

Some Fungal Infestations of Dried Fishes in Cochin Markets

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Dried fish constitutes a regular item of trade in India, particularly in the interior parts far away from the sea and rivers. The poor section of the society is the main consumer. The quality of dried fish never receives much attention at any stage of processing (drying) and storage. A good amount of these fish is discarded during drying due to fungal growth to avoid the danger of mycotoxin production.

A survey of the dried fish from the Cochin markets had revealed that they do carry fungal infestations and their chances of mycotoxin production cannot be ruled out as the strains of *Aspergillus flavus*, *Aspergillus ochraceus* and *Fusarium* spp. have been isolated.

As fresh fish is not available regularly throughout the year, dried fish is in demand during the period of scarcity. During the seasons of abundant catches, there is a glut in the sale of fresh fish. At such times the catch is preserved by salting and sun-drying to be sold during the lean season. The traditional methods are unhygienic and do not follow any particular standard. The larger variety are cleaned, washed, salted and dried, but smaller ones are left to dry over the hot sand.

None of the fish curing yards have suitable storage facilities, yet the dried fish have to be stored for several weeks before they are sold. The poor sections of the society are the buyers of the dried fish. The quality of dried fish never receives much attention at any stage of processing, production, storage and marketing. Little effort has been made to study the causes, nature and the extent of deterioration of dried fish even though the poor quality of cured fish is a well known fact.

The review paper by Phillips & Wallbridge (1976) reported a number of fungi, *Aspergillus* spp., *Rhizopus* spp., *Acremonium* spp., *Walleria seba* and *Sporodendron epizoum* from Pakistan, Thailand, Malaysia,

Hong Kong and Zambia. Osuji (1976) has reported from Nigeria *Penicillia* and *Aspregilli* infection from insufficiently dried fish. He reports that a substantial amount of fish is discarded during drying due to fungal growth. Dangers in retaining infected fish may be serious in view of the fact that these organisms are known to produce biochemically active mycotoxins especially aflatoxins. Rao *et al.* (1962) have stated that mould growth was a major cause of spoilage at all levels of humidity above 70% where the equilibrium moisture content for these fish was 25%. The drying of such products to a moisture content sufficient to inhibit the growth of xerophilic fungi may not be feasible for commercial storage (Frank & Hesse, 1941) and may be unacceptable to consumers (Sen & Lahiry, 1962).

A general survey of the fish markets of Cochin showed more variety and larger quantity of dried fish during summer months than during monsoon season. The smallest variety of the fish were found to be fully dried without even salting, bigger variety were salted and dried, while the larger variety were split, salted and dried, but the drying in the last case was not complete.

Materials and Methods

From different local markets of Cochin, dried fish were selected and each specimen

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was taken separately in polythene bags (Table 1). In the laboratory they were cut into small pieces, washed with sterilized distilled water to remove surface dirt, then dipped in 0.01% aqueous mercuric chloride solution for 2 min to kill the adhering microbial spores on the surface. The pieces were washed well with sterilized distilled water again to remove mercuric chloride solution.

The fish pieces were then planted in petri dish plates on potato dextrose agar (PDA) medium widely apart and incubated at $30 \pm 1^\circ\text{C}$ for 3 to 5 days. The colonies that showed up were isolated on PDA slants and incubated as in the previous case. Suspension of fungal mass was made from these slants in sterilized distilled water and several dilutions were made from each slant and plated out again in PDA plates and incubated as before. The different colonies that showed up were inoculated on different PDA slants and incubated. Thus pure cultures were isolated. After the incubation period, the slants were stored at 4°C in the refrigerator.

For confirming the saprobic nature of the fungal cultures thus isolated, dried fishes of good quality (apparently with no infection) were brought from the market and cut into

pieces and surface sterilized as was done at the time of isolation process initially. These pieces were then placed on sterilized watch glass in petri-dish plates. Suspension from the fungal slants of the corresponding fungus isolated from the particular dried fish made in 2 ml of sterilized distilled water was poured on the pieces. All this was carried out in aseptic condition. These plates were then incubated at $30 \pm 1^\circ\text{C}$. The fungi that grew on the fishes were maintained and the ones that failed were discarded as they were not the rot causing fungi.

