# Changes in Nicotinic Acid Content During Storage of Fishes and Shellfishes in Ice

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Nicotinic acid (niacin) content of oil sardine *(Sardinella longiceps)*, white tailed pink perch *(Nemipterus japonicus)* and two species of prawns *(Penaeus indicus* and *Metapenaeus monoceros)*, and its loss during storage in ice are reported. At the end of the storage period of two weeks, retention of nicotinic acid was 34% of the original value in sardine, 30% in prawns (both species) and 49% in white tailed pink perch. The loss is mainly attributed to leaching by ice melt water. A study of the seasonal change in nicotinic acid content of oil sardine showed a decreasing trend with increasing fat content.

Vitamin content of fish varies with species, age, season and also geographical locality of origin. The biological significance of these variations is not fully understood. Data on the vitamins of fishes from the Japanese (Higashi, 1961), Norwegian (Braekkan, 1959), English (Love *et al.*, 1959) and Russian (Oparin & Bukin, 1959) coasts are available in the literature. Within a fish itself, the vitamin content shows significant variation between different anatomical regions of its body. Thus Braekkan (1959) and Umemura (1951) observed that red meat of fish is generally richer in B-vitamins, compared to the normal meat. Niacin alone was found to be distributed more or less equally in the two types of meats

Very little information is at present available on the water soluble vitamins of Indian food fishes. The present study forms a part of a detailed programme to collect data on this aspect. This communication reports results of a preliminary study on the niacin content of two species of Indian prawns and two species of fishes, namely, oil sardine and white tailed pink perch. As oil sardine exhibits a remarkable seasonal variation in its proximate composition (Gopakumar, 1965), the changes in the niacin content of oil sardine during its lean period (July-August) and peak fat period (November-December) were also studied.

Niacin is the most abundant B-vitamin in fish muscle. Various reports are available on the niacin content of different fishes from temperate waters (Karrick, 1955; Higashi & Hirai, 1948; Higashi, 1961; Teeri *et al.* 1957). In India Khorana *et al.* (1942), Thakur & Karandikar (1951) Braganca (1944), Saha (1941) and Swaminathan (1944) have reported data on the niacin content of some common food fishes of Bengal region. Saha (1941) observed around 1 mg niacin/100 g of muscle in some fresh water fishes. Khorana found that Indian shad is the richest in nicotinic acid among species studied (2-4 mg/100 g muscle). Braganca found pomfrets also to be a good source of nicotinic acid. However, information on the B-vitamin content of fishes from the south west coast is scanty.

## Materials and Methods

Oil sardine *(Sardinella longiceps)*, prawns *(Penaeus indicus* and *Metapenaeus monoceros)* and white tailed pink perch *(Nemipterus japonicus)* used in this study were all procured from the local fish landing centre in fresh condition. They were immediately packed in crushed ice (1:1) and stored in insulated boxes. Muscle from these samples were taken and minced in a meat mincer to get uniform samples. Nicotinic acid content of the well mixed muscle samples was then estimated. Changes during iced storage were followed by regular sampling on alternate days. Throughout the storage period (13 days), the fish samples were kept in well iced (1:1) condition by replenishing crushed ice daily. In view of Braekkan's (1959) finding that red and white meats of fish do not differ significantly in their nicotinic acid content, no special attempt to separate the two types of meat was made in the case of oil sardine. For following seasonal changes in oil sardine, samples of comparable size were procured from the same landing centre during each month.

Nicotinic acid was estimated in the muscle samples according to the method of A.O.A.C. (1975). All chemicals used were of 'Analar' grade. Cyanogen bromide was prepared from bromine and potassium cyanide supplied by British Drug House, England.

## Results and Discussion

Changes in the nicotinic acid content of oil sardine, prawns (*M. monoceros)*, prawns (*P. indicus)* and white tailed pink perch are represented in Figs. 1, 2, 3, and 4. Fig. 5 gives variation in the niacin content of oil sardine during the lean (July-August) and peak fat period (November-Decemebr).

Oil sardine appears to be rich in nicotinic acid. The nicotinic acid level of oil sardine (8mg/100 g wet tissue) compares well with that of skipjack and Japanese mackerel (Higashi, 1961). The prawns and white tailed pink perch resemble cod in their niacin content with only 2.3 mg of the vitamin in 100 g muscle. Higashi (1961) has also observed that fatty fishes are generally richer in niacin compared to lean fishes.

