Utilization Using Liquid Smoke Fish Fillet As Preservatives

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Utilization Using Liquid Smoke Fish Fillet As Preservatives

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Abstract

Wider use of liquid smoke fogging its application to replace the traditional way . With liquid smoke smoke scents giving the fish will be more practical because it is only by spraying or dipping the fish in the liquid smoke solution followed by heating. Increasingly rapid development of liquid smoke in the preservation of food, because of the cost required for the manufacture of wood and smoke more efficient equipment, hazardous components can be separated or reduced before used in food as well as the composition of the liquid smoke is more consistent for repeated use . The purpose of this paper is to provide information to the consumer public regarding the potential use and usefulness of coconut shell liquid smoke as a preservative fish fillets that are environmentally friendly . Liquid smoke is a preservative Fish Fillet in lieu of a chemical preservative that is both environmentally friendly and fairly bright prospects for the future have to be developed to the community . The use of liquid smoke coconut shell which has been less than satisfactory results and is less practical and still need to do further study, especially the problem of potential toxic waste benzoepiren. At abundant natural resources that exist areas of West Sumatra province, the utilization of coconut shell liquid smoke as a preservative fillet fish have a chance to develop. From the security aspect of the health aspects , based on the results of studies carried out so far that liquid smoke is safe for health , but still need to continue to do research for the development of the use of liquid smoke.

Keywords : *Liquid Smoke . Shell , Preservation , Fish Fillet*

1. Introduction

Background

Among the types of freshwater fish are now being developed and cultivated Nile Tilapia (*Oreochromis niloticus*). This is because these fish live easy, fast Development, white flesh and tastes quite savory . Processing methods can be developed to the fish fillet is processing fish jerky. Making jerky fish fillets are based on research Dewi et al (1999) showed that the panelists preferred the fillet jerky using a mixture of sugar (granulated sugar and brown sugar), due to the organoleptic fillet the fish jerky has a color that is not too brown , characteristic odor , not too sweet flavor and consistency that is not too tough . In addition the use of sugar mixtures aims to reduce the color black after frying fish jerky result of browning reaction.

With the process of drying the fillets of fish jerky is traditionally resulting in a decrease in the water content of the product is expected inhibited microbial activity, resulting in a longer lasting power products . Due to the nature of the processing that is still traditional, fish jerky products are usually not packaged properly so easily contaminated by microorganisms that cause will reduce awetnya. In addition the product moisture content is relatively high . To obtain a lower water content, it is not jerky products made in the form of a thick but in the form of thin slices . It aims to

allow the flavors to more quickly penetrate into the fillet slices, as well as the drying process faster

Fumigation is a technique of embedding and incorporating a wide range of chemical compounds to smoke in food (Winarno, 1993) . Fumigation was originally intended to extend the shelf life of a material , but in line with the increase in public acceptance of the product, the purpose of the smoke began to turn to the flavor, which gives the aroma and distinctive taste and prevents rancidity due to oxidation of fatty meat. .

Fumigation can be done in both traditional and modern. Traditional fumigation can be done in cold and heat by burning wood or sawdust, where the fish are smoked in direct contact with the smoke . Side effects of the environment so polluted with smoke , while no modern fumigation using liquid smoke (vapor dispersion in the liquid as a result of condensation of smoke from pyrolysis of wood) as a curing medium .

Generally the wider community, especially coastal communities do fumigation with traditional curing techniques. Though this curing technique has a lot of shortcomings, among others, requires a long time, is not efficient in the use of firewood , the uniformity of the product to produce the desired color and flavor that is difficult to control, environmental pollution , and the most dangerous is the presence of residual tar and polycyclic hydrocarbons aromatic (benzo (a) pyrene) were deposited in the diet so as to endanger health . In areas producing smoked fish, to meet the source of smoke (fuel wood) many people who cut down trees , even be protective coastal mangrove were not spared from logging target. This situation makes the use of alternative fuel wood has to be well thought out and fogging technique was time to be replaced with modern fumigation.

Wider use of liquid smoke fogging its application to replace the traditional way . With liquid smoke smoke scents giving the fish will be more practical because it is only by spraying or dipping the fish in the liquid smoke solution followed by heating. Increasingly rapid development of liquid smoke in the preservation of food, because of the cost required for the manufacture of wood and smoke more efficient equipment, hazardous components can be separated or reduced before used in food as well as the composition of the liquid smoke is more consistent for repeated use (Maga, 1988). Contained in wood smoke antibacterial and antioxidant substances that can preserve food, especially fish fillets . The composition of these substances varies depending on the type of wood used. Softwood usually will produce fumes containing preservative lower than hardwoods. The use of hardwoods is more widely used by communities to fumigation. Consequently there will be more destruction of the environment (illegal logging) primarily to meet the needs of fumigation materials or for other processing needs. To overcome this problem, an alternative that can be done is by utilizing agricultural waste such as coconut shell as raw material liquid smoke. Some research on the production and use of liquid smoke has been carried out, among others, the determination of the temperature and time of pyrolysis of rubber wood to produce high quality liquid smoke (Darmaji et al.,2000), determination of the

antibacterial properties of liquid smoke produced from several types of softwood (Darmaji, 1996) , preservation of smoked tongue with liquid smoke produced from teak wood (Sari,2004). These studies all utilize hardwood and softwood separately. Whereas softwood with low lignin content will be very effective to extend the lasting power of fish and produce atypical flavor (Rojum,1999) when combined with other wood (hardwood) .

By looking at the potential and benefits of coconut shell is widely available as an agricultural waste in the Indonesian province of West Sumatra, it is necessary to improve the effectiveness of the use of hardwoods, especially coconut shell as material pengasap to improve the quality of liquid smoke and its use in the preservation of fish fillet jerky.

