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Original paper

SOME INVESTIGATION ON THE QUALITY OF SMOKED MACKEREL (*Rastrelliger* sp) USING VARIOUS WOOD WASTE OF LIQUID SMOKE

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ABSTRACT

Utilization of liquid smoke as an alternative method of processing fish is becoming more popular nowadays. Mackerel is one of nutritious fish commonly processed as smoked fish. Mackerel fish was dipped into 7,5% salt solutions and 5% liquid smoke of (A) sugar-reed waste; (B) teak wood waste; and (C) paddy chaff for about 15 minutes, dried in an oven at 50-80°C. The average of sensory value of the product was relatively high for all samples, A= 8.45, B=8.71, and C=8.52. Moisture content of the product range 53-58%, protein content 30-32%, fat content 9-10%; and ash content ± 2%. The highest phenol content was B=61.46 mg/Kg, while A=43.22 mg/Kg and C=52.30 mg/Kg. The samples A, B, and C all stay in good condition until 3 days of storage in room temperature. Statistical analysis of proximate data by using SPSS 11 method resulted p< 0.05, means that moisture content of A and B was significantly different. Protein content found that A was significantly different compared to B and C (p< 0.05). While fat and ash content was not significantly different in all samples (p > 0.05).

Key words: Quality, Smoked Mackerel, Liquid smoke, Various Wood waste

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INTRODUCTION

Fish smoking began to be used as a method of preservation when the improvement in flavour and the increase in the time for which the fish could be kept were noted. In most tropical countries, smoking is used not only to impart desirable flavours but also, and more importantly, to accelerate the drying process. On the other hand, most smoked products in countries with a developed 'cold' chain are now only lightly cured in order to give them a mild smokey flavour.

Liquid Smoke has been used in developed countries like Germany, USA, Japan, etc. as antimicrobial agent, flavouring tasks and improving texture in meats and fish products for more than 60 years. (Clucas and Ward, 1996; Laura, 2004). The phenolics compound act as preservatives which help prevent spoilage. (Guillen and Maria. 1998). Liquid Smoke gives an impart of preservation in meats and fish. (Milly and Toledo, 2004) found that Ready-To-Eat (RTE) of turkey dipped into liquid smoke in vacuum packaging stored at 4°C inhibited growth of *Listeria*

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monocytogenes. Liquid smoke is safe as the carsinogenic compound can be removed.

This research was aimed at evaluating the quality of smoked Mackerel using liquid smoke of sugar-reed waste (A), teak wood waste (B), and paddy chaff (C) and carried at the Laboratory of Fish Processing Technology, Faculty of Fisheries and Marine Sciences Diponegoro University Laboratory analysis were done to observe the chemical and microbial quality of products by using SNI (Standar Nasional Indonesia) methods. The Directorate General of Fisheries (1995). The method of research was experimental laboratories and the data were evaluated by using descriptive explorative method, with four (4) replications. Further evaluation was carried out in order to obtain the differences of three (3) samples especially the proximate data by using t -test from SPSS 11.

MATERIALS AND METHODS

The processing of smoked fish involves five major steps :

1. Preparation, mackerel fish was cut and washed.
2. Dipping. 20 kg of fish was dipped into 7,5% of brine and 5% of liquid smoke during 15 minutes.
3. Thawed. This was done by hanging fish on the rack during ± 1 hour in room temperature.
4. Drying. After being thawed, the fish was dried into the oven for about 3 hours and the oven temperature was maintained at 50-80°C.
5. Cooling. The fish was finally cooled until it reached the room temperature for chemical and microbial analysis.

RESULTS AND DISCUSSION

A. Organoleptic Test of Raw and Smoked Mackerel.

The average of organoleptic value of raw fish was 8.7 with the characteristic of eyes perfectly fresh, convex black pupil, translucent cornea, bright red gills, no bacterial slime, outer slime water white or transparent, bright opalescent sheen, no bleaching. Ten panelists were asked to test the samples during storage at room temperature. The organoleptic value of smoked fish is presented in **Table 2**.

As can bee seen in **Table 2**, the highest organoleptic value was found in sample B = 8.71, followed by sample C and A of 8.52 and 8.45 respectively.

