The Raw Material Size Effects on Oleoresin Content and Quality of Unripe Fruits Nutmeg Fuli

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Abstract

Research entitled effect of the size of raw material on oleoresin content and quality of unripe fruits nutmeg fuli (*Myristica fragrans* HOUTT) has been conducted in laboratory of station for testing certification of product quality (BPSPB), trade department in air tawar padang, west sumatera since February until May 2005. The objective of this research was to study the effect of the size of raw material on oleoresin content and quality of unripe fruits nutmeg fuli.

Completely randomized design (CRD) with 6 treatment and 3 replicates was employed in this research. Data collection was analyzed statistically using F-test and then continued using Duncan's New Multiple Range Test (DNMRT) at significant level 5%. The treatment were original material (A), 10-mesh sizing; material (B), 20-mesh sizing; material (C), 30-mesh sizing; material (D), 40-mesh sizing; material (E) and 50-mesh sizing; material (F), respectively. Parameter measurement was oleoresin content, volatile oil content, specific weight, bias index, and solvent residue.

The result showed the size of raw material in influence to oleoresin content, volatile oil content, specific weight, bias index, and solvent residue. The best result was found from E treatment (40-mesh sizing material) with 39.88% oleoresin content, 35.24% volatile oil content, 1.004 specific weights, 1.49 bias indexes, and 3.56% solvent residue.

Keywords: Unripe fruit nutmeg, Oleoresin, Volatile Oil, and solvent residue.

Introduction

In Indonesia, nutmegs are processed for their oil content and as the spice in cooking. Nowadays, fixed nutmeg commodities that have already been developed commercially for exporting purposes are nutmeg oil, whole nutmeg seeds, peeled nutmeg seeds and fully. Procession for nutmeg in other forms, such as for making oleoresin, is uncommonly done.

Like the other agricalture products, fully of nutmeg will face various damage risks if it is traded in unprocessed form. The depravation can be induced by insects' attack, fungus or chemical alteration. Chemical alteration of fully is happened on its structural components especially in volatile oil and fats. Seed and fuli of nutmeg have various quality thus it makes difficult to be standardized. Some dam-

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ages can be overcome by processing seed or fully of nutmeg into other forms, such as oleoresin.

Oleoresin from unripe nutmeg fuli is the product that gained by extracting from unripe nutmeg fuli with organic solute like methanol and ethanol. Oleoresin of unripe nutmeg fuli contains compounds that become aroma and taste characters from extracted matters. According to Kowari (1995), in general, oleoresin of dried unripe nutmeg fuli is made from crashing or the powder of dried unripe nutmeg fuli that extracted by one or more proper.

Condition of raw material of nutmeg fuli extraction with a deep consideration is the level of maturity of nutmeg seed and size of material. The size influences to the solubility of fuli's chemical components and affects the content and quality of oleoresin yielding.

Material size affects the contact between solute and material when extracting process runs, where the smaller material will be easier penetrated by the solute than the bigger ones. The proper size of raw material make the extracting process runs perfectly in a considerable time. In other hand, if the material will cause coagulation of material smoothly, then it will be harder penetrated by the solute. If the material has a bigger size, it will consume more extraction time and produce low content because of the reduction of the contact and interaction field between solute and material (Guenther, 1987).

Recall of their uncertainty of the size of material using in extraction unripe nutmeg fuli has possibility to increase the content and quality of oleoresin of unripe fruits fuli. Moreover, there is a need to study the best size of material in order to increase the oleoresin content and their quality. This research is purposed to review the effect of material size toward the oleoresin content and quality of unripe fruits nutmeg fuli.

Materials and Methods

Unripe fruit from Salido Village in Degency of Pesisir Zelatan West Aumatra is characterized by pale yellow in color (rather whitish), while the fruit is green. The fruits were puling and separated from beans. Fuli separated from beans and flesh fruit nutmeg was then dried by exposing to sunlight until moisture content at ±7%. Dried fuli was grinded with crush bitter mill mechanically using RX-100 national blender (Matsushita electric Industrial Co. Ltd, Osaka, Japan) by the mean of sieved with 10-mesh, 20-mesh, 30-mesh, 40-mesh and 50-mesh of sieve, respectively. The outcome was scaled with 100 g putting into 2000 ml goblet and added with ethanol solute with 900 ml. Afterward, the sample was inserted into goblet magnetic stirrer and lid tightly with aluminum foil holing the place to assemble thermometer. The sample was put in the goblet on the hot plate and the stirrer was run at 60℃.

Extraction process was conducted through 3 hours, followed by filtering the solution to get the filtrate and residue. Residue will be excluded, while the filtrate was succeeded with rotary vacuum evaporator at boiling point of solute as long as ±2 h under 1 atm pressure until produce the oleoresin of nutmeg fuli.