2. THE PURPOSE OF WRITING

The purpose of this paper is to provide information to the consumer (public) regarding the potential use and usefulness of coconut shell liquid smoke as a preservative fish fillets that are environmentally friendly

3 . THE INTRODUCTION OF LIQUID SMOKE

a. Liquid smoke

Liquid smoke is a waste product of the integrated coconut processing, namely the basic ingredients of coconut shell . Liquid smoke is a mixture of a solution of disperse wood smoke in the water made by condensing the results of pyrolysis liquid smoke. The results of the pyrolysis liquid smoke depends on the base material and the pyrolysis temperature. Liquid smoke has the ability to preserve foodstuffs has been done in Sidoarjo to smoke because of the milkfish phenolic compounds, acids and carbonyls (Tranggono et al, 1977) .

Condensate liquid smoke is the smoke that has suffered from storage and filtration for separating tar and particulate materials (Pazzola, 1995). One way to make liquid smoke is the smoke condensing products of incomplete combustion of wood. During combustion, the main component of wood in the form of cellulose, hemicellulose and lignin will undergo pyrolysis . During pyrolysis will form various compounds. The compounds contained in the smoke can be grouped into several categories, namely phenol, carbonyl (ketones and aldehydes especially), acids, furans, alcohols and esters, lactones, aliphatic hydrocarbons and aromatic hydrocarbons polisiklis (Girard, 1992). But the major components that contribute to curing reaction only three compounds , namely : acid, phenol and carbonyl (Hollenbeck, 1978) .

Smoke composition is influenced by several factors, including the type of wood, moisture content and combustion temperature are used. Hardwoods are more widely used than softwoods , hardwoods because generally produces a better aroma and richer content of aromatic compounds and acidic compounds. High moisture content will

reduce levels of phenol and carbonyl compounds as well as flavor enhancing products more acidic . Pyrolysis at a temperature of 600 ° C would result in the maximum levels of phenolic compounds, carbonyl and acid. Products are treated with the smoke of the pyrolysis temperature of 400 oC assessed as having a higher organoleptic quality than that required by the smoke of pyrolysis at higher temperatures. Wood combustion temperature rise followed by a linear increase polisiklis hydrocarbons, phenolic constituents in parallel with the increase occurs at a temperature of 400-800 ° C (Girard , 1992; Maga 1988) .

Liquid smoke is already in use in the United States for processing meat preservation after previously precipitated and filtered to separate the tar compounds. International market for liquid smoke products include the U.S., Europe, Africa, Australia and South America . Liquid smoke is a natural liquid condensates from wood smoke are brooded and filtered to remove tar and sediment particles (Maga, 1988). According to Simon et al. (2005) liquid smoke obtained by pyrolysis technique, where the compounds will evaporate simultaneously withdrawn from the hot zone of the reactor and will condense on the cooling system. Added that during the process of condensation will form a rough smoke condensate which will split into three phases, namely phase water soluble, not water soluble phase and phase tar. Water-soluble phase can be directly used, whereas the extract phase with high levels of tar that has been purified can be used again for the production of liquid smoke and usually called primary tar fractions (PTF). The quality of liquid smoke obtained from the pyrolysis is strongly influenced by the type of plants, temperature is used, the wood particle size and moisture content of wood (Guillen and Ibargoita, 1999).

Liquid smoke has several advantages, namely : easy to apply / practical usage , more uniform product flavor , can be used repeatedly, is more efficient in the use of materials pengasap, can be applied to various types of food, environmental pollution can be minimized and the most important compounds carcinogens that are formed can be eliminated (Simon et al. 2005). Liquid smoke can be applied in various ways such as spraying, dipping or mixed directly into food (Pearson and Tauber, 1984). Girrard (1992) divides the methods use liquid smoke for food products into six, namely (1) mixing , in which the liquid smoke is added directly to food products. For processed meat products, flavor is added in varying amounts. This method can be used for fish, meat emulsions , meat seasoning food , frankfurter -type sausage , cheese and other ole, (2) immersion and immersion, this method can produce food products that have a high organoleptic quality such as Italian sausage and cheese, (3) Injection (injection), a lot of smoke flavor that is injected varies between 0.2-1 % can provide uniform flavor especially dging pork belly, (4) Atomization, atomized smoke flavor into the product through a channel . This method gives good organoleptic quality of the meat, (5) Spraying, commonly used in meat processing continuously, (6) Evaporation, heating a liquid to produce a vapor smoke containing smoke is one of the methods used for the fumigation of foodstuffs .

The amount of smoke that is attached to the smoked material is influenced by several factors such as the composition and concentration of smoke, environmental conditions and the type of surface material that is smoked (Cutting, 1965). Added by Foster (1977) settling velocity of smoke particles in the water about 5-20 times greater than the surface of the dry matter and the deposition will be higher during the evaporation process is still ongoing.

Liquid smoke composition by Maga (1988) is as follows : water 11-92 % , 0.22-2.9 % phenol, acid 2.8-4.5 %, 2.6-4.6 % and tar carbonyl 1-17 %. Meanwhile, according to Tiger et al. (1962) cited Bratzlerr et al. (1969) the main component of wood smoke condensate was 24.6 % carbonyl, carboxylic acid 39.9 % and 15.7 % phenol. The smoke components function as antimicrobial, antioxidant, forming the aroma, flavor and color .