Tabel 2. Organoleptic value of smoked fish during storage at room temperature

Days of storage	Organoleptic value								
	Sugar-reed			Teakwood			Paddy Chaff		
	$\bar{x}$	s	CV	$\bar{x}$	s	CV	$\bar{x}$	s	CV
0	**8,45**	0,58	0,08	**8,71**	0,21	0,06	**8,52**	0,30	0,07
1	7,98	0,77	0,09	8,23	0,56	0,09	8,22	0,64	0,09
2	7,50	1,08	0,11	7,83	0,84	0,09	7,66	0,96	0,10

Notes $\bar{x}$ = average of organoleptic value of smoked fish.
S = deviation standard
CV = coefficient variation

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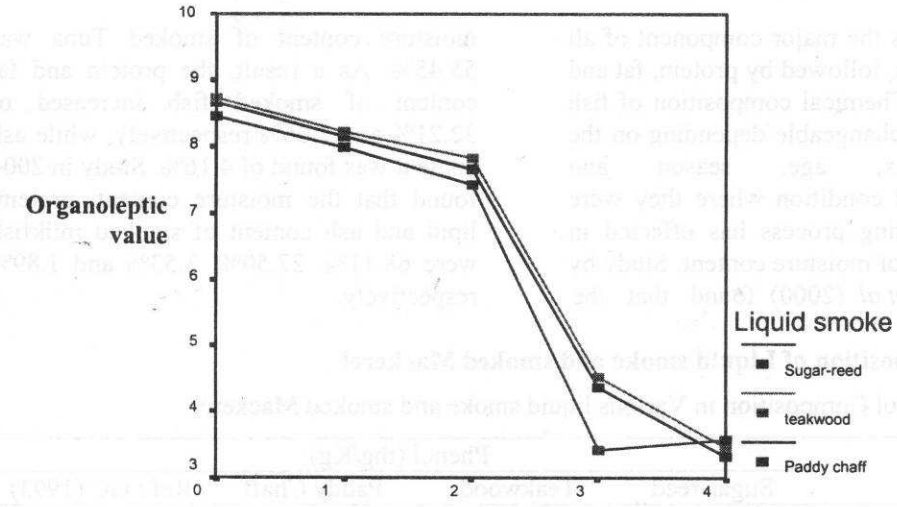
As can be seen in **Table 2** that all samples had a higher value than the minimum of 7 required by SNI, it means that the product had a good quality and had been accepted by panelists. Therefore, sugar-reed waste, teak wood waste and paddy chaff are possible to be used as a raw material of liquid smoke. Friedman test showed that Asymp. Sig. 0 < 5%; means that most panelists gave different values to the samples A, B, and C. Meanwhile hedonic test resulted that sample B has the highest value of 8.50 (mostly liked); whereas samples A and C had the same value of 8.17.



Curve 1. The relationship between days of storage and organoleptic value of smoked mackerel

Curve 1 showed that smoked fish treated by teak wood waste has the highest organoleptic value, followed by paddy chaff and sugar-reed liquid smoke.

B. Proximate Analysis

The moisture content of Mackerel is ± 70%, protein content of ± 22% and lipid content ± 5% (Swastawati, 2000). According to Clucas and Ward (1996) water content of fish ranges from 70 to 80% of the fresh weight, although some deep water species may contain in excess of 90%. Protein is found in the body of fish about 16-20%, while fat content has a wide range of 2.0-22%. Smoking and drying both resulted in a loss of weight due mainly to loss of water and water soluble nutrients during processes, and further reduction during the drying process. Therefore, smoking has given an effect in the changes of nutritional value of the fish. The proximate composition of smoked fish is presented in **Table 3**.

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Table 3. Proximate composition of smoked fish

Parameter	(%)		
	Sugar-reed	Teakwood	Paddy Chaff
Moisture	53,99 ± 3,93	58,01 ± 1,81	55,54 ± 1,94
Protein	32,82 ± 1,67	30,09 ± 0,76	30,52 ± 1,85
Lipid	9,10 ± 2,43	9,79 ± 1,63	10,13 ± 1,18
Ash	2,21 ± 0,33	2,22 ± 0,28	2,38 ± 0,34

Note: ± standard deviation; replication: 4 times.

Water is the major component of all species of fish, followed by protein, fat and ash content. Chemical composition of fish varies and is changeable depending on the species, sex, age, season and environmental condition where they were caught. Smoking process has effected in the reduction of moisture content. Study by Swastawati, *et al* (2000) found that the moisture content of smoked Tuna was 55,45%. As a result, the protein and fat content of smoked fish increased of 32.21% and 2.06% respectively, while ash content was found of 4.16%. Study in 2004 found that the moisture content, protein, lipid and ash content of smoked milkfish were 68.11%, 27.50%, 3.53% and 1.89% respectively.

