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SENSORY EVALUATION AND BIOCHEMICAL CHANGES OF FISH CUTLETS, MADE FROM DHOMA *(OTOLITHUS* SP) FISH DURING FROZEN STORAGE

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Abstract: Shelf life of fish cutlet prepared from marine water fish Dhoma were evaluated on the basis of biochemical and sensory qualities during frozen storage. The meat was separated from the fish and cutlet was prepared by following standardized recipe then frozen stored (-18^{0}C) and subjected to biochemical and sensory evaluation at interval of fifteen days through the study. Results indicated that the frozen cutlet was in acceptable condition up to 165 days at stored -18^{0}C. Biochemical parameters showed a rising trend pH, peroxide value, free fatty acid and total volatile base-Nitrogen, during the period of study. Scores for sensory parameters appearance, colour, taste, odour and overall acceptability showed a decreasing trend.

Keywords: Biochemical Changes, Fish Cutlets, Dhoma fish, Sensory Evaluation and Storage Study.

INTRODUCTION

The consumption of fish and seafood and their popularity has consistently increased during recent years (Bochi *et al*., 2008).In recent years, the increase of the world's population as well as various socioeconomic changes, has caused to an increase of the consumer's preference for ready-to-eat foods. Cakes, crackers, burgers, fish fingers, marinated products made from fish or other seafood products are of the most preferred ready-to-eat foods by consumers around the world and many studies have been conducted on the production, quality, and stability of these foods (Cakli *et al*., 2005).

Fish mince is used for the preparation of various products such as fish fingers, cutlets, sausages, cakes, analog products and certain canned products (Reddy *et al.,* 2012).

Battered and breaded product is convenience food valued greatly by the consumers all over the world. The process of coating with batter and bread crumbs increases the bulk of the product, thereby reducing the content of costly fish and thus reducing the cost product, coating enhances the appearance, color, texture and taste of food products and also the nutritional value of the product (Rathod *et al*., 2012). The aim of this study was to prepare

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fish cutlet from Dhoma fish meat and to investigate storage characteristics viz., biochemical pH, peroxide value (PV), free fatty acid (FFA) and total volatile base-Nitrogen (TVB-N) and sensory quality changes during frozen storage.

MATERIAL AND METHODS

Fresh Dhoma (*Ottolithus sp.*) procured from fish market of Ratnagiri. Fish samples were between 5.5 and 10.5 kg and transferred to processing hall under iced condition and then they were washed thoroughly with potable water then beheaded, gutted and again washed meat was separated which yielded 39% of meat based on total weight of fish.

Using standardised recipe the cutlets were prepared (Pawar *et al*., 2012). The standardized cutlet recipe included 100gm cooked Dhoma fish meat, 3gm salt, 10 ml oil, 5gm green chillies, 5gm coriander leaves, 5gm ginger, 5gm garlic, 25gm onions, 70gm cooked potatoes, 0.3gm pepper powder, 0.3gm clove powder, 0.2gm cinnamon powder, 0.2gm turmeric powder, 20gm bread powder.

The standardized batter mix (Pagarkar *et al.,* 2012) were prepared using 77.5% refined wheat flour, 9.7% corn flour, 9.7% bengal gram flour, 1.20% salt, 0.47% sodium tri polyphosphate (STPP), 0.47% turmeric powder, 0.96% carboxy methyl cellulose (CMC) which were mixed with water in the ratio of 1:2 and was blended to homogeneity. After the batter coating, it was covered with bread crumbs, they were flash fried at 180 ^{0}C for 30 sec. later packed in polypropylene pouches of 100gm capacity and frozen stored at -18 ^{0}C.

Analysis:

Proximate composition viz., moisture, crude protein, fats, carbohydrate and ash of raw fish and fish cutlet on the initial day of production and at the end of the storage were analysed according to AOAC (2005). Biochemicaland sensory quality was assessed during storage study at 15 days interval.

Chemical quality:

The pH, free fatty acid values were determined as per AOAC (2005). TVB-N contents of Dhoma fish cutlet was determined by the procedure given by Beatty and Gibbons, (1937) using Conway micro-diffusion units and results were expressed in terms of nitrogen mg/100g.

Sensory quality:

Sensory quality of catla fish cutlets were evaluated directly by 10 trained panelists, using a nine point hedonic scale (1-dislike extremely to 9-like extremely) for product acceptability.