The results of the study Tranggono et al. (1996) turns liquid smoke from coconut shell has 7 different dominant component, namely phenol, 3-methyl-1.2 - siklopentadion, 2-methoxyphenol, 2-methoxy-4-methylphenol, 4-ethyl-2-methoxyphenol , 2,6 - dimetoksifenol and 2.5 - dimethoxy benzyl alcohol , all of which are soluble in ether . Further added that of some other types of wood such as teak, lamtorogung, mahogany, camphor, bangkirai, keruing and glugu, liquid smoke produced acid (as acetic acid) between 4:27 - 11.3 %, phenolic compounds (as phenol) 2:10 to 5:13 % and carbonyl compounds (as acetone) 8:56 to 15:23 % .

b . Smoke as a preservative

Smoke can act as a preservative if the components of smoke settles or seep into the material smoked . Substances present in smoke is a material that is bacteriostatic and bacteriocidal . Compounds that are acting as anti-microbial compound is a phenol and acetic acid , which is increasing its role when there are two compounds together . In addition to the flavor and aroma of smoked products are also caused by carbonyl compounds and phenols (quaiacol , 4 - Metty - quaiacol , 2,6 - dimethoxy phenol) . Phenol is bacteriocidal as well as in addition to antioxidants . These properties mainly in phenolic compounds with high boiling point such as 2.6 - dimethoksi phenol , 2,6 - dimethoksi - 4 - methyl phenol . While phenolic compounds with low boiling points rather low antioxidant properties (Person and Tauber , 1973 in Tampubolon , 1988) .

Buckle et al. (1985) stated that the volatile acids in smoke will lower the pH so that it can slow the growth of microorganisms. According Darmadji (1996) acidity has a very big role in the inhibition of microbes. At pH 4.0 , liquid smoke is able to inhibit all spoilage bacteria and pathogens were tested . According to Girard (1992) Smoke- resistance of bacteria to treatment vary greatly . There are very sensitive (pathogenic and spoilage bacteria) and there are very resistant bacteria such as Micrococcus and lactic acid . While at high pH around 6.0 liquid smoke on the growth inhibition of bacteria began to decrease . The smoke is more effective at inhibiting the growth of the vegetative cells inhibit the growth of bacterial spores and smoke germisidal activity will increase as the temperature increases and the

concentration of smoke , while gram-negative bacteria are more sensitive than gram - positive bacteria .

The main function is to provide smoke flavor and color desired in the product due to the presence of smoke phenol and carbonyl compounds . The next function is the preservation because the content of phenolic compounds and acids that act as antibacterial and antioxidant (Pszczola , 1995 in Darmadji , 2002) . Product quality is determined by the amount of smoke that smoke sticks to the products that are affected by the thickness of the smoke , smoke movement velocity , humidity and surface moisture products (Wibowo , 1995) .

Girrard (1992) stated that the phenols in small concentrations can demonstrate its effectiveness as a barrier to oxidation reactions . Antioxidant compounds that are common in use in the United States also belonged phenolic compounds , namely BHT and BHA . Phenolic compounds with high boiling point such as 2.6 - dimetoksifenol - 4 - methylphenol and 2,6 - dimethoxy - 4 - etilfenol is a compound that plays an important role in antioxidant activity (Maga , 1988) . Further it is said that the phenolic compounds contained in the smoke and demonstrate antioxidant activity is pirokatkhol , hydroquinone , guaiacol , eugenol , isoeugonal , vanillin , salisilaldehid and 2 - hydroxybenzoic acid .

c . Carcinogenic compounds

Fumigation it can produce compounds that are not safe for human health because it is a carcinogen. Such compounds include benzo(a)pyrene and nitrosamines (Tonogai , 1982 in Hadiwiyoto et al . 2000) . According Simko et al . (2006) Polycyclic Aromatic Hidrokarbons (PAHs) contain harmful contaminants such as potentially cancer-causing substances and genes or mutations, are formed by the incomplete combustion of fossil fuels and other organic. From the results of his research, PAHs are found in every part of the environment, including the food that is processed by the process of evaporation , burning, roasting, frying and roasting oven. Rhee and Bratzler (1968) in Jaya et al . (1997);Andelman and Suess (1970) in Simko et al. (2006) stated that benzo(a) pyrene is a compound used as an indicator of contamination of PAHs in food because of its spread is very wide and is a carcinogen . Formation is influenced by several factors such as the type of wood and pyrolysis temperature (Tilger,1976 in Jaya et al.1997) and fat content material (Doremire et al. 1979 in Jaya et al. 1997) .

Benzopiren is a compound belonging to the Polycyclic Aromatic Hidrokarbons (Figure 2) . In a state of pure crystalline form (powder) is yellow with a melting point of 179ºC and 312ºC. The boiling point the molecular weight 252, is not soluble in water , slightly soluble in alcohol, soluble in benzene, toluene and xylem (Sax and Lewis , 1978 in Jaya et al. 1997) .

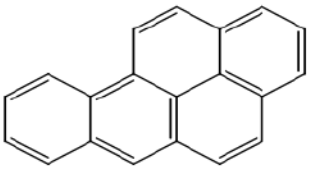

Figure 1 . 3,4 - Benzo (a) pyrene

Some research on the content of benzo (a) pyrene in liquid smoke , suggests there is a difference in the number of different types of wood . Table 7 shows the content of benzo (a) pyrene in some kind of timber . According to Maga (1999) that the higher the content timber will ligninnya benzopiren tend to produce more and more .

Table 1 . The content of benzo (a) pyrene (ppb) of liquid smoke in some kind of Timber various pyrolysis temperatures

	Pyrolysis Temperature (ºC)			
Wood Type	250	300	350	400
Cassava*	2.4	-	-	-
Mangrove	-	8:55	9.69	15:12
Kosambi	-	10:33	13.79	25.33
Teak	-	6.81	36.99	18:38
Coconut shell	-	16:01	19:10	41.14

Source: Jaya et al . (1997)
*Hadiwiyoto et al .(2000)

Several other studies also showed sizeable bezopiren content in a variety of smoked products . Gangoli research results (1986) showed that the levels of benzopiren satay (charcoal fuel) reached 5-8 ppb, coffee cooking couples containing 0.1-0.5 ppb, whereas in smoked fish (smoking hot) benzopiren content of about 0.47-2.6 ppb in the flesh , and 9-74 ppb in the skin .

