THE QUALITY OF NUTMEG SEEDS AND MACE FROM NORTH SULAWESI

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ABSTRACT

Nutmeg seeds and mace quality are important export commodity from North Sulawesi. Recently, Indonesian nutmeg seeds and mice were contaminated by aflatoxin which was emerged in the storage. This resulted in decrease in price and demand of nutmeg especially from European countries. Aflatoksin scientifically proven can cause cancer. Thus, the products should follow the quality control test to insure the safety and health of consumers to be exported to European countries. This study aimed to know the nutmeg seeds and mace quality using descriptive statistic method. The result showed that 77 nutmeg seeds and 14 mace exports sample tested in 2010 - 2013 qualified for standard quality according to Indonesian National Standard (SNI). However, those samples were contained Aflatoxin ranged between 1.67ppb to 2.00 ppb. This indicated that SNI was no longer able to determine the quality of the nutmeg seeds and mace for export.

Keyword: Nutmeg Seeds, Mace, Standard of Quality, Aflatoxin,

Introduction

Nutmeg (*Myristica fragrans*) or "pala" is a plant originated from the Banda Islands, Maluku. Due to the high value as a spice, nutmeg has become an important trade commodity since Roman times. Since European exploration, nutmeg is widespread in tropical regions such as Mauritius and the Caribbean (Island of Grenada). Nutmeg is an important export commodity from North Sulawesi to European, Asian and American countries. Based on data from Industry and Trade Agency of North Sulawesi Province, nutmeg North Sulawesi Province dominated 75% of market share in the world trade. Nutmeg powder is used as flavoring for foods and mixture for perfume or soap. Indonesia export 1,000 to 2,000 ton/month

nutmeg or 20,000 ton/year. Nutmeg from North Sulawesi is famous for its high quality and productivity. In 2007, the productivity was 1,655 ton and increased 10% in 2012, reached 9000 ton.

Based on flowering characteristic, nutmeg plant is *dioecious*, consists of male trees and female trees. The leaves are elliptical slim. The fruit is oval shaped like a lemon, yellow, fleshy and have flavorful distinctive because of its essential oil content. The nutmeg seed contained 7-14% essential oil. Nutmeg can be sold in the form of seeds, coated seeds (*arillus*) or mace salute, and fruit flesh (*fructus cortex*). The first harvesting is 7 to 9 years old and reached a maximum productivity after 25 years.

At the end of 2011 Indonesian nutmeg was contaminated by *Aflatoxin* which decreased the price from US$ 20,000/ton to US$ 16,500/ton. This problem also affected the demand from European countries which decreased the export value from 41 million Euro in 2011 to 23 million Euro in 2012.

Aflatoxin was produced by mold or fungi such as *Aspergillus flavus* and *Aspergillus parasiticus*. It is toxic and carcinogenic, thus harmful for human health. Favorable conditions for its growth include high moisture content and high temperature. At least there are 13 different types of *Aflatoxin* produce in nature with *Aflatoxin* B1 considered as the most toxic. The presence of *Aspergillus flavus* does not always indicate harmfull levels of *Aflatoxin*, but it reveals the presence of *Aflatoxin*.

Malingkas (2011) stated that drying process is important in the agriculutural produce to maintain the quality. However, the appropriate condition in the storage or warehouse is also important to prevent the contamination of microorganism such as *Aflatoxin*. This study aimed to know the nutmeg seeds and mace quality using descriptive statistic method.

Research Methodology

This study used descriptive statistic method.

Nutmeg and mace were delivered directly by the exporter to the testing laboratory for product quality. Office of North Sulawesi Province that has been accredited by the National Standardization Agency in order to get certificate of quality for export commodities, parameters measured refer to Indonesian National Standards (SNI) 01 – 0006-1993 for Nutmeg seeds and Indonesian National Standards (SNI) for Mace (SNI 01-0007-1993).

