East Asian Journal of Multidisciplinary Research (EAJMR)
Vol. 2, No. 1, 2023 : 167-176

The Effect of the Use of Type of Wood on the Appearance and Flavor of Smoked Skipjack

Rinto M. Nur[1]*, Iswandi Wahab[2], Juwita Kore[3], Ningsi Saibi[4]
[1,2,3]Universitas Pasifik Morotai
[4]Universitas Khairun
Corresponding Author: Rinto M. Nur rintomnur777@gmail.com

A R T I C L E I N F O

Keywords: Skipjack, Smoked Fish, Firewood, Organoleptics

Received : 14 November
Revised : 14 December
Accepted: 14 January

A B S T R A C T

This study aimed to analyze the influence of different types of wood on the appearance and taste of smoked fish. This study used four types of firewood: coconut tranks, driftwood, coconut husks, and sawdust. Fish that have been smoked are then carried out an organoleptic assessment of appearance and taste by 30 consumer panelists. The results showed that using different firewood types affects the appearance and taste of smoked skipjack fish. Smoking using coconut trunk wood provides an organoleptic value of appearance (8.07) and taste (8.40), according to Indonesian National Standard (>7). In contrast, the other three types of the wood show an organoleptic value of appearance and tasteless than 7.

DOI: https://10.55927/eajmr.v2i1.2512
ISSN-E: 2828-1519
https://journal.formosapublisher.org/index.php/eajmr/index

INTRODUCTION

Fish is one of the most popular foodstuffs because it is cheap and contains nutrients. Fish contains omega three and omega six and complete amino acid composition (Pandit & Sanger, 2010). However, fish is one of the foodstuffs that easily rots and spoils quickly. According to Jenie et al. (2001), the quality of fresh fish needs to be considered because fresh fish quickly degrades. The activity of enzymes, bacteria, and oxidation processes causes this. Adawyah (2008) explains that fish contains a high enough water content to break down quickly and decompose. In just 8 hours of being caught and landed, changes will occur that lead to damage. Therefore, it is necessary to process preservation and processing. The main objectives of preservation and processing are to protect fish from spoilage so that they can be stored for a long time, increase marketing reach, diversify the processing of fishery products, and increase income. One way of preservation is by smoking.

Smoking fish is a way of processing or preserving it by combining drying treatment and adding natural chemical compounds from the combustion of natural fuels. Palm et al. (2011) explained that smoking is a process of penetrating volatile compounds from burning wood in fish. Through combustion, a compound of smoke and heat will be formed. The smoke compounds stick to the fish and dissolve in the water layer on the surface of the fish's body so that a distinctive aroma and taste are formed in the product, and the color becomes golden or brownish. The process of smoking fish commonly carried out on Morotai Island is traditional smoking using natural fuels so that the fish are exposed to smoke directly (Rorano & Nur, 2019; Wahab et al., 2019). The fuel used in smoking fish varies from firewood, coconut husks, coconut trunks, and mangrove stems. Different fuels will produce different types of volatile compounds, thereby affecting the aroma and taste of smoked fish. Sukainah et al. (2014) reported that the organoleptic values of color, aroma, texture, and taste of smoked fish smoked using coconut shells were better than firewood.

THEORETICAL REVIEW

This study aimed to analyze the influence of different types of wood on the appearance and taste of smoked fish. This study used four types of firewood: coconut tranks, driftwood, coconut husks, and sawdust. Fish that have been smoked are then carried out an organoleptic assessment of appearance and taste by 30 consumer panelists. The results showed that using different firewood types affects the appearance and taste of smoked skipjack fish. Smoking using coconut trunk wood provides an organoleptic value of appearance (8.07) and taste (8.40), according to Indonesian National Standard (>7). In contrast, the other three types of the wood show an organoleptic value of appearance and tasteless than 7.

