International Journal of Food Science and Nutrition
ISSN: 2455-4898, Impact Factor: RJIF 5.14
www.foodsciencejournal.com
Volume 2; Issue 2; March 2017; Page No. 65-68

Nutrient analysis and sensory evaluation of fish soup powder prepared using white bait (*Stolephorous Spp.*)

[1] Sarah Priscilla S, [2] Nora Vigasini

[1] Assistant Professor, Department of Nutrition, Food Service Management and Dietetics, S.D.N.B Vaishnav College for Women, Chennai, Tamil Nadu, India

[2] Assistant Professor, Department of Home Science, Women's Christian College, Chennai, Tamil Nadu, India

Abstract
Protein and calcium deficiency are most commonly prevalent amongst all age groups. Unattended calcium deficiency may predispose one to osteopenia and osteoporosis very early in life. Protein deficiency may hinder muscle building and growth in young children. Fish bones have high calcium content. Fish is a very good source of protein, vitamin A, vitamin D and iodine. Small fishes which can be consumed with their bones are excellent sources of calcium. White bait is one such fish of the Anchoviella species, which can be consumed with bones. Value added products can therefore be developed utilizing this fish during seasons of surplus, in order to avoid wastage and also to fully tap their highly bioavailable calcium and protein sources at relatively low costs. In this study, fish soup powder was prepared incorporating white bait with bones in three different proportions of fish to starch and were subjected to nutrient analysis and sensory evaluation.

Keywords: deficiency, fish bone, value added product, white bait, fish soup powder

Introduction
Nutrient deficiencies leave an undesirable burden not only on individuals and the nationwide wellbeing but also on the entire cultural, societal and economic structure of the country. Nutrition-sensitive, food-based approaches are consequently needed to focus on food, whether natural foods or processed foods, for improving the quality of the diet and for overcoming and preventing deficiencies [1].

Fish is an excellent protein source of high biological value due to a favorable essential amino acid composition [2]. Fish bone being a natural resource of calcium and phosphorus may serve as an important dietary contributor of these nutrients, especially within population groups with low intakes of milk and dairy products [3].

Fatty fish is an important source of omega-3 fatty acids. Two omega-3 fatty acids found in fish are EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) [4]. Fish oils have a small effect on blood pressure, with some studies showing reduction of diastolic blood pressure by up to 4mm Hg [5]. Studies in rodents have demonstrated that marine n-3 fatty acids enriched diets decreases adipose growth and increase beta-oxidation [6].

Fish is rich in calcium particularly small fish when eaten with bones. Certain marine fishes are known to be good sources of vitamin D. But many varieties of small fish are underutilized [7].

In the present study fish soup powder was prepared incorporating white bait with bones. Corn starch was also used in the preparation. Preparation of value added products like fish soup powder using white bait may serve as a source of easily digestible and highly bioavailable calcium and protein at any time of the year for all age groups. Fish soup is one such healthy option that may be given to any age group as a nutritious appetizer.

AIM
The aim of the study was to formulate and analyze the nutrient content of fish soup powder prepared incorporating white bait fish with bones.

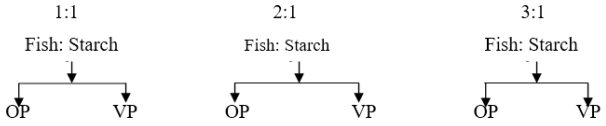
The objectives of the study are as follows
1. To formulate and standardize the preparation of fish soup powder incorporating white bait with bones in three different proportions of fish to starch (1:1, 2:1 and 3:1) and subjecting it to ordinary packaging and vacuum packaging.
2. To determine the nutrient content (moisture, energy, carbohydrates, proteins, fat, fibre, ash, calcium and phosphorous) of the samples on the 1st and 14th day of storage.
3. To determine the overall acceptability of the fish soup powder by subjecting it to sensory evaluation on 1st, 7th and 14th day of storage.

Methodology
The study was designed to develop fish soup powder incorporating white bait with bones. This is a small fish variety commonly known as 'Nethili meen' in Tamil.

Study design
The design of the present study was experimental in nature.

The present investigation was an attempt to formulate fish soup powder using three different ratios for fish to starch, that is, 1:1, 2:1, 3:1. The main purpose of the study was to incorporate white bait fish with bones in the preparation of fish soup powder so as to encourage the consumption of this small fish with bones which is a good source of highly bioavailable calcium and proteins.

Fish soup powder



OP – Ordinary packaging
VP - Vacuum packaging.

Formulation and Standardization of recipe

The recipe standardization process was subjected to three phases that is recipe verification, product evaluation, and quality adjustment. The proportion of ingredients used in the preparation of fish soup powder is given in table 1.

