

SHELF-LIFE OF HORSE MACKEREL FISH BALLS STORED AT 0-2°C

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ABSTRACT

The shelf-life of standardized horse mackerel fish balls was assessed by biochemical, microbiological, organoleptic and other spoilage changes at 0-2°C. There was decrease in pH value, moisture and the organoleptic scores. Expressible water percentage, TMA-N, TVB-N and peroxide value showed increasing trends. Total plate count also increased gradually during storage. Water separation in the treated sample was observed after 12 days and slimy consistency was noticed in the control sample on the 24th day. Based on these observations, it can be concluded that fish balls can be stored at 0-2°C for 20 days.

Keywords: Shelf-life, horse mackerel, chilled, fish ball

INTRODUCTION

During 2003, Maharashtra state contributed 256 t to horse mackerel landing (Anon., 2004). Although, horse mackerel is available in adequate quantity, it is not widely consumed in and around Ratnagiri in fresh condition. The main reasons for this are the dark red colour of the muscle, bitter taste, off flavour and difficulty in dressing owing to lateral-line scutes. However, the weaker sections of the society consume it quite often, although not regularly. Therefore, Todkari (2005) developed an emulsion type fish paste product with improved organoleptic quality characteristics.

Chilling preserves the freshness and quality of seafood products compared with traditional processing methods of smoking, canning, drying and freezing. Achieving this requires chilling foods immediately after packaging and processing. MAP, CAP and sous vide processing technologies are the tools for producing high quality ready meals. For the past few years, there is a growing

demand for cook-chill foods in Europe and America. Several studies have been made on cook-chill foods (Light *et al.*, 1988; Venugopal, 1993). However, so far, no work has been done on cook-chill storage of horse mackerel fish balls; hence, an attempt has been made to study its shelf life at 0-2°C.

MATERIAL AND METHODS

Freshly caught horse mackerel was brought to the processing hall, washed thoroughly, drained and weighed. Then, the fish were dressed, *i.e.*, beheaded and eviscerated. Fish were then washed, deskinning, filleted and weighed again. The fillets were chopped into fine meat pieces of approximately 4-5 mm size (*i.e.*, picked meat). Treated horse mackerel mince meat was prepared as per Kulkarni (2003). Alkaline solution of 0.5% NaHCO₃ was mixed with picked meat in a ratio of 1:5 (picked meat: alkaline solution) and held for 90 minutes with intermittent stirring. The slurry was allowed to settle for ten minutes. The

supernatant was decanted and the alkaline washed sample was subjected to water washing for ten minutes with intermittent stirring followed by settling (10 min) and decanting. One more water washing was given following the previous step. Excess moisture was removed by squeezing in a cloth and pressing in hydraulic press. Pressed meat was passed through meat mincer. Sodium tripolyphosphate (0.12%) was added to the treated minced meat. Lizard fish surimi procured from M/s Gadre Marine, Ratnagiri, was used in the preparation of fish balls.

Green chilly, coriander, ginger and garlic paste (GCGG) was prepared by mixing the above ingredients in equal quantities (w/w) and by washing, chopping and grinding into a fine paste. Fish ball paste was prepared as per the standardized procedure (Table 1) by

Table 1: Standardized recipe of fish ball paste*

Ingredient	Composition (%)
Horse mackerel surimi	47.25
Lizard fish surimi	31.50
Salt	1.57
Starch	11.81
Water	7.87
Total	100

*Horse mackerel : Lizard fish :: 60 : 40, Fish paste : GCGG paste :: 90 : 10
Only horse mackerel mince was used at the rate of 78.75% of fish ball paste in control.

mixing the ingredients in a grinder to obtain a uniform fish ball paste. Fish balls of 10 g each were prepared from fish ball paste. Similarly, plain fish balls were prepared by utilizing untreated horse mackerel mince meat along with starch, salt, water and sodium tripolyphosphate (0.12%) following the above procedure of fish ball preparation and were treated as control (Table 1). Fish balls were steamed for 21 minutes (Fig. 1), cooled, packed in trend packs and pasteurized at 100°C for

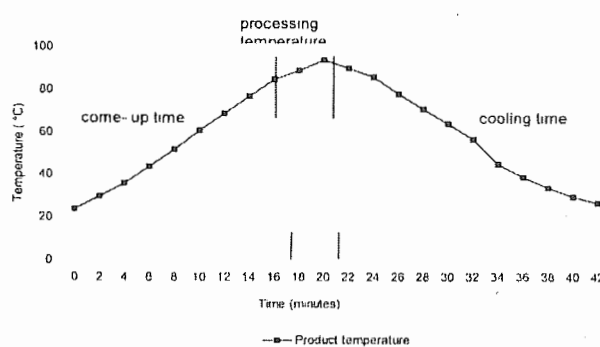


Fig. 1: Temperature profile of fish balls

20 minutes, followed by cooling at room temperature. Both the control and treated samples were stored at room temperature as well as at chill storage. Chilled samples were drawn at an interval of four days throughout the storage study. Control samples were drawn at an interval of two days.

