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Development of crab crispy product from soft shell crab, *Scylla serrata*

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Abstract

An experiment was conducted to standardize the method of development of Crab Crispy product from soft shell crab, *Scylla serrata*. Crab crispy was standardized with cheap and locally available ingredients. Proportions of ingredients for development of soft shell crab crispy was standardized i.e. 80:20 (w/w) in which ginger paste 4% (of total soft shell crab meat weight), garlic paste 4.4% (of total soft shell crab meat weight), corn flour 2.4% (of total soft shell crab meat weight), gram flour 3.6% (of total soft shell crab meat weight), green chili paste 3.6% (of total soft shell crab meat weight), salt 0.80% (of total soft shell crab meat weight), turmeric powder 0.40% (of total soft shell crab meat weight) and also red chili powder 0.80% (of total soft shell crab meat weight). Organoleptic evaluation by expert panelist was conducted. After organoleptic evaluation, most of the panelist were accepted crab crispy product with headonic point 8.0. Finally, Proximate composition of product “crab crispy” was estimated and it was observed that it contain 48.27% moisture, 23.43% crude protein, 20.20% fat and 8.10% Ash.

Keywords: Soft shell crab, Crab crispy, *Scylla serrata*, product

Introduction

Among the marine edible crustaceans, crabs occupy third position by virtue of its delicacy, demand and price. In India, the consumers mostly prefer large sized crabs, viz., *Scylla tranquebarica* and *Scylla serrata*. It is often called as mud crabs or mangrove crabs, although both terms are highly ambiguous, as well as black crab, is an economically important species of crab found in the estuaries and mangroves of Africa and Asia. It is most popular because of its meat quality, high price and export potential. It is fast growing, hardy and adapts itself to various aquatic conditions. Crabs are good source of food to marine life as well as to man and also protein source the nutritional quality of the crab proteins were compare very favourable than that of muscle meat of mutton, chicken, duck and fish (Zafar *et al.*, 2004) [15]. In India, usually the soft shell (water crab) crabs are discarded from the landing centre. One of the most valuable marketing forms is called “soft-shell crab”. The internet is one of the most important marketing channels for soft shell crab, with prices starting at US\$3.5 a unit, but going up to US\$8.00-10.00, depending on the size and presentation form of the product (live, cooled, frozen, or processed). Considering the present scope of crab product and to demand of new product from consumers, the study was undertaken to develop new product “Crab crispy” from soft shell crab. Thus the developed standardize method of preparation of “Crab crispy” from soft shell crab is discussed in this present paper,.

Materials and Methods

- **Crab:** Freshly caught soft shell Mud crab (*Scylla serrata*) locally known as “Mengan” and *Maukhekda* approximately 100 to 150 g were procured from aqua culturist, brought under live condition and immediately stored in frozen condition for further experimental purpose.
- **Salt:** Iodized Tata brand salt was used.
- **Vegetables:** The fresh vegetables viz., green chili, ginger, garlic and lemon were purchased from local market, Ratnagiri.

- **Ingredients:** Spices of good quality, red chili powder, turmeric powder, corn flour and gram flour were used.
- **Water:** Potable water was used whenever required during preparation of product.

Equipment used

- **Chopper and knife:** Stainless steel chopper and knife were used for cutting purposes.
- **Pan:** A frying pan was used for deep frying the crab.
- **Trays:** Stainless steel trays were used for mixing ingredients.
- **Zara:** Stainless steel (zara) was used for frying the product.
- **Electronic balance:** Digital electron balance having 0.01 g minimum sensitivity was used for weighing purpose.
- **Mixer grinder:** Mixer grinder was used for mixing and homogenizing the ingredients.
- **Deep freezer:** Deep freezer was used for storage of raw soft shell crab.
- **Hot air oven:** Hot air oven was used for drying and estimation of moisture content of product.
- **Autoclave:** A Quality brand Autoclave was used for sterilization of glassware's and media used for bacteriological analysis.
- **Incubator:** Bacteriological Incubator was used for incubation of samples.
- **Gas stove:** A liquid petroleum gas stove manufactured was used for cooking and frying process.
- **pH meter:** pH meter was used for pH estimation (range 0 to

11)

Glass wares: Standard quality glassware's were used.