Table 1: Preparation of Fish soup powder

Ingredients	Amount (g) ratio 1:1	Amount (g) ratio 2:1	Amount (g) ratio 3:1
Fish	50	100	150
Starch	40	40	40
Maida	10	10	10
Onions	50	100	150
Ginger	5	10	15
Garlic	5	10	15
Pepper powder	5	5	5
Cumin powder	5	5	5
Cinnamon	2nos	4nos	6nos
Salt	To taste	To taste	To taste

Method of preparation of soup powder

- Clean, weigh and pressure cook the fish for 30 minutes along with ginger garlic paste.
- Dehydrate the cooked fish in a microwave oven for 30 minutes, stirring intermittently to avoid charring.
- Chop and dehydrate onions in a microwave oven.
- Mix maida, corn starch, fish, onions (dehydrated and powdered), powdered pepper, cinnamon, cumin seeds and salt.

Fig 1: White Bait Fish Soup Powder

No chemical preservatives and artificial taste enhancers such as mono sodium glutamate were added. Salt was the only natural preservative used.

Since the fish was cooked with the required quantity of ginger garlic paste, it helped in subduing the characteristic fishy odour. Addition of other spices like pepper and cumin seeds imparted a pleasing flavour and aroma to the fish soup powder.

Method of preparation of soup

- Reconstitute 20 grams of fish soup powder in 200 ml of water.
- Bring the mixture to boil and simmer it for few minutes till the starch is gelatinized.
- Garnish the soup with freshly chopped coriander leaves and mushroom.

Fig 2: White bait fish soup

Packaging of fish soup powder

The fish soup powder prepared in three different ratios (1:1, 2:1, 3:1) were subjected to ordinary and vacuum packaging.

Nutrient Analysis

The moisture, energy, carbohydrates, protein, fat, calcium, phosphorus, iron and ash content of the 3 proportions of the fish soup powder were analyzed on the 1st and 14th day of storage.

Sensory Evaluation

The sensory evaluation of fish soup powder was carried out by 15 untrained panelists to find out their overall acceptability. Sensory evaluation was done on the 1st, 7th and 14th day after determining the microbial quality of fish soup powder. The samples were evaluated for attributes such as appearance, colour, taste, consistency, odour and overall acceptability using a five point hedonic scale. The scores given were 5, 4, 3, 2 and 1 which indicated excellent, very good, good, fair and poor.

Results and Discussion

Nutrient content of fish soup powder

The nutrient content of different proportions of fish soup powder was analyzed on the 1st and 14th day of storage. The findings are presented in Table 2.

Table 2: Nutrient content (mean values) of ordinary and vacuum packed fish soup powder on 1st and 14th day of storage.

Nutrients	Proportion of Fish : starch & Type of Packaging					
	1:1 ordinary packaging	1:1 Vacuum packaging	2:1 ordinary packaging	2:1 Vacuum packaging	3:1 ordinary packaging	3:1 Vacuum packaging
Calories (Kcal) 1st day	394.08	395.031	387.936	393.350	391.82	392.528
14th day	393.954	393.727	392.668	393.350	391.82	392.528
Carbohydrates(g) 1st day	86.41	86.18	87.554	86.564	86.405	86.617
14th day	86.509	86.259	86.37	86.564	86.405	86.617
Proteins (g) 1st day	8.69	8.98	8.23	9.06	9.12	9.04
14th day	8.555	8.719	9.07	9.06	9.12	9.04
Fat (g) 1st day	1.52	1.599	1.20	1.206	1.08	1.10
14th day	1.522	1.535	1.212	1.206	1.08	1.10
Calcium (mg) 1st day	234.03	234.4	281.0	280.01	299.81	249.20
14th day	233.75	233.96	280.01	280.01	299.81	249.20
Phosphorus (mg) 1st day	255.40	255.42	249.99	251.51	252.01	250.95
14th day	235.19	256.35	250.69	251.51	252.01	250.95
Iron (mg) 1st day	9.46	9.40	7.20	6.92	6.20	6.20
14th day	9.80	9.824	7.20	6.92	6.20	6.20
Moisture (%) 1st day	1.54	1.22	1.49	1.25	1.614	1.65
14th day	1.63	1.510	1.49	1.25	1.614	1.65
Ash (%) 1st day	0.84	0.82	0.644	0.71	0.784	0.58
14th day	0.77	0.74	0.644	0.71	0.784	0.58

The calorie content of the three proportions of fish soup powder ranged between 387-395 kilocalories. The carbohydrate content ranged between 86-88 grams per 100 grams of the sample. The major contributors for carbohydrate in the soup powder were corn starch and maida. The protein content of fish soup powder was found to be within the range of 8-9 grams per 100 grams, with fish being the only source of protein of high biological value. The fat content of the fish soup powder ranged between 1-1.59 grams/100grams of the sample. The calcium and phosphorous content ranged between 233-299 mg/100g and 235-256mg/100g. The iron content was between 6-9 mg per 100grams of the sample. The percentage moisture content was between 1.2-1.6 and ash between 0.5 to 0.8.