d. Proses Production of Liquid Smoke

1. Pyrolysis

Pyrolysis is derived from two words namely pyro which means heat and lysis means decomposition or degradation, so that means the decomposition of biomass pyrolysis because of the heat at temperatures over 150 ºC (Kamaruddin et al .1999) . He said there are two levels in the pyrolysis process, the pyrolysis of primary and secondary pyrolysis. Pyrolysis is the primary pyrolysis occurs in the raw material and

takes place at temperatures less than 600 ºC, which is the main decomposition are carbon (charcoal). Pyrolysis primary primary pyrolysis distinguished slow and fast. Primary pyrolysis occurs later in the process of making charcoal. At the rate of slow heating (temperature of 150 ºC-300 º C) the main reaction is dehydration (loss of water content), and the results of the overall reaction is carbon solids (C=charcoal), water (H2O), carbon monosikda (CO) and carbon dioxide (CO2). Primary pyrolysis occurs rapidly at temperatures over 300 ºC and produce gas, solid carbon (charcoal) and vapor (Kamaruddin et al.1999). In general, the reaction is as follows :

Biomass = steam + gas + charcoal + water
(100 g) (50-70 g) (4-10 g) (10-20 g) (13-25 g)

The secondary pyrolysis pyrolysis happens to particles and gases/vapors and ongoing results of the primary pyrolysis temperature above 600 ºC. The results of the pyrolysis temperature is karbonmonosikda (CO), hydrogen (H2) ,and hydrocarbons . While tar (secondary pyrolysis tar = SPT) approximately 1-6 % (Kamaruddin et al . 1999) .

According to Girard (1992), the pyrolysis of wood is an incomplete combustion reaction which include decomposition reactions of organic polymers into organic compounds with low molecular weight, oxidation and condensation reactions. The reactions that occur during wood pyrolysis process is the removal of water from the timber at a temperature of 120-150 º C (Girard, 1992) ; 100-150 ºC (Zaitsev et al. 1969) , hemicellulose pyrolysis at temperatures of 200-250 ºC, the pyrolysis of cellulose in temperature of 280-320 ºC and the pyrolysis of lignin began to occur at a temperature of 400 ºC.

Previous Panshin (1950) in Kamarudin et al. (1999) has stated that the pyrolysis process produced a variety of products that are generally classified into three kinds , namely : (1) The gases are not condensable. Gases released in the process of carbonization is mostly CO2 and partly in the form of gases such as CO flammable, CH4, H2 and other low-level hydrocarbons. The average composition of the total gas produced in the pyrolysis process of wood are presented in Table 8, (2) a distillate liquid smoke and tar. Chemical composition consisting of methanol, acetic acid, phenol, methyl acetate, formic acid and others. (3) The residue in the form of charcoal (carbon).Charcoal is a black solid consisting mainly of carbon. At high temperatures, the carbon content rose more perfect because of dehydration and removal of products volatile .

Table 2 . The average composition of the gas in the pyrolysis process of wood

	Levels of the gas component (%)
Carbon dioxide	50.74
Carbon monoxide	27.88
methane	11.36
hydrogen	4.21
ethane	3.09
Unsaturated hydrocarbon	2,71

Source: Panshin , 1950 in Kamarudin et al . , 1999.

Cellulose pyrolysis takes place in two stages . The first stage is the reaction of the acid hydrolysis followed by dehydration produce glucose . The second stage is a reaction that produces acetic acid and homologs and water and a small amount of furan and phenol (Gilbert and Knowles, 1975 in Fatima, 1998) . According to Tillman (1981) in Tahir (1992), the reaction of cellulose thermal degradation begins with bond breaking glycosides into monosaccharide units, followed by the decomposition reaction of monosaccharides into gases and condensation reactions that produce charcoal.

Hemicellulose composed of pentosan (silane and araban) and heksosan (mannan and galaktosan). Pyrolysis pentosan produce furfural , furan and its derivatives as well as a long series of carboxylic acids . Pyrolysis heksosan mainly produces acetic acid and homologs. The compounds were obtained from the pyrolysis of lignin plays an important role in providing the aroma of smoke smoked products. These compounds are phenols and phenol ethers, such as guaiacol (2-methoxy phenol), syringol (2,6-dimethoxy phenol), homolog - homolog and its derivatives (Girard, 1992). Added that the chemical structure of softwood lignin is different from the chemical structure of lignin from hardwood . The difference lies in the structure of the methoxy substituent on the ring aromatic, thus causing differences in results pirolisisnya. In hardwoods, lignin pyrolysis will produce syringol and derivatives as the main products, while the soft wood, pyrolysis will produce guaiacol and its derivatives (Fatimah, 1998).

2 . Refrigeration

Cooling is basically an attempt to release the heat of a substance into the environment at a lower temperature, but is sometimes on a particular process can release heat at a higher temperature. Cooling also means lowering the temperature of the material in accordance with the requirements so that the water content in the material do not need to freeze (Helhman and Singh, 1981) .

The process of cooling a material can be closer to a colder fluid from the material itself .According to Kamaruddin (1976), colder fluid (refrigerant) can be circulated in a manner that allows for the transfer of heat is taken from the material to be cooled .

Added that the process of heat transfer by convection can occur, conduction and radiation . Convection is heat transfer processes associated with fluid movement . If the movement of the fluid is due to the external force is called forced convection, whereas if the movement of fluid occurs due to differences in densities that cause the difference in temperature is called free convection .

Conduction is the transfer of energy through direct contact between molecules of different substances temperature. Radiation is heat transfer by electromagnetic waves emitted by atomic vibrations on the surface of a material .