METHODOLOGY

The tools used in this study were a knife, a plastic bag, a plastic container, a bamboo clamp, a smoking area, and an organoleptic assessment questionnaire for appearance and taste. The materials used in this study were skipjack,

coconut husks, coconut trank, sawdust, driftwood (*kiloti*), water, and cooking oil. The procedure in this study consisted of several stages, namely the preparation of skipjack tuna raw materials obtained from the Morotai Island People's Market. Then the skipjack tuna is split open, and the gills and entrails are removed, washed, clamped with bamboo, washed again, weeded, and smoked with four types of fuel (coconut husks, coconut trank, sawdust, driftwood) separately. Smoked fish that has been cooked is then smeared with cooking oil. Furthermore, the measurement of the organoleptic value of smoked fish in the form of appearance and taste was carried out using a questionnaire based on the Indonesian National Standard 01-2346-2006. The panelists used were consumer panelists of 30 people. The data was obtained from the organoleptic value of taste and appearance of smoked fish. The data was then analyzed using the analysis of variants (ANOVA) and continued with Duncan's Multiple Range Test (DMRT) at a significant level of 5%. Data analysis using the SPSS 22.0 program.

RESULTS AND DISCUSSIONS

Fish is a high-quality food source, especially because it contains a lot of protein, fat, vitamins, and minerals that humans need. Fish is also a highly perishable food. One effort to improve fish preservation is to use smoking techniques. The smoking technique combines drying and heating processes to give a distinctive taste. *Fumigation* is a processing method that combines wood for drying treatment and the application of natural chemical compounds from combustion products that affect the smoking process, including the smoking temperature. Smoking should use at high temperatures because smoked fish changes the appearance or appearance of the fish flesh, so it is necessary to select fresh fish, equipment, and smoked materials such as wood fuel (Moeljanto, 1992). In this study, fish were smoked using a different type of wood. The wood used for smoking fish is coconut trunks, driftwood (timber that washes up on the beach), coconut husks, and sawdust. The smoked fish was then subjected to organoleptic tests with 30 panelists with panelist backgrounds, namely lecturers, students, and homemakers. Panelists were asked to assess smoked fish in terms of appearance and taste.

Different Use of Firewood

The use of fuel from coconut trank, driftwood, coconut husks, and sawdust in the process of smoking fish has a variation of time and different effects of smoking. Fumigation using coconut trank and coconut husks takes ± 2-3 hours. Whereas for driftwood and sawdust, it takes more than 3 hours. It is caused by the high heat generated by coconut trunks and coconut husks. According to Adawyah (2008), the maturity of fish depends on the results of chemical reactions through the process of smoking fish, both heat or temperature and the environment, so that smoked fish meat is cooked and has a consistent color. Smoking at high temperatures will speed up the maturity of smoked fish. The maturity of the fish during the smoking process will produce a different appearance of the fish in the final result of smoking. In addition, coconut trank fuel and coconut husks are very easy to obtain, so they are very practical.

Processing fish with coconut tranks and coconut husk also gives a pleasant aroma, brownish color, chewy texture, and a distinctive taste compared to driftwood and sawdust. The effect of the difference in the fuel used will produce different smoke. Furthermore, it will produce differences in sensory properties. It can be assumed that the reaction between carbonyl compounds and protein, in general, contributes to the formation of color on the surface of smoked fish products, while phenolic compounds absorbed into the product play a role in producing the taste and aroma of smoked fish products (Kjällstrand & Petersson, 2001). Fish also have differences in taste due to the presence of various volatile compounds.

Appearance of Smoked Fish

The results showed the level of acceptance of the appearance of smoked skipjack with an average value of 5.20 (sawdust), 6.07 (driftwood), 6.27 (coconut husks), and 8.07 (coconut trunk). It is because the smoke absorbed by the fish's body varies greatly depending on the type of fuel used, so the color on the surface of the fish is also different. Thus the results of the average smoked fish meat of the panelists give a neater and very neat appearance value according to Indonesian National Standard (INS) 2725.3: 2009, where the minimum value of INS for appearance is 7, meaning that the appearance of smoked skipjack using coconut trank wood meets the quality standards of smoked fish (Table 1).

Table 1. The Organoleptic Value of the Appearance of Smoked Skipjack

Wood type	**Organoleptic value***
Sawdust	5,20±1,87 a
Driftwood	6,07±2,08 ab
Coconut husks	6,27±1,70 b
Coconut trunk	8,07±1,85 c

Note: * Numbers followed by the same letter are not significantly different; ±SD; N = 30; p=0.05

The results of the organoleptic test stated that the wood species of coconut tranks had a significant difference from those of driftwood, coconut husks, and sawdust. It is because the heat and smoke produced are evenly distributed during smoking and absorbed by the smoked fish according to the conditions of the smoking room. Coconut trank contains more lignin than other types of wood. In addition, this wood also contains hemicellulose. Lignin compounds will produce aromatic chemical compounds in the form of phenols if they are subjected to combustion or pyrolysis.

