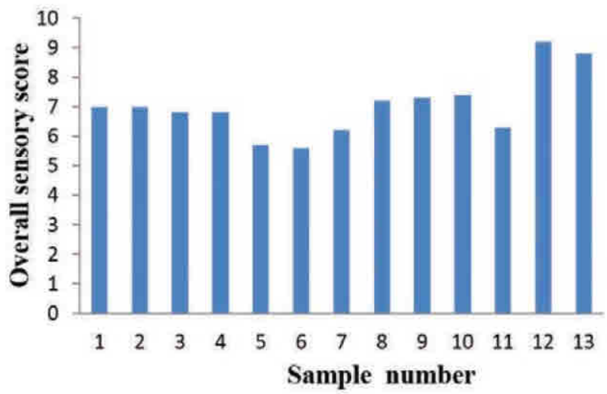

Fig. 1. Overall sensory score of sausage samples

The optimum combination of sausage was found to be 66.8% fish mince with 1.6% each of oats and wheat fibers (S12); and 62.5% fish mince with 2.5% wheat fiber and 5% oats fiber (S13). On the basis of the proximate evaluation of samples, control and Sample S12 had no significant change in the proximate values. The Sample S12 had 18% carbohydrate,15% protein, 7% fat, 1% ash and 59% moisture. But Sample S13 had higher amount of carbohydrate, protein and less moisture compared to control. The proximate composition of Sample S13 was 23% carbohydrate, 16% protein, 7% fat, 1% ash and 53% moisture.

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Control Sample S12 Sample S13

Fig. 2. Dietary fiber incorporated tuna sausage samples (S12 and S13) and control

Quality evaluation studies in ready-to-use squid soup tablets

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Development of value added products from seafood is an important need in fish processing industry. There is an increasing demand for ready to cook or ready to serve type seafood products.

Squids have been consumed by humans for centuries. Although squid is widely consumed, people still do not understand or under-estimate its nutritional value. It is found that squid may be one of the greatest untapped sources of protein in the marine environment. On comparing squid to other edible marine life, it is evident that squid has a larger ratio of edible parts to the whole body. In squid, the edible portion represents 60-80 percent of the weight of the animal, the body being 50 percent and the arms being 30 percent. Squid contains all eight essential amino acids in nearly proportioned quantities. Squid meat is having a characteristic sweet taste. Since the quantity of fat is too low, the amount of cholesterol present does not constitute a health hazard, even to those who are on a diet. Squid meat also has higher levels of zinc, manganese and copper than many other types of seafoods. The high nutritional quality of squid has given the idea of developing a dehydrated squid soup tablet which gives instant soup on mixing with boiling water.

Fresh squid procured from Cochin Fisheries Harbour were iced immediately in 1:1 ratio and brought to the laboratory in insulated boxes. The edible portions were cut into small pieces and were washed thoroughly in running tap water. The cut meat was dried at 50 °C and the dried meat was powdered. The other ingredients *viz.*, onion, garlic, ginger, pepper, cumin etc. were cleaned, dried and powdered. The vegetables like beans and carrots were chopped into fine pieces, blanched and dehydrated. The base flour used was maida and corn flour. Each ingredient of the required quantity was weighed out into a clean vessel and mixed well. Dough was made by adding water and butter and flattened into even layer from which soup tablets were cut out using a round mould. The tablets were dried at 60 °C to a moisture content of ≤10%. It is further cooled, packed in small LDPE pouches and stored at ambient temperature. The storage studies of tablets have shown that it has an extended shelf life of one year. Figure 1 and 2 depicts the dehydrated squid soup tablet before and after packing.