On comparing the nutrient content on the 1st and 14th day of storage, the carbohydrate, protein, fat, calcium, phosphorous, iron and moisture remained fairly constant before and after the study period. However, there was a moderate increase in the protein content as the proportion of fish used in the preparation of soup powder increased. A similar observation was made for the calcium content.

Sensory evaluation of fish soup powder

A comparison of ordinary and vacuum packaged samples was made and ranked according to the order of preference based on sensory attributes such as appearance, colour, taste, consistency, odour and overall acceptability. The findings are presented in table 3.

Table 3: Ranking of ordinary and vacuum packed samples (1:1, 2:1 & 3:1) based on sensory attributes

Attributes	Sample	OP		VP	
		Mean	Rank	Mean	Rank
Appearance	1:1	4.58	2	4.55	1
	2:1	4.62	1	4.46	2
	3:1	4.53	3	4.55	1
Colour	1:1	4.26	2	4.4	2
	2:1	4.26	2	4.4	2
	3:1	4.53	1	4.42	1
Taste	1:1	4.04	2	4.06	2
	2:1	3.68	3	3.84	3
	3:1	4.19	1	4.29	1
Consistency	1:1	4.46	2	4.6	2
	2:1	4.62	1	4.69	1
	3:1	4.62	1	4.51	3
Odour	1:1	3.84	2	3.75	3
	2:1	3.99	1	3.86	2
	3:1	3.79	3	3.95	1
Overall acceptability	1:1	4.33	3	4.58	1
	2:1	4.40	2	4.46	2
	3:1	4.62	1	4.35	3

OP- Ordinary packaging VP - Vacuum packaging

Table 3 shows that for the attribute appearance, 2:1 ranked first for OP and 1:1 and 3:1 ranked first for VP samples. For both OP and VP, 3:1 ranked first for the aspect of color. As far as taste and consistency were concerned, 3:1 and 2:1 ratios ranked first for both OP and VP samples. As far as odour was concerned, 2:1 ratio of the OP and 3:1 ratio of the VP samples ranked first. The 3:1 OP sample ranked first for overall acceptability followed by 2:1 and 1:1 ratios, whereas for VP samples, 1:1 was preferred first followed by 2:1 and 3:1. It was observed that fish soup, irrespective of the proportions of fish to starch used, were well appreciated and accepted by all members of the panel. However, a few opined that the 3:1 ratio, which had a higher percentage of fish, contributed a strong fishy unpleasant odour & taste and therefore was less acceptable, while some expressed that 1:1 ratio which had a less percentage of fish, was like any other soup preparation and did not have the characteristic fish flavor that was expected and this formed the basis for it to score least. Nevertheless, 2:1 ratio was ranked second for overall acceptability for both OP and VP samples. This suggests that the proportion of fish to starch used is a matter of preference. However, more the proportion of fish used, more will be the protein and calcium available apart from other macro and micronutrients.

Conclusion

It can be finally concluded that white bait (*Stolephorous spp*.) when incorporated with bones in the preparation of fish soup powder is an excellent source of protein and calcium for all age groups and therefore can be strongly recommended as a nutritious food for all. Regular intake of fish soup will definitely prove to be advantageous in improving the calcium and protein status of all age groups. This easily digestible soup can be served as a nourishing drink for all age groups at a relatively low cost.

References

1. Gibson R, Yeudall F. & Drost N. Experiences of a community-based dietary intervention to enhance micronutrient adequacy of diets low in animal source foods and high in phytate: a case study in rural Malawian children. J Nutr 133, Suppl. 2003; 11:3992-3999.
2. Alipour HJ, Shabanpoor B, Shabani A, Mahoonak AS. Effects of cooking methods on physico-chemical and nutritional properties of Persian sturgeon Acipenserpersicus fillet.International Aquatic Research Journal, 15-23.ISSN 2010, 2008-4935.
3. Larsen T, Thilsted SH, Kongsbak K, Hansen M. Whole small fish as a rich calcium source, British Journal of Nutrition, 2000; 83:191-196.
4. Mozaffarian D, Rimm EB. Fish intake, contaminants, and human health: evaluating the risks and the benefits. JAMA, 2006; 296:1885-99.
5. Von Schacky C. N-3 Fatty acids and the prevention of coronary atherosclerosis. Am J Clin Nutr, 2000; 71:224-7.
6. Nakatani T, Kim HJ, Kaburagi Y, et al. Low fish oil inhibits SREBP 1 proteolytic cascade, while a high fish-oil feeding decreases SREBP -1 m RNA in mice liver: relationship to antiobeisty. J Lipid Res. 2003; 44:369-379.
7. Charley H. Food Science. 2nd ed. Macmillan Publishing Company, New York, 1982, 433.