Coconut trank is also one of the weaknesses of this type of material. Until now, coconut trank has been known as the tree of life because almost every part of this plant can be used. Optimum utilization of coconut is still limited to products in the form of copra and coconut oil, while it still needs to be improved in other products. Coconut trank is one part of the coconut plant that has the potential to be utilized. Coconut trank consists of parenchyma tissue as the ground tissue and many vascular bundles scattered between the parenchyma tissues. The vascular bundles are spread inside the stem with different densities

so that when used as a building material, it stings with strength. As with other types of wood in general, it is hygroscopic and changes dimensions due to the absorption and release of moisture (Swastawati et al., 2013).

According to Wardhani (2004), coconut trunks differ from other hardwoods. The coconut trunk does not have a cambium, and the vascular bundles are not uniform and are scattered randomly. According to Rojo (1988), the holocellulose of a coconut trunk is 66.7% higher than other parts, such as skin, fiber, and leaf sheaths. The range of cellulose content in coconut trunks is 28.10-36.55%. Coconut hasks is easy to obtain and is a by-product of agriculture. The composition of the coir in coconuts is around 35% of the total weight of coconuts. Coconut husks consists of fiber and cork (pitch), which connects one fiber to another. Coconut husks consists of 75% fiber and 25% cork. The potential for using coconut husks fiber as a biosorbent to remove heavy metals from water is quite high because coconut husks fiber contains lignin (35-45%) and cellulose (23-43%) (Carrijo et al., 2002).

Sawdust is a raw wood material processed and sliced using a tool (wood saw) into small dregs. Sawdust waste has considerable potential to be used as a raw material for charcoal briquettes. Wood sawdust which has been a waste for companies can be used as a business opportunity. Sawdust contains chemical components such as cellulose, hemicellulose, lignin, and extractive substances.

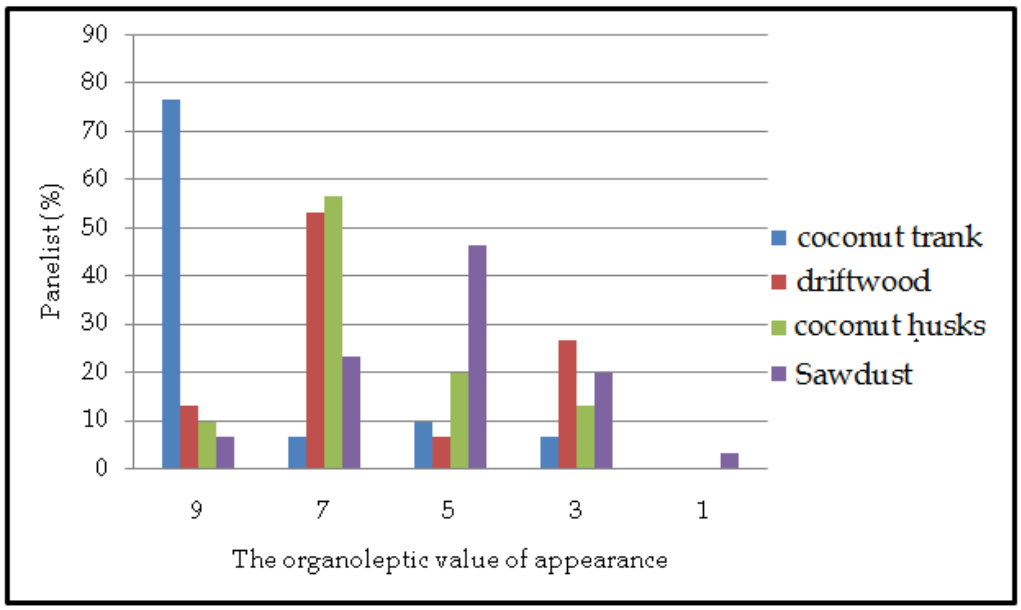

Figure 1. Percentage of Panelists in the Organoleptic Assessment of the Appearance of Smoked Skipjack

