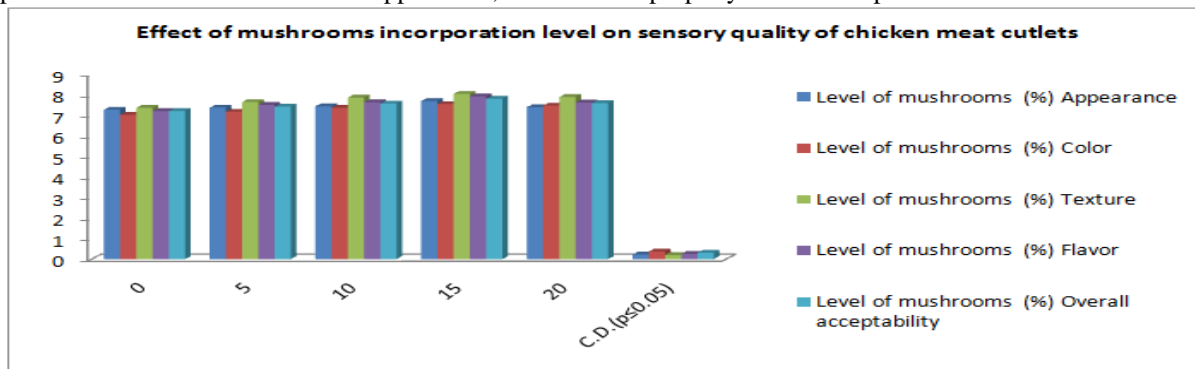


Table 4 : Effect of sesame seeds incorporation levels on the sensory quality of chicken meat cutlets. (n=9)

Level of sesame seeds (%)	Appearance	Color	Texture	Flavor	Overall acceptability
0	7.14 ± 0.15	7.01 ± 0.20	7.27 ± 0.11	7.08 ± 0.11	7.13
1	7.21 ± 0.10	7.16 ± 0.14	7.33 ± 0.15	7.16 ± 0.22	7.22
1.5	7.51 ± 0.09	7.75 ± 0.23	7.82 ± 0.26	7.92 ± 0.13	7.75
2	7.72 ± 0.13	7.96 ± 0.19	8.02 ± 0.17	8.24 ± 0.18	7.99
2.5	7.88 ± 0.16	8.21 ± 0.09	8.43 ± 0.15	8.63 ± 0.16	8.29
3	7.37 ± 0.15	7.80 ± 0.13	8.19 ± 0.19	8.12 ± 0.27	7.87
C.D.(p≤0.05)	0.37	0.48	0.50	0.53	0.35

* C.D. = Critical Differenc

Appearance , color, texture, flavor and overall acceptability scores were maximum at 2.5% level

of sesame seed incorporation. So this level was selected and also beyond that there was perceptible change in flavor and its color darkened.

