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Lemon grass (*Cymbopogon citratus*): A plant for future medicinal edible oil

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ABSTRACT

The proximate composition of the lemon grass and oil content were studied for the various physico-chemical properties such as – oil content, ash, moisture, acid value, saponification value, iodine value, free fatty acid (FFA), specific gravity, mean molecular mass (MMM), refractive index (RI) as per standard procedure. The fatty acid determination was done by using Gas liquid Chromatography (GC). The dry matter, crude protein, crude fibre, ether extract and ash contents of the grass were 68.04 %, 10.28, 12.21, 16.07 % and 9.76% respectively. The oil was found to be rich in linoleic acid (30.72%), oleic acid (28.17%), myristic acid (4.33%) as well as lauric acid (1.87%) compared to that of palm oil. The ratio of the oil to the oven dried grass was 1:1.2. The saponification value was 205.66 while the refractive index was 1.453. The values for the specific gravity, free fatty acid, total acid and ester value were 0.95, 12.86, 49.64 and 156.02 respectively. The results revealed the potential of lemon grass oil for future medicinal and nutritional values. [Medicinal Plants 2011; 3(2) : 169-171]

Keywords : Lemon grass, oil, physico-chemical properties, fatty acid content

Lemon grass which is a fast growing wild aromatic perennial grass was found to be native to India but, it is now found growing in various countries of the world. The grass is known by various names in different countries - Lemon grass, Barbed wire grass, silky heads Citronell grass, Fever grass, Hierba luisa (Lemongrass-oil.shtml.htr.). The plant attains a height of about 1 meter (3 feet) with network of roots and rootlets that exhaust the soil rapidly. In Nigeria, the grass is known as tea grass because people drink it as tea or add it to other herbs for the treatment of malaria. It was noted as a valuable ingredients in pharmaceutical industry (used in perfume/soap making) and also as insect repellent.

The oil which could be extracted through steam distillation (Sharon, 2009) was found to be essential in aromatherapy industry. The oil which is not acidic is rich in vitamin A.

The main chemical component of the oil include citral, farnesol, nerol, citronellal and myrcene, geranyl acetate and traces of monene and citral (Sharon, 2009). The essential oil of the grass is characterised by its yellow colour and watery consistency/ viscosity.

The oil properties include antiseptics, astringent, febrifuge, insecticidal, antimicrobial, antifungal (Grenera, 2008) as well as antidepressant. It could also be used to relax tired body. It also helps in relieving the symptoms of jet lag, clears headache as well as combating nervous exhaustion and other stress related conditions. The oil could be used to better digestion nausea and menstruation problems, muscle cramps

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spasms and so on. In the present study, Lemon grass found in the wild was studied for their physico-chemical composition.

The grass was collected around the University of Ilorin main campus and later oven dried at 70°C for 48 hours. The dried lemon grass was milled using milling machine so as to expose the surface area.

The milled sample was weighed while the oil was extracted using petroleum ether (BP 60-80) for 6 hours. The oil obtained was kept in the oven at 70°C so as to evaporate the remaining petroleum ether while the oil yield was calculated.

The moisture content was evaluated by oven drying a known weight of the sample in an oven at 105°C for 24 hours and the percentage moisture content was calculated thus :

$$\% \text{ Moisture} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

It was weighed and express in percentage of the total content. It was determined using the method of William (1966) while the density was determined using pycnometer

The acid value, and saponification value of the oil were determined using the method of BPC (1985). Free fatty acids was calculated from the relationship as 1 unit of Acid value $\approx$ 0.503% (Cal. as oleic acid) and mean molecular mass was estimated from the relationship $560/SV \times 100$, while refractive index was determined using refractometer.

Ester value was determined by subtraction between Saponification value and Acid value and rancidity value were determined using spectrometric technique.

The grass and the oil were examined for their proximate composition using the method of A.O.A.C (1990) while the fatty acids profile of the oil was determined using Gas liquid chromatography.