The standardized product (60 : 40 :: horse mackerel surimi : lizard fish surimi and 10% GCGG) was analysed for pH, moisture and peroxide value (AOAC, 1990), TMA-N, TVB-N (Beatty and Gibbons, 1937), folding test, expressible water (Suzuki, 1981) and microbiological tests (Speck, 1976). Statistical analysis was carried out as per Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

During storage, the samples stored at room temperature got spoiled within four

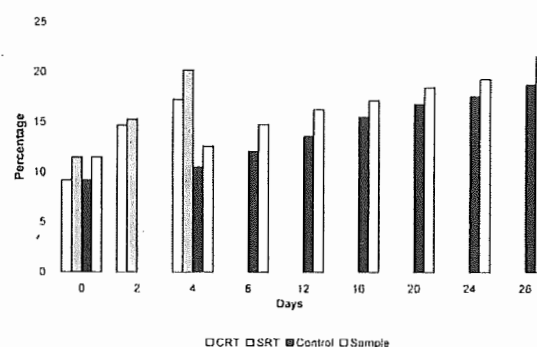


Fig. 2: Changes in expressible water percentage of fish balls stored at chill storage

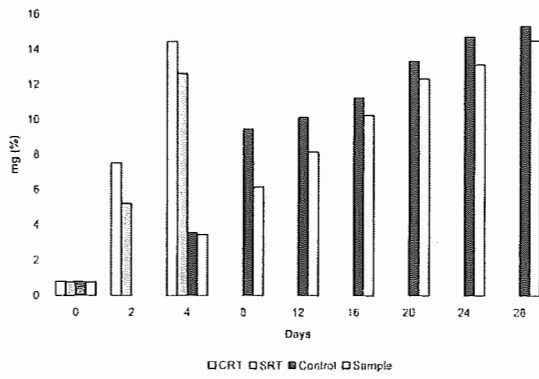


Fig. 3: Changes in TMA-N content of fish balls stored at chill storage

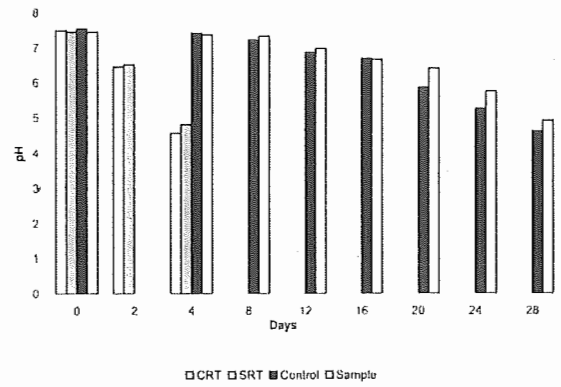


Fig. 7: Changes in pH of fish balls stored at chill storage

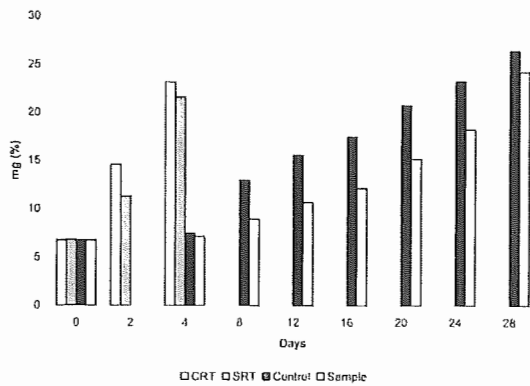


Fig. 4: Changes in TVB-N content of fish balls stored at chill storage

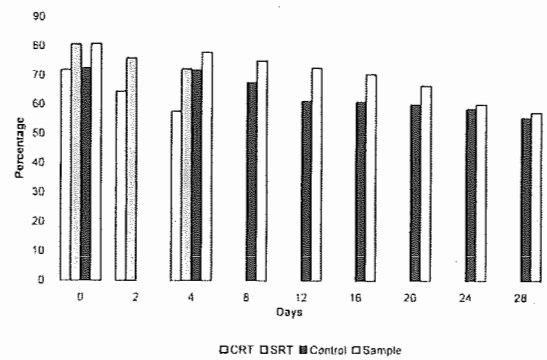


Fig. 8: Changes in moisture content of fish balls stored at chill storage

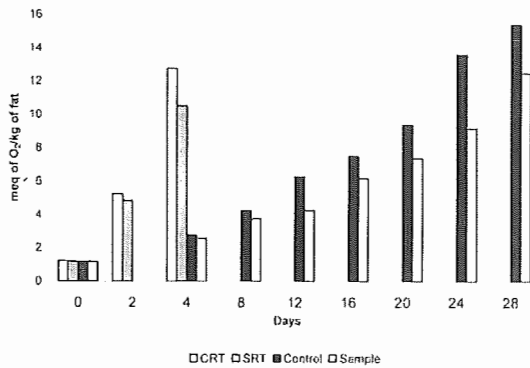


Fig. 5: Changes in peroxide value of fish balls stored at chill storage

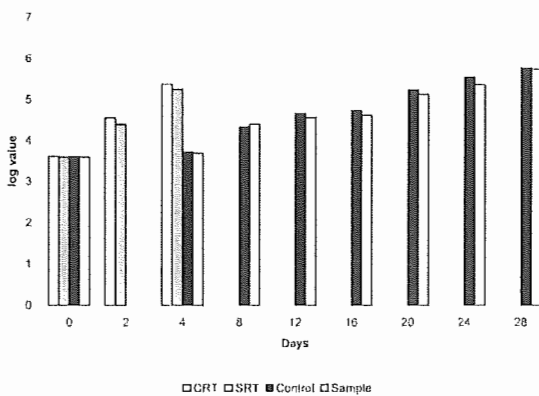


Fig. 6: Changes in total plate count of fish balls stored at chill storage

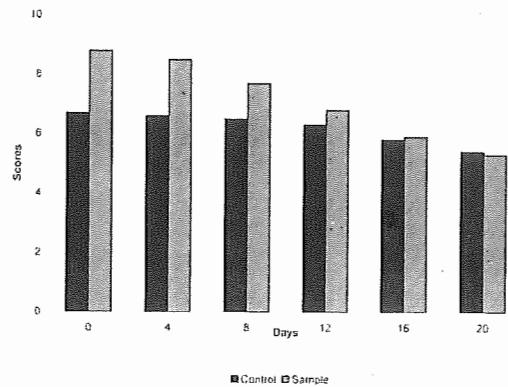


Fig. 9: Changes in organoleptic quality characteristics of fish balls stored at chill storage

days and it was noticed that there was gradual reduction in the quality characteristics of the product stored at 0-2°C from the first day to the 20th day up to which these were acceptable. It was observed that there was loss in original flavour on the 24th day and hence, the panelists rejected the samples.

Increase in the levels of expressible water, TMA, TVB, peroxide value and TPC (Fig. 2-6) and decrease in pH, moisture, folding test grades and organoleptic scores (Fig. 7-9) were noticed during storage. Similar increasing and decreasing trends were noticed for the above parameters during the cook-chill storage of fish bakarvadi (Subhedar, 1999) and skinless fish sausage (Desai, 1999). Increase in expressible water percentage, TMA, TVB and TPC, and consequent decrease in moisture and pH may be attributed to the growth of microorganisms during storage. Carbohydrates, if available, are usually preferred by microorganisms to the other energy-yielding foods (Frazier and Westhoff, 1995). The hydrolysis of sugar and carbohydrates by bacteria resulted in acid production with the subsequent release of water from the emulsion and other compounds from foods. This was reflected by the changes in the above parameters.

