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Physical Characteristics of the Essential Oil Extracted from Released and Improved Lemongrass Varieties, Palmarosa and Citronella Grass

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Abstract

The grass species lemongrass, palmarosa, and citronella/nardus grass are one of the aromatic and medicinal plants which know days Wondo genet Agriculture center is working on their essential oil yield increment and releasing different varieties. The essential oils were extracted using hydro distillation methods. This study investigated the analysis of physical characteristics of lemongrass varieties, palmarosa, and citronella grass essential oils. From the released three lemongrass varieties WG-Lomisar-Java has the highest oil content (1.25 %± 0.02) and the other two varieties namely Lomisar-I and WG-lomisar-UA (upper awash) have the same oil content (1.2%± 0.02). WG-lomisar-UA (upper awash) has the largest relative density/specific gravity (0.9015± 0.0002) and WG-Lomisar-Java has the smallest value (0.9007± 0.0002). In the case of the refractive index, Lomisar-I has a large value (1.4890± 0.0002) and WG-Lomisar-Java has a small value (1.4870± 0.0002). The oil content of palmarosa was 1.2%± 0.03, the specific gravity was 0.8815± 0.0002 and the refractive index was 1.4720± 0.0002, whereas Citronella grass contains 1.3%± 0.01 oil content, 0.9108± 0.0002 specific gravity, and 1.4800± 0.0002 refractive indexes.

Keywords: Citronella grass, Essential oil, Lemongrass, Palmarosa, Physicochemical.

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Contents

Contribution of this paper to the literature
This study investigated the analysis of physical characteristics of lemongrass varieties, palmarosa, and citronella grass essential oils.

1. Introduction

Essential oils are concentrated essences extracted from different parts of plants, containing hundreds of substances, but typically with the prevalence of one, two or three of them that characterize the fragrance [1]. Essential oils are highly concentrated secondary metabolites of diverse functions in the plant system. Ancient Romans, Greeks, Egyptians, the Middle, and the Far East used regularly essential oils as perfumes, food flavors, deodorants, pharmaceuticals, and embalming antiseptics [2]. In Spain and France from the early 1300s, distillation was developed to produce more concentrated essences of aromatic grasses and herbs like mints, citronella, lemongrass, lavender and sage [3]. In Ethiopia Wondo Genet agricultural research center is among research centers found in the Ethiopian Institute of Agricultural Research Center (EIAR) which coordinates research activities on *lemongrass, palmarosa, and citronella grass.*

Lemongrass, Cymbopogon citratus, is a perennial medicinal plant belonging to family Geramineae, and it is distributed worldwide especially in tropical and subtropical areas of Africa, Asia, and America [4]. The chemical composition of lemongrass essential oil depends on many factors such as genetic diversity, temperature, light intensity, maturity stage, and agricultural practice and main effective compounds of lemongrass are citral and essential oil [5-10].

Cymbopogon martini (Roxb.) Wats. var. motia, known as palmarosa, is a perennial herb, widely distributed in tropical and subtropical regions [11]. It contains essential oil, whose main components are geraniol and geranyl acetate [12]. The essential oil from Cymbopogon martini is widely used as a flavoring for food, beverages, and snuff products, as a valuable component for perfumes, cosmetic and pharmaceutical products, and against the action of various bacteria, fungi and microorganisms [11].

Cymbopogon nardus, common name **citronella grass**, is a perennial aromatic plant from the Poaceae grass family, originating in tropical Asia and based oil production, citronella grass is also used for culinary purposes, as a fragrance, aroma and flavor flavoring [12, 13].

This study aims to evaluate the physical properties of the essential oil extracted from released and improved grass species namely lemongrass varieties, palmarosa, and citronella grass.

2. Materials and Methods

2.1. Sample Collection and Preparation

The Experiment was carried out in the Wondo Genet Natural Product Laboratory.The samples of three released lemongrass varieties namely Lomisar-I, WG lomisar-java and WG lomisar-upper awash (UA), Palmarosa and Citronella grass at optimum harvesting age was collected from Wondo genet Agricultural Research Center experimental field. The sampling site was located at an altitude of 1800 m a.s.l., and latitude and longitude of N 39° 1' 44" E 8° 25' 59". The collected samples were weighed and transported to Wondo Genet Natural Product Laboratory for extraction.

2.2. Essential Oil Extraction

The essential oil was extracted from fresh leaves using the Clevenger type apparatus for 3 hours by hydro-distillation methods and dried with anhydrous Na_2SO_4 according to Tepe, et al. [13].