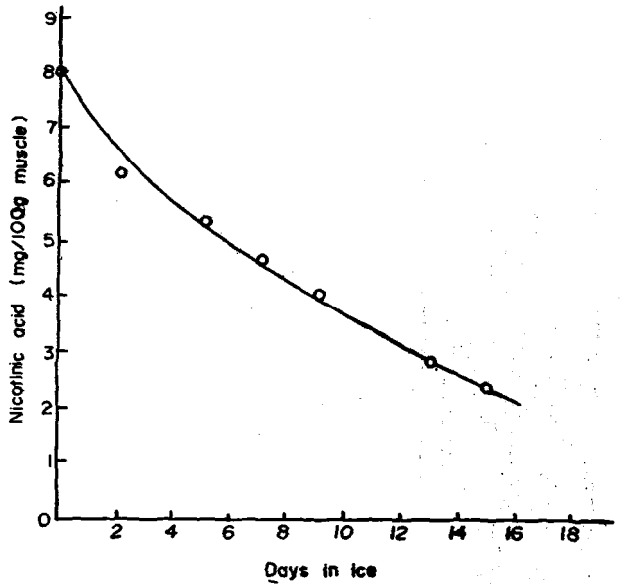


Fig. 1. Changes in nicotinic acid content during storage of *Sardinella longiceps* in ice

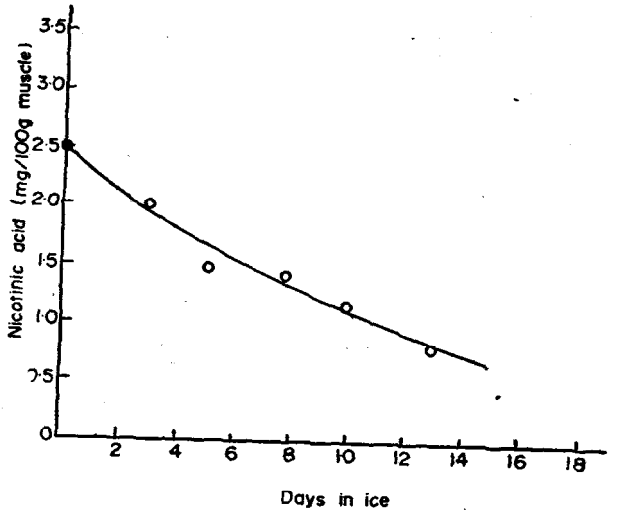


Fig. 2. Changes in nicotinic acid during storage of *Metapenaeus monoceros* in ice.

During storage in ice, there was a regular decrease in the niacin content in all cases, presumably due to leaching by ice melt water. After 13 days' storage in ice, both species of prawns retained only 30% of the original quantity of niacin in the muscle. For oil sardine and white tailed pink perch, the corresponding figures after the same storage period were 34% and 49% respectively. After the first 10 days in ice, the rate of loss significantly slowed down in all cases. Niacin is stable to high temperature, light and also to wide variation in pH (Harris & Karmas 1975). The loss in niacin during storage in ice can be only due to leaching by ice melt water. Pearson *et al.* (1951) have observed that loss in niacin in frozen and thawed muscle samples is mainly due to the loss in thaw drip. Jadhav & Magar (1970) observed about 40–45% retention of nicotinic acid in frozen white pomfrets, surmai and mackerel after storage for 18, 20 and 27 weeks respectively. They also observed that after 12 weeks of storage there was no further decrease in the nicotinic acid content. Fatima & Magar (1965) have reported 75% retention of niacin in beheaded prawns after 12 days of storage at 0° C, when the prawns were stored in polythene bags. At −18°C they have reported almost 100% retention.

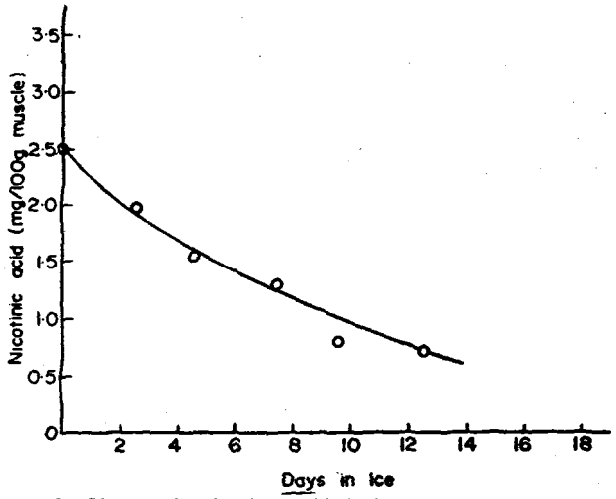


Fig. 3. Changes in nicotinic acid during storage of *Penaeus indicus* in ice.

