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Studies on Antarctic Krill *Euphausia superba* - Biochemical and Processing Aspects

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Antarctic krill, harvested from Southern ocean during the first Indian Antarctic krill expedition, was processed on board FORV Sagar Sampada. Changes in biochemical parameters during frozen storage were studied. Various products were prepared from the mince obtained from krill. The chemical composition was similar to other related species. Fluoride in the shell migrated into the meat on frozen storage to the tune of 44% after three months.

Key words: Antarctic krill, chemical changes, fluoride content

Antarctic krill, *Euphausia superba*, is considered to be one of the promising resources for human consumption (Gulland, 1983; Budzinski *et al.*, 1985). Proper utilization of this valuable resource is of extreme importance at a time when most of the conventional resources are reaching or exceeding optimum sustainable limits. The harvested krill poses several processing problems such as fragility, intense post-mortem proteolytic activity and high fluoride content, which have to be tackled during processing and storage. (Galas, 1979; Bobrovskaya *et al.*, 1981; Christians *et al.*, 1981). Several investigations have been carried out to study the processing aspects and biochemical characteristics, but the results vary greatly (Budzinski *et al.*, 1985).

The present work was carried out to study the various aspects of processing of krill, besides assessing its biochemical changes, changes in fluoride content and other physical parameters.

Materials and Methods

The krill samples were collected from the Southern Ocean between 57° 53' - 61° 13'S and 31° 40' - 36° 31' E, during the First Indian Antarctic Krill Expedition (FIKEX), organized by Department of Ocean Development, Govt. of India, on board FORV Sagar Sampada. Only non-feeding and slightly feeding krill, which were pinkish red in colour, with an average length of 35 mm and above, were taken for processing. Feeding krill (green in colour) were removed before further processing activity. The duration of trawling was reduced in order to reduce the quantity of catch and thus to minimize physical damage.

The krill taken aboard, was cleaned, weighed and packed in cartons lined with polythene sheets, frozen at -35°C and stored at -30°C for further studies. Apart from this, the fresh whole krill was processed to mince, tail meat, coagulate and boiled krill, which were frozen and stored as above. The mince was prepared using BAADAR 694 meat bone separator. The tail meat was prepared using prototype roller peeling machine. Moisture, total nitrogen (TN), crude fat, non protein nitrogen (NPN), ash and fluoride content were determined according to the methods of AOAC (1990). Tri-methyl amine (TMA) and total volatile basic nitrogen (TVBN) were

Table 1. Proximate composition of Krill samples

	Moisture %	Crude protein (%)	Crude fat (%)	Ash (%)	TVBN (mg/ 100 g)	α-AN (mg/ 100 g)	NPN (mg/ 100 g)
Whole krill	82.30	10.75	1.07	1.99	11.20	140.00	420.00
Tail meat	78.80	13.13	0.49	0.63	4.50	49.00	280.00
Cephalothorax	82.50	10.50	0.28	0.88	8.20	120.00	108.00
Mince	74.11	15.25	0.80	1.05	12.10	180.00	409.00

estimated by micro diffusion method of Conway (1947) from trichloro acetic acid extract. α - Amino nitrogen (α-AN) was estimated as per the method of Pope & Stevens (1939).

Results and Discussion

Krill body comprises of cephalothorax and tail. The tail can be further peeled to obtain meat. It was observed that the cephalothorax formed 32-36% of the total body weight. The tail meat and carapace accounted for 26-28% and 25-27%, respectively. The balance of 10-18% was lost on separation. The yield of whole boiled krill, headless krill, tail meat, krill mince and krill coagulate from the whole krill was 80%, 65%, 12%, 75% and 40%, respectively.

Freshly caught krill had to be processed immediately, as the krill became unfit for processing after four hours of harvest. The frozen samples showed a weight loss of 7-10% on thawing, after a storage period of 3 months at - 30°C. The proximate composition of the krill sample is given in Table 1.

The chemical composition and food qualities of krill are very similar to related species like shrimp, crab, lobster, etc. According to Grantham (1977), krill, being a pelagic crustacean, has higher moisture and fat contents than bottom living species and proportionally less crude protein. Due to variations in age, season, location, sex, physiological condition and diet, biochemical composition of krill samples vary greatly (Grantham, 1977). The biochemical composition of krill determines its technological and nutritional properties and thus directly influences the selection of processing and product options. Information regarding the species of krill and molecular structure of the proteins present is somewhat confusing and contradictory. Some of these discrepancies can probably be accounted for by the rapid autolysis of the krill protein after

Table 2. Changes in fluoride content (mg/1000g) during frozen storage

	Storage period (months)			
	0	1	2	3
Whole krill	195.26	188.09	179.25	174.28
Tail meat	16.28	17.36	18.47	23.25
Cephalothorax	269.26	262.45	255.36	250.46
Mince	40.03	42.15	45.25	46.32
Boiled krill	185.80	172.15	171.36	169.26
Shell	132.23	116.25	110.26	105.36

harvest (Gilberg, 1971; Srinivasagam, 1971; Bykov, 1975 and Budzinski *et al*, 1985).

The fluoride content of whole krill and its different portions are given in Table 2. It was observed that the fluoride migration occurred from the shell to the meat on storage (Christians & Leinemann, 1980 and Christians *et al.*, 1981). It was evident from the data that the concentration of fluoride in the tail meat registered an increase of 44% on storage at -30°C for 2 months. The changes in fluoride content of other products from krill on storage were marginal. Bykowski *et al.* (1981) and Boone & Manthey (1983) made similar observations. Because of the migration of fluoride from the shell to the meat, it is recommended that the whole catch may be converted to intermediate products like tail meat, mince, coagulate etc. which can be used for preparation of several products for human consumption.

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