Influence Of Beef Submersion with Various Concentration of Coconut Shell Liquid Smoke Against Total Bacteria Count, Shelf Life and Acceptability

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ABSTRACT

The research on the influence of beef submersion used various concentration of smoke liquid coconut shell toward total bacteria count, shelf life and acceptability was to know the level of concentration of coconut shell liquid smoke of beef thus gained the lowest total bacteria count, the longest shelf life and acceptability of (color, taste, smell and total acceptance) the most favor. This research did based on Complete Randomized Design, with five type of repetitions of submersion coconut shell liquid smoke with concentrations those were 0%, 2,5%, 5% and 10% (v/v), with repetition as many as 4 times. The research result showed that the beef submersion used smoke liquid coconut shell influenced to the decreasing total bacteria, increasing shelf life, taste and total acceptance of beef but did not influence to color and smell of beef ($p<0.05$). Liquid smoke can be used until to the concentration 10% resulting total bacteria count as many as $11,73 \times 10^6$ CFU/g, shelf life as long as 1341 minutes and acceptability (color, taste, smell and total acceptance) with hedonic scale from rather favor to very favor.

Key words: beef, liquid smoke, coconut shell, shelf life

INTRODUCTION

After cuts of beef will experience changes in chemical, physical and microbial. Changes in chemistry began after the cut, which stops the blood circulation which causes the blood functions as an oxygen carrier halted all, as a result the process of oxidation - reduction come to a halt. Then there is a solution of anaerobic glycolysis of glycogen to lactic acid so that the pH of the meat becomes fall and cause the enzyme to be active catepsin. Protein split into peptone and amino acids, these products are used by bacteria to grow and form enzymes, which bacteria break down proteins and produce more products that stank (Muchtadi T and Sugiono, 1992). Microorganisms can grow in the range pH 5 to 8, a common bacterium grows optimally at pH 7.0, while for yeast and molds grow at pH 3 to 8.5. pH value of beef ranged from 6.2 to 6.4 so that bacteria, yeasts and molds can grow well in it (Frazier WC and Westhoff *et al*, 1998). The total number of bacteria that is conditioned upon the Indonesian National Standard (2000) maximum limit microbial contamination on fresh meat is 10^4 CFU / ml. Preserving meat has a goal to secure the meat from the damage or decay by microorganisms and to extend the shelf life (Soeparno, 2005).

Liquid smoke can be used as a meat preservative because it has a degree of acidity (pH) of liquid smoke that reached 2.0 which causes stunted growth of harmful bacteria. Liquid smoke proved to suppress the growth of spoilage bacteria and pathogens such as *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas* and *Salmonella* groups. Pyrolysis of coconut shell to produce liquid smoke containing phenol compounds by 4.13%, carbon 11.3% and 10.2% organic acids (Darmadji P, 2006). The result showed a coconut shell liquid smoke contains higher antimicrobial compounds and has a lower pH than most other liquid smoke (Darmadji P, 1997). Liquid smoke is a mixture of wood smoke dispersion in water is made with liquid smoke pyrolysis results. Results of pyrolysis liquid smoke is dependent on raw material and pyrolysis temperature. The main compounds in liquid smoke consists of phenols and organic acids (acetic acid, propionic, butyric and valerat), which can effectively control microbial growth (Darmadji P, 1997). The use of liquid smoke for preservation mackerel (*Rastrelliger neglectus*) Fresh conducted with 5-10% concentration of liquid smoke for 30 minutes to maintain freshness of the fish up to 24 hours. Results of research on dumbo spiced filet marinated in liquid smoke concentration of 10% for 1 minute to produce the most desirable

organoleptic qualities include taste, odor and color. Results of research on tuna (*Euthynus affinis*) are soaked in liquid smoke concentration of 5% for 30 minutes produces organoleptic quality of the most preferred (Maydina S, 2004).

MATERIALS AND METHODS

The materials used for this study is beef. The stages are carried out in meat preservation using liquid smoke following a coconut shell, meat weighed, then washed with running water and then drained for 5 minutes, then soaked in liquid smoke concentration of coconut shell with 0%, 2.5 %, 5%, 7.5%, 10% for 30 minutes. Then the meat that had been soaked with liquid smoke first drained for 5 minutes. Packaging performed by using sterile plastic. Then do a test on the total number of bacteria using the method of Total Plate Count (TPC) (Ministry of Health, 1991). Durable power is determined by initial testing decay (Puntodewo HS, 1998) and the acceptability of this test using a scale hedonic / preference level (Soekarto ST, 1985). This research conducted experiments in the laboratory.

