

Research Article

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Fungal flora in different salt cured fishes collected from markets of Cuddalore district, Tamil Nadu

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Abstract

Keywords

Salt cured and sun dried fishes,
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Fungal density and
Species composition
of fungi.

Drying and salt curing are important methods of fish preservation, especially of lower valued fishes which are used for local consumption. Some times when catch in more important food fishes otherwise costlier also been used. In the present investigation, popular dried fishes like *Mugil cephalus*, *Rastrelliger kanagurta*, *Sardinella fimbriata*, *Trichiurus lepturus*, *Rhizoprionodon acutus* were collected from different fish markets of Cuddalore such as (i) Parangipettai (ii) Cuddalore OT (iii) Mudasalodai (iv) Samiyarpettai and (v) Chidambaram. Potatodextrose agar was used and fungal density was estimated. *Aspergillus flavus*, *Aspergillus fumigates*, *A.niger*, *Penicillium spp*, *Mucor spp*, *Candida spp*. Were the fungi isolated and the fungal density was in the range of 10^2 to 10^3 CFU/g. Among 25 samples tested, seven samples were devoid of any fungal contamination.

Introduction

Fish is one of the main sources of biologically valuable animal protein consumed by over 10% world population (Mazumber et al., 2008). Drying process inhibits enzyme activity as well as microbial growth by reducing the available water in the fishes, drying coupled with salting is expected to improve the quality of the still fish. Further due to the various reasons bacterial and fungal contaminations were reported in these

preserved samples leading to quality issues and public health. Contamination is a common problem in dried fish and severely affects the quality of the fish (Patterson and Ranjitha et al., 2009). About 17% of the total fish catch is used for dry fish production in India (Jeyashakila et al., 2003). Some people prefer dried fish products of fresh and marine species against fresh fish and fish is a good alternative to meat (Mohamed et al., 2013).

Fish is a renewable resource which is taken either fresh (or) preserved. Fish being a perishable food, it should be preserved as quickly as possible. Sun drying and salt curing are the important methods used in coastal areas, especially when the catch is more. Salting and Drying allow the penetration of salt inside the fish flesh and reduces the microbial load besides arresting autolytic spoilage that happens due to enzyme activity naturally available in fish. Maximum salt usage even extends up to 23-25% of NaCl in oily fishes like sardines (Fath El-Bab, 2005). Salting followed by drying reduce the a_w value very low, so that contamination of salted cured fishes generally in reduced number. However microbes prefer low a_w value are capable of multiplying in this kind of products. Hence the present study.

Materials and Methods

All the chemicals used in the present study were purchased from the Himedia laboratories, India.

Sample collection

Five different popular salt cured and sun dried fishes like *Mugil cephalus*, *Rsatrelliger kanagurta*, *Sardinella fimbriata*, *Trichiurus lepturus*, and *Rhizoprionodon acutus* were collected from five fish markets of Cuddalore district, such as (i) Parangipettai (ii) Cuddalore OT (iii) Mudasalodai (iv) Samiyarpettai and (v) Chidambaram Tamil Nadu. These fish samples were randomly selected and kept in unused polythene bags and transported to the laboratory.

Isolation of fungi

25g of each sample was blended with 225ml of potato dextrose broth, mixed well and designated as 10^{-1} . Further dilutions were done up to 10^{-4} and 10^{-2} to 10^{-4} were spread on the surface of the potato dextrose agar surface. The plates were incubated at room temperature for 4-7 days and observed for fungal colonies. Density was calculated and axenic cultures were obtained using slide culture technique. (Fig.1)



Fig1: Isolation of Fungi

Microscopic identification of fungi

A portion of fungal colony was used for staining with LPCB (Lacto phenol cotton blue) and observed under low magnification in a microscope for identification based on morphology of mycelium and spores.

Results and Discussion

In this research work five different popular dried fish varieties such as *Mugil cephalus*, *Rastrelliger kanagartha*, *Sardinella fimbriata*, *Trichiurus*

lepturus and *Rhizoprionodon acutus* were collected from five different fish markets located in Cuddalore district as (i) Parangipettai (ii) Cuddalore OT (iii) Mudasalodai (iv) Samiyarpettai and (v) Chidambaram. Composite of samples of each fish variety collected from a particular market was analyzed for Total Fungal Density and further identified for their species composition. All the fish samples were collected from all the fish markets and their density, species identified and the characteristic features of fungi isolated are given in Table 1 and 2.

