



## POSITIVE EFFECT OF NUTMEG (*MYRISTICA SUCCEDANEA*) PULP EXTRACT AS PRESERVATIVE INGREDIENT ON THE QUALITY OF SMOKED CAKALANG FISH

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### Abstract

Nutmeg pulp is commonly discarded as the residue in harvesting process. Thus, to enhance its value, nutmeg pulp which has the antibacterial properties can be processed as an alternative of preservative ingredients. The aim of this study is to identify the effect of nutmeg pulp extract as preservative ingredient on the quality of smoked Cakalang fish. This is a quantitative study with randomized controlled trial design. Samples in intervention group were given 1000 g nutmeg with 1000 ml water and 500 g nutmeg with 1000 ml water, respectively. While samples in control group were given 1000 ml water only. The analysis of *E. Coli* through national standardized method and organoleptic test were done in each sample. The obtained data were analysed using computer. The results show that the organoleptic scores for intervention group were eight and seven in control group. Statistical analysis was done with one way anova on those three groups and the result shows that there is a significant difference of *E. Coli* growth with  $p$  value  $0,012 < 0,05$  (F value 10.118). It is concluded that the adding of nutmeg pericarp extract affects the growth of *E. Coli*.

**Keywords:** Nutmeg, *E.Coli*, Organoleptic, Smoked Cakalang

### 1. Introduction

Nutmeg (*Myristica Fragrans Houtt*) is one of the original spice commodities of the archipelago and has now spread widely to all corners of the world (Faridah Nur Didah *et al*, 2013). There are currently many nutmeg (*Myristica Fragrans Houtt*) producing countries, but the nutmeg from Banda Island in Maluku remains the best in the world. In some areas, nutmeg fruits (*Myristica Fragrans Houtt*) are discarded as a waste after the seeds and mace (*foli*) are taken. Based on the data from the Agriculture Office of Ternate City in 2016, the production of nutmeg seeds was 1032 tons per year. From the results of so many nutmeg (*Myristica Fragrans Houtt*) seeds, if the nutmeg (*Myristica Fragrans Houtt*) is processed into a type of derived product, the value will increase and it will also increase the income of nutmeg (*Myristica Fragrans Houtt*) farmers. The nature of nutmeg

(*Myristica Fragrans Houtt*) which is acidic and contains essential fats or oils has the function as an anti-bacterial so that the nutmeg (*Myristica Fragrans Houtt*) can be used as an alternative preservative in preserving food such as smoked fish which is easily damaged. Fish is a food commodity that has perishable properties, because the nutrient content such as protein 18-30% and water is quite high (70-80%) which is a good medium for the development of spoilage bacteria so fish need to be handled (Steven Tumonda *et al*, (2017) To maintain the quality and storability of skipjack fish, the smoked fish is processed in North Maluku, known as "fufu fish." This kind of fish is consumed mostly by the community because it has a good taste and a special odor. To prevent microbiological degradation of smoked skipjack fish, people immerse it with nutmeg (*Myristica Fragrans Houtt*) extract as an alternative preservative because of the nature of the nutmeg (*Myristica Fragrans Houtt*) as an antibacterial.

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## 2. Method

This research aims to determine the effect of nutmeg (*Myristica Fragrans Houtt*) extract as an alternative preservative to the quality of microbiology and organoleptic of smoked cakalang fish. This type of research is quantitative research with a randomized block design (Rachamat Mochamad, 2017). The research took place in the Poltekkes of Ternate Nutrition Laboratory and the Laboratory for the Development and Testing of Fisheries Quality (LPPMHP) of Ternate City.

This study is an experimental study using a randomized design group with a large sample size of 9 units, consisting of 3 treatments and three sample blocks with a simple random sampling technique. Organoleptic data were analyzed using the scoring method, while the content of contamination was *E coli* by the method (SNI 01-2346-2006). The results were then analyzed using the help of a computer analysis program on the one way ANOVA statistical test method for the treatment given.