Based on the organoleptic test results for the appearance of smoked skipjack fish using coconut trank, the number of panelists who gave a score of 9 was 76.67%, a value of 7 was 6.67%, a value of 5 and 1 was 10.00%, a value of 3 was 6, 67%. Data from the organoleptic test results for the taste of smoked skipjack using driftwood scored nine, as much as 13.33%, value 7, as much as 53.33%, value 3, as much as 6.67%, value three as much as 26.67%. While the organoleptic test results for the taste of smoked skipjack using coconut husks, the number of

panelists who gave a score of 9 was 10.00%, a score of 7 was 56.67%, a value of 5 was 20.00%, a value of 3 was 13.33%. During the organoleptic test results for the taste of smoked skipjack using sawdust, the number of panelists who gave a score of 9 was 6.67.00%, a value of 7 was 23.33%, a value of 5 was 46.67%, a value of 3 was 20.00%. Furthermore, Ratna et al. (2011) reported that smoking with different types of wood gave different appearances (color and shape) to smoked milkfish.

One type of processing that can be used to inhibit the activity of microorganisms is smoking fish. Besides aiming to provide benefits for preserving fish, processing fish by smoking also gives a pleasant aroma, brownish or blackish color, good texture, and a distinctive taste. Moreover, delicious in processed, smoked fish meat (Wibowo, 2020). *Smoking* can be defined as the process of penetrating volatile compounds in fish produced from wood burning, which can produce products with a specific taste and aroma so that inhibiting enzymatic activity in smoked fish can affect the quality of smoked fish chemical compounds from wood smoke so that the appearance of smoked fish is very attractive or brownish. The chemistry of wood smoke is generally in the form of phenols (which act as antioxidants), organic acids, alcohols, carbonyls, hydrocarbons, and nitrogen compounds such as nitrous oxide, surface aldehydes, and then penetrate the smoked fish meat.

Smoked Fish Flavor

The taste, appearance, smell, and texture of smoked fish are formed by the carbonyl groups in the smoke reacting with the proteins and fats in the fish's body. The main carbonyl component in smoke that plays an important role is phenol, which also acts as an antioxidant. The brown color is produced from the reaction of phenol with oxygen in the air. The phenol components that play a role in smell and taste are guaiacol, 4-methyl guaiacol, and 2,6-dimethoxy phenol (Cardinal et al., 2006). Meanwhile, Jónsdóttir et al. (2008) stated that several phenolic compounds, such as guaiacol and siringol, were very specific to smoked fish. The value of the organoleptic test results for the flavor of smoked skipjack based on the use of 4 different types of firewood can be seen in Table 2.

Table 2. Organoleptic Value of Flavor of Smoked Skipjack

Wood type	Organoleptic value*
Sawdust	5,60±1,30 a
Driftwood	6,67±1,75 b
Coconut husks	6,93±1,44 b
Coconut trunk	8,40±1,90 c

Note: * Numbers followed by the same letter are not significantly different; ±SD; N = 30; p=0.05.

The organoleptic analysis of smoked skipjack using a variety of firewood showed that the result of smoking using coconut tranks received the highest average score from the panelists (8.40). Based on the DMRT test (Table 2), smoking treatment with coconut tranks showed that the organoleptic value of

smoked fish taste was significantly different from smoking using driftwood (6.67), coconut husks (6.93), and sawdust (5.06). According to (Wibowo, 2020), the organoleptic quality criteria for the taste of smoked fish are delicious, the flavor of the smoke is soft to sharp without bitterness or bitterness, and it does not flavor rancid. Flavor is one of the determining factors for the panelists' preference for food products. The flavor of many foodstuffs is assessed using the sense of taste or the tongue.

