

## Standardization of cooking method of fish ball using spice mix as preservative and spice mix formulation

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### Abstract

In the present study attempts were made to minimize the use of preservatives for development of fish balls that too keeping in mind the taste of Indian people. Fish ball is generally considered as a bland food, in order to popularize it, ready to eat fish balls as per Indian taste was developed. The method of preparation of the restructured fish product i.e. fish balls from the fish *Catla catla*, were standardized by adopting two methods of cooking (microwave and conventional oven) separately to standardize the best time temperature combinations for visualizing the doneness of the products prepared. The descriptive scale was followed to rate the doneness of the fish balls after sensory evaluation by three panel members. Four categories of spice mix (MFSM, MDH, LPSM and MPSM) were taken in three concentrations (1, 2 and 3%) to standardize the best level and type of spice mix in terms of color, flavor, spiciness and over all acceptability of the fish ball individually cooked in conventional and microwave oven. The above mentioned parameters were standardized by judging through sensory evaluation (9 point hedonic rating scale).

**Keywords:** catla catla, fish ball, spice mix, conventional oven, microwave, sensory evaluation

### 1. Introduction

The carps offer distinct advantages such as white colour of meat and good taste, whereby offer good scope for value addition [1]. Fish is a cheap source of protein for the world's population. In the developed world, fish and fishery products are gaining importance as a health food. Several scientists have worked on the cook-chill foods [8, 10, 11, 16]. Currently consumers particularly urban ones are interested in ready to eat food products such as fish fillets, patties, balls etc. This is mainly due to increasing number of working women, reasonable increase in income, education, awareness and consciousness towards quality, freshness, nutrition, hygiene and health [13]. This has led to the development of several fishery products varied in taste, texture and appearance. In the present study, an attempt has been made to develop ready to eat fish balls by conventional and microwave oven baking which were quick refrigerated ( $4\pm 1^\circ\text{C}$ ) after preparation and may be consumed as such, near to fresh like products not storing for extended period of time in frozen storage. Likewise, no added starch and frying were accomplished to produce low fat products for more health benefits. In this present investigation preparation of fish balls was carried out with additives like sodium chloride (NaCl) and tetra sodium pyrophosphate (TSPP) added at 2% and 0.4% level respectively as per the recipe followed [15] and USDA guidelines [14].

### 2. Materials and methods

Catla (*Catla catla*), a fresh water species was purchased from the local fish market, Hisar. LDPE bags, aluminium foil, other ingredients and containers were purchased from local market, Hisar.

Clove, Cinnamon, Mace, Black pepper, Red pepper, Cardamom, Cumin seed, Ginger dried, Indian bay leaf (Tejpatta), Nutmeg, Pipali, Onion powder, Garlic, Sugar, Salt, Phosphates.

#### 2.1 Standardization of different combinations of spice mix and additives Used

Of four different types of spice mix, the best one was selected by undergoing sensory analysis in three different levels of spice mix i.e. 1%, 2% and 3% through semi trained panel members. The details of the types of spice mix and their level of concentrations of spice ingredients are designated as below (Table 1):

**MPSM:** Market popular spice mix was obtained from local market Hisar which is locally prepared by following the formulation mentioned and available in different sized packing according to the weight.

**MFSM:** Mild flavour spice mix and the recipe was adopted by referring the literature [9]. This spice mix was prepared by selecting the following ingredients i.e. sugar (1.5%), onion powder (1%), garlic powder (1%), black pepper powder (0.25%), cinnamon (0.25%) and cumin (0.25%) and all these ingredients were mixed well to obtain a homogenous mixture. The above mentioned spice powders were prepared by adequate drying and grinding to form fine powder.

**LPSM:** Laboratory prepared spice mix was obtained by well mixing of suitably dried and grounded whole spices. After sensory quality testing of the previous two spice mix, changes in concentration of various spice ingredients was determined in LPSM.

**Table 1:** Details of trial recipes used for spice mix formulation

Ingredients	MPSM (%)	MFSM (%)	LPSM (%)
Clove	1.66	-	8.0
Cinnamon	3.3	0.25	4.0
Mace	1.66	-	4.0
Black pepper	29.7	0.25	10.0
Red pepper	-	-	10.0
Cardamom	16.5	-	10.0
Cumin seed	16.5	0.25	20.0
Ginger dried	16.5	-	18.0
Indian bay leaf (Tejpatta)	6.6	-	4.5
Nutmeg	5.0	-	2.0
Pipali	3.3	-	6.5
Onion powder	-	1.0	
Garlic	-	1.0	
Sugar	-	1.5	

MPSM Market Popular Spice mix  
 MFSM Mild Flavor Spice Mix  
 LPSM Laboratory Prepared Spice Mix  
 MDH Commercial Spice mix package

**MDH:** Spice mix available in the standard packages in the brand name of MDH (Mahashai di hatti) garam masala powder was also taken as one of the spice mix for the study.

lot and no spice mix was added in the other lot. The quantity to be used was depicted in (Table 2).