The physico-chemical composition of the lemon grass and the oil are shown in Table 1. The dry matter content of the lemon grass was higher than the values reported for *Panicum maximum* and *Andropogon gayanus* (Odedire and Babayemi, 2008). The crude protein content was in line with the crude protein content of grasses like *Brachiaria utica*, *Avena sativa* and *Lablab purpureus*. However, the crude protein content was slightly higher than the protein content of *Panicum maximum*, *Andropogon gayanus* and *Pennisetum purpureum* (Odedire and Babayemi, 2008) while the ether extract of 16.70% reported herein was higher than the ether extract reported for most grains but fell within the values reported for Soybeans and *Etanda*

Table 1. Comparative evaluation of the Proximate Composition of Lemon Grass (*Cymbopogon citratus*), *Panicum maximum* and *Andropogon gayanus*

Parameters (%)	Lemon Grass	<i>Panicum maximum</i> *	<i>Andropogon gayanus</i> *
Dry matter	68.04	26.00	—
Crude Protein	10.28	9.36	6.72
Crude fibre	12.21	29.00	20.35
Ether extract	16.07	7.00	7.00
Ash	9.76	7.00	10.50

*Source : Odedire and Babayemi (2008)

africana (Belewu et al., 2007). The ash content which is an indication of the mineral content fell within the values reported for *Panicum maximum* and *Andropogon gayanus*.

The oil yield: Lemon grass was found to be in the ratio of 1:1.2. The oil which was dark green in colour remained in semi-drying at room temperature.

The iodine value is a measure of determining the degree of unsaturated fatty acids (UFA) in oil. The oil value of most different vegetable oil ranges between 10 and 185 (coconut oil, rape seed oil, soybean oil and sardine oil). The iodine value of lemon grass oil fell within this range. The iodine value reported herein was higher than that reported for some vegetable oil (Table 2). The acid value reported suitable for transesterification was about 6.2 MJKOHg⁻¹. The value reported for lemon grass in this study showed acid value in this range.

The saponification value of non edible oil was between 170 and 350MJ/g) and this could be used in making soap and hair shampoo. However, the value

Table 2. Quality characteristics of Lemon grass oil

Parameters	
Specific gravity	0.95
Refractive index	1.453
Saponification value	205.66
Free fatty acid (%)	12.86
Total acid value (%)	49.64
Ester value, mg KOH/g	156.02
Rancidity index	3.6 Red, 20 Yellow, 7.4 Blue
Mean molecular mass	272.29
Iodine value (g/100g)	175.35

reported was slightly lower than the value reported for *Jatropha curcas* (Rani and Kulkarni, 2008). The refractive index of lemon grass in this study agreed with the value reported for *Jatropha* species (*J. nana*, *J. gossypifolia* and *J. curcas*) (Table 2). The free fatty acid value reported was higher than the value reported for most *Jatropha* species except *J. curcas*. Additionally, the specific gravity of the sample was in accordance with value of *Jatropha* species (Rani and Kulkarni, 2008).

The ester value is the most vital constituent of the oil and it is used in judging oil quality because it is the carrier of the carrier of the characteristics odour of the oil. Additionally, the rancidity index is also used to evaluate the oxidation of fat. The value reported in this study shows that the oil shows on rancidity.

Table 3 showed the fatty acid profile of Lemon grass oil compared with the standard fatty acids. Among the saturated fatty acids (SFA) are lauric acid and myristic acid which were approximately 1.87 and 4.33% respectively. The unsaturated fatty acid like oleic acid was 28.17%. However, the saturated fatty acid values were lower than that of soybean oil and palm oil. The higher content of lauric acid of Lemon grass was added advantage for the consumers.

The fatty acids showed similarities with many oily plants like soybean and palm oil. Fatty acid determination by GLC showed that the oil was highly unsaturated. The unsaturated fatty acids of lemon grass compared favourably with that of Soybean oil. It could be concluded from this study that Lemon grass contained essential oil with higher percentage of unsaturated fatty acids (UFA) and the oil characteristics fell within the range reported for other edible oil. The great advantage of lemon grass is its perennial nature and its easy cultivation hence; it will provide economically viable crop with better future for essential oil which needs great attention.

Table 3. Comparison of fatty acid profile of lemon grass oil with other edible oil (soybean oil and palm oil)

Parameters	Soybean oil*	Palm oil**	Lemon Grass oil
Linoleic acid	50.00-54.00	10.50	30.72
Oleic acid	20.00-22.00	38.70	28.17
Myristic acid	0.2-12.00	1.10	4.33
Stearic acid	3.00-9.00	4.60	0.001
Lauric acid	—	0.20	1.87
Palmitic acid	10.7	43.30	0.26

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