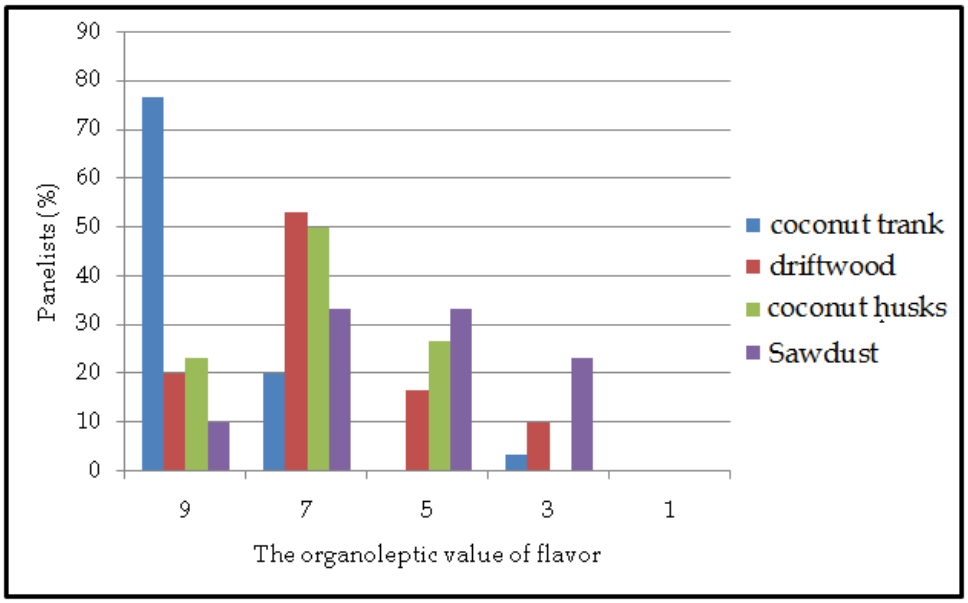

Figure 2. Percentage of Panelists in the Organoleptic Assessment of the Flavor of Smoked Skipjack

Based on the organoleptic test results for the taste of smoked skipjack using coconut trank, the number of panelists who gave a score of 9 was 76.67%, a value of 7 was 20.00%, a value of 5 and 1 was 0.00%, a value of 3 was 3, 33%. Data on organoleptic test results for the flavor of smoked skipjack using driftwood scored nine, as much as 20.00%. Value seven is as much as 53.33%, value three as much as 16.67%, and value three as much as 10.00%. While the organoleptic test results for the flavor of smoked skipjack using coconut husks, the number of panelists who gave a score of 9 was 23.33%, a score of 7 was 50.00%, a value of 5 was 26.67%, a value of 3 was 0.00%. During the organoleptic test results for the flavor of smoked skipjack using sawdust, the number of panelists who gave a score of 9 was 10.00%, a value of 7 was 33.33%, a value of 5 was 33.33%, a value of 3 was 23.33%.

According to Purnomo & Salasa (2002), hardwood (non-resinous) or coir and coconut shells must be used to get good quality smoked fish. Softwood will produce smoke which contains compounds that can cause unwanted things and smells. After being smoked, the fish has a distinctive taste and aroma. The taste and aroma are produced by acid compounds, phenols, aldehydes, and other substances as helpers produce this taste. Burning hardwoods containing cellulose and lignin will produce formaldehyde, acetaldehyde, carboxylic acids, phenols, cresols, primary and secondary alcohols, and ketones. The cellulose pyrolysis

process will form funeral and phenol groups. In contrast, lignin pyrolysis will produce pyrogallol and tar methyl esters, a mixture of guaiacol, cresol, and phenol compounds. The smoke ingredients are in detail depending on what material is used as a raw material. It can be wood, coconut shell, shell, oil palm, coconut husks, and cassava stalks. Girard (1992) further explained that various factors, including the type of wood, the moisture content in the wood, and the combustion temperature used, influence smoke composition.

CONCLUSIONS AND RECOMMENDATIONS

Provide some conclusions and the implementation of the research results**.** The study results a show that using different types of firewood affects the appearance and taste of skipjack smoked fish. Processing fish with coconut trunk and coconut husk also gives a pleasant aroma, brownish color, chewy texture, and a distinctive taste compared to driftwood and sawdust. The smoking time using coconut trunk and coconut husk takes ±2-3 hours. Meanwhile, driftwood and sawdust take more than 3 hours. Smoking using various types of wood gives a different value to the appearance and taste of skipjack. Smoking using coconut trunk gave an organoleptic value of appearance (8.07) and taste (8.40), according to Indonesian National Standard (> 7). In contrast, the other three types of wood showed an organoleptic value of appearance and taste of less than 7.

FURTHER STUDY

The fuel used in smoking fish varies from firewood, coconut husks, coconut trunks, and mangrove stems. Different fuels will produce different types of volatile compounds, thereby affecting the aroma and taste of smoked fish. Reported that the organoleptic values of color, aroma, texture, and taste of smoked fish smoked using coconut shells were better than firewood.

REFERENCES

Adawyah, R. (2008). Pengolahan dan Pengawetan Ikan. PT. Bumi Aksara.

