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Research Article

Chemical composition and oil characterization of *Monodora myristica* (African nutmeg) and *Myristica fragrans* (nutmeg) seeds from Rivers State, Nigeria

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Abstract
Nutmeg (*Myristica fragrans)* and African nutmeg (*Monodora myristica)* have faced several limitations in the past due to limited knowledge about their comparative chemical composition and nutritional properties. Accordingly, this research was designed to evaluate the chemical composition and nutritional profile of nutmeg and African nutmeg seeds, in addition to examining the physicochemical characteristics of the oils derived from them. Seed samples were obtained from a local market in Port Harcourt, Nigeria, and analysed using established standard methods to determine their nutritional constituents, chemical attributes, and oil quality parameters. Results showed that *M. fragrans* had a lower moisture content (7.770%) and a higher fat content (18.070%) than *M. myristica* (9.730% moisture; 14.100% fat). Phytochemical analysis revealed that seeds of *M. myristica* contained higher levels of saponins (8.183±0.099 mg/100g) and tannins (0.627±0.035 mg/100g), while those of *M. fragrans* were richer in flavonoids (7.510±0.086 mg/100g) and phytates (0.623±0.031 mg/100g), these compounds are associated with antioxidant activities. A higher seed oil yield was observed in *M. fragrans* (36.08%), while *M. myristica* yielded slightly less oil (32.47%). Chemical analyses indicated that the seed oil from *M. myristica* had higher iodine and peroxide values, whereas *M. fragrans* had a lower peroxide value and a relatively lower pH. Understanding these distinct profiles will support targeted applications in food and cosmetic industries.

Keywords: *Monodora myristica, Myristica fragrans*, Physicochemical properties, Phytochemicals, Seed oil

INTRODUCTION

Throughout human history, plants have served as a fundamental source of therapeutic agents across civilizations, with a vast majority exhibiting some form of medicinal potential. In Nigeria, numerous medicinal plant species exist; however, only a limited number are domesticated, while many others are harvested from the wild. In recent years, scientific attention has increasingly focused on the bioactive properties of various Ayurvedic medicinal herbs, largely because of their natural origin, cost-effectiveness, and relatively minimal adverse effects (Wang *et al.,* 2025). The rising cost of prescription drugs and the bio-prospecting of new plant

-based medicines have further boosted interest in medicinal plants as health aids. Generally, medicinal plants produce constituents with medicinal properties, mainly as secondary metabolites (Aja *et al.,* 2014). Traditional medical practices in many tropical countries often involve using plants in their whole form or specific parts such as roots, stems, barks, fruits, seeds, juices, flowers, and exuviates, often prepared as infusions or decoctions (Phua, 2009; Tugume and Nyakoojo, 2019).

Monodora myristica (African nutmeg), sometimes referred to as calabash nutmeg or African nutmeg, is a perennial tropical tree in the Annonaceae family. The species occurs naturally in both evergreen and deciduous forest zones across tropical Africa (Uyoh *et al.,* 2014a). It is known by several indigenous names, including *ehuru ofia* (Igbo) and *ariwo* (Yoruba), and is also called awerewa, Iubushi, Ghana seed, or orchid nutmeg in different regions. Although widely distributed in tropical and subtropical areas, it remains relatively underexploited compared to other commercial spices. Various plant parts, particularly the seeds, bark, and flowers, have been reported to contain minerals, proteins, amino acids, vitamins, and phenolic compounds (Agiriga and Siwela, 2017). These constituents are associated with diverse biological activities, including antioxidant, anti-inflammatory, antimicrobial, antihypertensive, hepatoprotective, antidiabetic, and cholesterol-modulating effects. The seeds are typically ground and incorporated into soups and other traditional dishes as flavouring agents, while crude extracts are used in ethnomedicinal practices for managing a range of ailments.

Myristica fragrans, commonly known as true or Indonesian nutmeg, is native to the Banda Islands and is now cultivated widely in tropical regions of Asia, Africa, and the Americas (Sasikumar, 2021; Lahane *et al.,* 2023). The tree produces a yellow-green fruit that matures several months after flowering and consists of fleshy pericarp, seed, mace (aril), and shell in defined proportions. The brightly colored aril surrounding the seed contributes significantly to the characteristic aroma and commercial value of the spice. Historically, *M. fragrans* played a central role in international spice trade, particularly during the Middle Ages and Renaissance, when it was highly valued in Europe for both culinary and medicinal purposes (Lahane *et al.,* 2023).