## 3. Results and Discussion

### a. Sample Characteristics

Samples used in this study were 9 units with variations of 1000 grams of nutmeg (*Myristica Fragrans Houtt*) flesh dissolved in 1000 ml of water in 3 sample units (P1H3, P1H6, P1H9), 500 grams of fruit flesh dissolved in 1000 ml of water as much as 3 sample units (P2H3 P2H6 P2H9) and a counter as much as 3 sample units (P3H3, P3H6, P3H9) which were given only 1000 ml of water as immersion media. The type of fish used as a medium is a type of bluefin tuna that is widely used by crafters of cakalang fufu (smoked skipjack fish) as a basic ingredient. The fogging process used heat curing techniques made from coconut belts using the fogging oven. The time needed for the smoking process was 120 minutes until the fish was cooked.

### b. Organoleptic Test

The results of the organoleptic appearance in Table 1 show that the Fufu skipjack fish group which was treated with 1000 gram and 500 gram nutmeg (*Myristica Fragrans Houtt*) extracts had a score of 8. The Fufu tuna fish given the nutmeg (*Myristica Fragrans Houtt*) extract was more interesting because it had brownish and shiny patterns in the resulting color. The color pattern is expected as the result of the treatment effect of nutmeg (*Myristica Fragrans Houtt*) extract when

soaked. In the group without treatment, the nutmeg (*Myristica Fragrans Houtt*) extract got a score of 7. The appearance of the group with young and not shiny brownish complexion was different from the one from the treatment group. The assessment score was still below the maximum value but it had approached the value of 9 specifically in the treatment group.

**Table 1.** Organoleptic Testing of Nutmeg (*Myristica Fragrans Houtt*) Extract 1000 Grams, 500 Grams and Stoves with Scoring Method on Fufu Skipjack Fish (Smoked Tuna)

Treatment	Scores of Appearance
1000 Grams	8
500 Grams	8
Contour	7

Organoleptic Test with Scorial Test Methods is a method in evaluating the appearance of fishery products used to determine the quality level based on the scale of number 1 (one) as the lowest value and number 9 (nine) as the highest value, (SNI 01-2346-2006). The organoleptic test in table 1 shows that the fufu skipjack (smoked skipjack) fish group which was given an extra 1000 gram and 500 gram nutmeg (*Myristica Fragrans Houtt*) treatment had a score of 8. Fufu skipjack (smoked skipjack) fish which were given an extra appearance of nutmeg (*Myristica Fragrans Houtt*) appeared more attractive because the color produced had a brownish and shiny complexion. The color pattern is predicted as the result of the treatment effect of nutmeg (*Myristica Fragrans Houtt*) juice when soaked. In the control group without nutmeg (*Myristica Fragrans Houtt*) juice treatment, it had a score of 7. The appearance of the control group with young and shiny brownish complexes was different from the one of the treatment group. The assessment score was still below the maximum value but it approached the value of 9 specifically in the treatment group. Nutmeg (*Myristica Fragrans Houtt*) has a good potential because it is needed for various purposes in the food, beverage, medicine and other industries. A more specific need is that nutmeg (*Myristica Fragrans Houtt*) can be used as a preservative for antibacterial, Tanendri Arrizqiyani , Sri Sumiati, M. M. (2018). Nutmeg (*Myristica Fragrans Houtt*) has benefits as an antibacterial, especially in several types of positive

and negative salt bacteria, (Shan, B., Cai, YZ, Brooks, JD, & Corke, H. (2007)).

**c. Effect of Extract of Fruit Ingredients Pala Against Bacteria E.Coli In Fish Fufu (Smoke Fish)**

**Table 2.** Effect of Estrak Nutmeg (*Myristica Fragrans Houtt*) Of *E. Coli* on Fufu Skipjack (Skipjack Smoke)

Treatment	n	Average	St.Dev	F	Sig
1000 gr	3	0	± 0	10,118	0,012
500 gr	3	0,6667	± 1,154		
Kontor	3	4,6667	± 2,081		

Based on analysis of the data in Table 2, it shows that the average contamination of bacteria *E. Coli* in the group countered 4.6667 with St.Dev, ± 2.08167. Microbial growth of *E Coli* occurred on the sixth day and continued to grow more and more on the ninth day of storage, while the 1000 gram treatment group that was given nutmeg (*Myristica Fragrans Houtt*) extract did not experience contamination or growth of microbes *E Coli*. In the treatment group, 500 gr of nutmeg (*Myristica Fragrans Houtt*) extract was given an average contamination or growth of microbes *E Coli*. 0.6667 with St.Dev. ± 1,15470. Microbial growth of *E Coli* only occurred on the sixth day of storage, but the growth of bacteria *E Coli* was still low when compared with the control group.

