

Fungi That Produce Toxins in Salted Fish

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Abstract. Salted fish are fish that are processed through a process of salting and drying. The contamination of fungi in salted fish can be caused by prolonged storage. Storage of salted fish that is too long can cause the growth of various fungi. One of the fungi that often grows in salted fish is the fungus of *Aspergillus* sp. Some species of the *Aspergillus* sp fungi can produce aflatoxin, one of which is *Aspergillus flavus*. This study aims to determine the contamination of toxin-producing fungi in salted fish in the traditional Banjarbaru market in Indonesia. The type of research used is descriptive survey. Samples were taken by purposive sampling taken from 5 salted fish sellers each taken 3 different types of salted fish so that the number of samples was 15. The results were obtained from 15 samples examined, 6 positive samples contaminated with *Aspergillus flavus* fungi, 8 positive samples contaminated with *Aspergillus niger* fungi, 5 positive samples contaminated with *Monilia sitophila* fungi, 6 positive samples contaminated with *Rhizopus* sp fungi, 6 positive samples contaminated with *Penicillium* sp fungi, and 1 positive sample contaminated with *Mucor* sp fungi. Based on the results of the study, samples of salted fish contaminated with *Aspergillus* sp fungi were 73% (11 samples) and no samples were contaminated with *Fusarium* sp.

Keywords; fungi; toxins; salted fish

INTRODUCTION

Bacteria and fungi can contaminate food such as vegetables, fruits, milk and meat. Foods that have contained microorganisms are decomposed so that they can reduce nutritional value, delicacy, even foods that have been decomposed can cause a person to be sick until he dies because of the toxins produced¹.

Fungi have potential hazards to human or animal health. This organism can produce various types of toxins called mycotoxins. Fungi can also cause allergies and infections. In addition, according to Tournas et al, 2001, fungi can cause various decomposition of food ingredients². Foods that are decomposed by fungi can become foul-smelling and stained with certain colors³.

The source of protein that is also consumed by the community is salted fish. Salted fish are fish that are processed through a process of salting and drying. Salted fish have low water content due to absorption by salt and evaporation by heat⁴.

Fungi that often grow in conditions of low water content have the potential to produce poisons. One of them is salted fish most often overgrown with *Aspergillus* sp. *Aspergillus* sp. there are many in the environment, in various types of substrate and soil^{5,6}. The

dominant types of fungi in salted fish are *Polypaecilum pisce* and *Aspergillus niger*⁷. Dried food or marinated meat can be damaged by the fungi of *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus glaucus*, *Aspergillus tamarii*, *Eurotium* sp., *Emericella* sp⁸.

Wheeler et al., 1986 stated that several samples of salted fish taken from markets in Indonesia, found *Aspergillus flavus* fungi, but aflatoxin was not found in these samples⁹. Aflatoxin can be carcinogenic, mutagenic, teratogenic^{10,11}, hepatotoxic, immunosuppressive¹² and especially causes of liver cancer^{13,14}. Another toxin found in salted fish is moniliformin produced by *Fusarium fusaroides*¹⁵.

Toxin-producing fungi have been found in salted fish samples in several regions in Indonesia, but for the Banjarbaru area there are no known types of pollutant fungi that produce toxins. Whereas public consumption of salted fish in Banjarbaru is relatively high, based on observations of the number of salted fish sellers in many traditional markets. This study aims to determine the contamination of toxin-producing fungi in salted fish at the traditional Banjarbaru market.

MATERIALS AND METHODS

Type of descriptive observational research, which is a type of research conducted with the main purpose of making a description or descriptive of a situation objectively.

The study population was all salted fish sold by 5 salted fish sellers in the Bauntung Banjarbaru market. The sample of this study was taken by purposive sampling with the criteria of salted fish which showed a state of damage such as the presence of leucorrhoea with fish flesh slightly shrinking. Salted fish was taken at 5 sellers, each of 3 different types of salted fish so that the number of samples was 15.

The tool used is a microscope (Leica ICC50E), electrical balance (Acis AD 600i), autoclave (Memert), oven (WTC Binder). The research material used Potato Dekstosa Agar (merck) with chloramphenicol 0.05%. The variables in this study were the types of toxin-producing fungi (*Aspergillus* sp and *Fusarium* sp) in salted fish.