Table 1. Criteria for Nutmeg Seed

Parameters	**Standard**
Moisture content (% wb)	max 10 %
Mold content (%)	max 8 %
Death Insects	max 4
Excreta (mg/lbs)	maks 0.00
Mammal feces (mg/lbs)	max 0.00
Others things (%)	max 0.00

Source: Indonesian National Standard (SNI) for Nutmeg Seeds (SNI 01-0006-1993)

Table 2. Criteria for Mace

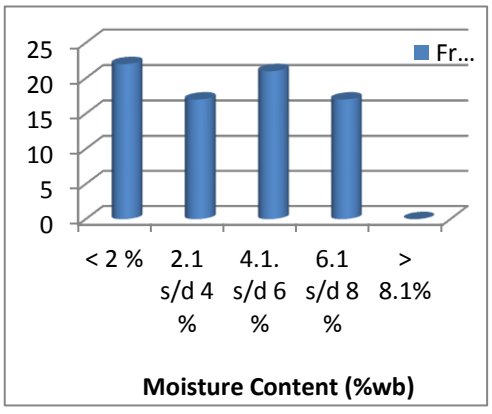
Parameters	**Standard**
Moisture content (% wb)	max 10 %
Mold content (%)	max 2 %
Death Insects	max 4
Excreta (mg/lbs)	max 1.00
Mammal feces (mg/lbs)	max 3.00
Others things (%)	max 0.50
Insects feces (%)	Max 1

Source: Indonesian National Standard (SNI) for Mace (SNI 01-0007-1993)

Result And Discussion

Moisture Content

The moisture content of nutmeg seeds sample and mace was fulfill the requirement from SNI as shown in figure 1 and figure 2.



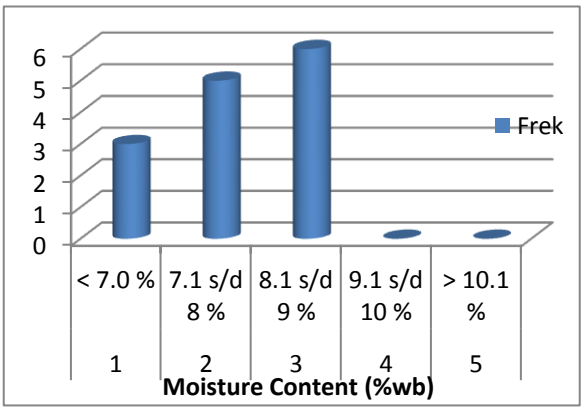


Figure 1. Moisture content of Nutmeg Seeds Figure 2. Moisture content of Mace

Figure 1 shows that moisture content on Nutmeg seed samples ranged from 2 %wb to 8 %wb. Most of samples from 77 export samples, that is about 22 samples were less than 2 % wb. Furthermore, on figure 2 it shows that moisture content on Mace samples were ranged from 7 %wb to 10 %wb. From 14 export samples, about 6 Mace samples ranged from 8.1 %wb to 9 %wb, whereas only 3 Mace samples that reached less than 7 %wb of moisture content.

Table 2 and table 3 shows about another parameters for Nutmeg seeds and Mace. Those data established that whole sample were qualified for Indonesian National Standard.

Table 2. Another Standards of Nutmeg seeds

No	Parameters	N	Standard	Research Result	Conclusion
1	Death Insects	77	max. 4	0	Qualified to SNI
2	Excreta (mg/lbs)	77	max. 0,00	0,00 mg/lbs	Qualified to SNI
3	Mamal Feces (mg/lbs)	77	max. 0.00	0,00 mg/lbs	Qualified to SNI
4	Others Things (%)	77	max. 0,00	0%	Qualified to SNI

Tabel 3. Another Standards of Mace

No	Parameters	N	Standard	Research Result	Conclusion
1	Death Insects	14	max. 4	0	Qualified to SNI
2	Excreta (mg/lbs)	14	max. 1	0.25	Qualified to SNI
3	Mamal Feces (mg/lbs)	14	max. 3	0,00 mg/lbs	Qualified to SNI
4	Others Things (%)	14	max. 0,50	0.27%	Qualified to SNI
5	Insectcs Feces (%)	14	max. 1	0.25%	Qualified to SNI

Mold Content and Other Variable

Mold content criteria followed SNI 01-0006-1993 for Nutmeg seeds and Mace can be found on figure 3 and figure 4. Those data shows that all samples were qualified to SNI standards. However, *Aflatoxin* content on mace samples are above the maximum standard (Table 3).