**2.2 Methods for preparation of fish ball**

Fish balls from fresh water fish *Catla catla* were prepared:

- Balls without spice in conventional oven (P1S0M0)
- Balls with spice in conventional oven (P1S1M0)
- Balls without spice in microwave oven (P1S0M1)
- Balls with spice in microwave oven (P1S1M1)

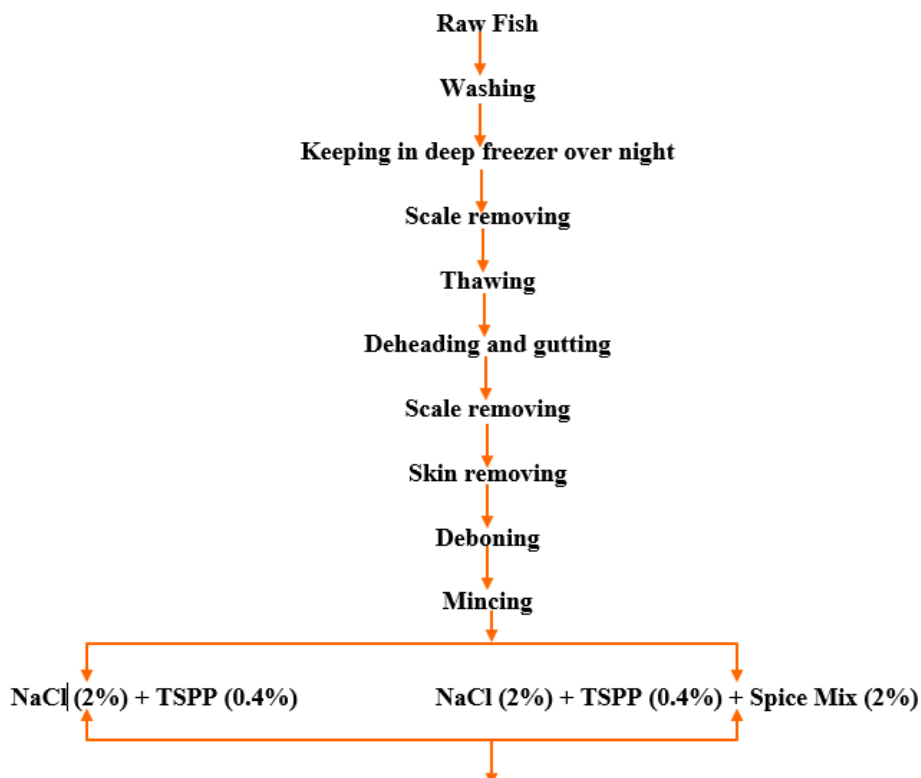
**Table 2:** Recipe for fish ball preparation

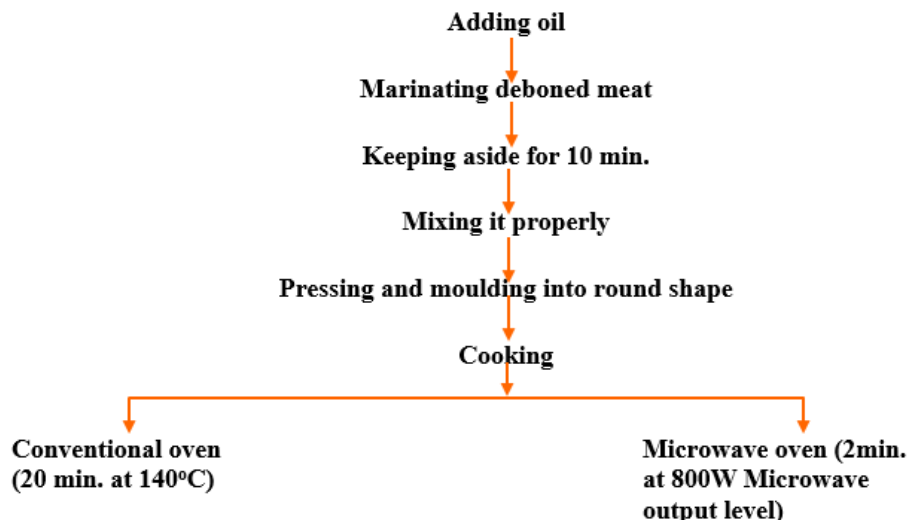
Ingredients Used	Amount added
Fish meat	1.0 kg
NaCl	20 g
TSPP	4.0 g
Mustard Oil	100 ml
Spice mix	20 g (Optional-only for spiced containing products)