Although both species are recognized for their culinary and ethnomedicinal importance, systematic comparative evaluation of their seed composition and oil characteristics remains limited. In particular, insufficient data exist regarding differences in their proximate composition, phytochemical profiles, and physicochemical properties of the extracted oils. Thus, in this study, a systematic comparative evaluation of the seed composition and oil characteristics of both *M. myristica* and *M. fragrans* was carried out to determine their nutritional and chemical properties under the same laboratory conditions and procedures. Understanding these distinct profiles will support targeted applications in food, pharmaceutical and cosmetic industries.

MATERIALS AND METHODS

Plant sample collection and preparation

The seeds of *Monodora myristica* and *Myristica fragrans* were obtained from Mile one market in Diobu, Port Harcourt, Rivers State. Three separate batches of *Monodora myristica* seeds were purchased from different local farmers who get the seeds directly from the forest in Khana Local Government Area of Rivers State, Nigeria and sell them at the market, while the seeds of Myristica fragrans were purchased from retailers in the market, as they are not native to Africa. The seeds were sundried for three days before being taken to the laboratory, where they were placed in a desiccator for complete dehydration. The dehydrated seeds were then pulverized into a fine powder.

Proximate analysis

The proximate composition of *M. fragrans* and *M. myristica* seeds were evaluated to quantify moisture, ash, crude fibre, lipid, protein, and carbohydrate contents. Determination of moisture, ash, crude fibre, and lipid fractions was conducted according to the procedures outlined by Udo *et al.* (2009). Total nitrogen was measured using the Macro-Kjeldahl technique, and crude protein was subsequently calculated as described by Onwunka (2005) and Udo *et al.* (2009). Carbohydrate content was estimated by difference, calculated as the remainder after subtracting the percentages of ash, crude fibre, crude protein, and moisture from 100.

Phytochemical analysis

Quantitative determination of selected phytochemicals, including saponins, tannins, alkaloids, flavonoids, and phytates, was carried out using established protocols reported by Harborne (1973) and Edoga *et al.* (2006).

Oil extraction

Fixed oils were obtained from powdered seed samples of each batch of both nutmeg species using Soxhlet extraction with n-hexane as solvent, following standard AOAC guidelines (AOAC, 2000) and the procedure described by Afolayan *et al.* (2014). Approximately 200 g of each pulverized sample was subjected to continuous extraction for eight hours. The solvent was subsequently removed under reduced pressure using a rotary evaporator. Residual oil was dried at 75 °C for 1 hour to eliminate remaining solvent traces, cooled in a desiccator, and stored in airtight containers pending physicochemical characterization.

Physicochemical analysis of the seed oils

The physicochemical properties of the extracted seed oils from both nutmeg species were determined.

Physical characterization

Percentage yield was calculated as Percentage yield = volume of oil divided by sample weight, then multiplied by 100. The physical state of the extracted oil was examined visually after removal from the desiccator.

Chemical characterization

Determination of pH

The pH was determined with a properly calibrated pH meter. The electrode was immersed in the oil sample after it had stabilized for 30 minutes, and the reading was recorded.

Determination of specific gravity

Specific gravity was determined using a density bottle. The sample mass in a 50 mL density bottle was measured, and the density was calculated as (mass/volume of density bottle). Specific gravity was calculated as (sample density/water density) at 25 °C.

Determination of melting point

The oil's melting point was determined by freezing it in a beaker, and a thermometer was used to measure the temperature at which it began to melt.

Determination of viscosity

Viscosity was determined using the capillary viscometer method following specified national standards. A cleaned and dried viscometer was used in a thermostatic bath set at 40 °C. The sample was drawn into the viscometer, placed in the bath for 20 minutes, and the flow time between two marks was measured using a stopwatch. The measurement was repeated multiple times to obtain an average flow time within specified deviation limits. Kinematic viscosity was calculated using the formula: Vt = C * Tt, where C is the viscometer constant and Tt is the average flow time.

Determination of relative density

Relative density was evaluated using a pre-weighed density bottle. Ten millilitres of the oil sample and an equal volume (10 mL) of distilled water were measured separately into the bottle, and their masses were recorded. Density was calculated as mass divided by volume, and relative density was subsequently derived from these values.