Statistical Methods:

The data were analyzed using appropriate statistical methods (Snedecor and Cochran, 1967). Using analysis of variance (ANOVA) technique significant difference between the means of treatments was found out and further subjected to least significant difference among or between the treatments.

RESULTS AND DISCUSSION

The moisture, crude protein, fat and ash contents in fresh Dhoma fish were 73.63%, 21.15%,2.26% and 1.96% respectively. Similarly, with slight variation was reported by Khanolka, (2005) in moisture (74.50-73.00%), crude protein (20.62-21.00%), fat (2.49-2.50%) and ash (1.24-2.50%) contents in fresh Dhoma and Johniusdussumeri respectively, whereas Ramchandran and Solankhi (1988) reported the moisture, crude protein, fat and ash contents in fresh Otolithus sp. were 77.41, 16.02, 3.3 and 0.84% respectively**.**

The proximate composition of Dhoma fish cutlet at the beginning is shown in (Table 1). The percentage of moisture was 67.40%, crude protein 14.86%, fat 15.43%, ash 2.31%. At the end of the experiment, the Dhoma fish cutlet kept in storage at -18^{0}C temperature showed slight variation in the proximate composition. The Dhoma fish cutlet kept in storage had moisture, crude protein, fat, and ash content of 66.81, 13.35, 16.38, 3.46 % respectively. Ninan *et al*., (2010) reported no variation in fish cutlet during the frozen storage. Pandey and Kulkarni (2007) reported the decrease in the moisture content in grass carp cutlets and fish fingers during the frozen storage at -18^{0}C for 6 months. Kamat (1999) reported fish cutlet prepared from bleached and unbleached fish meat content of moisture, protein, fat and ash were 65.01, 12.06, 6.31 and 1.39% and 60.21, 16.20, 14.32 and 1.43% respectively.

Table 1: Proximate composition of Dhoma fish cutlet at the beginning and at the end of frozen storage study

Attribute	**Stored cutlets**	
	Initial (Days)	**Final (Days)**
Moisture (%)	67.40	66.81
Crude Protein (%)	14.86	13.35
Fat (%)	15.43	16.38
Ash (%)	2.31	3.46

Chemical quality parameters

The change in pH of fish muscle is usually a good index for quality assessment. It is important determining of fish quality as texture of fish.The increase in pHis caused by the enzymatic degradation of fish muscle (Love, 1992 and Vareltzis*et al*.,1997). In the present study cutlet showed slightly increased pH from 6.20 to 6.69 (Fig.1) during frozen storage. Pawar (2011) reported the cutlet made from catla fish showed increasing trend of pH from 6.50 to 6.79 when stored at -2 to -4°C.

