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IDENTIFICATION OF *Aspergillus* sp. FUNGUS IN SALTED DENCIS FISH (Sardina pilchardus) AT LAMBARO MARKET ACEH BESAR REGENCY

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ABSTRACT

Aspergillus sp. is a fungal species known for producing aflatoxins, toxic secondary metabolites that threaten food safety and may cause aspergillosis in humans. Salted dencis fish (*Sardina pilchardus*) is widely consumed due to its affordability and long shelf life; however, improper processing and storage often increase the risk of fungal contamination. This study aimed to identify the presence of Aspergillus sp. in salted dencis fish marketed in Lambaro Market, Aceh Besar Regency. A descriptive qualitative approach was applied through macroscopic and microscopic examinations. A total of eight samples were purposively collected from traders storing salted fish openly. Samples were cultured on Potato Dextrose Agar (PDA) and incubated at 37°C for seven days. The findings revealed that 87.5% (7 out of 8) of the samples were positive for Aspergillus sp., predominantly *Aspergillus niger*, while 12.5% (1 sample) showed negative results. The high prevalence of *Aspergillus* sp. contamination indicates a significant risk associated with openly stored salted fish. These findings emphasize the importance of proper storage practices and greater awareness among both producers and consumers to ensure food safety.

Keywords: *Aspergillus sp., aflatoxin, salted fish, food safety, microbial contamination*

INTRODUCTION

Fungi are a group of eukaryotic organisms that play a significant role in human life and the environment. Their presence can bring both benefits and risks. On the one hand, fungi are used as food ingredients, antibiotic producers, and biotechnological agents in the fermentation industry. On the

other hand, some types of fungi can be pathogenic, produce toxic compounds, or cause food spoilage. Fungi's ability to survive in a variety of environmental conditions makes them readily found in soil, air, plants, and food products. Morphologically, fungi are characterized by the presence of hyphae, mycelium, and reproduction through spores, allowing them to reproduce rapidly in suitable media. This makes fungi a significant potential contaminant in food, especially in tropical regions with favorable humidity and temperatures.

One genus of fungi that has received considerable attention is *Aspergillus* sp. This genus comprises various species that are widely distributed in nature, and some of them have significant implications for human health. Aspergillus sp. are known as filamentous fungi commonly found in decaying organic matter, soil, air, grains, and dried food products. Some species, such as Aspergillus flavus and Aspergillus parasiticus, are known for their ability to produce aflatoxin, a mycotoxin compound that is hepatotoxic and carcinogenic. Aflatoxin is a serious threat to global food security because it can contaminate agricultural commodities and processed products. In addition, other species such as Aspergillus fumigatus and Aspergillus terreus can also cause opportunistic infections called aspergillosis, especially in individuals with weakened immune systems, such as those with HIV/AIDS, cancer patients, or organ transplant recipients.

Epidemiological data shows that infections caused by *Aspergillus* sp. are a significant health problem. According to a report by the *World Health Organization* (WHO), an estimated 400,000 people worldwide suffer from *Chronic Pulmonary Aspergillosis* (CPA), with more than 70,000 cases occurring as a complication of sarcoidosis. Although cases of invasive aspergillosis are rare, this disease can be fatal, especially for individuals undergoing immunosuppressive therapy. In Indonesia, the burden of fungal disease is also quite large. Data from 2013–2019 estimated the prevalence of serious fungal diseases to reach 7.7 million cases per year, or approximately 2.89% of the total population. Of these, an estimated 49,500 cases of invasive aspergillosis per year, approximately 378,700 cases of CPA, approximately 336,200 cases of allergic bronchopulmonary aspergillosis, and 443,800 cases of severe asthma related to fungal sensitization. This fact shows that Aspergillus sp. is not only a potential threat, but has become a real issue in Indonesian public health.

The link between *Aspergillus* sp. and food safety is increasingly important. This fungus can grow in low humidity conditions and can even survive at relatively low water levels. This makes various dried products susceptible to contamination, including cereals, nuts, spices, and dried fish products. A product commonly found in Indonesia and at high risk of fungal contamination is salted fish. Salted fish is a popular traditional processed product widely consumed by the public due to its distinctive taste, affordable price, long shelf life, and abundant availability in traditional markets.