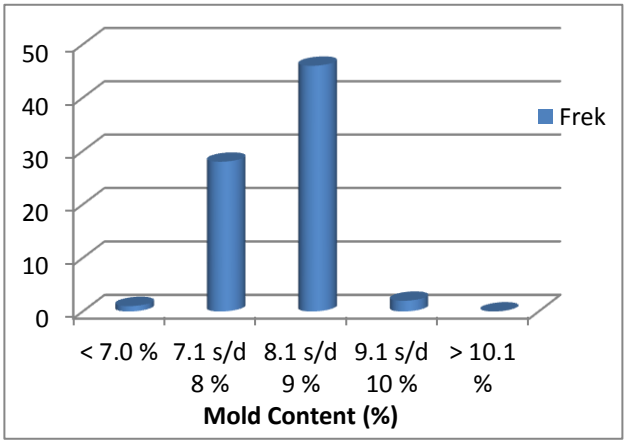


Figure 3. Mold Content in the Nutmeg Seeds

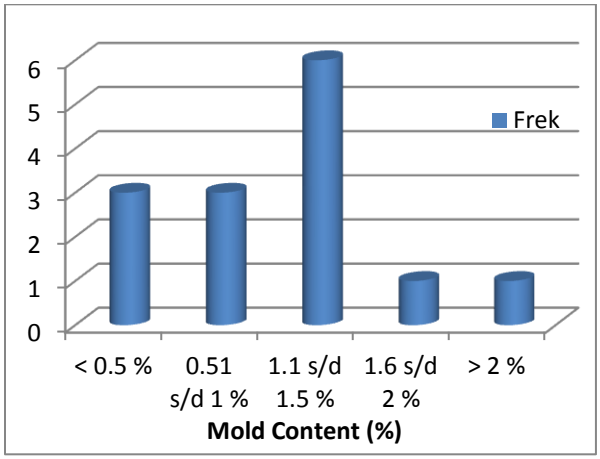


Figure 4. Mold content in Mace

Figure 3 shows mold content on Nutmeg seeds samples ranged from 7 % to 10 %. Most of samples from 77 export samples, just 1 sample that less than 7 %, whereas about 46 samples were ranged from 8.1% to 9 %. Furthermore, on figure 4 shows that mold content on Mace samples were ranged from 0.5 % up to 2 %. From 14 export samples, about 6 mace samples were ranged from 1.1 % to 1.5 %, whereas just 1 Mace sample that reached up to 2 % mold content in Mace.

Table 3. Aflatoxin content in the samples of nutmeg seeds

Year 2011						
No	**Code**	**Characteristics**	**Test method**	**Test Result**	**Unit**	**Information**
1	Pa 1	Aflatoxin B1	BF-ADAC-2000	not detected	ppb	DL: 1.67
2	Pa 2	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
3	Pa 3	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
4	Pa 4	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
5	Pa 5	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
6	Pa 6	Aflatoxin B1	BF-ADAC-2000	not detected	ppb	DL: 1.67
7	Pa 7	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
Year 2012						
1	Pa 7	Aflatoxin B1	BF-ADAC-2000	2	ppb	
2	Pa 6-3	Aflatoxin B1	BF-ADAC-2000	2	ppb	
3	Pa 5-3	Aflatoxin B1	BF-ADAC-2000	2	ppb	
4	Pa 4-3	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
5	Pa 3-3	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
6	Pa 2-3	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	
7	Pa 1-3	Aflatoxin B1	BF-ADAC-2000	1.67	ppb	

Whole data inform us that the quality of nutmeg seeds and mace from North Sulawesi were qualified for National Standards, but if confronted with standards of the buyers of the contents of Aflatoxin, then the commodity directly reject it does not fulfill world market requirement to Indonesia National Standard for Nutmeg Mace (SNI 01-0006-1993).

Field observation at the gathers level for processing and collecting, apparently found many lapses such as nutmeg collection adjacent to other merchandise so it is likely contaminated with foreign materials very possible (Figure 5). Furthermore, in terms of packaging using plastic bags (Figure 6) may cause air aeration will not optimal, so the water content of nutmeg and mace to increase and provides opportunities for growth of microorganism and later Nutmeg and mace will be tainted by the *Aflatoxin* produced by a fungus.