2.3. Physical Quality parameter of essential oil

2.3.1. Essential Oil Content

From the essential oil extracted essential oil contents of grass species samples were calculated based on the formula described below

$$\text{Oil content (w/w (\%)} = \frac{\text{mass of extracted oil (g)}}{\text{mass of extracted sample (g)}} \times 100$$

2.3.2. The Specific Gravity of the Essential Oil

The specific gravity was determined according to the method described by Chophi, et al. [14]. The 5ml of distilled water was added to the cleaned pycnometer. The distilled water was weighed (M_{water}) (make sure that there is no bubble or air inside the pycnometer while weighing). The distilled water was removed and the pycnometer was dried. Then the same volume of oil was added into the pycnometer and was weighed (M_{oil}). Finally, specific gravity or relative density was calculated using the following formula

$$\text{Specific gravity/relative density} = \frac{Mass\ of\ oil}{Mass\ of\ water} \text{ X } 100$$

2.3.3. Refractive Index Determination

The refractive indexes of the essential oils were measured by Refractometer (Reichert, AR200) according to the method described by Chophi, et al. [14]; Pirbalouti, et al. [15]. The prism of the Digital spectrophotometer was cleaned and the read button was pressed first to make sure that it is cleaned well. The sample was applied to the prism of a Digital spectrophotometer using a micropipette. Finally, the result of the refractive index was read and recorded. The triplicate analysis was taken place and the result was the average of triplicate value in all cases.

2.4. Data Analysis

Significance differences in physical properties of the essential oil extracted from released and improved grass species were subjected to analysis of variance (ANOVA) using the Microsoft Excel software.

3. Results and Discussion

The physical quality parameter of aromatic plants in this study like essential oil content, relative density or specific gravity, refractive index, appearance, color, and odor were analyzed and the results were shown in the following tables Table 1 and Table 2.

Table-1. Physicochemical parameters of lemongrass varieties (n=3).

Variety type	EOC% (w/w)	Specific gravity	Refractive index	Appearance	Color	Odor
Lomisar-I	1.2±0.01	0.9012± 0.0002	1.4890± 0.0002	Clear liquid	Yellowish	Sweet smell, lemony
WG-Lomisar-Java	1.25±0.02	0.9007± 0.0002	1.4870± 0.0002	Clear liquid	Yellowish	Sweet smell
WG-lomisar-UA (upper awash)	1.2± 0.02	0.9015± 0.0002	1.4883± 0.0002	Clear liquid	Yellowish	Sweet smell

Note: Where EOC= is Essential oil content.

From Table 1, it was shown that WG-Lomisar-Java has the highest oil content with a value of 1.25 % ± 0.02 from the three released varieties. The remaining two varieties namely Lomisar-I and WG-lomisar-UA (upper awash) have the same oil content (1.2%± 0.02). The value of essential oil content of all lemongrass varieties of this research finding was less than the finding of Pirbalouti, et al. [15]. The difference was maybe because of the difference in sample location and agroecology between two samples.

WG-lomisar-UA (upper awash) has the largest relative density/specific gravity (0.9015± 0.0002) followed by Lomisar-I (0.9012± 0.0002) and WG-Lomisar-Java (0.9007± 0.0002). The value of the relative density/specific gravity of lemongrass varieties in this study was greater than the values expressed in Taweechaisupapong, et al. [16]. The reason for the difference in values between two findings was maybe because of the difference in the sample location climatic condition and agroecological difference including soil type.

In the case of the refractive index, Lomisar-I has a large value (1.4890± 0.0002) and WG-Lomisar-Java has a small value (1.4870± 0.0002). The values of the refractive index of this research finding were found within the range of values observed in Taweechaisupapong, et al. [16]. The appearance of all three varieties was clear liquid and their color was yellowish. The odor of Lomisar-I was a sweet smell, lemony and that of the remaining two varieties was a sweet smell. Analysis of Variance (ANOVA) oil content, specific gravity, and refractive index were significantly different from variety to variety because of $F_{calculated} > F_{critical}$.

Table-2. Physical parameters of palmarosa and citronella grass (n=3).

Plant name	EOC% (w/w)	Specific gravity	Refractive index	Appearance	Color	Odor
Palmarosa	1.2± 0.03	0.8815± 0.0002	1.4720± 0.0002	Clear liquid	Pale Yellow	Pleasant odor with rose-like smell
Citronella	1.3± 0.01	0.9108± 0.0002	1.4800± 0.0002	Clear liquid	Pale yellow	Sweet smell

Note: From Where EOC= is Essential oil content.

Table 2, it was shown that palmarosa has 1.2%± 0.03 oil content, 0.8815± 0.0002 specific gravity and 1.4720± 0.0002 refractive indexes. The value of essential oil content of this study was less than the value of essential oil reported by Rajeswara, et al. [11]. Again, the refractive index and specific gravity of palmarosa oil were less than values reported by Taweechaisupapong, et al. [16].

Citronella grass contains 1.3%± 0.01 oil content,0.9108± 0.0002 specific gravity, and 1.4800± 0.0002 refractive index. The values of the refractive index of this study were within the range of results reported Baker, et al. [12]; Phovisay, et al. [17] and the values of specific gravity were greater than the report of Baker, et al. [12]; Phovisay, et al. [17]. The difference maybe because of the difference in the sample location and agroecology. Both of them are clear liquid and have a pale-yellow color. The odor of palmarosa was Pleasant odor with the rose-like smell but the odor of citronella grass was a sweet smell.

4. Conclusion

In this study physicochemical quality parameters analysis of three lemongrass varieties, palmarosa and citronella grass were analyzed. The parameters were essential oil content, refractive index, specific gravity, appearance, color, and odor. The values of these physicochemical quality parameters were significantly different from one variety to the other in lemongrass.

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