Methods of Product preparation

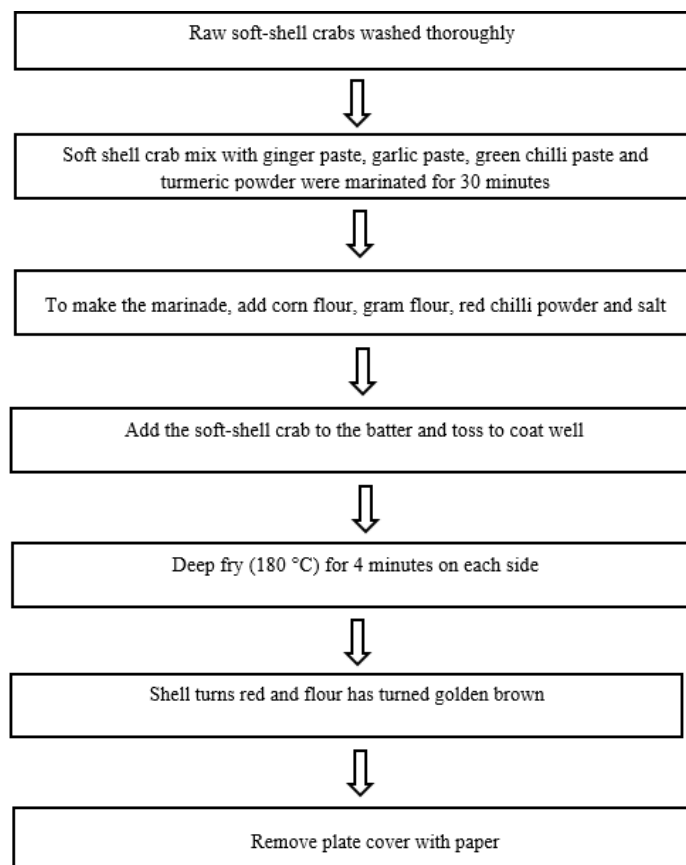
The soft shell crab (*S. serrata*) was procured from the aqua culturist. Molted crab within 3 hours was used for product preparation. Crabs were thoroughly cleaned and gills were removed. All the ingredients (spices, ginger, garlic and chili paste) were mixed properly. Then crab and ingredients mixture was marinated for 30 minutes. Crabs were becomes ready for deep frying until golden brown color appears. Sensory evaluation of product was done with the help of selected panelist.

Percentage yield of separated meat

Fresh raw soft shell crabs approximately in the range 100 g to 150 g were weighted collectively. After dressing, the final dressed soft shell crab weight was taken. This procedure was repeated again and the average percentage yield of separated meat was calculated.

Applied Method for preparation of Crab crispy

Crab crispy was prepared according to the method given by (<http://www.stylecraze.com/articles/yummy-crispy-chicken-recipes-by-sanjeev-kapoor/>) with some modification in which chicken meat is replaced by soft shell crab meat.



Standardization of recipe

- **Standardization for different concentrations of soft shell crab**
Three different type of crab crispy was prepared by incorporating three different concentration ratio of soft shell

crab and ingredients viz. (T₁) 70:30 (w/w), (T₂) 80:20 (w/w) and (T₃) 90:10 (w/w) (Dange, 2017).

- **Standardization of different levels of ginger paste**
The crab crispy was prepared with incorporation of different levels of ginger paste viz. 4.0 g (T₁), 4.5 g (T₂), 5.0 g (T₃).

Remaining all the ingredients were kept constant and product is deep fried at 180 °C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Pawar *et al.*, 2012).

- **Standardization of different levels of garlic paste**

The crab crispy was prepared with incorporation of different levels of garlic paste *viz.* 4.5 g (T₁), 5.0 g (T₂), 5.5 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Pawar *et al.*, 2012).

- **Standardization of different levels of corn flour**

The crab crispy was prepared with incorporation of different levels of corn flour *viz.* 2.0 g (T₁), 2.5 g (T₂), 3.0 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Mugale, 2013).

- **Standardization of different levels of gram flour**

The crab crispy was prepared with incorporation of different levels of gram flour *viz.* 3.5 g (T₁), 4.0 g (T₂), 4.5 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Mugale, 2013).

- **Standardization of different levels of green chilli paste**

The crab crispy was prepared with incorporation of different levels of green chilli paste *viz.* 4.0 g (T₁), 4.5 g (T₂), 5.0 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Pawar *et al.*, 2012).

- **Standardization of different levels of salt**

The crab crispy was prepared with incorporation of different levels of salt *viz.* 0.5 g (T₁), 1.0 g (T₂), 1.5 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Mugale, 2013).