Phenol Composition of Liquid smoke and smoked Mackerel

Tabel 4. Phenol Composition in Various liquid smoke and smoked Mackerel

Samples	Phenol (mg/Kg)			
	Sugar-reed	Teakwood	Paddy Chaff	Ref : GC (1993)
Liquid smoke	477	293	263	160
Smoked Mackerel	43.22	61,46	52,30	-

Note: *Giulini Chemie (1993).

The phenols of smoke contribute essentially to the typical flavour of smoked foods. Apparently certain phenolic compounds such as guaiacol, syringol and eugenol play a predominant role in this flavouring effect of smoke. As can be seen in **Table 4,** the composition of phenol in different liquid smoke sources varies. It is probably due to an increasing amount of phenols in liquid smoke is not necessarily connected with an increasing concentration of phenols in smoked fish. Absorption of liquid smoke into the flesh fish is also strongly influenced by the smoke generation and the temperature of the smoking process.

According to World Health Organization (WHO, 1994), although phenols contribute mainly to the flavour of smoked fish, an addition of such phenols to meat products does by far not give a smoke flavour which is comparable to the effect of veshly developed wood smoke. Wibowo (2002) stated that the stipulations of liquid smoke and a minimum salt concentration can protect the consumer against bacterial that would result from possible contamination of the product. The maximum of phenols composition in foodstuff is 317 mg/Kg. (Risk, 2005 and Occupational Safety and Health Administration, U.S. Department of Labor, 2005).

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CONCLUSIONS

In conclusion, adequate, reliable and time saving methods for the smoking procedure are available. Much more research will be necessary to find out whether the concentration of liquid smoke can offer sufficient information on the sensoric and toxicological quality of smoked fish and liquid smoke preparations. If such key substances are known, the quality control of smoked products in industry and food inspection could be essentially simplified.

REFERENCES

Guillen, Maria D. and Maria L. Ibargoitia, *J. Agric. Food Chem.*, 1998, 46 : 1276-1285.

Hadiwiyoto, S. 1993. *Teknologi Pengolahan Hasil Perikanan.* Liberty. Yogyakarta. 275 hlm.

Harris dan Karmas. 1989. Pengaruh pengolahan dengan zat tinambah terhadap zat gizi *dalam Evaluasi Gizi Pada Pengolahan Bahan Pangan*. Penerbit Institut Teknologi Bandung. Bandung, 388-407 hlm.

Kanoni, S. 1991. *Kimia dan Teknologi Pengolahan Ikan*. Pusat Antar Universitas Pangan dan Gizi Universitas Gadjah Mada. Yogyakarta.

Laura, A. Brandt. 2004. Liquid Smoke. Solve Formulation Problems. Copyright from Internet. http://www.chemical21.com.

Milly, P.J. and Toledo, R.T. 2004. *Validation of Liquid Smoke Treated Ready to Eat (RTE) Meat Products for Control of Listeria innocua M1.* Department of Food Science and Technology. University of Georgia, Food Science Building. Athens, GA 30602-7610.

Occupational Safety and Health Administration. 2005. Occupational Safety and Healthy Guideline for Phenol. USA. http://www.osha/phenol.com.

Poernomo, S. H. 2002. *Teknologi Pengolahan Ikan Buku II.* Departemen Kelautan dan Perikanan Pusat Pendidikan dan Pelatihan Perikanan. Jakarta.

Risk, T. 2005. *European Hazard Symbols*. Seoul, Korea. Setiawan, I., Darmadji, P., Raharjo, B. 1997. Pengawetan Ikan dengan Pencelupan dlam Asap Cair. *Prosiding Seminar Nasional Teknologi Pangan*. Buku I. Perhimpunan Ahli Teknologi Pangan Indonesia, Jakarta. 348-371 hlm.

Swastawati. 2000. Analisis Finansial Usaha Pengasapan Ikan Skala Rumah Tangga. SAINTEKS Vol.VII No. 2 : 186-195.

Wahyuni, Sri. 2002. Evaluasi Mutu Ikan Teri (*Stolephorus* sp.) Asap yang Diolah Secara Tradisional pada Tikus Wistar. Institut Pertanian Bogor, Bogor. http://www.telkomnet.com/swahyuni.

Wibowo, S. 2002. *Industri Pengasapan Ikan*. Penebar Swadaya. Jakarta. 94 hlm.

World Health Organization (WHO). 1994. Internatinal Programme on Chemical Safety, Environmental Health Criteria 161: Phenol. WHO. Geneva. http://www.who.com/phenol.