Fig. 1. Dehydrated squid soup tablets before packing

Fig. 2. Dehydrated squid soup tablets after packing

The prepared soup powder tablet was having 22% protein and 1.43% fat. It's keeping quality was assessed for a period of 12 months. The squid soup tablet was acceptable throughout the storage period of 12 months and was scored within the levels of acceptance during sensory evaluation. The limit of acceptability for sensory evaluation was fixed as 5. Figure 3 illustrates the changes in sensory attributes in soup tablet on

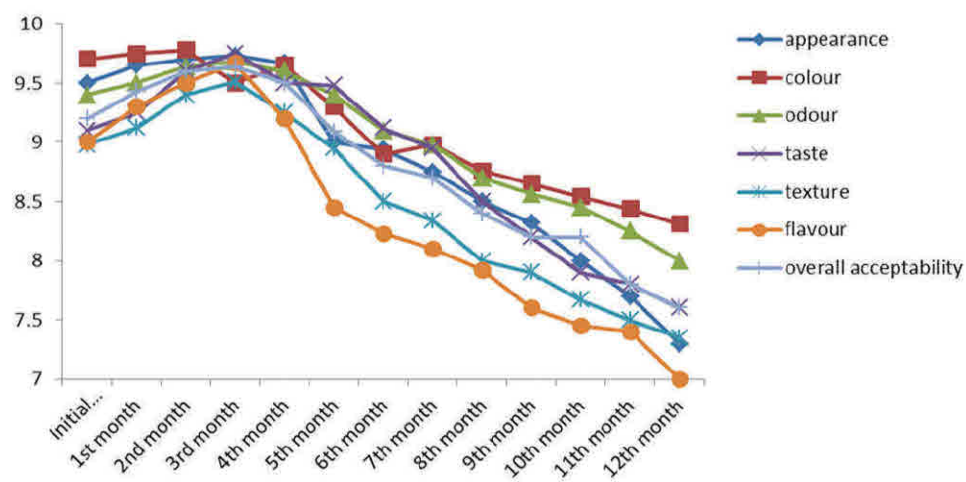

Fig. 3. Change in sensory attributes in soup tablet on storage at room temperature

storage at room temperature.

The chemical spoilage indices *viz*; TMA, TVB-N, TBA, pH, FFA, a_w were found to increase as the storage period advances. All these parameters were within the acceptable value till the end of storage period of 12 months. Total plate count (cfu/g) of the soup tablet increased during the storage period and it reached upto 6.8 X 10^5 cfu/g. There was only 3 log cycles increase during the storage period. Bacteria of public health significance were assessed during storage period. *E. coli*, *Vibrio* sp., *Salmonella* sp. and *S. aureus* could not be detected in the samples during the storage study.

Utilization of yellowfin tuna protein hydrolysate in health beverage formulation

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Seafood is an easily available and cheapest food source meeting the protein requirements of approximately 2.9 million people, globally. There is a high potential in marine processing industries to convert and utilize this food and their by-products as valuable functional ingredients. Among the by-products, hydrolysates or bioactive peptides can be utilized as a potential source of natural ingredient and in this context more focus is given by researchers on improving the bio-availability and bio-accessibility of these marine protein hydrolysates for validating as functional ingredients for healthy foods. Functional foods defined to be those with specific health benefits, hold a strong market position world-wide and the functional beverage sector accounts for approximately 12.5% of the world functional food market. A wide range of customers (47%) opined that fortified foods and drinks satisfy their recommended nutritional requirements (Sloan, 2003). In this regard, fortified supplements in the form of blended drinks are a good option which has enhanced taste as well as improved nutritional value. Recently there has been an exceptional demand in the food industry for inexpensive proteins and bioactive peptides for human consumption. Several attempts have been made on utilization of protein hydrolysate in the formulation of various products but, still there is immense scope for its utilization in beverages especially in health-based energy drinks on account of its superior functionalities (Singh *et al.*, 2009). Additionally, alternative uses for co-products of the fish processing industry are highly sought-after as these co-products are excellent sources of nutrients like protein. The utilization of protein hydrolysate from cannery discards like tuna red meat for such health formulations is an ideal approach. The current study was conducted to formulate a health beverage incorporating protein hydrolysate from yellowfin tuna red meat.

Tuna protein hydrolysate (TPH) derived from yellowfin tuna red meat under optimum hydrolytic conditions was used. Based on RSM, 12 different ingredient combinations were prepared and subjected to sensory analysis to derive the best combination of health mix. The sensorily selected health mix was added with different levels of TPH *viz*., 2.5, 5, 7.5 and 10% referred to as HM1, HM2, HM3 and HM4, respectively (Fig. 1). Health mix without addition of TPH was kept as control *viz*., HM. Nutritional, functional, antioxidant, physical and sensory properties of the samples were assessed. Incorporation of protein hydrolysate in the HM improved the