Experimental design used is Complete Random Design (RAL) with 5 treatments of various levels of concentration of liquid smoke coconut shell 0% (A1), 2.5% (A2), 5% (A3), 7.5% (A4), 10% (A5) and 4 times repeated, so that 20 units of the experiment. The total amount of data obtained bacteria transformed with logarithm transformation (log x), while the organoleptic test data to the color, taste, smell and the total revenue that will be transformed with the transformation. The data obtained were analyzed using Varian Analysis and to know the difference between the treatment performed Tukey test (Honestly Significant Difference / HSD) (Gasperz, 1991).

RESULTS AND DISCUSSION

The ability to suppress the total number of bacteria increases with increasing concentration of liquid smoke. This is caused by the phenol compounds contained in the liquid smoke. Phenol is an acidic alcohol, so called carbolat acid. Acidic conditions by the presence of phenol can affect the total number of bacteria. Growth of bacterial cells can be disrupted by the component phenols, phenol has the ability to damage proteins and cell membrane (Rahayu PW, 2000). Phenol binds to the protein through hydrogen bonds resulting in protein structures become corrupted. Most of the cell wall structure and bacterial cytoplasmic membrane were protein and fat. Instability in the cell wall and cytoplasm membrane of bacteria causing selective permeability function, the function of active transport, control of protein structure from bacterial cells become disrupted. Cytoplasm integrity disruption resulted in the escape of macromolecules and ions from the cell. Bacterial cell to lose its shape, and there was lysis. fenolat compounds are bacteriostatic or depending on the concentration of liquid smoke (Pelczar and Chan, 1988). Bacterial cell death means the loss of the ability of bacteria to permanently reproduce (grow and multiplicate). Phenol compounds can also be combined with organic acids that work synergistically to prevent and control the growth of bacteria (Astuti, 2000)

Table 1. Difference between total number of treatment against bacteria.

Treatment	The average number of total bacteria (X 10^6 CFU/g)	Significance 0.05
A_1	76,05	a
A_2	64,37	ab
A_3	55,31	ab
A_4	43,60	b
A_5	11,73	c

Note: The same small letters to the column indicates not significantly different at α 0.05

Shelf Life of Beef Meat

Table 2. Difference between treatment against average shelf life of beef meat

Treatment	Average of Shelf Live (minutes)	Significance 0.05
A_1	595,67	a
A_2	800,33	b
A_3	1018,67	c
A_4	1204,33	d
A_5	1341,00	e

Durable power was increasing in accordance with the increased concentration of liquid smoke. Symptoms of bacterial growth due to decomposition of them is formed slime (mucus) on the surface of the meat, loss of pigment color of the meat, there is gas production, the smell is less tasty and defects, and decomposition of fat. The formation of mucus on the surface of the meat caused by the growth of bacteria *L. viridens*. Slime-forming bacteria are green *Thermospacta Enterococcus* and *Bacillus*. The formation of acid constructed by the bacteria

Lactobacillus, Clostridium and *Enterococci.* Discoloration caused by the meat pigment (myoglobin) change into brown metmyoglobin, a yellow or green is caused by bacteria forming sufmyoglobin (Lawrie, 2003). Change the color can also be caused by the formation of pigment by the microbes themselves (Frazier, 1988). The higher concentration of liquid smoke as a preservative coconut meat to produce the total number of bacteria that the lower and increases durable power of meat, this is in accordance with the purpose of reducing the amount of curing early microbial cells and slow the logarithmic growth phase microbes (Nurwantoro and Djariyah, 1997).

Acceptability

Test acceptability of the color of beef after the meat is marinated with various concentrations of liquid smoke has a coconut shell with boiled meat temperature 80 ° C for 30 minutes, prior to boiling the flesh color differences occur at each concentration. But after soaking boiled beef with various concentrations of liquid smoke coconut shell did not provide tangible effect on meat color. No significant influence on any given concentration of myoglobin caused by substances found in meat that has denatured so that the meat warming will change color from purplish red to brown (Winarno, 1992), so that each concentration of submergence showed a brown color not too different. Carbonyl compounds in the smoke have a role in coloring and flavor products. Types of carbonyl compounds contained in liquid smoke include vanillin and siringaldehide.

