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Microbial and biochemical quality of fish soup powder prepared using whitebait (*Stolephorus spp*.) With bones

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Abstract
Many contemporary foods available in the market today are rich in carbohydrates and fats but are deficient in protein and calcium. Consumption of such foods over a period of time may lead to overweight, obesity, hypertension, atherosclerosis, diabetes, osteopenia, osteoporosis etc. The need of the hour is to address micronutrient deficiencies at a young age before their onset by providing healthy alternatives. This is possible by incorporating fish in food based strategies in either preventing or treating nutrient deficiencies. Value added fish products have the potential to address this issue. One such product is fish soup powder prepared with bones that can serve as a concentrated source of nutrients across different age groups. In this study fish soup powder was prepared using white bait with bones in three different proportions of fish: starch (1:1, 2:1 & 3:1). The keeping quality of the product was assessed using specific biochemical and microbial tests. The findings showed that the product had good keeping quality for 14 days. Since there were no major differences in the microbial and biochemical quality of three different proportions of fish soup powder in the ordinary and vacuum packed samples, this study revealed that it is sufficient to store fish soup powder in sealed polythene covers and that vacuum packaging is not an absolute essentiality.

Keywords: Fish soup powder, Value added fish product, Biochemical and Microbial tests

1. Introduction
Consumption of fish provides important nutrients to a large number of people worldwide and thus makes a very significant contribution to nutrition. Except for the fatty species, fish is relatively low in calories, moderately priced and is an excellent source of high quality animal protein, vitamin, minerals, micronutrients and essential fatty acids. In a large number of developing countries, fish has always been appreciated as a traditionally and culturally acceptable component of the diet.

Fish is highly perishable. It has to be consumed immediately or be processed into stable products for future consumption. Value added products can therefore be developed utilizing fish species 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 (John *et al*., 2002) [1].

White baits are marine, small sized coastal schooling fishes occurring in all seas. They are widely distributed along the Indian coast (Vivekananda and Jayasankar, 2008) [2]. Whitebait are annually renewable resources but during seasons of surplus large quantities are wasted due to improvident usage (Gopakumar, 2002) [3]. This necessitates the development of an alternative method for the utilization of this fish in order to reduce wastage and ensure gainful exploitation of its calcium and protein content.

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 snack or appetizer.

Hygienic preparation and packaging of fish soup powder may extend the keeping quality of the product. Production and sales of these value added products will always have a ready market and will also pave the way for a lucrative business proposal for women entrepreneurs.

Aim of the study

The aim of the study was to formulate fish soup powder using white bait with bones and analyze its microbial and biochemical quality on the 1st, 7th and 14th day of storage using specific tests.

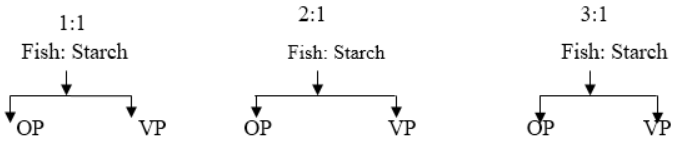
Objectives

1. To 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 microbial quality (Total plate count, coli forms and salmonella) of the fish soup powder on the 1st, 7th and 14th day of storage.
3. To determine the biochemical quality (Free fatty acid content and peroxide value) of the fish soup powder on the 1st, 7th and 14th day of storage.

2. Methodology

Study design: The design of the 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.