Salted fish, including the dencis (*Sardina pilchardus*), are processed through salting and drying to reduce the water content, thus inhibiting the growth of spoilage bacteria. The salting process plays a crucial role in reducing microbial activity because salt has osmotic properties that can draw water from fish tissues, while creating unfavorable conditions for microorganisms. However, in practice, the quality of salted fish depends heavily on the processing technique, the type and concentration of salt used, and the drying conditions. In tropical regions like Indonesia, the rainy season often hampers the drying process because sunlight is not always available. As a result, salted fish often does not dry completely, making it more susceptible to contamination by microorganisms, including fungi.

In addition to processing factors, the storage and distribution conditions of salted fish also affect the final product quality. Many traders in traditional markets still use open plastic containers or unhygienic storage areas. Humid, dusty market conditions, as well as exposure to air pollution and insects, increase the potential for contamination. Under these conditions, *Aspergillus* sp. can grow easily due to its xerophilic nature, ability to thrive in relatively low humidity, and adaptability to room temperature. Therefore, salted fish is at risk of becoming a growth medium for *Aspergillus* sp., which then enters the human body through consumption. This poses a serious threat to public health as it can lead to aflatoxin exposure and fungal infections.

From a nutritional perspective, dencis fish actually has significant value. This fish is a source of animal protein with a complete content of essential amino acids and is rich in omega-3 fatty acids, which are beneficial for cardiovascular health. The protein content of dencis fish is relatively high, reaching around 20%, making it a highly nutritious side dish choice for various levels of society. However, fungal contamination has the potential to reduce nutritional quality and even pose health risks. Consuming salted fish contaminated with Aspergillus sp. not only reduces nutritional benefits but can also cause long-term toxic effects, including liver damage, decreased immune function, and the risk of cancer.

Lambaro Market in Aceh Besar Regency is one of the largest salted fish trading centers in Aceh. The market's high volume of salted fish trading activity results in a wide variety of products, both in terms of quality and storage methods. Observations indicate that most traders still use open plastic containers for storing salted fish, which certainly does not meet hygienic standards. This situation increases the potential for fungal contamination, including Aspergillus sp. Given the high public interest in dencis salted fish and its role as a daily food source, it is important to conduct research on the presence of Aspergillus sp. in salted fish sold at this market. This research is relevant not only for determining the level of fungal contamination, but also as an initial effort to raise public and trader awareness regarding the importance of hygienic handling of salted fish. The research results can be used as a basis for recommendations for improvements in the processing,

storage, and distribution of salted fish, so that the product reaches consumers with greater safety. From an academic perspective, this research also contributes to the addition of scientific data related to fishery-based food safety in Indonesia, particularly regarding the prevalence of *Aspergillus* sp. fungal contamination in salted fish. Thus, this research not only has practical value for the community, but also theoretical value that can serve as a reference for further research.

Overall, food safety is a crucial issue because it directly relates to public health. Indonesia, as a maritime nation with high fish consumption, must ensure that its fishery products are safe from contamination. Salted fish, a popular product, is susceptible to fungal contamination due to traditional processing and storage practices. Therefore, identifying the presence of Aspergillus sp. in salted dencis fish sold at Lambaro Market in Aceh Besar Regency is an important first step in preventing health risks from consuming contaminated food. This research is expected to provide a clear picture of the level of fungal contamination and serve as a basis for developing more effective control strategies.

METHODS

This study used a qualitative descriptive design and was conducted at Lambaro Market, Aceh Besar Regency, and the Medical Laboratory Technology Microbiology Laboratory of the Aceh Health Polytechnic. Salted dencis fish (Sardina pilchardus) samples were collected using a purposive sampling technique based on the criteria of salted fish being stored openly without adequate protection. Of the 13 traders encountered, eight samples were selected for analysis. Sampling was carried out using sterile and labeled plastic bags, then all samples were immediately taken to the laboratory for further examination.

Prior to analysis, research equipment was sterilized using an autoclave at 121°C for 15 minutes and an oven at 160–180°C depending on the type of equipment. Potato Dextrose Agar (PDA) media was prepared by adding antibiotics to prevent bacterial growth. Salted fish pieces were planted on PDA media with a sterile loop, then incubated at 37°C for 3–7 days. Identification was carried out macroscopically by observing the morphology of the colony, including color, shape, and texture. Next, microscopic examination was carried out by dropping a 10% KOH solution on the colony pieces placed on a glass object, then observed under a microscope at 10x and 40x magnification. Positive results were determined based on the discovery of septate hyphae and conidia typical of *Aspergillus* sp.