Observation was conducted to the content of oleoresin, volatile oil value, specific weight, bias index and solute residue, respectively.

Results and Discussion

Oleovesin Content

The content of oleoresin was produced in the range between 19.19–39.88%. Treatment of the highest number of oleoresin was E (40-mesh in size of material) with the content at 39.88% and the lowest content was produced in A (untreated), at 19.19%, respectively.

The content was more increase by the lesser of material size until reaching the highest point at treatment E (40-mesh of material size). Afterward, the increment of material smoothness was worthless, even tend to decrease the content, as showed in treatment F (50-mesh in size of material), where the content was decreases. The content increment was used by the smooth of material induce of the wider material's surface. Consistently, the contact between solute and material showed better and the component was contained in nutmeg fuli melted into solute liquid and informed to oleoresin. This is the reason of rising of oleoresin content.

The high number of content in treatment E (40-mesh sizes) was caused by the perfect contact between material and solute, thus promoting the ability to solute to extraction of oleoresin by raising the level of oleoresin content.

The smoothness level of material used in the process was affected the oleoresin content because the fine material determines the contact surface of materials for solution. The proper smoothness will induce the perfect extraction in a considerable time (Moestafa, 1981).

In addition to the report by Health and Reinocius (1986), the lesser of material size, the more breaking cells, the wider contact surface between materials and solute, and the faster of velocity to reach the system equilibrium were observed, respectively. Automatically, in the same time of extraction, material with lesser of particle size will produce the more oleoresin extracts.

Proper form of material (40-mesh sizing) was bought the completely occurrence of extraction and high content of oleoresin, as the result.

The low content with treatment A was caused by the oil gland interrupt the open, thus the oleoresin was completely extracted. This hypnosis is supported by the research by Guenther (1987) that the rough material impact to the intra cells space was spread and lowered the solute efficiency. Figure 1 shows the oleoresin content as the effect of the size of the raw material.

Volatile oil Content

The size of material inserted into the distillation process showed an impact to the degree of volatile oil containing in unripe nutmeg fuli. It's range between 23.2752%–35.2492%. Treatment of the highest content of volatile oil is the treatment E (40-mesh) as much as at 35.2492% and the lowest number for the same category is the treatment A (Untreated), counted at 23.2752%, respectively.