Statistical test results with the one way ANOVA method among the treatment groups of 1000 grams, 500 grams and the control group showed that the differences in microbiological growth of *E coli* from the treatment group with an F count of 10.118 were significant at  $p < 0.012 < 0.05$ .

From these results, it can be assumed that if the nutmeg meat extract subtract is given 1000 grams (*Myristica Fragrans Houtt*) as a soaking media for skipjack smoked fish, it can inhibit the microbiological growth of *E coli*. If the extract of the nutmeg juice is reduced by 500 grams (*Myristica Fragrans Houtt*) as a medium for smoked skipjack fish, it gives 22% of growth potential microbiological growth of *E coli* on the sixth day of storage.

Meanwhile, in the microbial growth of *E Coli* pollution contact group, it occurred on storage on the third day with an microbiological growth of *E coli* potential growth rate of 33% and it continued to increase on the sixth day by 44%, and on the

ninth day, the microbiological growth of *E coli* was increased to 78%.

The average contamination of *E coli bacteria* occurred on the sixth day and grew more and more on the ninth day of storage. In treating 1000 grams, there was no potential for growth of *E coli* because groups of compounds was suspected to have antibacterial potential in nutmeg (*Myristica Fragrans Houtt*) which are flavonoids and terpenoids. The content of flavonoids is one of the largest groups of natural phenols that have a tendency to bind to proteins so that it interferes with the metabolic processes of *E coli* to multiply (Poeloengan Masniari dan Raptiwi, 2010) the process of the mechanism of action of the flavonoid in inhibiting bacterial growth, wherein the *flavonoid* and *terpenoids* can cause damage to bacterial cell wall permeability, (Rumopa, P. M. E., Awaloei, H. and Mambo, C., 2016)).

Gansareng Alfisiane (2018) research resulted that Extract of nutmeg (*Myristica Fragrans Houtt*) (*Myristica Fragrans Houtt*) has antibacterial activity against *E coli bacteria*. There are a lot of chemical contents in nutmeg which have various benefits which start from its seed, mace and ruit. Nutmeg can be an alternative for food preservation due to its essential oil property that can act as the antibacteria such as alkaloids. Alkaloid itself is an antimicrobial substance that can inhibit DNA esterase and RNA polymerase as well as cells respiration. Those alkaloid properties affect the quality of smoked fish.

The difference in concentration of nutmeg extract (*Myristica Fragrans Houtt*) from 500 grams and 1000 grams (*Myristica Fragrans Houtt*) given to fish as soon as possible can increase the growth of *E coli bacteria*. Essentials such as *flavonoids* and *terpenoids* are contained in extracts of nutmeg meat (*Myristica Fragrans Houtt*). The nutmeg meat (*Myristica Fragrans Houtt*) with thicker substrate has the higher potential for essential oils such as *flavonoids* and *terpenoids* (Kausar, T. A. (2015).

Besides flavonoid and terpenoid factors as antibacterial, the fogging process has a role because the process can reduce the water content of the fish. Raw Bluefin tuna has high water content as a medium for the growth of microorganisms. Moisture content can affect the appearance, texture, and taste of food. High and low levels of water in food ingredients also determine the durability of these foodstuffs. High water level results in an easy bacteria, (Tanendri Arrizqiyani, Sri Sumiati, M., (2018)

Gansareng Alfisiane Research, (2018), Extract of nutmeg (*Myristica Fragrans Houtt*)

(*Myristica Fragrans Houtt*) has an antibacterial activity against *E coli bacteria*. The difference in concentration of nutmeg (*Myristica Fragrans Houtt*) extract affects the inhibition of the growth of *E coli bacteria*, where the higher the concentration is, the higher the activity inhibiting the growth of *E coli bacteria* will be.