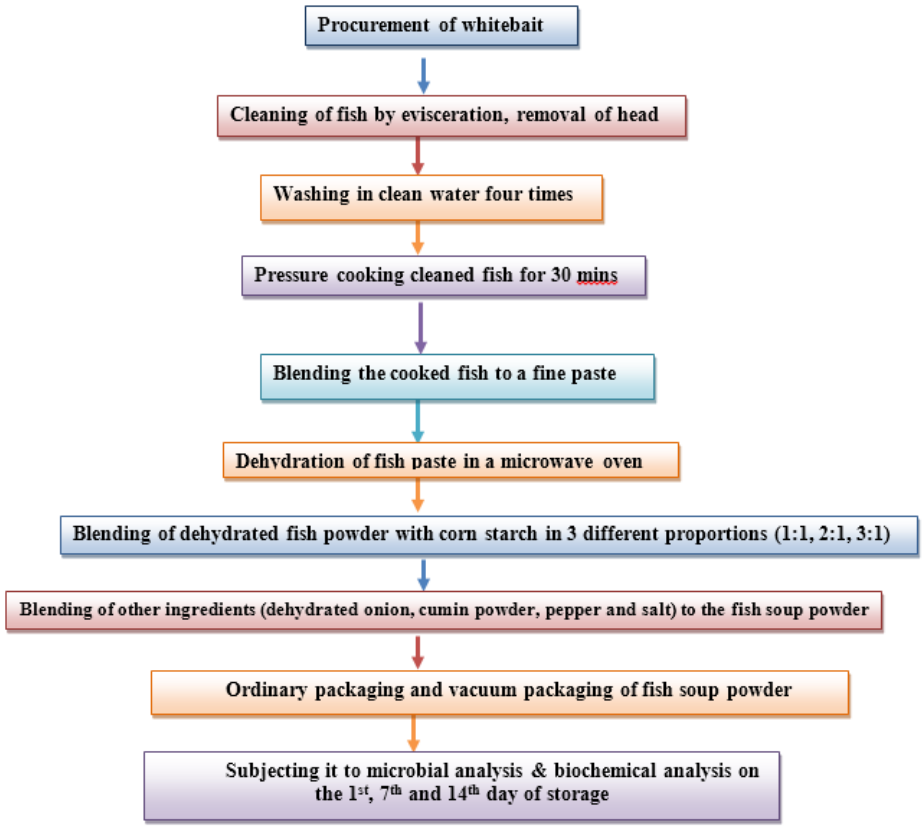


Table 1: Microbial quality of ordinary and vacuum packaged fish soup powder on the 1st, 7th and 14th day of storage.

Parameters	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
TPC cfu/g 1st day	216	262	245	262	258	259
TPC cfu/g 7th day	276	255	261	273	275	262
TPC cfu/g 14th day	262	282	253	289	275	240
Coliforms -1st day	Absent	Absent	Absent	Absent	Absent	Absent
Coliforms-7th day	Absent	Absent	Absent	Absent	Absent	Absent
Coliforms-14th day	Absent	Absent	Absent	Absent	Absent	Absent
Salmonella- 1st day	Absent	Absent	Absent	Absent	Absent	Absent
Salmonella-7th day	Absent	Absent	Absent	Absent	Absent	Absent
Salmonella-14thday	Absent	Absent	Absent	Absent	Absent	Absent
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

The total plate count of all samples was between 216 to 289 cfu/g which was within the acceptable range of 30 to 300 colonies for food products but on the higher side (Reference values from Indian Standard Specification for Edible fish powder IS: 10059-1981). Nevertheless, there are several studies that have confirmed that the process of cooking

eventually reduces the microbial load of the food. In this study, the type of packaging did not influence the TPC as both types of packaging showed similar values. *Coli forms* and *Salmonella* were absent in all proportions of fish soup powder during the 1st, 7th and 14th day of storage.

In the present study, the moisture content of the samples ranged between 1.2%- 1.65% (refer Table 1), which was well within the value of 10 given by the Indian Standard Specification for edible fish powder (IS: 10059-1981). Since the moisture content was very low, it made the environment in conducive for the growth of pathogenic organisms like *coliforms* and *salmonella*. These findings provide evidence that the samples of this present study could be kept for a period of 14 days.

Biochemical quality of fish soup powder

The free fatty acid content and peroxide values of the samples were analyzed on the 1st, 7th and 14th day of storage. The findings are presented in Table 2.

Table 2: Free fatty acid content (FFA) and Peroxide value (PV) of ordinary and vacuum packaged fish soup powder on the 1st, 7th and 14th day of storage.

Biochemical parameters	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
FFA –% of oleic acid (mg/100g)1st day	38.06	40.14	42.27	45.79	44.73	45.14
FFA –% of oleic acid (mg/100g)7th day	40.04	45.29	45.28	34.85	63.32	38.03
FFA –% of oleic acid (mg/100g)14th day	39.48	45.19	37.72	37.98	40.06	39.51
PV-Milli equivalent/1000g 1st day	Found absent	Found absent	Found absent	Found absent	Found absent	Found absent
PV-Milli equivalent/1000g 7th day	Found absent	Found absent	Found absent	Found absent	Found absent	Found absent
PV-Milli equivalent/1000g 14th day	Found absent	Found absent	Found absent	Found absent	Found absent	Found absent

The free fatty acid (FFA) content of fish soup powder that was subjected to the two packaging methods was found to be within the range of 37-63 mg in 100g of the sample. The FFA content of ordinary packaged samples for proportions 1:1, 2:1 and 3:1 showed an increase on the 7th day of storage with proportion 3:1 showing maximum value of 63.32. For samples that were vacuum packed, proportions 2:1 and 3:1 showed a marginal decrease whereas proportion 1:1 showed an increase in the FFA content on the 14th day of storage. Nevertheless, significant changes were not observed in FFA content of all samples except for the 3:1 ordinary packaged sample on the 7th day of storage**.** The FFA and PV of the fish soup powder could not be compared with any reference value since these values were not available.

The absence of peroxide value in all samples may indicate that the samples have not undergone oxidative rancidity or autoxidation. This may signify that the products have a good keeping quality until day 14 of storage.

3. Conclusion

It can be concluded that white bait (*Stolephorous spp.*) when incorporated with bones in the preparation of fish soup powder did not show signs of deterioration for a period of 14 days of storage as evidenced by the microbial and biochemical analysis. Production of fish soup powder is a potential lucrative business venture for women entrepreneurs and self - help groups. It can be started as a business at home level or a as a cottage industry or even on a larger scale. With the ever increasing market for ready-to-cook foods, this prospective business proposal seems to have a promising future in the Indian market if prepared in a hygienic way.

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