Figure 5. Nutmeg seeds are stored with other merchandise

Figure 6. Nutmeg and mace paced in plastic bags

Overall, all the samples were meet the requirement from SNI. However, they did not fulfill the quality requirement in the world market, especially for aflatoxin content, thus they was rejected by the buyers. Field observations revealed some findings that might cause the contamination. For example, the collector sorted nutmeg close to other commodities, thus it increase matter contaminations.

Furthermore, plastic used in packaging cause inappropriate air aeration. It would increase water content of nutmeg and mace and affected moisture content, which would trigger microorganism growth such as *Aflatoxin*.

Conclusion and Recommendation

Conclution

1. All nutmeg seed and mace samples evaluated were fulfill SNI criteria except for aflatoxin content.
2. Based on interview result with farmers, collectors, and traders in North Sulawesi most of them did not know the method to prevent or detect aflatoxin contamination on their product.

Recommendation

1. The SNI 01-0006 for Nutmeg Seed SNI and SNI 01-0007-1993 for mace may require revision following international standard to avoid ban or rejection from the buyer.
2. Technical assistance and institutional guidance for all parties involved Nutmeg trade is necessary to ensure quality and sustainability in the world market. Thus improve especially in North Sulawesi. .

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JUDUL

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Nama penulis pertama[1] Nama penulis kedua[2]

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[1]Alamat penulis pertama (lengkap dgn email)

[2]Alamat penulis kedua (lengkap dgn email)

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ABSTRAK

(abstrak ditulis dalam bahasa Indonesia, maksimum 250 kata)

Satu paragraf, memuat tujuan, metode penelitian yang digunakan, hasil, dan maksimum lima kata kunci.

***Kata Kunci**: aaaa, bbbb, cccc, dddd, eeee.*

PENDAHULUAN

Pendahuluan memuat latar belakang penelitian secara ringkas dan padat, dan tujuan. Dukungan teori tidak perlu dimasukkan pada bagian ini, tetapi penelitian sejenis yang sudah dilakukan dapat dinyatakan.

METODE PENELITIAN

Metode penelitian merupakan prosedur dan teknik penelitian. Antara satu penelitian dengan penelitian yang lain, prosedur dan tekniknya akan berbeda. Kalau tidak berbeda, berarti penelitian itu hanya mengulang penelitian yang sudah ada sebelumnya. Tapi bukan berarti harus berbeda semuanya. Untuk penelitian social misalnya, populasi penelitian mungkin saja sama, tapi teknik samplingnya berbeda, teknik pengumpulan datanya berbeda, analisis datanya berbeda, dan lain.lain. Mohon diuraikan dengan jelas, bukan hanya mengopi dari penelitian lain. Kalau mau disertakan penelitian yang dilakukan termasuk ke dalam kategori penelitian yang mana, mohon diperhatikan dengan baik, jangan asal mengopi. Bagian ini bisa dibagi menjadi beberapa sub bab, tetapi tidak perlu mencantumkan penomorannya.

HASIL DAN PEMBAHASAN

Bagian ini memuat data (dalam bentuk ringkas), analisis data dan interpretasi terhadap hasil. Pembahasan dilakukan dengan mengkaitkan studi empiris atau teori untuk interpretasi. Jika dilihat dari proporsi tulisan, bagian ini harusnya mengambil proporsi terbanyak, bisa mencapai 50% atau lebih. Bagian ini bisa dibagi menjadi beberapa sub bab, tetapi tidak perlu mencantumkan penomorannya.

PENUTUP

Bagian ini memuat kesimpulan dan saran. Kesimpulan dan saran dapat dibuat dalam sub bagian yang terpisah. Kesimpulan menjawab tujuan, bukan mengulang teori, berarti menyatakan hasil penelitian secara ringkas (tapi bukan ringkasan pembahasan). Saran merupakan penelitian lanjutan yang dirasa masih diperlukan untuk penyempurnaan hasil penelitian supaya berdaya guna. Penelitian tentunya tidak selalu berdaya guna bagi masyarakat dalam satu kali penelitian, tapi merupakan rangkaian penelitian yang berkelanjutan.