Cardinal, M., Cornet, J., Serot, T., & Baron, R. (2006). Effects of the Smoking Process on Odour Characteristics of Smoked Herring (Clupea harengus). Http://Journal.Ift.or.Id.

Carrijo, O. A., Liz, R. S., & Makishima, N. (2002). Fiber of Green Coconut shell as Agriculture substratum. Brazilian Horticulture, 20, 533–535.

Girard, J. P. (1992). Smoking In Technology Of Meat Product. Translated by Bernard Hamminhs and ATT.

Jenie, Betty, S. L., Naratifa, & Suliantari. (2001). Peningkatan Keamanan dan Mutu Simpan Pindang Ikan Kembung (Rastelliger SP.) dengan Aplikasi dan Kombinasi Natrium Asetat, Bakteri Asam Laktat dan Pengemasan Vakum. Jurnal Teknologi Dan Industri Pangan, 21–27.

Jónsdóttir, R., Olafsdóttir, G., Chanie, E., & Haugen, J. E. (2008). Volatile Compounds Suitable for Rapid Detection As Quality Indicators of Cold Smoked Salmon (Salmo salar). Food Chemistry, 109, 184–195.

Kjällstrand, J., & Petersson, G. (2001). Phenolic Antioxidants In Wood Smoked. Journal Elsevier, 277(1–3), 477–484.

Moeljanto, R. (1992). Pengawetan dan Pengolahan Hasil Perikanan. Penerbit Swadaya.

Palm, L. M. N., Deric, C., Philip, O. Y., Winston, J. Q., Mordecia, A. G., & Albert, D. (2011). Characterization of Polycyclic Aromatic Hydrocarbons (PAHs) Present In Smoked Fish from Ghana. Advanced Journal of Food Science and Technology, 3(5), 332–338.

Pandit, I. G. S., & Sanger, G. (2010). Oksidasi Lemak Ikan Tongkol (Auxis thazard) Asap yang Direndam Dalam Larutan Ekstrak Daun Sirih. Jurnal Jurusan Pengolahan Hasil Perikanan, 2(5), 870–873.

Purnomo, & Salasa. (2002). Teknologi Pengolahan Hasil Perikanan. Universitas Terbuka.

Ratna, Safridar, & Yulinar. (2011). Variasi Jenis Bahan Bakar pada Pengasapan Ikan Bandeng (Chanos chanos forskal) Menggunakan Alat Pengasapan Tipe Kabinet. Jurnal Ilmiah Pendidikan Biologi. Biologi Edukasi, 3(2).

Rojo, J. P. F. O. (1988). Coconut Wood Utilization, Rescarch an Develompment: The Philippine Experience. FPRDI and IDRC.

Rorano, M., & Nur, R. M. (2019). Sanitasi dan Higiene Pengolahan Ikan Tuna dan Cakalang Asap DiTanah Tinggi Desa Gotalamo Kabupaten Pulau Morotai. Jurnal Aksara Publik, 3(2), 134–141.

Sukainah, A., Patang, Y., & Yuliandi. (2014). Penerapan Berbagai Sumber Bahan Bakar dan Konsentrasi Garam pada Pengasapan Ikan Layang. Jurnal Galung Tropika, 3(3), 139–148.

Swastawati, F., Surti, T., Agustini, T. W., & Riyadi, P. H. (2013). Karakteristik Kualitas Ikan Asap yang Diproses Menggunakan Metode dan Jenis Ikan Berbeda. Jurnal Aplikasi Teknologi Pangan, 2(3), 126–132. https://doi.org/10.17728/jatp.v2i3.142

Wahab, I., Kore, J., & Nur, R. M. (2019). Perbandingan Proses Pengasapan Ikan

Cakalang Menggunakan Alat Konvensional dan Lemari Pengasapan Di Desa Daruba Pantai Kabupaten Pulau Morotai. Jurnal Ilmu-Ilmu Perikanan Dan Budidaya Perairan, 14(2), 33–38.

Wardhani, I. Y. (2004). Distribusi Kandungan Kimia Kayu Kelapa (Cocos nucifera L). Jurnal Ilmu & Teknologi Kayu Tropis, 2(1), 1–7.

Wibowo. (2020). Industri Pengasapan Ikan. In Penebar Swadaya. Penebar Swadaya.