- **Standardization of different levels of turmeric powder**

The crab crispy was prepared with incorporation of different levels of turmeric powder *viz.* 0.3 g (T₁), 0.5 g (T₂), 0.7 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Pawar *et al.*, 2012).

- **Standardization of different levels of red chilli powder**

The crab crispy was prepared with incorporation of different levels of red chilli powder *viz.* 0.5 g (T₁), 1.0 g (T₂), 1.5 g (T₃). Remaining all the ingredients were kept constant and product is deep fried at 180°C for 6-8 minutes in frying pan and then subjected to organoleptic evaluation (Dange, 2017).

Results

- **Yield (%)**

The percentage yield of separated soft shell crab was 75% based on the total weight of crab (Table 4 and Fig. 3). The percentage yield of separated hard shell crab meat was 36% based on the total weight of crab (Table 5 and Fig. 4).

The standardization of ingredients for crab crispy indicated that the ingredients namely soft shell crab (100 g), ginger paste (5 g), garlic paste (5.5 g), corn flour (3 g), gram flour

(4.5), green chilli paste (4.5), salt (1 g), turmeric powder (0.5) and red chilli powder (1 g) of the soft shell crab are the standard proportions of the ingredients for the crab crispy product. Organoleptic evaluation was also carried out for crab crispy product and it was seen that crispy crab product was very much liked by the panellists (Table 24).

- **Standardized ingredients for the preparation of crab crispy in percentage**

The standardization of ingredients for crab crispy indicated that the ingredients namely soft shell crab (80:20 w/w), ginger paste (4%), garlic paste (4.4%), corn flour (2.4%), gram flour (3.6%), green chilli paste (3.6%), salt (0.8%), turmeric powder (0.4%) and red chilli powder (0.8%) of the soft shell crab are the standard proportions of the ingredients for the crab crispy product. Organoleptic evaluation was also carried out for crab crispy product and it was seen that crispy crab product was very much liked by the panellists.

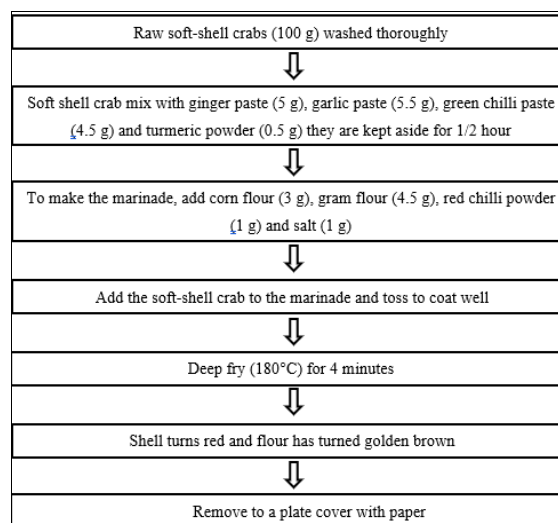
Table 1: Standardized ingredients for the preparation of crab crispy in quantity

Sr. No.	Ingredient	Quantity (g)
1.	Soft shell crab	100
2.	Ginger paste	5
3.	Garlic paste	5.5
4.	Corn flour	3
5.	Gram flour	4.5
6.	Green chilli	4.5
7.	Salt	1
8.	Turmeric powder	0.5
9.	Red chilli powder	1

Table 2: Standardized ingredients for the preparation of crab crispy in percentage

Sr. No.	Ingredient	Quantity (%)
1.	Soft shell crab	80.00
2.	Ginger paste	4.00
3.	Garlic paste	4.40
4.	Corn flour	2.40
5.	Gram flour	3.60
6.	Green chilli	3.60
7.	Salt	0.80
8.	Turmeric powder	0.40
9.	Red chilli powder	0.80

Flow Chart No. 3 Standardized method for preparation of crab crispy



Organoleptic evaluation of crab crispy from soft shell crab

Crab crispy was standardized with required ingredients step by step. Organoleptic evaluation by expert panelist was conducted. Later organoleptic evaluation report was supported with statistical analysis and used as a base for standardization (Table 26 and Fig. 14).