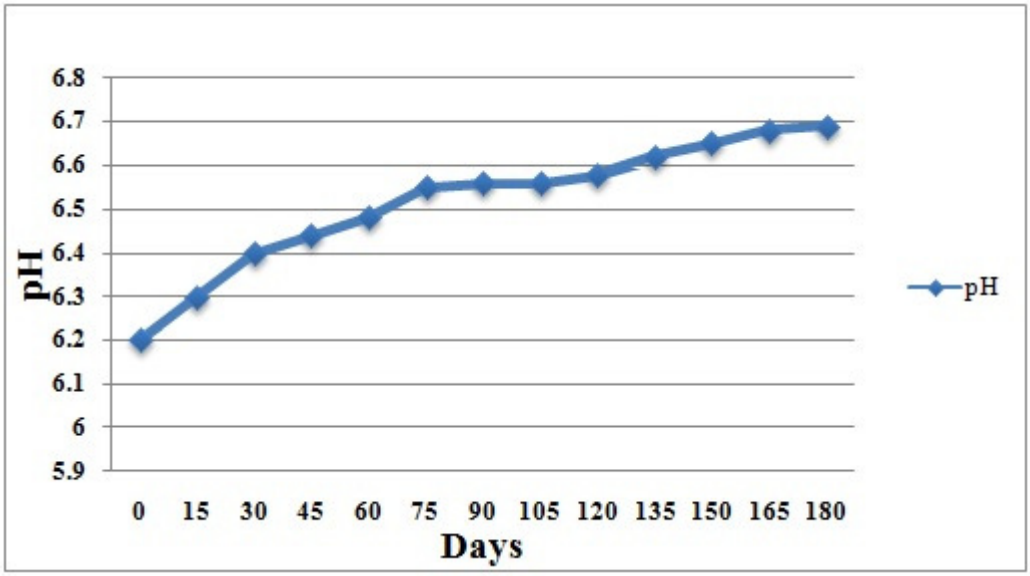
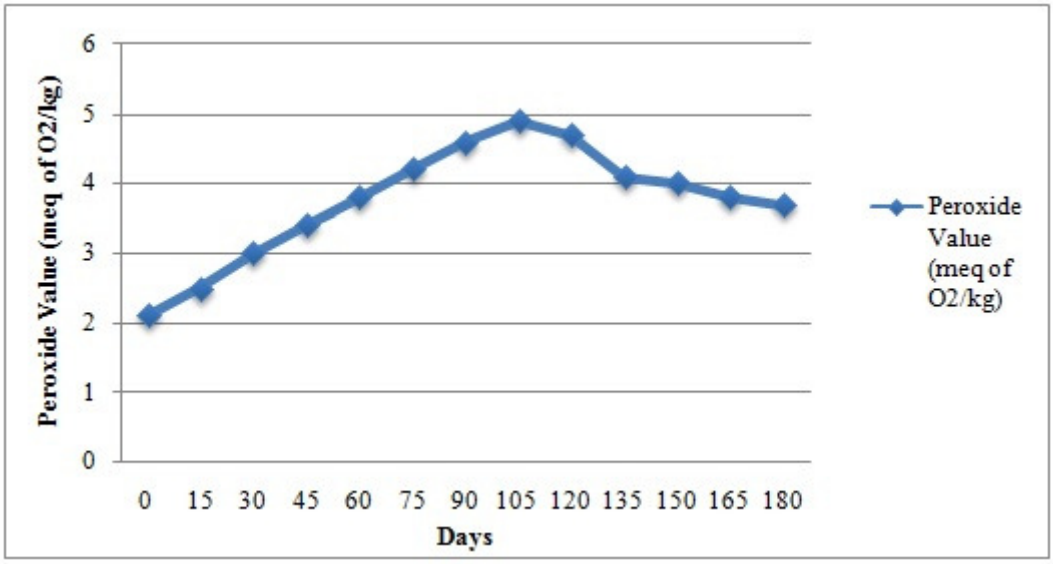


Fig. 1: Changes in pH of Dhoma fish cutlet during storage at -15 to -18°C

Changes in peroxide value (PV):

The PV value in frozen stored cutlet increase gradually from initial value of 2.1 to 4.7 and at the end of 120 days and further show gradually decrease in PV from 4.1 to 3.7 (Fig. 2) meq. of O_2/kg at the end of 180 days. Peroxide value of mackerel mince cutlet prepared from bleached and unbleached surimi increased (Kamat, 1999) gradually from an initial value of 2.8 and 3.4 to 30 and 40 meq of O_2 /Kg at the end of 9 and 5 weeks period of storage at -14°C respectively. Joseph *et al*., (1984) reported decreasing trend of peroxide value in both flash fried and raw cutlets. The peroxide value of flash fried cutlets were 8.16 to 5.81, 8.16 to 1.59 and 8.16 to 4.50 meq of O_2 /Kg and raw cutlets were 9.5 to 6.23, 9.50 to 3.98 and 9.55 to 6.22 meq of O_2 /Kg at 4°C, -8°C and -20°C respectively.



(Fig. 2): Changes in peroxide value of Dhoma fish cutlet during frozen storage

Changes in free fatty acid (FFA):

In the present study, Dhoma fish cutlet during frozen storage at -18°C was shown increased in FFA from 1.15 to 2.09 mg/100g till 120thday and then onward started decreasing 1.88 to 1.6 mg/100g on 180thday (Fig. 3).Pawar(2011) also reported FFA in catla fish cutlet during frozen storage at -18°C increase gradually from initial value 0.95 to 2.12 mg/100g till 105thday and then onward stared decreasing to 1.77 mg/100 on 180thday. Joseph *et al*., (1984) reported FFA content in flashed fried and raw cutlet in the range of 0.98 to 1.49 and 2.03 to2.82 mg/100g respectively at 4°C. Reddy *et al*., (1992) reported increasing FFA in fish finger developed from croaker and pink perch meat up to 6th week and 10thweek respectively and then decreased slightly upto 14thweek and remained almost stable at -20°C.