Although there was increase in TMA and TVB, the values were well within the acceptable limit. This may be due to the fact that fish balls are a mixture of different types of foods. The bacteria as explained above might have utilized the carbohydrates first and later, gone in for meat portion and hence, the increase in TMA and TVB might have been slow (Joshi, 1990).

Similarly, the peroxide value, although showed an increasing trend, the levels were well below the limit (10 to 20 meq of O₂/kg of fat) set for rancidity (Connell, 1980). The organoleptic evaluation also indicated that the product was not rancid on the 20th day, but there was loss in the original flavour and other attributes. Apart from the organoleptic evaluation, certain spoilage changes were also noticed during the storage study. It was noticed that the fresh smell was lost on the 24th day. Water started accumulating at the bottom of the pouch from the 12th day onwards and it increased gradually. Fish balls were somewhat sticky to touch on the 24th day. There was decrease in folding test grades of the product during chill storage, which correlated with the decreasing textural scores and increase in expressible water. Based on biochemical, microbiological and organoleptic characteristics and other changes, it can be concluded that fish balls with 10% GCGG, can be stored at 0-2°C for 20 days. Similarly, many researchers have reported shelf-life of cook-chilled foods, *i.e.*, 14 days at 1-3°C for cooked-chilled fish product (Light *et al.*, 1988), 14 days at 0-2°C for fish bakarvadi (Subhedar, 1999) and 14 days at 0-2°C for skinless fish sausage (Desai, 1999).

Due to the bitter taste of the components, *i.e.*, histidine (Fuke, 1994) and hypoxanthine (Lindsay, 1994), the use of horse mackerel is limited. However, the product developed (Todkari, 2005) will be of immense utility with reduction in the bitter taste components thereby adding value to the least in demand fish. A shelf-life of 20 days at 0-2°C will be an advantage to the producer and consumer.

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