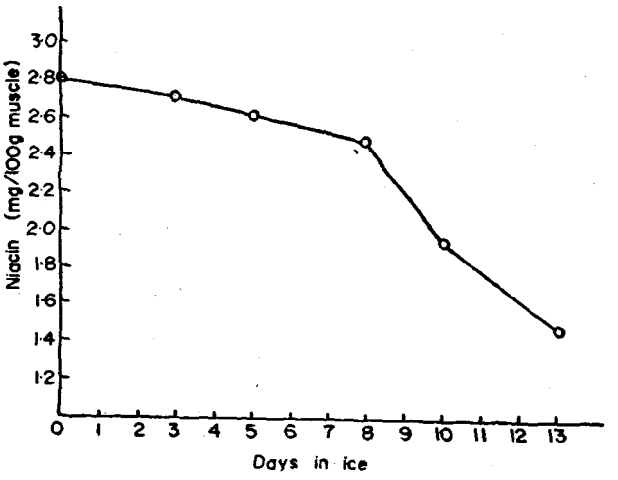


Fig. 4. Changes in niacin content of *Nemipterus japonicus*.

Compared to prawns and oil sardine, white tailed pink perch showed less leaching, due to its thick skin covered with a thick layer of scales. This is reflected in its better retention of nicotinic acid during storage. In the case of oil sardine belly bursting during storage also accelerates the loss due to leaching.

The changes in the nicotinic acid content of oil sardine (Fig. 5) during different months reveal an interesting feature. During July when fat content is lowest (Gopakumar, 1965) the fish has the highest niacin content. With an increase in fat there is a corresponding decrease in niacin in the muscle. In December, when fat content is highest, niacin registers the lowest value. Obviously, these changes are connected to the feeding habits of the fish during the pre-spawning and post-spawning periods. But its exact role in these changes is not clear. It is however, interesting to note that though fatty fishes are generally rich in niacin (Higashi, 1961), the same fatty fish show lower content of niacin during its peak fat period.

Liver is generally richer in niacin than other tissues of the body (Higashi & Hirai, 1946). Seasonal changes in the distribution of niacin between muscle and liver is a factor to be studied in detail in this connection. Considerable amounts of nicotinic acid is bound to proteins and carbohydrates in muscle (Ghosh *et al.*, 1951). Changes in bound niacin during different months is also another factor calling for greater attention. Higashi & Hirai (1948) observed that niacin content of fishes with greater locomotive power is generally higher. It is not known whether changes in niacin content of sardine muscle during different months is connected in any way to the muscular activity during the pre and post-spawning months.

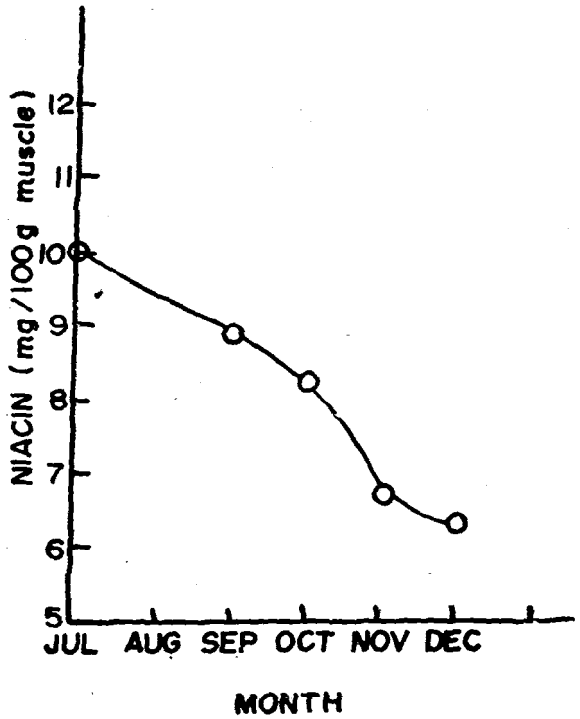


Fig. 5. Seasonal changes in niacin content of oil sardine muscle.

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