Determination of refractive index

The refractive index was measured at 25 °C with an Abbe refractometer. A small quantity of the oil (two drops) was applied to the prism surface, after which the refractive index reading was taken directly from the instrument.

Determination of acid value

Acid value was determined following the procedures described by AOCS (2001) and Varona *et al.* (2021). Precisely 1 g of the oil sample was dissolved in 150 mL of a 95% (v/v) ethanol–benzene mixture. The resulting solution was titrated with methanolic potassium hydroxide delivered from a burette, using phenolphthalein as the indicator. The endpoint was identified by the appearance of a pink colour that persisted for at least 10 seconds.

Determination of peroxide value

Peroxide value was assessed according to the method of Varona *et al.* (2021). The oil sample was accurately weighed (to 0.001 g) into a 250 mL conical flask, after which 10 mL of chloroform was added to dissolve the oil. Subsequently, 15 mL of glacial acetic acid and 1 mL of saturated potassium iodide solution were introduced. The flask was immediately stoppered, shaken for one minute, and kept in the dark briefly. Thereafter, 75 mL of distilled water and two drops of 1% starch indicator were added and mixed thoroughly. The iodine released was titrated with 0.01 M sodium thiosulphate until the blue colour disappeared, marking the endpoint.

Determination of iodine value

Iodine value was measured using the procedure outlined by Varona *et al.* (2021). Five millilitres of chloroform were added to a dry conical flask containing Dam's iodine solution dispensed from a burette in a fume cupboard. After allowing the reaction to proceed for 30 minutes, 20 mL of water and 5 mL of freshly prepared potassium iodide were added and mixed gently. The mixture was titrated with 0.025 N standard sodium thiosulfate under continuous stirring to ensure proper mixing of both phases. When a pale-yellow colour appeared, starch indicator was added dropwise, and titration continued until the solution became completely colourless.

Determination of saponification value

Saponification value was determined in accordance with Varona *et al.* (2021). Approximately 1.0 g of oil (accurate to 0.001 g) was weighed into a 50 mL quickfit flask. Ethanolic potassium hydroxide solution (0.5 mL) was added, and the mixture was agitated thoroughly using an electric shaker. A reflux condenser was attached, and the mixture was heated under reflux for 60 minutes with a heating mantle. After refluxing, 0.05 mL of phenolphthalein indicator was introduced, and the solution was titrated with 0.5 M hydrochloric acid to a colourless endpoint. A blank determination was performed simultaneously under identical experi-

mental conditions.

Data analysis

All experimental measurements for each seed batch were conducted in triplicate. The resulting values were used to calculate the mean and corresponding standard error. Differences between the two species for all measured parameters were evaluated using Student's t -test, performed with Genstat (Discovery Edition).

RESULTS AND DISCUSSION

Proximate composition of seeds of *Monodora myristica* and *Myristica fragrans*

M. Myristica was significantly richer (P<0.05) in moisture (t=7.16), ash (t=10.3), crude fibre (t=30.71), and protein (t=28.28), while *M. fragrans* had higher fat (t=61.49) and carbohydrate (5.93) contents (Table 1). The relatively low moisture content in both species (7.7 –9.7%) suggests their suitability for long-term storage and potential for oil extraction. The reduced moisture content minimizes microbial spoilage and degradation in both species. The total ash contents were 3.09% (*M. fragrans*) and 4.16% (*M. myristica*). The results obtained here were comparable to values (2.60% and 2.25%) reported by Akpabio and Akpakpan (2012) and Akinyede *et al.* (2016), respectively. Samples with high ash content would most likely have higher concentrations of various elements, which would consequently speed up metabolic processes and improve growth and development (Elinge *et al.,* 2012; Akinyede *et al.,* 2016). The protein in both species was appreciable (8.29% and 10.10%) in *M. Fragrans* and *M. Myristica*, respectively. Generally, any plant that provides less than 12% of its caloric value from protein is not considered to be a good source of protein (Ali, 2010). Thus, these two species may not qualify as ideal sources of protein, but they may contribute to the daily protein requirement in diets.