Results and Discussion

The fungal species thus isolated were *Aspergillus flavus* and *Aspergillus ochraceus* from *Trichiurus* sp. (Ribbon fish) *Penicillium lividum*, from *Scomberomorus* (Naimeen), *Fusarium equiseti* from *Nemipterus* sp. (Kilimeen). The dried *Penaeus* sp. (shrimp) and *Engraulis* sp. (anchovies) did not show any fungal growth in dry season but in rainy season both showed *Aspergillus niger* infection and *Engraulis* sp. showed *Paecilomyces* sp. infection too. The bigger variety of fish which were not very fleshy were salted and dried. Still bigger variety which were quite fleshy were slit, salted and dried. In the latter case the drying was not complete. The samples of *Trichiurus* sp. from which

Table 1. Details of dried fish collected from Cochin

Local names of fish	Zoological names	Family	Methods of curing
Seelavu	<i>Sphyraena</i> sp.	Sphyraenidae	Salted and fully dried
Anchovies (Kozhuva)	<i>Anchoviella</i> spp.	Engraulidae	Fully dried
Aila	<i>Rastrelliger</i> spp.	Scembridae	Salted and dried
Mullen	<i>Leiognathus</i> spp.	Leiognathidae	Salted and fully dried
Manangu	<i>Thrissa</i> sp.	Engraulidae	Salted and fully dried
Manthal	<i>Cyanoglossus</i> sp.	Pleuronectidae	Salted and fully dried
Lizard fish	<i>Saurida</i> sp.	Scopelidae	Salted and dried
Koorie	<i>Tachysurus</i> sp.	Siluridae	Salted and dried
Parava	<i>Lactaries</i> sp.	Lactaridae	Split, salted and dried
Shark	<i>Scoliodon</i> sp.	Scolopsidae	Split, salted and dried
Pomfret	<i>Pampus</i> sp.	Stromatoidae	Split, salted and dried
Parava (small)	<i>Lactarius</i> sp.	Lactaridae	Salted and dried
Velurie	<i>Kowala coval</i>	Clupeidae	Salted and fully dried
Ribbon fish	<i>Trichiurus</i> sp.	Trichiruridae	Salted and dried
Anchovies (small sized)	<i>Anchoviella</i> sp.	Engraulidae	Fully dried
Naimeen	<i>Acomberomorous</i> sp.	Scombridae	Salted and dried split
Mullen	<i>Leiognathus</i> sp.	Leognathidae	Salted and dried
Pallathi	<i>Etroplus</i> sp.	Cichilidae	Salted and fully dried
Shrimp	<i>Penaeus</i> sp.	Penaeidae	Fully dried
Kilimeen	<i>Nemipterus</i> sp.	Nemipteridae	Fully dried

Aspergillus flavus and *Aspergillus ochraceus* were isolated were in a badly deteriorating condition and this was lightly salted and dried. *Scomberomorus* spp. were cut into two to three pieces, slit, salted and dried. *Penicillium lividum* was isolated from its fleshy parts. *Nemipterus* sp. was slit and dried and from its flesh *Fusarium equiseti* was isolated. All the fungi exhibited xerophilic tendency. Two of the fungi, *Aspergillus flavus* and *Aspergillus ochraceus* out of the six fungi isolated are the ones whose representatives have been reported to produce mycotoxins. It will be worthwhile to screen the above fungi for their production of mycotoxins *in-vitro* and *in-vivo*.

The investigation is very preliminary and further work is in progress to study the nature and the action of these fungi on the infection and deterioration of dried fish, their injurious effect to the consumers and their production of biochemically active mycotoxins.

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