Table 15: Organoleptic evaluation of crab crispy prepared by using three different concentrations of soft shell crab

Sample Characteristics	Soft shell crab concentration in crab crispy		
	T ₁ 70:30	T ₂ 80:20	T ₃ 90:10
Appearance	8	8	8
Colour	8	8.5	7
Taste	9	9	8
Odour	9	9	8
Texture	8	8.5	7
Overall acceptability	8.4	8.6	7.6

Proximate composition of crab crispy product prepared by adopting standardized method

The moisture, crude protein, crude fat, carbohydrate and ash were determined. The values were moisture 48.27%, crude protein 23.43%, crude fat 20.20% and ash 8.10% (Table 27 and Fig. 15).

Discussion

The method standardization of crab crispy from soft shell crab, sensory evaluation of crab crispy are discussed in this chapter.

- **Proximate composition of soft shell and hard shell crab**

Present study indicated that moisture, crude protein, fat and ash content of soft shell crab were 83.16%, 15.03%, 0.51% and 1.3% respectively. Sudhakar *et al.* (2009) observed similar trends in proximate composition of soft shell crab of (*Portunus sanguinolentus*) which was recorded as 17.7% protein and 1.50% fat. The results for proximate composition of hard shell crab (*Scylla serrata*) was similar with slight variation to that of reported by Zafaret *al.* (2004) [15]. They reported 79.00% moisture in male and 79.50% moisture in female, while crude protein content 18.20% in male and 17.20% in female and fat content 0.49% in male and 0.44% was recorded in female and ash content was 1.80% and 1.62% in male and female respectively. Variations in proximate composition in crab were due to size, sex, moulting stage and type of feed and culture environment. Mukundan *et al.* (1981) they observed proximate composition of hard shell crab such as 79.23% moisture, 17.50% protein, 0.21% fat and 1.39% fat. Virginia *et al.* (1974) they observed proximate composition of hard shell crab of (*Scylla serrata*) was 80.30% moisture, 14.90% protein, 2.90% fat and 1.8% ash.

- **Standardization of different ingredients in crab crispy**

The crab crispy was prepared with three different concentrations of various ingredients and subjected to organoleptic analysis by 10 trained panelists in the college of fisheries, Ratnagiri using 9 point hedonic scale (1- Not like very much; 5- Neither like nor dislike; 9- Like extreme) as per Meilgaard *et al.* (1990).

- **Standardization of crab crispy using different concentrations of soft shell crab**

The crab crispy was prepared with 70:30 (w/w), 80:20 (w/w) and 90:10 (w/w) ratios of soft shell crab to ingredients concentration and subjected to organoleptic analysis by 10 trained panelists using 9 point hedonic scale (1- Not like very much; 5- Neither like nor dislike; 9- Like

extreme) as per Meilgaard *et al.* (1990). The product having 80:20 (w/w) soft shell crab concentration appeared to be ideal according to panelists. It had high overall acceptability score i.e. 8.6 whereas the product 70:30 (w/w) crab meat and 90:10 (w/w) crab meat scored 8.4 and 7.6 points respectively as overall acceptability. Thus among the three concentrations, crab meat having concentration 80:20 (w/w) crab meat was selected for experimentation. According to panelists, the crab crispy with 80:20 (w/w) crab meat concentrations was most appropriate and gave the required good taste. (Table 17 and Figure 4). Working in the similar direction Dange (2017) prepared fish samosa from Indian mackerel (*Rastrelligerkanagurta*) with 50% (w/w) fish meat concentration.

- **Standardization of crab crispy using different concentrations of ginger paste**

The concentrations of ginger paste used in present study were 3.2%, 3.6% and 4%. Rest all ingredients were kept constant. The overall acceptability was highest for crab crispy made by using 4% concentration of ginger paste. The scores for overall acceptability were 8.3, 8.5 and 8.7 (Table 18 and Figure 5). Hence the concentration of 4% ginger paste noted as an appropriate one. Similarly Pawar *et al.* (2012) used 2.09% of ginger paste in cutlet prepared from Catla (*Catla catla*).

- **Standardization of crab crispy using different concentrations of garlic paste**

Pawar *et al.* (2012) used 2.09% of garlic paste in cutlet prepared from Catla (*Catla catla*). But in the present experimentation the crab crispy was prepared with three different concentrations of garlic paste and subjected to organoleptic analysis. The concentrations of garlic paste were 3.6%, 4.0% and 4.4% of soft shell crab. Rest all ingredients were kept constant. 4.4% concentration of garlic paste had highest overall acceptability. The scores for overall acceptability were 8.4, 8.5 and 8.8 (Table 19 and Figure 6). Hence the concentration of 4.4% garlic paste noted as an appropriate one in the preparation of crab crispy.