M. fragrans also exhibited a superior fat content (18.07%) compared to *M. myristica* (14.10%), indicating its potential as a more efficient source for edible and industrial oil production. Higher percentages of fat (43.80% and 38.50%) were reported by Akpabio *et al*. (2012) and Akinyede *et al.* (2016), respectively. Carbohydrate content was relatively low in both species (*M. fragrans* - 18.84% and *M. Myristica* - 7.61%). Carbohydrates provide energy to the cells in the body and spare the body protein from being used. The values obtained for carbohydrates in both species were lower than those reported by Akpabio and Akpakpan (2012) (39.88%) and Akinyede *et al.* (2016) (28.09%). The observed differences in carbohydrate content relative to reports by Akpabio and Akinyede (2012) may be attributed to several interrelated factors. First, geographical and edaphic variability, including soil type, climate, and agronomic conditions, can significantly influence nutrient allocation in seeds (da Silva *et al.,* 2021).

Phytochemical composition of seeds of *Monodora myristica* and *Myristica fragrans*

Results of the phytochemical analysis of the seeds of the two nutmeg species are given in Table 2. The concentrations of alkaloids reported in this study (2.61% and 2.13% for *M. myristica* and *M. fragrans,* respectively) were comparable to what was reported in *T. Tetraptera* (2.26%), and *Eromomastax polyspema* and *E. Speciosa* (3.61% and 2.87%) by Uyoh *et al.* (2013, 2014b). Alkaloids possess analgesic, antispasmodic, and antibacterial properties and are among the most significant plant substances in medicine (Stay, 1998; Harisaranraj *et al.,* 2009; Uyoh *et al.,* 2014b).

Flavonoid contents of 5.32% and 7.51% were reported for *M. myristica* and *M. fragrans*, respectively, which are higher than the 3.60% and 2.67% reported for E. polyspema and E. speciosa (Uyoh *et al.,* 2014b) and the 3.84% reported for *T. tetraptera* (Uyoh *et al.,* 2013). Flavonoids are associated with antioxidant activities and are said to be biologically active against liver toxins, tumours, viruses, other microbes, allergies, and inflammation. Flavonoids are also reported to play a role in the protection of blood vessels, especially tiny capillaries that carry oxygen and nutrients to cells (Okwu, 2004; Uyoh *et al.,* 2014b). For authentication, a standard antioxidant assay (such as DPPH, ABTS, or FRAP) will be necessary to determine whether the higher flavonoid content in M. fragrans actually translates into superior free-radical scavenging activity compared to M. myristica, as this was not covered in this research.

The flavonoid content of 7.51 mg/100 g observed in this study is lower than that reported for well-established flavonoid-rich foods such as berries, cocoa, or certain legumes, which may contain 50–500 mg/100 g depending on species and processing (Manach *et al.,* 2004; Shahidi and Yeo, 2018). From a nutritional perspective, such a concentration suggests that the seed is unlikely to serve as a major standalone dietary source of flavonoids. However, biological significance cannot be inferred solely from total quantity, as antioxidant and anti-inflammatory effects depend on compound profile, synergistic interactions, and bioavailability (Shahidi and Yeo, 2018). Even moderate levels may contribute to cumulative antioxidant intake when consumed regularly or incorporated into formulations. Therefore, while the flavonoid concentration supports potential functional value, further studies evaluating bioaccessibility, in vitro antioxidant capacity, and dose–response relationships are necessary before therapeutic claims can be substantiated.

Table 1. Proximate composition of seeds of *Monodora myristica* and *Myristica fragrans;* Results are expressed as mean ± standard error of mean

Species	Moisture (%)	Ash (%)	Fat (%)	Crude fiber (%)	Protein (%)	Carbohydrate (%)
M. myristica	9.73 ± 1.46	4.16 ± 0.09	14.10 ± 0.05	13.11 ± 0.02	10.10±0.04	7.61±1.31
M. fragrans	7.77 ± 1.49	3.09 ± 0.05	18.07 ± 0.04	12.13 ± 0.03	8.29±0.05	18.84±1.37

Table 2. Phytochemical analysis result for *Monodora myristica* and *Myristica fragrans* ;Results are expressed as mean ± standard error of mean

Species	Alkaloids (Mg/100g)	Flavonoids (Mg/100g)	Saponins (Mg/100g)	Tannis (Mg/100g)	Phytate (Mg/100g)
M. Myrisctica	2.61 ± 0.15	5.32 ± 0.18	8.18 ± 0.10	0.63± 0.04	0.13 ± 0.02
M. Fragrans	2.13 ± 0.07	7.51 ± 0.09	5.153 ± 0.10	0.37 ± 0.02	0.62 ± 0.03

Saponin content for *M. myristica* (8.18%) and *M. fragrans* (5.15%) was reported in this study.