3 . Cooler and condenser unit

All heat exchange cooling system by releasing heat into the air , but there is also another way is by releasing heat into the air through direct contact with water (Lee and Sears, 1959 in Firman, 2004). Added that based on the refrigerant used , can be divided into two, namely: (1) with the air conditioner. Air as the refrigerant flows into the cooler with the help of a fan. The air conditioning has a major component of finned pipe winding. Air flows through the inside of the pipe while cooling flows on the outside. Most of this type is equipped with a cooling fan, (2) with water cooling device. Water as a refrigerant is pumped into the cooler. Usually this water after coming out of the cooling device for cooling dilairkan again. If available water is plenty, the water coming out of the cooling device directly discharged. Water cooler with a generally cylindrical shaped tube with a line of pipes installed in dalamnya.Kondensor function as a refrigerant condensing during the desorption process, which is to throw the heat and change the material form of a gas into a liquid refrigerant (Heldman and Singh, 1981). The condenser is a tool to make the condensation temperature and high pressure. Condenser cooled with cold air from the water that is pumped and circulated in the tube at room temperature while cooling gaseous material with high temperature and pressure along the pipeline flows in the condenser. The gas is cooled by the outside air temperature drops so cold. Once the temperature reaches the temperature of condensation and then a process of condensation. His form gradually changed into a liquid but the pressure is still high. Time cooling material out of the bottom of the condenser his form has been completely transformed into a liquid. Image -making equipment such as liquid smoke figure 3 below .

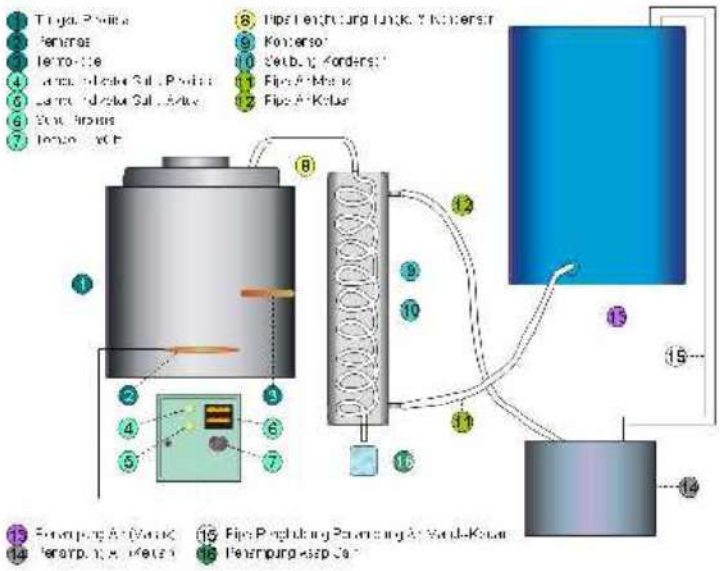

Figure 3 . Equipment maker of liquid smoke

4 . Materials Liquid Smoke Author

1 . Coconut shell

Coconut shell is the hardest part of the coconut fruit. Located next to the fiber with a thickness of 3-5 mm and serves as a protective coconut meat from damage caused by external influences (Awang, 1991). Whole coconut fruit consists of 30 % pulp, 33 % fiber, 15 % shell and 22 % coconut water (Jeanette et al. 1985 in Bintoro et al. 2000). Coconut shell as well as having a large amount of wood lignin and small amounts of cellulose. Methoxyl content of coconut shell similar to the wood, and the water content varies according to the environment, the variety and ripeness of the fruit. Coconut shell derived from the ripe fruit on the air dry state water level around 6-9 % (Djatmiko and Ketaren, 1978). The chemical composition of coconut shell can be seen in Table 3 .

Based on the research results Yulistiani et al . (1997) contains cellulose, hemicellulose and lignin coconut shell are respectively 29.66 % , 41.72 % and 18:35 %. Analysis of the results of smoke coconut shell pyrolysis (400 ° C) using GC - MS, showed that there are two main compounds at a concentration of 1:28 % phenol and 9.60 % acetic acid , both of which are antimicrobial compounds .

Table 3 . The chemical composition of coconut shell

Parameters	Sri Lanka	Philippines
Ash content	0.61	12:55
Lignin	36.51	27.27
Fibers	53.06	32.52
Pentosan	20:54	5:26
Cellulose	32.52	28.26
Methoxyl	-	5.48

Source: Djatmiko and Ketaren, 1978.

5 . Application of liquid smoke

One of the advantages is the liquid smoke can be applied to foods that are usually not smoked (Maga, 1988). Liquid smoke has been applied to the processing , including the meat and livestock products , processed meats, cheeses and cheese smeared. Liquid smoke is also used to add smoke flavor to sauces, soups, canned vegetables, herbs and spice mixture. The new application is to add liquid smoke flavor to foods that reduced fat (Pazzola, 1995) . According Varnam and Sutherland (1995) liquid smoke is easier to use, more economical and can be applied at the desired temperature, it is also possible to menfraksinasi liquid smoke to obtain the desired organoleptic properties . Liquid smoke can be applied to products in various ways, namely :

a. Mixing

Liquid smoke can be added directly to the product such as sausage , salami , cheese topical, emulsified meats, grilled meats and condiments etc. (Girrard, 1992; Hollenbeck , 1978: Pazzola, 1995) .The amount of liquid smoke is added to the product between 0.1-1% by weight of the product (Gorbayov , 1971) .

b. Dyeing

Smoked Products immersed in a liquid containing liquid smoke for 50-60 seconds . Immersion in liquid smoke treatment effect on the color of smoked products but it feels very weak . Products are treated in this way showed satisfactory organoleptic quality overall . This method is mainly done for fish , pork, shoulder , abdomen and sausage meat . This method was also performed on the cheese industry in Italy , where the cheese is immersed in a salt solution of smoke (Girrad , 1992: Hollenbeck , 1978) .

c. Injection

Liquid smoke added to the solution which is injected in an amount varying between 0.25 to 1 % . This method produces flavor and repetition are more uniform in fish meat (Girrard , 1992) .

d . Atomization

Diatomisasikan liquid smoke into a channel where fish products bergerak. This gives the appearance of smoke in the abdomen meat products, sausages and ham, obtained in this way have good organoleptic qualities (Girrard , 1992 ; Hollenbeck , 1978; Pazzola , 1995) .

e . Evaporation

Evaporation of liquid smoke from the hot surface will change back from a liquid form of liquid smoke to steam / smoke (Hollenbeck , 1978) .