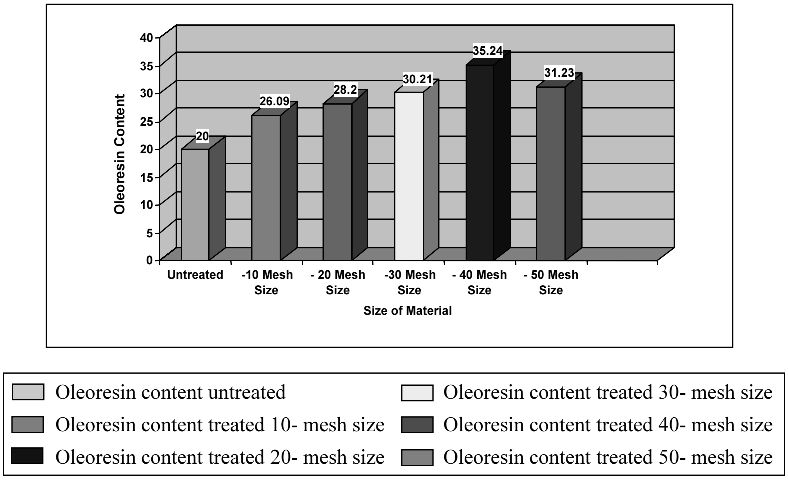

Fig. 1. Oleoresin content as effect of the size of the raw material

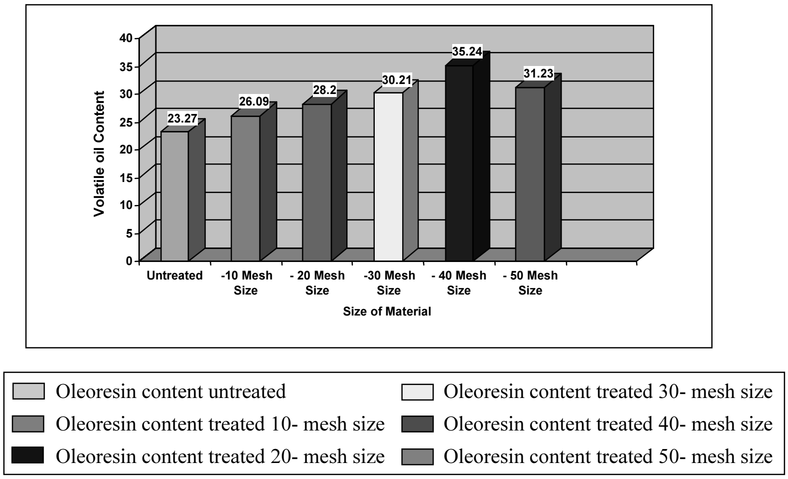

Fig. 2. Volatile oil contents as effect of the size of raw material

The high number of volatile oil content in the treatment E (40-mesh) was caused by the complete interaction between material and solute in the process to gain volatile oil, therefore the degree of product was increased. However, the material comes to smooth in the processing manner impact in high evaporation of oil content and automatically descends oleoresin content. Our data suggested the report by Moestafa's (1981) that the proper smoothness of material influenced the successful of the shorten of extraction time, on the other hand, Figure 2 shows that the volatile oil content was effected the size of raw material.

Specific Weight

Specific weight of oleoresin by extracting process was influenc-ed by the side of extracted materials. The highest number of specific weight by the treatment E (40-mesh) was recorded at 1.0039 and the lowest by treatment A. (untreated) was at 0.9002, respectively.

Specific weight of oleoresin was determined by molecular mass of each component that composite of oleoresin. If the extraction produced the component with high molecular mass such as lipid, carbohydrate and resin, oleoresin was produced with high specific weight. In the other way, if extraction result contains the many components with low molecular mass, the low specific weight of oleoresin has an impact.

The high number of specific weight in the treatment E (40-mesh) was caused by the contact between the solute and material in the perfect way, and all components in oleoresin could be extracted in comprehensive. Components of the oleoresin such as lipid, oil and resin were soluble in ethanol and in the components with high molecular mass, the high specific weight of oleoresin were constituted. In the previous research, Monich (1968) reported that ethanol was characterized by easy dissolving resin compound, oil, lipid acids and other organic compounds. Those compounds were the long chained organic compounds, which role in supports the high specific weight of oleoresin.

The lowest number of specific weight was given in the treatment A (untreated). This number possibly origin from the extracted non-chopping material, which effected the lessening of contact between solute and material. It created the sort of difficulty for solute to penetrate cell tissue, therefore some components like lipid, carbohydrate and resin were extracted in the little number of lowering the specific weight of oleoresin product. Figure 3 shows that specific weight was affected by the size of row material.

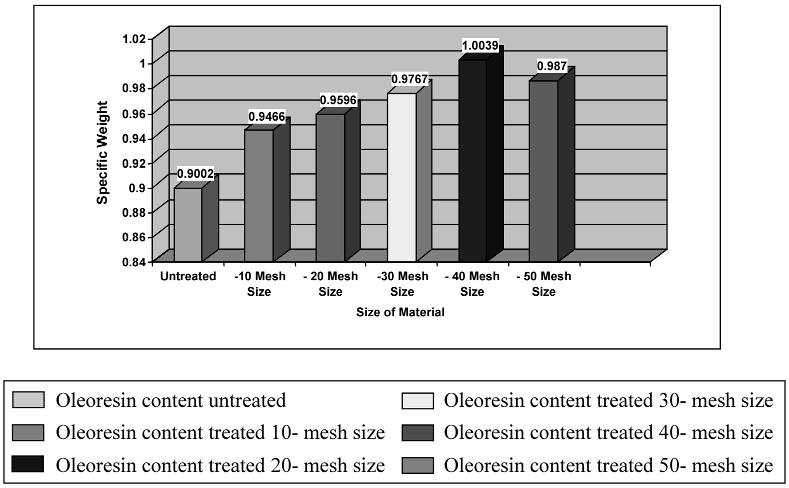

Fig. 3. Specific weight as effect of the size of row material

Bias Index

Bias index of material was compared between the sinus of fallen angle and bias angle from bundle of light with 589.3 ± 0.3 mm in wavelength down from air to certain material maintaining in a constant direction.

Material size in fact could give the significant influence to bias index of oleoresin of unripe nutmeg fuli. The highest number was given by the treatment E (40-mesh) as much at 1.4975 and the lowest one in the treatment A (untreated material) counted at 1.4595, respectively.

Bias index was affected by the length of carbon chain and amount of the double binding. The longer of carbon chain, the more double binding, the higher bias index were reported (Formo, 1979).

The higher value of bias index in the treatment E (40-mesh) was caused by the size of 40 mesh to sieve the material, hence the contact between material and solute were conducted in a complete way. This even induced the polymer as the component with high molecular mass (in this case resin) extracted in perfect. In the previous research by Monich (1968) that oil, lipid and resin were composed by long chained compound, thus the extracted oleoresin was contained the long-chained carbonic compound in such a great mass that lead to the increase of the value of bias index of oleoresin.