- **Standardization of crab crispy using different concentrations of corn flour**

Mugale (2013) used 12.15% of corn flour in fish ball prepared from minced meat of tilapia (*Oreocromis mossambicus*). But in the present experimentation the crab crispy was prepared with three different concentrations of corn flour and subjected to organoleptic analysis by 10 trained panelists using 9 point hedonic scale. The concentrations of corn flour were 1.6%, 2.0% and 2.4% of soft shell crab. Rest all ingredients were kept constant. The overall acceptability was highest for crab crispy made by using 2.4% concentration of corn flour. The scores for overall acceptability were 6.8, 7.5 and 8.5 (Table 20 and Figure 7). Hence the concentration of 2.4% corn flour noted as an appropriate one.

- **Standardization of crab crispy using different concentrations of chilli paste**

Pawar *et al.* (2012) used 2.09% of chilli paste in cutlet prepared from Catla (*Catla catla*). But in the present experimentation the crab crispy was prepared with three different concentrations of chilli paste and subjected to organoleptic analysis by 10 trained panelists using 9 point hedonic scale. The concentrations of chilli paste were 3.2%, 3.6% and 4.0% of soft shell crab. Rest all ingredients were kept constant. The overall acceptability was highest for crab

crispy made by using 3.6% concentration of chilli paste. The scores for overall acceptability were 8.0, 8.5 and 7.5 (Table 22 and Figure 9). Hence the concentration of 3.6% chilli paste noted as an appropriate one.

- **Standardization of crab crispy using different concentrations of salt**

Mugale (2013) used 1.21% of salt in fish ball prepared from minced meat of tilapia (*Oreochromis mossambicus*). But in the present experimentation the crab crispy was prepared with three different concentrations of salt and subjected to organoleptic analysis by 10 trained panellists using 9 point hedonic scale. The concentrations of salt were 0.4%, 0.8% and 1.2% of soft shell crab. Rest all ingredients were kept constant. The overall acceptability was highest for crab crispy made by using 0.8% concentration of salt. The scores for overall acceptability were 7.6, 8.6 and 6.8 (Table 23 and Figure 10). Hence the concentration of 0.8% salt was chosen.

- **Standardization of crab crispy using different concentrations of turmeric powder**

Pawar *et al.* (2012) used 0.08% of turmeric powder in cutlet prepared from Catla (*Catla catla*). But in the present experimentation the crab crispy was prepared with three different concentrations of turmeric powder and subjected to organoleptic analysis by 10 trained panelists using 9 point hedonic scale. The concentrations of turmeric powder used were 0.24%, 0.4% and 0.56% of soft shell crab. Rest all ingredients were kept constant. The overall acceptability was highest for crab crispy made by using 0.4% concentration of turmeric powder. The scores for overall acceptability were 7.8, 8.6 and 7.4 (Table 24 and Figure 11). Hence the concentration of 0.4% turmeric powder noted as an appropriate one.

- **Standardization of crab crispy using different concentrations of red chilli powder**

Dange (2017) used 0.08% of turmeric powder in fish samosa prepared from Mackerel (*Rastrelligerkanagurta*). But in the present experimentation the crab crispy was prepared with three different concentrations of red chilli powder and subjected to organoleptic analysis by 10 trained panelists using 9 point hedonic scale. The concentrations of red chilli powder were 0.4%, 0.8% and 1.2% of soft-shell crab. Rest all ingredients were kept constant. The overall acceptability was highest for crab crispy made by using 0.8% concentration of red chilli powder. The scores for overall acceptability of red chilli powder were 7.8, 8.6 and 7.4 (Table 25 and Figure 12). Hence the concentration of 0.8% red chilli powder noted as an appropriate one.

- **Proximate composition of crab crispy product prepared by adopting standardized method**

In the present work, while study the nutritive value of product, it was found that the crab crispy product contained 23.43% crude protein, 48.27% moisture, 20.20% fat and 8.10% ash. In the present scenario there is an increasing demand of ready to eat products from all over the world. It is therefore, crab crispy product will becomes is also highly nutritious product in near future.

Conclusion

From the results of the present investigation, it can be concluded that soft shell crab serve as better raw material in making value added products like crab crispy as it has got higher meat yield as compared with hard shell crab. crab crispy prepared from soft shell crab (15.03%) meat had higher protein content of

(23.43%).

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