6 . Study of the use of liquid smoke as a preservative fish fillets

Budaraga study (2008) on the application of coconut shell liquid smoke to the fish prior to processing differences in treatment given different concentrations of liquid smoke showed that the best concentration of liquid smoke obtained on application of liquid smoke concentration of 0.6 % as indicated by the highest protein content (33,69 %) and test organolektik mainly from the appearance and color preferred by consumers and liquid smoke can act as a substitute anchovy preservative formaldehyde and borax . In this study, the duration of application has not determined the best, as determined both 5 minutes and need to do a search sources producing liquid smoke that could be used as a substitute for formalin preservative .

Based on the suggestions of research conducted in 2008, then further research Budaraga (2010a) conducted a study with the treatment of various treatments pyrolysis temperature (100°C, 200°C, 300°C and 400°C) combined with some liquid smoke sources of raw materials derived from waste plantation crops (coconut shell, coco and cinnamon) obtained results cinnamon liquid smoke showed the best results in terms of aspects of the content of benzo (a) pyrene (0.4 ppm) , the amount of liquid smoke condensate produced (380 ml of 5 kg of liquid smoke cinnamon for 1 hour at a temperature of 400 °C), and the specificity of the resulting odor . Based on these results, it is suggested because of the content of benzo (a) pyrene toxic nature is still high above the standard provisions of the FAO that is a maximum of 10 ppb in liquid smoke product generated, it needs to be done in various ways purification of liquid smoke obtained grade III. Another suggestion that because of the specificity of the smoke smell out of the liquid, it is necessary to also research the raw material moisture content differences cinnamon.

Furthermore, based on the results of further research studies Budaraga (2010b) treats the process of making liquid smoke at the pyrolysis temperature of 400 oc with treatment differences in moisture content of the raw materials with a long cinnamon pyrolysis (0.5 hour, 1 hour,1.5 hour and 2 hours), and liquid smoke obtained from the treatment of wood, sweet dried prior to purification with a time of 1.5 hours pyrolysis best with acetic acid content of 43 %, while 3.17 % 3.95 % phenol furfural, while the highest was obtained in the wet on a long cinnamon pyrolysis 1 hour. The best actual results subsequently be purified by a variety of

treatments that purification by distillation (100 OC temperature and 200oC) , decantation (1 day , 2 days , 3 days and 4 days) and by filtration using activated charcoal , zeolite , activated charcoal mixture with zeolite , the results obtained after purification largest yield obtained for purification by filtration and decantation with a range of 92-98 % yield , while the yield obtained in the distillation of 42-62 % further on a specific gravity no significant difference in numbers , to chemical components such as pH , total acids and phenols found no differences in the numbers prodding , but in general that the distillation process produces better color liquid smoke (clear) than by filtration and decantation . Based on test results using HPLC , compounds not detected benzo (e) pyren the cinnamon liquid smoke either before purification and after purification .

Based on these results the next phase of the research will be to apply liquid smoke cinnamon on tilapia fillets with a treatment difference in the concentration of liquid smoke cinnamon (5,10,15 and 20 %) and differences in immersion time (5 minutes , 10 minutes and 15 minutes) . Strategic grant research activities being carried out in the year 2011 today, next best results among the combination of long immersion with different concentrations of liquid smoke cinnamon tilapia filet on the application will be continued storage at room temperature combined with a wide variety of packaging (plastic polyethylene , propylene and without packaging) . From the results of the study are expected to be out of tilapia filet product quality , shelf life and safe for health .

Based on the research above, the chances of the development of liquid smoke as a preservative in food , especially processed fishery will be very good the next . Especially for areas of West Sumatra Province potential development of freshwater fisheries such as tilapia and catfish. The existence of processing and preservation will maintain price stability so that farmers' income to be stable . Given the huge potential in addition , tilapia has been done to study to be processed into filet . Until now specifically to study catfish filet smoke using liquid smoke has not been done . A recent study is the application of coconut shell liquid smoke on African catfish filet was done by Yanti.RA , and Rochima (2009) , and the results obtained that the use of drying temperature 90 ° C gives a good effect on the chemical characteristics of African catfish filet of fish liquid smoke at room temperature storage for 9 days which includes levels of TVB MGN 82.94 % , TBA levels of 1.0666 mg malonaldehyde / kg , moisture content of 18.59 % (b , k) , and the pH value of 5.24

Seeing an opportunity for the community above most in making catfish smoke especially in the province of West Sumatra still use firewood for curing , and requires a long time is 7-9 hours, then the solution uses liquid smoke , especially the use of liquid smoke cinnamon will help improve income communities engaged in the business of making smoked catfish. The advantages of using liquid smoke cinnamon if used by the public is a. reduce the impact of the use of firewood for curing because it would be damaging forests, b. help reduce pollution during the public to make charcoal from wood smoke coming out sweet that can be captured

into a liquid smoke that provide additional income for rural communities , c . time use in the manufacture of smoked fish will be shorter which is 4-5 hours so it will reduce the cost of production , and could use a fuel briquette coconut shell that is environmentally friendly , d . The quality of the smoked catfish believed to be better both in terms of the appearance of color , aroma and flavor shelf life , in addition to will be safer for health .