Saponins are a diverse group of naturally occurring glycosides produced by plants as a defence mechanism against foreign pathogens; thus, they can be considered natural antimicrobials (Zaynab *et al.,* 2021; Rachwal and Gustaw, 2025). They enhance the penetration of proteins through the cell membrane (Sule *et al.,* 2011). They are also useful cholesterol-lowering agents (Xiao *et al.,* 2025) and help in the relief of cough (Petrovic, 2022). Saponins are reported to possess anti -cancer properties (Wang *et al.,* 2024).

The high saponin content in *Monodora myristica* oil (8.18% dry weight) underscores the need for careful safety evaluation before food or cosmetic applications. Saponins are amphiphilic glycosides with beneficial bioactivities, including antioxidant and emulsifying properties, but can also exert toxic effects depending on structure and dose, particularly via interaction with cholesterol in cellular membranes, leading to erythrocyte disruption and hemolysis in vitro (Zhang *et al.,* 2022; Jarzębski *et al.,* 2020). The hemolytic activity is structurally dependent, as saponin–sterol complexes promote pore formation and cytolysis. To ensure safe utilization, comprehensive toxicological studies are recommended, including in vitro hemolysis assays, cytotoxicity testing on relevant human cell lines, and in vivo subchronic toxicity assessments following Organization of Economic Cooperation and Development (OECD) guidelines, which would establish critical safety thresholds such as No Observed adverse Effect Level (NOAEL). Additionally, processing methods to reduce saponin content should be explored. Traditional treatments like boiling, roasting, soaking, and fermentation have been effective in lowering antinutrient levels (Thaez *et al.,* 2019), while advanced refining approaches, including solvent fractionation, activated carbon adsorption, alkaline degumming, and molecular distillation, can selectively remove saponins while preserving lipid quality (Li *et al.,* 2025). Integrating toxicological validation with optimized processing is essential to safely develop *M. myristica* oil for food and industrial applications.

Tannins are dietary anti-nutrients, and their presence in reasonable amounts (0.627% and 0.37%) in *M. myristica* and *M. fragrans* gives both of them their characteristic astringent taste. Tannins are useful in the treatment of intestinal disorders such as diarrhea and dysentery, as well as urinary tract infection (Fraga-Corral *et al.,* 2021). The value for phytate obtained from both species was 0.13% (*M. myristica*) and 0.63% (*M. fragrans*). These values may be considered relatively low compared with those obtained from other spice plants and comparable to the value reported for *M. myristica* (Akpabio and Akpakpan, 2012). Phytates are known to significantly affect digestibility by forming complexes with essential minerals, such as calcium, iron, and zinc, thereby reducing their bioavailability. Also, phytates bind with proteins and enzymes, interfering with protein digestion and enzyme activity (Coulibaly *et al.,* 2011; Gänzle, 2020). However, processing methods such as cooking are known to significantly reduce phytate levels in seeds, thereby improving the nutritional value of seeds and grains (López-Moreno *et al.,* 2022).

Physicochemical properties of the seed oils

The physicochemical parameters of the extracted oils are summarized in Table 3. Oil recovery was higher in *Myristica fragrans* (36.08%) than in *Monodora myristica* (32.47%). In both cases, the oils were liquid at room temperature. The chemical characteristics are presented in Table 4. The pH of *Myristica fragrans* oil was 4.82, indicating acidity, whereas *Monodora myristica* oil had a pH of 5.72, reflecting a slightly alkaline nature. The mildly acidic nature of *M. fragrans* oil may offer advantages in cosmetic and skincare formulations.

Specific gravity values were 0.97 cP for *M. fragrans* and 0.95 cP for *M. myristica*. These results are comparable to previously reported values for *Monodora myristica* (0.96 cP) and *Parkia biglobosa* (0.95 cP) (Adolf *et al.,* 2018) and fall within the typical range for seed oils (Gunstone, 2011).