DAFTAR PUSTAKA

Bagian ini hanya memuat referensi yang benar-benar dirujuk; dengan demikian, referensi yang dimasukkan pada bagian ini kaan ditemukan tertulis pada bagian-bagian sebelumnya. Sistematika penulisannya adalah :

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Aturan Penulisan

- Tulisan merupakan hasil penelitian
- Tulisan ilmiah menggunakan bahasa Indonesia baku, setiap kata asing dicari padanannya dalam bahasa Indonesia baku, dan tidak perlu menyertakan bahasa asingnya.
- Kalimat yang diambil dari tulisan ilmiah dalam bahasa asing diterjemahkan dalam bahasa Indonesia baku.
- Referensi menggunakan aturan author, date hanya mencantumkan nama belakang penulis dan tahun tulisan (contoh: Kotler, 2000) dan mohon dicek ulang dengan daftar pustaka (sangat membantu jika menggunakan fasilitas bibliography yang ada di word processor)
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  - Huruf Times New Roman, ukuran 12
  - Semua jenis rumus ditulis menggunakan Mathematical Equation (bagi pengguna MS Word ada di bagian Insert => Equation), termasuk pembagian/fraksi, Zigma, Akar, Matriks, Integral, Limit/Log, Pangkat, dsb.
  - Semua jenis simbol menggunakan simbol standar yang ada di Word Processor (bagi pengguna MS Word ada di bagian Insert => Symbol)
  - Judul tabel dan gambar ditulis di tengah, title case, dengan jarak 1 spasi dari tabel atau gambarnya. Tulisan "Tabel" atau "Gambar" dengan nomornya diletakkan satu

baris sendiri. Judul tabel diletakkan di atas tabel (sebelum tabel) dan judul gambar diletakkan di bawah gambar (setelah gambar).

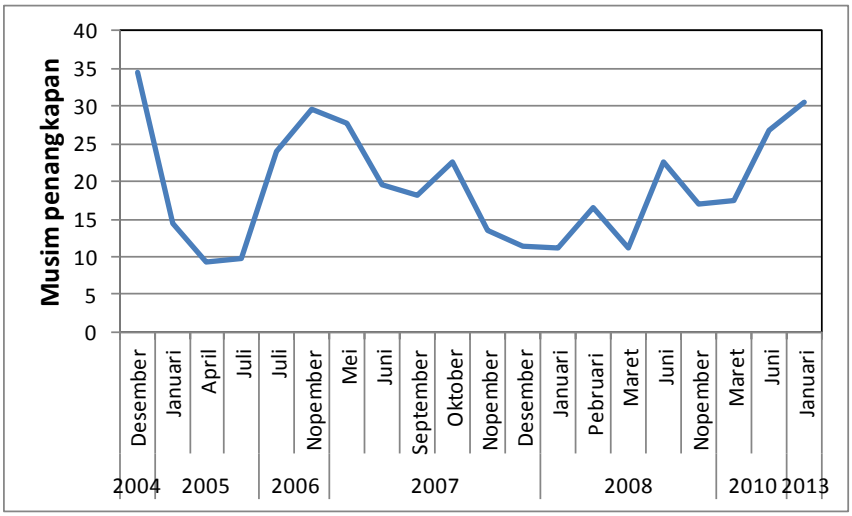
- Penulisan sumber tabel atau gambar diletakkan di bawah tabel dan gambar (center pada gambar dan sejajar tabel pada tabel dengan huruf 10 pt). Pada gambar, penulisan sumber diletakkan setelah judul gambar dengan jarak 1 spasi. Tulisan dalam tabel 10 pt.

Contoh tabel

Tabel 1. Berat sampel dan berat ekstrak kasar

Perlakuan	Berat sampel	Ekstrak kasar)
4 ppt	5	0,12
8 ppt	6	0,016
12 ppt	7	0,276

Contoh Gambar



Gambar 1. Musim penangkapan ikan dasar berdasarkan trip bulanan.