Planting on Potato Dekstrose Agar media was carried out by spreading 1 ml of sample from 10 gr / 100 ml homogenization. Incubation of room temperature for 3-7 days and observed colony morphology. *Aspergillus* sp colonies are white, yellow-brown, brown to black or green. *Fusarium* sp colonies can be pale or bright with or without cotton mycelium, the color of leucorrhoea is yellow, pink, red or purple.

Microscopic examination of the suspect colonies by means of wet preparations using 10% KOH. Positive results of *Aspergillus* sp if fungi with septic hyphae are found, conidiophores are not branched, sterigmata like cotton, vesicles at the tip of conidiophores. *Fusarium* sp positive results if fungi with hyaline macroconidia are found, two to several cells, fusiform to crescent shaped. Microconidia one to two cells, hyaline, fusiform or ovoid, straight or curved.

RESULT AND DISCUSSION

Questionnaire results data

Salted fish from each seller came from different places, namely from Alabiu as many as 3 samples (20%), Pleihari as many as 3 samples (20%), Hulu Sungai as many as 3 samples (20%), Tabaniau as many as 3 samples (20%) and Jorong as many as 3 samples (20%).

The duration of salted fish storage while at the seller is that 2 sellers store salted fish for <1 month as many as 6 samples (40%) and 3 sellers store salted fish for 1 month for 9 samples (60%).

All sellers did not know that salted fish could be contaminated with fungi as many as 15 samples (100%). Found 1 seller selling near TPS with a sample size of 3 (20%), 4 sellers selling not adjacent to the TPS as many as 12 samples (80%).

Laboratory Examination Results

Table 1 Results of Examination of Fungi in Salted Fish in Banjarbaru

Code sample	Fungi species found					
	<i>Aspergillus flavus</i>	<i>Aspergillus niger</i>	<i>Monilia sitophila</i>	<i>Rhizopus sp</i>	<i>Penicillium sp</i>	<i>Mucor sp</i>
1A	+	+	-	-	-	-
1B	+	-	+	+	+	-
1C	-	-	+	+	-	-
2A	-	+	-	+	+	-
2B	-	-	-	+	-	+
2C	-	+	-	-	-	-
3A	+	-	-	-	-	-
3B	-	-	+	+	-	-
3C	-	-	-	-	+	-
4A	-	+	-	-	-	-
4B	+	-	+	+	+	-
4C	-	+	-	-	+	-
5A	+	+	+	-	-	-
5B	+	+	-	-	+	-
5C	-	+	-	-	-	-
Σ	6	8	5	6	6	1

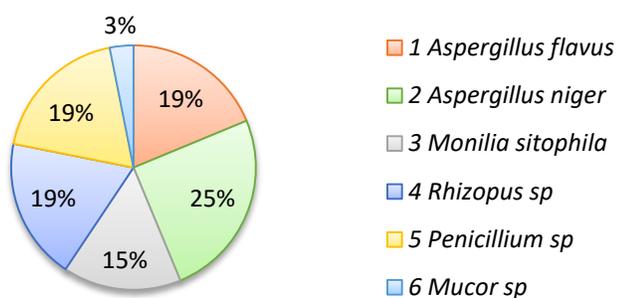


Figure 1 Percentage of Results of Fungi Inspection of Salted Fish in Banjarbaru

To find out the relationship between the results of the questionnaire and the results of the examination of *Aspergillus sp* fungi can be seen in the following description:

Table 2. Areas of origin of salted fish and growth of *Aspergillus sp.*

No	Origin of Salted Fish	Results of examination of <i>Aspergillus sp.</i>			
		Positif		Negatif	
		Σ	%	Σ	%
1	Alabiu	2	13%	1	7%
2	Pleihari	2	13%	1	7%
3	Hulu Sungai	1	7%	2	13%
4	Tabaniau	3	20%	0	0%
5	Jorong	3	20%	0	0%
Total		11	73%	4	27%