**Preparation of fish balls**

As fish ball is an emulsified restructured product, two types of emulsions were made in which salt (2%) and TSPP (0.4%) were taken as common ingredients in all the samples and this was further divided in two lots containing spice mix in one

Afterwards these two lots of samples were kept in microwave and conventional oven for cooking. Likewise, four types of fish balls (P1S0M0, P1S0M1, P1S1M0, P1S1M1) were obtained. The flow chart for manufacturing process of fish ball is shown in Fig. 1





**Fig 1:** Flow sheet for the preparation of fish ball using Conventional and Microwave oven cooking

**3. Results and Discussion**

In conventional oven cooking three temperatures (140, 150 and 160 °C) were selected for standardizing the product doneness after cooking for 10, 20 and 30 min. (Table 3).

**Table 3:** Selection of different time-temp. combinations to evaluate doneness of fish products (using descriptive scale) in conventional oven

Product	Temperature Selection ( °C)	Time (Minutes)		
		10	20	30
Fish ball	140	1.0 ± 0.0	3.0 ± 0.0	0.0 ± 0.0
	150	1.66 ± 0.58	3.0 ± 0.0	0.0 ± 0.0
	160	2.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0

The fish balls immediately taken out from oven were subjected to sensory testing using the descriptive rating scale (Table 4).

**Table 4:** Descriptive rating scale for best time-temperature combination

Rare done	1
Medium done	2
Well done	3
Over cooked/hard	0

Laboratory prepared spice mix (LPSM) with 2% concentration level was used in final product development which has been formulated in the laboratory after comparing it with three other types of spice mixes. The best time-temperature selected for preparation of fish balls in conventional oven was standardized at 140°C for 20 min. after assessing the level of cooking by judging the doneness of the products to get the optimum desired after taste effect. The results indicating the descriptive scale data regarding selection of optimum time (min.) of microwave cooking to standardize the doneness of the fish ball was also observed (Table 5).

**Table 5:** Selection of time to evaluate doneness of fish balls (using descriptive scale) in microwave oven

Type of product	Time of cooking (Min)		
	1	1.5	2
Fish Ball	1.0 ± 0.0	1.66 ± 0.0	3.0 ± 0.0

The fish balls preferred 2 min. of cooking in microwave oven as rated highest by sensory evaluation and it is determined that the product achieved optimum quality in terms of taste within this time.

Laboratory prepared spice mix (LPSM) with 2% concentration level proved to be the most accepted one in producing color to the products as it was prepared by mixing more spice ingredients in higher amounts. Flavor of fish products by the use of LPSM (2%) highly influenced the overall flavor acceptability of the product. This particular spice mix formulation also attained the highest scores for spiciness at 2% level in the fish balls cooked in conventional and microwave oven. In market popular spice mix (MPSM) the black pepper was incorporated in higher amount leading to more pungency which was not liked by the panelists. Least spiciness scores were observed in mild flavor spice mix (MFSM) due to mildness of the ingredients present. In MDH, altered composition of spice mix which was unknown and it was accepted at moderate level. Out of 4 types of spice mix with three concentration levels, the best results in terms of color, flavor, spiciness and overall acceptability was found in LPSM at 2% level which was selected to be incorporated as spice mix for fish ball preparation in conventional and microwave ovens). Emulsion type fish paste products are traditional products of Japan. These products are relished for high gel strength, white in colour and bland taste characteristics. These products as such are not suitable for Indian palate and therefore, many attempts have been made to develop various emulsion type fish paste products suitable to Indian palate such as fish ball in curry, fish ball with various vegetable ingredients, kamaboko with various vegetable ingredients, fish bakarwadi etc. These products are either consumed fresh or chilled for short term storage [2, 5, 6, 12, 17] or frozen stored for long term storage [5, 18]. Keeping this in mind spice mix is incorporated in the fish balls both to enhance taste as well as preservative property. The highest cooking yield was observed in fish balls cooked by conventional oven with addition of spices may be due to less moisture loss in conventional oven than microwave oven which resulted in more weight of the products after cooking. Spices also have

incorporated some added effects in increasing the cooking yield by adding their own weight in the spiced products.

#### 4. Conclusion

The global demand for seafoods is increasing because of their high nutritive value and health benefits. Nowadays people prefer ready-to-serve products from fish and shellfish which can be stored for longer periods without preservatives. Thermally processed products meet these requirements. In the present study products were standardized using spice mix as preservatives. Such spices are added which have preservative effects.

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