According to Formo et al. (1979), the value of bias index was related to the structure and composition of organic compound in such material. Bias index was raised along with the increment of the length of carbonic chain in organic compound forming from polymeric reaction inside to the oil during the extraction process produced a compound with high molecular mass. This molecular mass is reason for the rising of oil density for the difficulty of fallen light to be biased and result in bigger bias index. Figure 4 shows that bias index was affected the size of raw material.

Residue of solute

On the analysis of solute residue, material size has also given the significant influence to the sol-

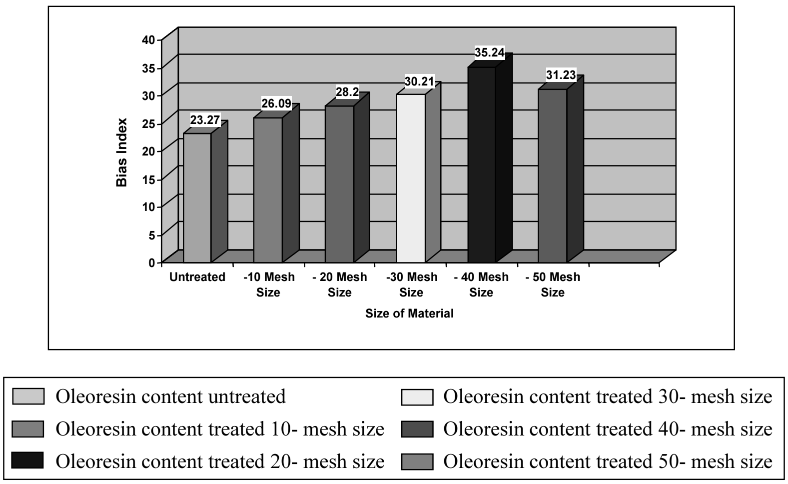

Fig. 4. Bias index a effect of the size of row material

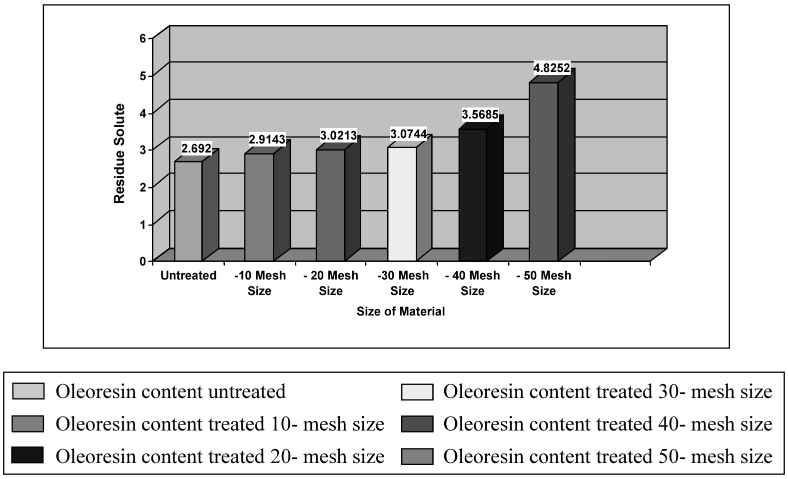

Fig. 5. Residue of solute as effect of the size of raw material

ute residue of oleoresin of unripe nutmeg fuli. The higher number of solute residue was gained in the treatment F (50-mesh) as much at 4.8252% and the lowest number was by the treatment A (untreated material), counted at 2.6920%, respectively.

The lesser of material size and the bigger solute residue were brought from the extraction process, because the tiny material induced the interaction between material in order to solute wider and the solute is trapped in material to hugger. These results were proved in solute residue containing in the treatment F (50-mesh), where it has the finest size of sieve amongst the others.

According to Riyanto (1986), the good oleoresin product is free from or contains the least solute residue, because solute residue was affected the quality, especially the aroma of the product.

Based on some characteristic analysis of oleoresin of immature nutmeg fuli, the values were still in tolerance standard of EOA (Essential Oil Association) No. 241 in the reports by Purseglove et al. (1981). Figure 5 shows that residue solute was affected by the size of raw material.

Conclusions

The research has been summarized as follow:

1. Material size treatments were showed the significant influence to the oleoresin content, volatile oil, specific weigh, bias index and solute residue of produced oleoresin of unripe nutmeg fuli.
2. The best result of the research was the extraction with material size 40-mesh (treatment E) where the content of oleoresin at 39.8803%; volatile oil degree at 35.2492%; specific weight at 1.0039; bias index at 1.4975 and solute residue at 3.5685%, respectively.

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