Tabel 3 Storage time salted fish and growth of *Aspergillus sp.*

No	Storage time	Results of examination of <i>Aspergillus sp.</i>			
		Positif		Negatif	
		Σ	%	Σ	%
1	< 1 month	3	20%	3	20%
2	1 month	8	53%	1	7%
Total		11	73%	4	27%

Tabel 4. The seller knows that salted fish can be contaminated with fungi

No	The seller knows that salted fish can be contaminated with fungi	Results of examination of <i>Aspergillus sp.</i>			
		Positif		Negatif	
		Σ	%	Σ	%
1	Yes	0	0%	0	0%
2	No	11	73%	4	27%
Total		11	73%	4	27%

Tabel 5. Place to sell near temporary dumps and growth of *Aspergillus sp.*

No	Place to sell near temporary dumps	Results of examination of <i>Aspergillus sp.</i>			
		Positif		Negatif	
		Σ	%	Σ	%
1	Yes	2	13%	1	7%
2	No	9	60%	3	20%
Total		11	73%	4	27%

Based on table 1, samples of salted fish contain aspergillus fungi. According to Dwidjoseputro (2003), *Aspergillus* sp fungi are saprophytic fungi which are ubiquitous¹. The food left open is easily touched by this fungus. One of the dangerous fungi species from the genus *Aspergillus* sp is *Aspergillus flavus* which can produce aflatoxin. Aflatoxin is found in food with contamination of these fungi, namely corn, beans, food and dried fruit, milk and some meat products^{16,17} also animal feed¹⁸. In addition to the fungi *Aspergillus* sp, other fungi were found which contaminated salted fish samples namely *Rhizopus* sp, *Penicillium* sp, *Mucor* sp, and *Monilia sitophila*.

Based on table 3, it is known that the 1-month storage period of 3 sellers produced 8 positive samples contaminated with *Aspergillus* sp fungi (2 samples contaminated with *Aspergillus flavus* fungi, 3 samples contaminated with *Aspergillus niger* fungi and 3 samples contaminated with *Aspergillus flavus* and *Aspergillus niger* fungi). Based on these results, it can be seen that the longer the salted fish is stored, the fungal growth will also develop. According to Fibrianto (2008), most food ingredients cannot be stored for a long time because they will soon experience decay by fungi and bacteria¹⁹.

Table 5. shows that there is 1 seller selling near a landfill. Laboratory tests on salted fish samples produced 2 positive samples contaminated with *Aspergillus* sp fungi (1 sample contaminated with *Aspergillus flavus* fungi, 1 sample contaminated with *Aspergillus flavus* and *Aspergillus niger* fungi). Many fungi are found in rubbish because of the role of the fungi themselves as decomposers of the remaining ingredients or organic waste so that the fungi spores from garbage can contaminate salted fish nearby. According to Karmana (2008), some fungi have the ability to decompose organic waste so that the waste will decompose and return to nature²⁰. The contamination of fungi in salted fish can come from selling environments that are close to landfills or can also be caused by other things such as contamination from air fungi and also the length of storage while at the seller.

All sellers leave salted fish open or not closed. According to Gandjar (2006), air in the open contains many fungal spores that are easily carried away by the wind. Salted fish that are left open may be contaminated by fungal spores from the air.

The contamination of fungi in salted fish may be influenced by the raw materials used to make salted fish of poor quality. Raw materials that are usually used in making salted fish include fish, salt and water. The fish used in processing salted fish comes from fish that are not fresh or fish that have withered, the salt used is low-quality salt which is cheap, the water used is not from clean water. Raw materials whose quality is not good are likely to have been contaminated by microorganisms. According to Supardi and Sukamto (1999), mixing other previously contaminated ingredients can increase microbial contamination of food ingredients²¹.

Apart from raw material, processing that is not clean and good is also likely to cause salted fish to be contaminated by fungi. Salted fish makers do not wash their hands before processing salted fish, do not wash the fish clean, use non-washed or dirty processing equipment. According to Supardi and Sukamto (1999), improper processing can cause damage to food ingredients²¹.

CONCLUSION

Salted fish contaminated with *Aspergillus* sp as much as 73% (11 samples), and no samples of salted fish contaminated with *Fusarium* sp.

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