#### 4. Conclusion and Suggestion

The administration of nutmeg extract affects the organoleptic qualities of smoked cakalang fish; and the application of 500 g and 1000 g nutmeg extract influence the growth of *E. Coli*. As an input for further research, other microbiological parameters, water content, PH, venols and vacuum and non-vacuum storage should be added to the Fufu skipjack fish.

#### 5. Acknowledgments

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#### 6. References

- Badan, National Standardizati (2009) 'Indonesian National Standard (SNI) 2725.1'. Quality Smoked Fish Jakarta. Available at: <https://fliphtml5.com/hafz/qmad/basic/>.
- Faridah Nur Didah, Yasni Sedarnawati, Suswantinah Antin, A. W. G. (2013) 'Characterization of Chemical and Microbiological Quality of Instant Bandrek Products and Nutmeg (*Myristica Fragrans Houtt*) Syrup (*Myristica fragrans*) No Title', *Indonesian Agricultural Science Journal (JIPI)*, 18(1), pp. 43-48. Available at: <https://journal.ipb.ac.id/index.php/JIPI/article/view/8364/6520>.
- Gansareng, A. (2018) 'Antibacterial Activity of Nutmeg (*Myristica Fragrans Houtt*) Extract (*Myristica Fragrans Houtt*) Against *Escherichia Coli Bacteria*', *Pharmacon Unsrat*, 7(3), pp. 52-56. doi: ISSN 2302-2493.
- Institution, National Standardizati Onrganoleptic A. O. S. T. (2006) 'Indonesian National Standard (SNI) 01-2346O'. Jakarta: Determination of coliform and *Escherichia coli* in fishery products. Available at: <http://sispk.bsn.go.id/SNI/Detail/SNI/7115>.
- Kausar, T. A. (2015) *Uji Aktivitas Antifungal Minyak Atsiri Buah Pala (Myristica Fragrans Houtt) Terhadap Jamur Candida Albicans Secara In Vitro*. Universitas Syiah Kuala. Available at: [https://etd.unsyiah.ac.id/baca/abstrak.php?biblio\\_id=16602](https://etd.unsyiah.ac.id/baca/abstrak.php?biblio_id=16602).
- Poeloengan Masniari dan Raptiwi (2010) 'Antibacterial Activity Test Of Mangos Teen (*Gardnia mangostana* Linn) PEEL', *Health Research and Development Media*, XX(2), pp. 65-69. doi: 2338-3445.
- Rachmat, M. (2017) *Metodologi penelitian gizi dan kesehatan*. 2nd edn. Jakarta.
- Rumopa, P. M. E., Awaloei, H. and Mambo, C. (2016) 'Inhibitory Test Of Nutmeg Seed extract (*myristicae fragrans*) To bacterial growth of *staphylococcus aureus* and *streptococcus pyogenes*', *Jurnal e-Biomedik (eBm)*, Volume 4(Nomor 2). Available at: <https://media.neliti.com/media/publications/68471-ID-uji-daya-hambat-ekstrak-biji-pala-myrist.pdf>.
- Shan, B., Cai, YZ, Brooks, JD, & Corke, H. (2007) 'No TitleThe in vitro antibacterial activity of dietary spices and medicinal herb extracts. *International Journal of food microbiology*', *International Journal of food microbiology*, 117 (1)(1), pp. 112-119. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S2231253612230036>.
- Steven Tumonda, Hanny Mewengkang, S. M. T. (2017) 'Quality Assessment of Skipjack Fish (*Katsuwonus pelamis* L) Smoke Against Moisture and pH Value During Storage.', *Journal of Fisheries Product Technology Media*, 5(2), pp. 158-162. doi: 2337-4284.
- Tanendri Arrizqiyani, Sri Sumiati, M. M. (2018) 'Antibacterial Activity Of Flash And Lead Of Nutmeg (*Myristica Fragrans*) To *Escherichia Coli*', *Journal Vocation Health*, 4(2), pp. 91-94. doi: ISSN 2442-5478.