Based on the description above then do research for 3 years to produce smoked catfish filet higher quality , have a longer shelf life and safe for health . Then research conducted in year 1 is to apply the use of liquid smoke cinnamon derived from dry wood raw material before purification (Budaraga research results in 2009 and 2010) on the application of African catfish filet smoke combined with the use of different concentrations . The existence of this treatment will be out the research applications of liquid smoke (immersion) for 10 minutes prior to purification (grade 3) with the appropriate concentration for preservation smoke Dombo catfish filet (Budaraga, 2012) . Catfish filet Dombo smoke after being given further treatment without packaging stored at room temperature . The parameters observed were : organoleptic properties , chemical properties , antimicrobial , antioxidant and toxixitasnya properties . So that the output of this research will have a comparison analysis between African catfish smoked using wood fumigation with smoke Dombo catfish using liquid smoke using coconut shell briquette fuel . Based on the results of the first study (2012) , followed two years of research which uses a distillation purification step using a temperature of 100 °C (based on research results Budaraga in 2010) , then smoked catfish filet given the same treatment as the treatment above, and stored at room temperature without use packaging. The parameters observed were: organoleptic properties, chemical properties, antimicrobial , antioxidant and toxixitasnya properties . So that research outputs are expected to produce smoke Dombo catfish filet higher quality and safe for health .

From the research, Year 2 (2013) above will continue fieldwork 3rd Year with treatment equally store at room temperature results of the best research in the study of 1 (one) and year 2 (two) combined with different types of packaging (polyethylene packaging, poliproplilen and sterofoam), further storage at room temperature and observed parameters include : organoleptic properties , chemical properties , antimicrobial , antioxidant and shelf life of the product filet . So that the output of this study will get a product shelf life of smoked catfish filet on the packaging which is considered the best by consumers, and the quality is still acceptable and safe for health .

Further directions of research after the research is completed applications will be developed to study the use of liquid smoke cinnamon on products processed fishery products such as fish nuggets, fish brains, sausages and fish balls so that with this study will actually be able to create materials processed results fisheries are safe for health and can encourage people to avoid the use of preservatives such as formaldehyde and borax banned very harmful to health . Furthermore, while the

above description of the research roadmap that has been conducted by researchers , which will be performed as well as the proposed research plan after the study can be described as follows :

a. **The research activities that have been conducted since 2007-2011 Researcher**

1.Study application of liquid smoke, ---------- (Budaraga , 2007) Coconut shell on anchovy
2 . Study of the use of pyrolysis temperature ---------- (Budaraga 2009) combination with the use of different sources of raw materials the quality of liquid smoke
3 . Study of the use of cinnamon,---------- (Budaraga , 2010).with a water content of different combinations with different long pyrolysis to quality liquid smoke cinnamon
4 . Study several ways of refining liquid smoke ---------- (Budaraga , 2010) cinnamon grade 3 to produce smoke grade liquid cinnamon
5 . Study application of liquid smoke cinnamon ---------- (Budaraga , 2011) Grade 2 on tilapia filet (already implemented)
6 . Older studies tilapia filet store.---------- (Budaraga , 2011). combined with the type of Different packaging on storage at room temperature (being implemented)

b. **Research applications that have been implemented and the development of the use of liquid smoke cinnamon for processed fishery products such as catfish filet Dombo smoke**

1 . Study the effect of drying temperature on ---------- (Yanti et . , Al , 2009) Chemical characteristics of the African catfish filet smoke liquid at room temperature storage
2 . Study application of liquid smoke cinnamon ---------- (Already implemented in 2012) Grade 3 to smoke in storage African catfish Room temperature .
3 . Study application of liquid smoke cinnamon.---------- (Already implemented in 2013) Grade 2 of the African catfish smoke in storage room temperature

c. **Planning after this research is completed**

1 . Study application of liquid smoke cinnamon. ---------- (Planning. 2015) the quality of the fish nuggets during storage at room temperature
2 . Study application of liquid smoke cinnamon,---------- (Planning. 2016)

the quality of fish for brains storage at room temperature
3 . Study application of liquid smoke cinnamon.---------- (Planning. 2015). the quality of fish sausage and meatballs for storage at room temperature

c . How to Make Liquid Smoke In Fish Fillet Preservative material Non-Carcinogenic (Budaraga , 2011)

1 . **Coconut shell material Pyrolysis Process .**

The process of separating the material with no direct flame heating , 100 kg of coconut shell that has been cleared of sabutnya has been reduced in size and included kereaktor pyrolysis capacity of 150 kg , is heated to a temperature of 400 degrees C for 2-4 hours , will be obtained three fractions : 1 . Solid fraction in the form of charcoal with high quality , 2 . Weight fraction in the form of tar ,

2. **Light fraction and methane gas fumes** .From our light fraction stream condensation pipe to smoke in order to obtain liquid methane gas while the gas continues to be not takterkondensasi (can be used as fuel) . Liquid smoke obtained can not be used for food preservatives because they contain hazardous materials .

3 . Purification process liquid smoke

The process of purification of liquid smoke to get liquid smoke that contains no harmful ingredients making it safe for food preservatives . Liquid smoke obtained from the condensation of smoke in the pyrolysis process was deposited over a week ago and then we take over the liquid and put into a distillation apparatus , different processes such as pyrolysis liquid smoke if the material distillation , distillation temperature of about 100-150 degrees C , the results of our distillate capacity , distillate still not be used as a food preservative is no longer a process that must be passed .

4 . Process Filtration with Zeolite Active distillate

Filtration process with zeolite active distillate intended to get active substances are completely safe from harmful substances . The way the smoke distillate liquid substances we flush into the active zeolite column and obtained filtrate liquid smoke that is safe from hazardous substances and can be used for non- carcinogenic food preservative .

5. **Process Filtration active zeolite filtrate with Activated Carbon**.

Filtrate active zeolite filtration process with activated carbon is intended to obtain the filtrate liquid smoke with the smell of smoke is mild and does not

sting , how filtrate of active zeolite filtration flowed into the column containing activated carbon so that we obtain a filtrate liquid smoke with the smell of smoke is mild and do not sting , then completed the liquid smoke as a food preservative which is safe, effective and natural .

6. **Control Quality Control**

To maintain the quality of liquid smoke in terms of both safety and effectiveness as a food preservative required test apparatus using GC / MS .