Table 3. Physical characteristics of the seed oils of *Monodora myristica* and *Myristica fragrans*; Results are expressed as mean ± standard error of mean

Species	Percentage yield (%)	State of oil
M. myristica	32.47	Liquid
M. fragrans	36.08	Liquid

The melting point of *M. myristica* oil (30.56°C) was slightly higher than that of *M. fragrans* (29.77°C). Similarly, viscosity was greater in *M. myristica* (0.48 g/mL) than in *M. fragrans* (0.45 g/mL). Density measurements followed the same trend, with values of 0.97 g/mL for *M. myristica* and 0.95 g/mL for *M. fragrans*. Refractive index values were 1.49 and 1.46 for *M. myristica* and *M. fragrans*, respectively.Acid values were low and closely comparable, although slightly higher in *M. fragrans* (0.83 mg KOH/g) than in *M. myristica* (0.72 mg KOH/g). Overall, *M. myristica* oil exhibited marginally higher specific gravity, melting point, viscosity, density, and refractive index. These physicochemical differences may affect processing behavior, storage stability, and formulation performance. The low acid values observed for both oils suggest good quality and stability (Khan, 2018).The iodine value was higher in *M. myristica* (93.73 mEq/kg) compared to *M. fragrans* (83.35 mEq/kg). Since iodine value reflects the degree of unsaturation in lipids (Muhammad *et al.,* 2012), the higher value indicates a greater proportion of unsaturated fatty acids and potentially increased susceptibility to oxidative deterioration (Olaniyi *et al.,* 2014). Further analysis using Gas Chromatography–Mass Spectrometry (GC–MS) would provide more detailed fatty acid profiling and is recommended for future studies.

Peroxide value (PV), an indicator of oxidative rancidity, was 9.22 mEq/kg for *M. myristica* and 5.24 mEq/kg for *M. fragrans*. Lower peroxide values are associated with greater oxidative stability during storage (Buthelezi, 2019). Although *M. myristica* showed a comparatively higher PV, both oils remained below the maximum limit of 10 mEq/kg established by the Codex Alimentarius Commission for groundnut oils (CODEX, 2001). It should be emphasized that these PV measurements represent the oxidative state of the oils at the time of analysis. Since the seeds were purchased from local markets and prior storage conditions were unknown, handling practices may have influenced the recorded values.

Both oils recorded almost identical saponification values (188.50 mg KOH/100 g). Saponification value provides an estimate of the proportion of low-molecular-weight triacylglycerols present (Sajjadi, 2016) and is also related to foaming capacity, an important property in soap and detergent manufacture (Adolf *et al.,* 2018). The values obtained, being well above 100, indicate that both oils are suitable for soap production (Oladiji *et al.,* 2010; Adolf *et al.,* 2018).

Conclusion

This study revealed the chemical properties of the seeds of *M. fragrans* and *M. myristica,* as well as the unique potentials of the seed oils. Seeds of *M. myristica* were richer in saponins and tannins, which are known to have medicinal properties. It is a relatively high-iodine-value characterized oil. Meanwhile, seeds of *M. fragrans* contained higher protein and fiber content as well as higher concentrations of flavonoids, which are associated with nutritional and antioxidant properties. *M. fragrans* oil had a lower peroxide value and a slightly acidic pH. Understanding these distinct profiles will support targeted applications in the food and cosmetic industries.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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Table 4. Chemical characteristics of seed oils of *Monodora myristica* and *Myristica fragrans;* Results are expressed as mean ± standard error of mean

Species	pH	SG (25°C)	MP (°C)	V (cP, 25°C)	D (g/ml, 25°C)	RI (25°C)	IV mg KOH/g	PV mg KOH/g	SV mg KOH/g	AV mg KOH/g
M. Myristica	5.72 ± 0.06	0.97 ± 0.01	30.56 ± 0.30	0.48 ± 0.03	0.97 ± 0.01	1.49 ± 0.01	93.77 ± 0.93	9.22 ± 0.05	188.50 ± 0.56	0.82 ± 0.04
M. Fragrans	4.82 ± 0.23	0. 95± 0.011	29.77 ± 0.18	0.45 ± 0.01	0.95± 0.01	1.46 ± 0.02	83.35 ± 0.59	5.24 ± 0.06	180.10 ± 1.54	0.72 ± 0.04

Key: SG = Specific gravity, MP = Melting point, V = Viscosity, D = Density, RI = Refractive index, IV = Iodine value, PV = Peroxide value, SV = Saponification value, AV = Acid value

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