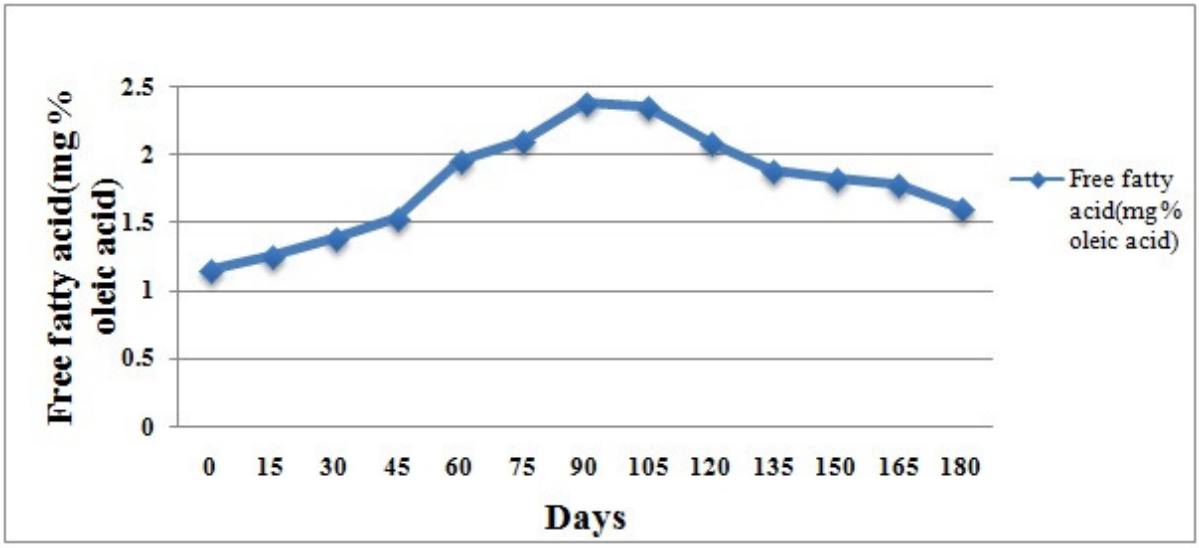


Fig. 3: Changes in free fatty acid (mg % oleic acid) of Dhoma fish cutlet during frozen storage

Changes in TVB-N (Total volatile base-Nitrogen):

TVB-N (Total volatile base-Nitrogen) is a commonly used chemical method to determine spoilage of fish (Tokur *et al*., 2004). TVB-N of Dhoma fish cutlet during frozen storage was increased from 2.09 to 15.38 mg/100g till 150th day and then onward stared decreasing from 15.1 to 14.85 mg/100g on 180th day (Fig. 4). Pawar, (2011) TVB-N of catla fish cutlet stored in chilled storage showed increasing trend from 4.15 to 13.74 mg/100g also TVB-N of catla fish cutlet during frozen storage was increased up to 15.06 mg/100g till 105th day and then onward stared decreasing to 10.53 mg/100g on 180th day.

