Fish bars: A convenient ready to eat fish snack

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Fish bars are very convenient, pre-portioned, individually-wrapped, ready-to-eat healthy snacks which can be fortified with vitamins, minerals and other nutrients. These are much more nutritious choice than a candy bar, cookies, chips or other snack food. Globally nutritious bars have gained importance and popularity during the recent years and perceptibly in India, it is an emerging product. Fortification of fish protein (60-65%) in such convenient foods offers high quality digestible protein with fewer calories than similar sized portion of meat. So, the growing demand for exploring new and fortified bars needs to be filled by developing such products that conform to emerging trends of nutraceutical and functional foods.

Fish bars are protein enriched snacks of good nutritional value developed from fish meat blended with a standardized formulation of ingredients, processed under conventional steam cooking. The steam cooking causes heat induced gelation in the salt solubilized fish protein, which imparts a proper texture to the product.

The gelation induced during steam cooking, provides a typical meat texture with a good

gel strength (212 g.cm) which is acceptable in non-homogenous types of bars. The non-homogenous texture was contributed by nuts, almonds and raisins giving adequate hardness (30 N) and elasticity to the bars. Fish bars having a moisture content of 60% and water activity of 0.9, requires low temperature preservation. The bars developed were stored under chilled (2°C) and frozen (-18°C) conditions in two different packaging materials (Metalized poly ester (MPE) and Polyester polyethylene (PPE) films) and were subjected to storage studies for 16 weeks and 12 months, respectively.

The chilled stored bars showed an initial pH of 5.96 which increased to 6.29 in MPE packs and 6.23 in PPE packs after 16 weeks of storage. Slightly higher total volatile base nitrogen (TVB-N) and trimethylamine (TMA) values were noticed in PPE packed (22.4 and 11.2 mg N2/100g) than MPE packed samples (19.6 and 9.6 mg N2/100g) but both TVB-N and TMA levels were well below the maximum level of acceptability. The oxidative indices like peroxide value (PV) and free fatty acids (FFA) increased during storage period. Even after 16 weeks of storage, the Thiobarbituric acid

reactive substances (TBARs) value was observed to be in range of 0.36-0.39 mg malondialdehyde (MDA)/Kg (Fig 1). The meat bar having an L* 39.35, a* 7.83 and b* 21.07 initially, showed a slight increase in the colour attributes after 16 weeks with L* 43.49, a* 6.68 and b* 19.69 in MPE and L*42.17, a*6.91 and b*21.62 in PPE stored samples. Microbiologically, bars packed in MPE and PPE were safe throughout the storage period under chilled conditions. So, the products were acceptable up to 16 weeks under chilled storage conditions.

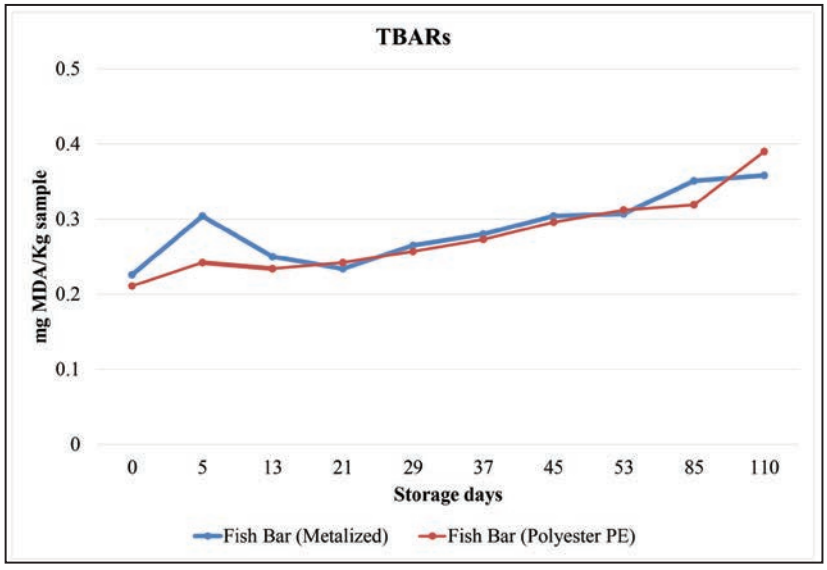

Fig 1 Changes in the TBARs value of fish bars during chilled storage

Consequently, fish bars stored under frozen conditions were analysed for a period of 12 months. During the frozen storage, all the physico chemical parameters were within acceptable range. A slight change in pH was observed from an initial pH of 5.96 which increased to 6.07 in MPE and 6.18 in PPE packed bars after 12 months. On storage, maximum TVB-N and TMA values observed were 18.2 and 9.8 mg N2/100g and 19.6 and 9.8 mg N2/100g in MPE and PPE respectively. Similarly, the oxidative indices were also found to be within the limit. After 12 months of storage PV, FFA and TBA values were observed to be in the range of 9.5 meq/ Kg fat, 7.15 % and 1.3 mg MDA/ Kg in MPE packs and 3.3 meq/ Kg, 2.78% and 1.24 m MDA/kg in PPE stored samples. Even though a slight flavour and colour loss was observed, microbiologically bars were acceptable throughout the frozen storage. So, the fish bars under frozen condition had a good shelf life of one year and no significant variations were observed bet-ween samples stored in selected packaging materials.

Seaweed: An excellent agent of bioremediation in aquatic environment

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Globalization and population growth in urban area, along with wild expansion of agricultural and industrial activities had led to the increase in the generation of waste water which ultimately reaches the aquatic environment and thereby impacting the entire food chain of the system (Akpor *et al*., 2014). The untreated waste water which is released to the natural water bodies accounts to around 60% of that produced, which is highly alarming.

The bioremediation practices were started very early by Romans employing microorganisms for