6. Liquid Smoke Safe For Health.

Head of Food and Drug Monitoring Agency (BPOM) Sampurno said liquid smoke (liquid smoke) that was recently introduced as an alternative food preservative formaldehyde is safe for health. "In other countries, these preservatives are categorized as ' gras ' or Generally Recognized As safe or generally safe to eat , " he said , in Jakarta , Monday (16/1) . however , he said , to ensure the safety of these products for consumers , BPOM will conduct further testing of the preservative made from coconut shell burning smoke it . " BPOM is researching the security level of this product with test Lethal doses (LD) 50 to test the level of toxicity , " said Sampurno following the signing of the cooperation agreement between the production of liquid smoke Indonesia Cooperative Council (Dekopin) and the Center for Integrated Coconut Processing (PPKT) . Similar to Sampurno , researchers from the Faculty of Mathematics and Natural Sciences (IPA) , Gadjah Mada University (UGM), which pioneered the manufacture of liquid smoke in Indonesia , Bambang Setiaji ,also said that the preservative liquid smoke is safe to say kesehatan.Ia , although clinical trials of colored liquid dark brown which can inhibit the growth of bacteria that has not been done , but the product does not contain preservatives that are harmful to health compounds .Bambang said phenolic compound - long chain phenols contained in the liquid smoke is not a chemical compound that is harmful to health . The only compounds in liquid smoke is not good for the health of Benzo (a) aspirin or commonly called tar was , he said , has been eliminated at the beginning of the manufacturing process . After the outbreak of the issue of the use of formalin - formaldehyde in water which is used to preserve dead bodies in some food products formalin preservative alternative offered .

Liquid smoke , which is made from distilling the smoke of burning coconut shells , a type of preservative formalin substitutes are offered in addition to Chitosan . Preservative in the country of manufacture initiated since 1992 has previously only used to preserve fish , especially in the production of smoked milkfish .

According to Bambang (2007) , the fish are soaked for 10-15 minutes in a mixture of 25 percent and 75 percent smoke liquid water can be preserved for 25

days . " 25 liters of liquid smoke mixed in 75 liters of water can be used to soak the fish 1,000 milkfish . Yet in the next, said Bambang , a preservative that is now sold for Rp . 6.000/liter in Yogyakarta it can also be used to preserve food products other like wet noodles and tofu . " But of course at lower concentrations , when used to preserve fish 25 percent, to know and noodles only about 5 percent , " said Bambang . Bambang said that in order to develop the use of liquid smoke as a food preservative , has built PPKT 13 liquid smoke production centers are located at Yogyakarta , Gorontalo , Sumba , and Tabanan . PPKT also cooperates with Dekopin to build production centers so that the new liquid smoke product that can be used by the wider community . Typically , to preserve fish , meat , and other foodstuffs is the method of fumigation . its function is to lower the water kadara to develop the color , flavor -specific and inhibit microbial growth . however, this method has the disadvantage that , the quality is inconsistent , difficult to control the process , terdepositnya ter in foodstuffs , and this dangerous, often also cause air pollution.

Can be overcome by using liquid smoke Liquid smoke can be done degan direct addition to the product in the form of sauces , dipping , spraying , fogging , and the evaporation of liquid smoke . then how secure if we use liquid smoke ... ? To prove bahawa liquid smoke is safe , has been testing the determination of lethal concentrantion 50 (LC50) to fish or pengujuian lethal dose 50 (LD50) in mammals such as rabbits , rats , and mice . LD50 determination is a determination of the ability of toxic chemicals which cause acute death of experimental animals up to 50 % via oral administration . This test is very important to measure and evaluate the toxic characteristics of a chemical . can also provide information about the human health hazards from exposure to the chemicals in the body in a short time via the oral route . Acute toxicity can be defined as the occurrence of poisoning due to exposure to toxic materials in a short time , usually can be calculated LC50 and LD50 values . This value ddidapkan through statistical processes and functions measure the acute toxicity of materials kimia.uji relativism can be performed using certain species such as mammals , birds , fish , invertebrates and algae vascular plants . while for the LD50 test is recommended using rats , mice , and rabbits . results of the study can be summarized as follows .

The study was conducted in female mice by using liquid smoke grade 2 and parameter determination is sought is a lethal dose 50 (LD50) . prapenelitian first performed with various stages doses using 2 mice in each group . This test is intended to get the second dose mice which did not experience death . before they were fasted for 4 hours and 2 hours after . prapenelitian given liquid smoke 1 grade 2 at a dose of 10,100,1000 and 10,000 mg / kg bw , then do prapeneltian 2 with dose 2000.4000 , and 8000 mg / kg bb.dari results of the study mentioned that the clinical symptoms are seen in the high -dose treated mice including

increased activity , increased breathing , mice appear stretched and rested in the corner of the cage . mice eventually close their eyes and looked calm . treatment with high -dose group , mice dying after the critical period (3 hours) while mice in the other group died in the period between 24-48 hours . Smoke LD50 search results of grade 2 by the method of Reed - Muench obtained a dose of 7848 + - 191.069 . This dose of liquid smoke menunjuka grade material 2 is expressed relatively non-toxic . Now you do not have to worry , because the safety of liquid smoke (Soesanto et al , 2008) .

4. CONCLUTIONS

Liquid smoke is a preservative Fish Fillet in lieu of a chemical preservative that is both environmentally friendly and fairly bright prospects for the future have to be developed to the community . The use of liquid smoke coconut shell which has been less than satisfactory results and is less practical and still need to do further study, especially the problem of toxins benzoepiren .

Based on the potential waste of natural resources that are abundant existing areas of West Sumatra province , the utilization of coconut shell liquid smoke as a preservative fish fillets have a chance to develop. From the security aspect of the health aspects , based on the results of studies carried out so far that liquid smoke is safe for health , but still need to continue to do research for the development of the use of liquid smoke .

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