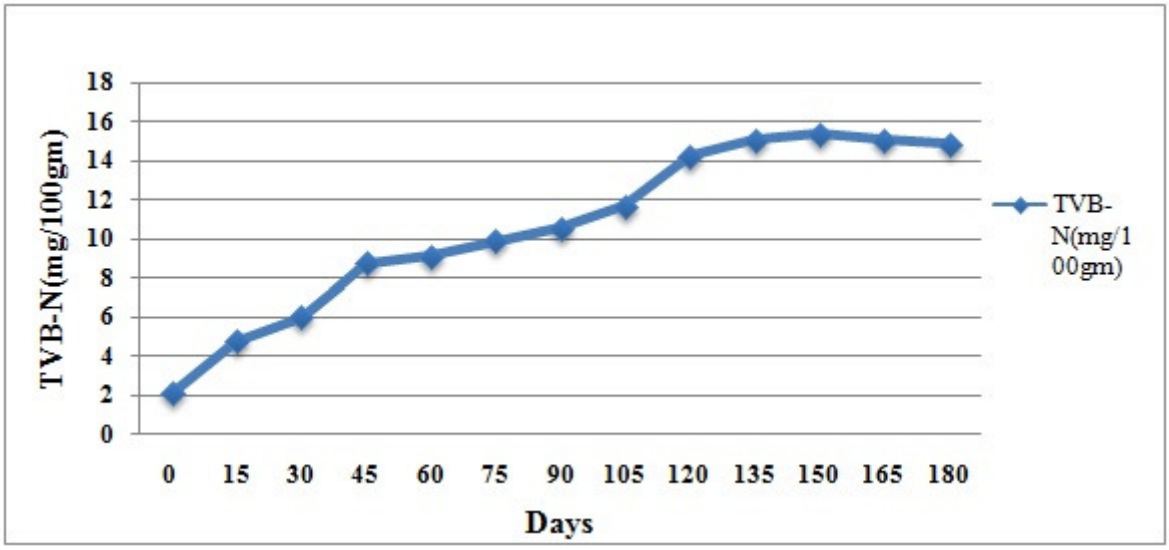


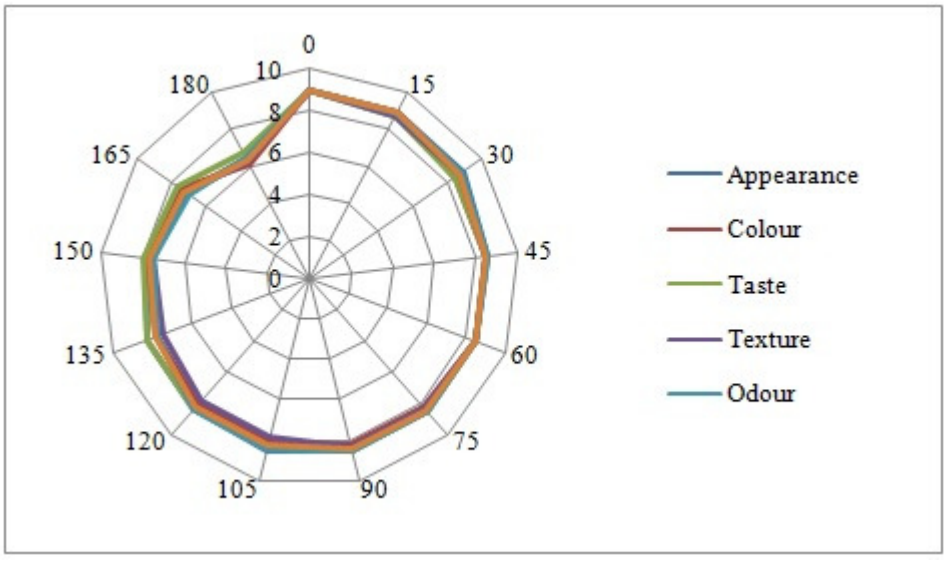
Fig. 4: Changes in TVB-N (mg/100g) of Dhoma fish cutlet during frozen storage

Changes in sensory quality characteristics:

The result of organoleptic evaluation of cutlet kept in storage (-15 to -18°C) showed slight decrease in overall acceptability in of the Dhoma fish cutlet when storage period increased from 0 to 180 days. The cutlet kept in storage was not in acceptable condition after 165 days (Fig. 5). This may be due to formation of some volatile low molecular weight compounds, lipid oxidation and protein degradation during chilled and frozen storage (Undeland and Lingnert, 1999 and Pawar, (2011).

Joseph *et al.,* (1984) reported raw and flash fried cutlets prepared from lizard fish, threadfin bream, Jew fish and miscellaneous fish among that lizard fish cutlet showed highest acceptability. The raw cutlet had storage life of 6 days, 11 weeks and 19 weeks at 4°C, -8°C and -20°C respectively. The flash fried (FF) cutlets had shelf lifeof 22 weeks at -20°C. The FF cutlets were superior in organoleptic quality compared to raw cutlet during early stage of storage and at the end of storage both had almost same rating.

Pawar, (2011) reported that organoleptic score of catla fish cutlet kept in chilled stored was slightly decrease in overall acceptability of the catla fish cutlet from 0 to 18 days during storage at -2 to -4°C and that catla fish cutlet kept in frozen stored was not in acceptable condition after 150 days.



(Fig. 5): Sensory evaluation of catla fish cutlet during frozen storage

CONCLUSION

The paper described quality changes of batter and bearded fish product fish cutlet based on evaluation of biochemical parameters (pH, PV, FFA and TVB-N) and sensory qualities on frozen storage. The rate of quality deterioration was an accelerated process with the

passage of storage time which was assessed by means of biochemical parameters and sensory evaluation score. The batterand bearded fish product fish cutlet prepared following standardised recipe from Dhoma, had a shelf life of 165 days.

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