The data obtained consisted of positive and negative identification results for each sample. These results were calculated as a percentage by comparing the number of positive samples to the total number of samples examined. The data were presented in tables and figures, then analyzed

descriptively to explain the level of *Aspergillus* sp. contamination in salted dencis fish sold at Lambaro Market. They were also compared with previous research findings to strengthen the interpretation of the results.

RESULTS AND DISCUSSION

Results

Table 1. Identification of *Aspergillu*s sp. on salted sardine (*Sardina pilchardus*) from Lambaro Market, Aceh Besar

Sample Code	Result	Remarks
DT 1 A	Positive (+)	*Aspergillus niger*
DT 2 A	Negative (-)	-
DT 3 A	Positive (+)	*Aspergillus niger*
DT 4 A	Positive (+)	*Aspergillus niger*
DT 5 A	Positive (+)	*Aspergillus niger*
DT 6 A	Positive (+)	*Aspergillus niger*
DT 7 A	Positive (+)	*Aspergillus niger*
DT 8 A	Positive (+)	*Aspergillus niger*

Summary: Out of eight salted sardine samples examined, seven (87.5%) were positive for *Aspergillus niger*, while one sample (12.5%) was negative.

Discussion

The results indicated that *Aspergillus niger* was the predominant fungal contaminant found in salted sardines (*Sardina pilchardus*) sold at Lambaro Market, Aceh Besar. A total of 87.5% of the tested samples showed positive growth, characterized macroscopically by black granular colonies and microscopically by septate hyphae and spherical conidia. These findings highlight that the majority of salted fish sold in traditional markets is susceptible to fungal contamination, particularly by A. niger.

The high prevalence of A. niger contamination aligns with previous studies conducted in coastal regions of Aceh, where salted fish products were frequently colonized by xerophilic fungi. A. niger is well adapted to environments with low water activity and relative humidity, conditions that are commonly present in dried fish products. Its ability to survive at ambient temperatures ranging from 24°C to 37°C further explains its persistence in salted sardines, especially when storage and handling practices are suboptimal.

The presence of A. niger in salted fish is not merely a matter of spoilage but also raises significant public health concerns. This species has been reported as one of the major causes of otomycosis and chronic respiratory diseases, such as chronic pulmonary aspergillosis (CPA). Moreover, A. niger can produce secondary metabolites, including mycotoxins, which are harmful if ingested over time. Chronic exposure may lead to hepatic damage, immunosuppression, and an increased risk of carcinogenesis.

Given that salted fish is a widely consumed protein source among Indonesian communities, the risk of exposure to fungal contaminants is considerable.

Observations during sampling also revealed poor hygienic practices among traders. Most vendors stored salted sardines in open plastic containers, which allowed direct contact with dust, insects, and humid air. These storage conditions create an environment favorable for fungal growth, particularly in tropical climates where humidity levels are high. Therefore, improving post-harvest handling and storage practices is crucial to reduce the risk of contamination.

The results of this study reinforce the importance of routine monitoring of fungal contamination in traditional food products. Similar findings have been reported in other food commodities such as shrimp paste, peanuts, and spices, where Aspergillus species were frequently detected. Future studies should extend the identification process to other potentially toxigenic species, such as A. flavus and A. fumigatus, using molecular methods like PCR for more accurate results. Such approaches will provide a stronger basis for food safety policies and consumer protection in Indonesia.

CONCLUSION

This study revealed that 87.50% of salted sardine (*Sardina pilchardus*) samples collected from Lambaro Market, Aceh Besar, were contaminated with *Aspergillus niger*, while only 12.50% were negative. The high prevalence of fungal contamination indicates a considerable risk to food safety and public health, as A. niger is known to produce harmful mycotoxins. Producers are advised to improve hygienic practices during processing, drying, and storage, including the use of clean, covered containers to prevent environmental contamination. Consumers should also be more aware of physical indicators of spoilage and avoid purchasing salted fish that shows signs of fungal growth. Strengthening both production and consumption practices will reduce the risk of contamination.

Further studies are recommended to investigate other Aspergillus species and assess the levels of mycotoxins present in contaminated products. Such research will provide a more comprehensive understanding of the risks and support the development of stricter food safety standards to protect public health.

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