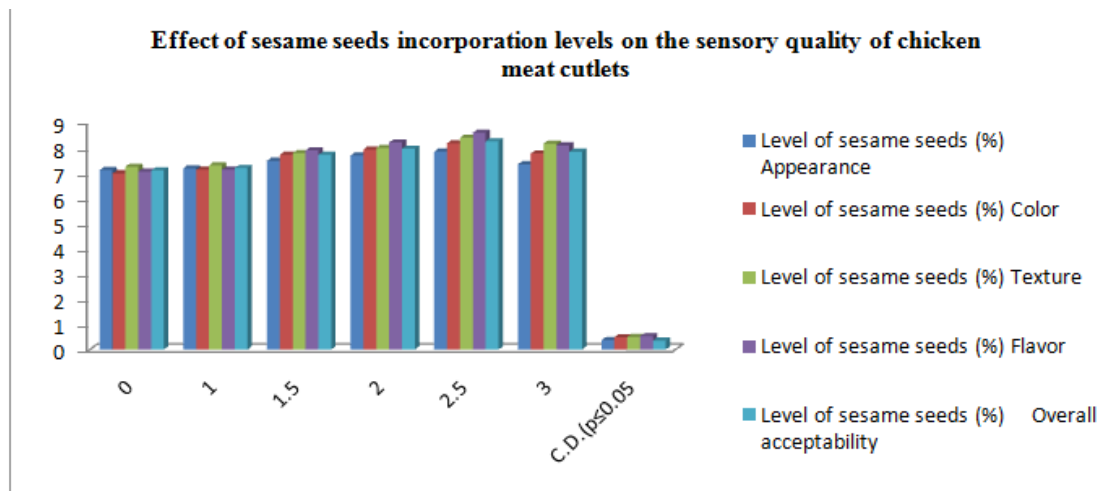
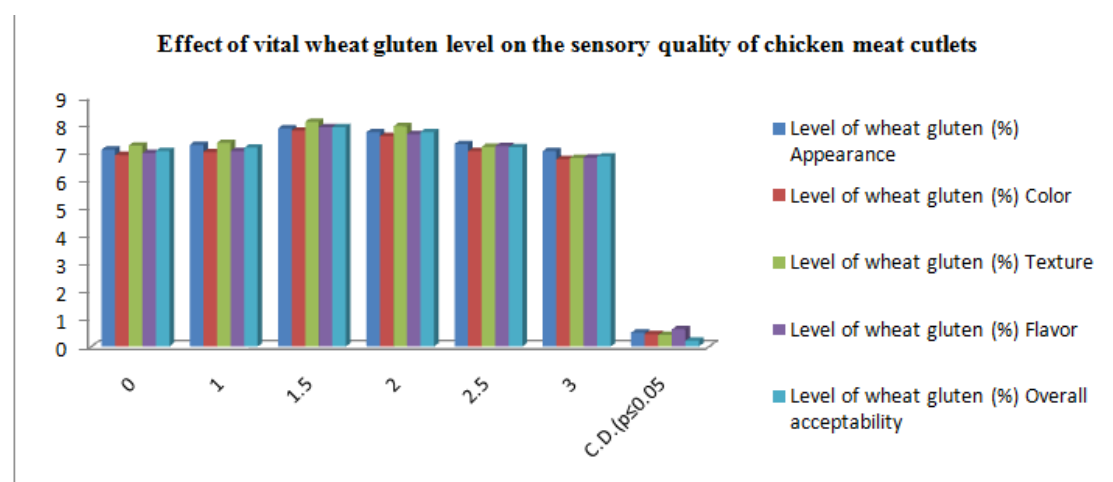


Table 5: Effect of vital wheat gluten incorporation levels on the sensory quality of chicken meat cutlets (n=9)

Level of wheat gluten (%)	Appearance	Color	Texture	Flavor	Overall acceptability
0	7.10 ± 0.21	6.90 ± 0.11	7.24 ± 0.20	6.97 ± 0.26	7.05
1	7.27 ± 0.17	7.01 ± 0.14	7.34 ± 0.11	7.05 ± 0.22	7.17
1.5	7.86 ± 0.14	7.78 ± 0.20	8.10 ± 0.12	7.91 ± 0.20	7.91
2	7.72 ± 0.13	7.58 ± 0.08	7.94 ± 0.16	7.66 ± 0.12	7.73
2.5	7.30 ± 0.17	7.04 ± 0.14	7.20 ± 0.14	7.22 ± 0.21	7.19
3	7.05 ± 0.21	6.75 ± 0.13	6.80 ± 0.13	6.81 ± 0.26	6.85
C.D.(p≤0.05)	0.50	0.45	0.42	0.62	0.21

Similarly as shown in table 8 when vital wheat gluten was added upto 3 percent there was drastic decrease in texture and flavor scores and also on

texture and overall acceptability scores. So 1.5 percent level was selected for incorporation based on these sensory scores.



V. CONCLUSION

As per the result of the present study, 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 15%, 2.5% and 1.5% levels respectively. The organoleptic quality such as appearance, color, texture, flavor and overall acceptability scores of chicken meat cutlets containing functional ingredients was found higher than that of control sample.

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 fiber content. In addition it enhanced the physical quality of the formulated cutlets and proved healthier food for consumer without detrimental effect on the sensory attributes of the Product.

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