Table 1: Microbial density of Salt cured and sun dried fish samples

Dried fish samples name	Collection spot	Fungal Density CFU/g)	<i>A.niger</i> 8/25	<i>A.fluvus</i> 7/25	<i>A. fumigatus</i> 12/25	<i>Penicillin spp</i> 8/25	<i>Mucor spp</i> 6/25	<i>Candida spp</i> 3/25
<i>Mugil cephalus</i>	1	1.4×10 ²	+	-	++	-	+	-
	2	3.2×10 ²	-	+	++	++	-	-
	3	0	-	-	-	-	-	-
	4	5.6×10 ³	++	-	-	-	+	-
	5	4.1×10 ³	-	-	+	+	-	-
<i>Rostrelliger kanagartha</i>	1	3.9×10 ²	++	-	++	+	+	-
	2	0	-	-	-	-	-	-
	3	1.1×10 ³	+	-	-	++	+	+
	4	0	-	-	-	-	-	-
	5	2.7×10 ³	++	-	++	+	-	-
<i>Sardinella fimbriata</i>	1	0	-	-	-	-	-	-
	2	2.6×10 ²	+	++	-	-	++	-
	3	4.1×10 ³	+	-	-	-	-	-
	4	1.0×10 ³	-	-	+	+++	-	-
	5	1.7×10 ³	-	++	+	-	++	-
<i>Trichiurus lepturus</i>	1	0	-	-	-	-	-	-
	2	0	-	-	-	-	-	-
	3	2.0×10 ²	++	+++	+	-	-	-
	4	1.1×10 ³	+	+	++	-	+++	+++
	5	0	-	-	-	-	-	-
<i>Rhizoprionodon acutus</i>	1	3.3×10 ²	-	+	+++	+	+	-
	2	2.7×10 ²	+	-	-	-	-	+
	3	3.8×10 ³	-	-	+	-	+	-
	4	6.1×10 ³	-	+++	-	-	++	-
	5	12×10 ³	-	-	+	++	-	++

Table 2: Fungal types from dried fish sample

S.No	Morphological characters	Fungus identified
01	<ul style="list-style-type: none"> *Fungus consists of a smooth and colorless conidiophores. * Their development starts off white, but after a few days, it becomes black and produces conidial spore. * The conidiophores darker as near the apex and end in a globose vesicle with a diameter of 30-75 µm. 	<i>Aspergillus niger</i>
02	<ul style="list-style-type: none"> *Hyphae with spetate wall rough and containing vesicles. *The length of the conidiophores varied from 800-1200µm. * Spores yellowish green on upper surfacr and golden yellow in the lower surface *The vesicles forms of the shape of sub-globose. 	<i>Aspergillus flavus</i>
03	<ul style="list-style-type: none"> *The produce spores of between 200-400mm size. * Around the apex, the tipes are grey in color, due to conidiophores. * They feature a slick finish. 	<i>Aspergilleus fumigatus</i>
04	<ul style="list-style-type: none"> * White at first, then blue-green, gray-green, olive-gray, yellow, or reddish with time of incubation progressed. 	<i>Penicillium spp.</i>
05	<ul style="list-style-type: none"> * Very tiny threads form the cell shape, which is capped by spore clusters in the shape of balls. *The colony usually white, beige, or grey in colour, and it grew quickly. 	<i>Mucor spp.</i>
06	<ul style="list-style-type: none"> *Small, oval, measuring colony2-4µm n diameter. * A single budding of the cells may be observed in the yeast form, which is unicellular and reproduced through budding. 	<i>Candida spp.</i>

Drying is the process of removing water from a fish body by evaporating it under the influence of the sun and wind. Fish and fish consumption products are popular in coastal areas. The fish where dried microbial growth is reduced. (Daramola et al.,2012).

Among 25 fish samples collected, seven of them did not show any fungal contamination. Rest of them (72%) showed fungal density in the range of 10² to 10³ CFU/g. These results indicated type of fish as well as handling decide the density besides other factors. As the markets are situated 25 km radius, not many changes expected. Similar drying pattern, amount of the salt used ; fishes caught from same (or) nearby waters, handled by fishermen of same fishing villages are few

reasons possible behind the almost similar fungal density noted.

Aspergillus fluvus, *Aspergillus fumigates*, *Penicillium spp*, *Mucor spp* and *Candida spp* were the fungi identified in these samples (i.e) 3 species of *Aspergiillus* were noted and obviously they were the dominant fungal pathogens found in the environmental samples also. On the contrary *Candida spp* was found to be the least found fungal form. Many other previous reports also showed *Aspergillus spp* as dominant forms (Jay Martin and David et al.,2005).

However regarding species of *Aspergillus*, fish variety and market place concerned showed varying results. So also with other fungal species. It showed that fungal species available in the market premises as well as human handling them also influence. However the density and number of species observed in the present study indicated moderate level of contamination. According to Poernomo et al., 1992, the concentration of salt solution used influenced the microbial as well as rehydration ability of salted fishes which in turn the moisture content of samples are decided in storage. However shelf life might be more than that of unsalted fish due to the various reasons quoted above. Rahman et al., 2021, suggested a new method of using irradiated chitosan coating to improve microbial quality of dried fishes and even to reduce fly attacks. Following advanced methods will definitely reduce these fungal pathogens which affect human beings especially.

Conclusion

The results of the present investigation gave the basic information related to microbial quality of salt cured fishes sold in market places of Cuddalore district and possible reasons behind the results obtained. Even with the existing procedures, moderate microbial contamination observed. Better practices in future would improve the quality of the dried fishes to a larger extent.

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