Soaking meat by using coconut shell liquid smoke concentrations from 0 to 7.5% did not produce significant differences from each other due to the interval between the concentrations of liquid smoke that is given is not much different. Soaking beef using various concentrations of liquid smoke coconut shell does not provide a real impact on odor. This is because the smell is very subjective and difficult to measure, resulting in different opinions in assessing the quality, the sensitivity difference in the feel and smell in addition one of the characteristics of liquid smoke is to make the product smell consistent (Pseszola, 1995) and panelists just kissed the surface meat which gives relatively the same smell. Soaking meat using various concentrations of coconut shell liquid smoke to the total revenue of beef provide a real or significant influence, it is because the power received on a food is determined by the stimulation that comes with food through the five senses of sight, smell, tasting, and hearing. However, the main factors that ultimately affect the total revenue of the food is flavor stimuli generated by food (Soekarto ST, 1985).

CONCLUSIONS

Liquid smoke can be used up to 10% concentration to produce the lowest number of total bacteria for 11.73 x 10^6 CFU / g, most long lasting power for 1341 minutes and acceptability (color, taste, smell, and the total acceptance) with the scale a bit like hedonic until very like.

Table 3. The influence of treatment acceptability against meat

Variables	Treatments				
	A_1	A_2	A_3	A_4	A_5
Acceptability					
- Colour	3,50	3,45	3,45	3,50	3,85
- Taste	3,30a	3,90ab	3,30ab	3,65ab	4,30b
- Odor	3,60	4,05	3,50	3,95	4,15
- Total Acceptance	3,55a	3,60a	3,65a	4,15a	4,30b

REFERENCES

Astuti. 2000. Utilization Tempurung Sabut and Shell Oil and Oil for Making Liquid Smoke for Natural Food Preservatives. http://alcoconutmultiply.com/journal/item/6. [December 29, 2008]

Darmadji P. 2006. Liquid Smoke Food Preservatives Safe. Biweekly tabloid-Vol. 1, 22, Agrina, Jakarta.

Frazier WC, Westhoff DC.1998. Food Microbiology. Mc-Graw-Hill Book Co. New York. P. 104-105.

Gasperz, V. 1991. Analysis Techniques in Research Experiment I. Tarsito, Bandung. P. 33-50.

Lawrie RA. 2003. Meat Science. Translators: Aminudin Initiative. Jakarta: UI-Press. Jakarta. P. 143-152, 225-226. Maga, J.A. 1988. Smoke in Food Processing. CRC Press, Florida. P. 154.

Muchtadi, TR and Sugiono. 1992. Lesson Laboratory of Food Material Science. Department of Education and Culture. Director General of Higher Education Center. University Food and Nutrition. Institute of Agriculture, Bogor. P. 3-12.

Maydina S. 2004. The influence of Liquid Smoke against Providing Water activity (Aw) and Organoleptic Quality of Fish Tongkol (Euthynus affinis). Muhammadiyah University of Malang. Poor.

National Standardization Agency. 2000. Microbial contamination Limit and Limit Pollution Residues in Animal Origin Food SNI No. : 01-6366-2000. DSN, Jakarta.

Nurwantoro, Djariyah AS. 1997. Animal-Vegetable Microbiology. Doubleday.

Pelczar JM, Chan ECS. 1988. Microbiology Basics 2. Publisher UI Press. Jakarta.

Pszczola DE. 1995. Tour Highlights Production and Uses of Smoked-Based Flavors. Liquid Smoke - A Natural Aqueous Condensate of Wood Smoke Provides Various Advantages, in Addition to Flavor and Aroma. Food Technol. P. 49, 70-74.

Puntodewo HS. 1998. Analysis of Milk and Meat Quality. Faculty of Veterinary Medicine Airlangga University, Surabaya. P. 38-47.

Rahayu PW. 2000. Antimicrobial activity of Traditional Food Ingredient Processing Industry Results Against Bacterial Pathogens and Destroyer. Vol 11 (2). Bulletin of Food Technology and Industry.

Soeparno. 2005. Meat Science and Technology. Gadjah Mada University Press, Yogyakarta. P. 1, 263-264, 5-10, 199-200

Soekarto ST. 1985. Organoleptic assessment for the Food Industry and Agricultural Products. Work Bhrata script. Jakarta. P. 45-50, 61-81.

Winarno. 1992. Food Chemistry and Nutrition. PT. Main Gramedia. Jakarta. 175