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Research Article

Physical Characteristics of the Essential Oil Extracted from Released and Improved Spearmint Varieties, Peppermint and Japanese Mint

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ABSTRACT

The mint species namely spearmint, peppermint and Japanese mint which belong to the genus mentha, the family Lamiaceaeare the most aromatic and medicinal plants those Wondo genet Agricultural research center is working on their different research activities and releasing different varieties. The essential oils were extracted using the hydro-distillation method. This study investigated the analysis of physical characteristics of spearmint varieties, peppermint and Japanese mint essential oils. The analyzed physical properties were Essential Oil Content (EOC), specific gravity (relative density) and refractive index. The three released spearmint varieties namely Liyu, WGSM03 and WGSPM Fran (java) have equal essential oil content and relative density with value 0.8% and 0.9210 respectively. WGSPM fran (java) has highest refractive index with the value 1.489 ± 0.002. The value of the refractive index for the other two varieties was 1.487 ± 0.002 and 1.485 ± 0.002 for WGSM03 and Liyu respectively. The oil content, specific gravity and refractive index of peppermint were 1.3%, 0.9215 and 1.462 respectively whereas Japanese mint contains 0.7% essential oil content, 0.9210 specific gravity (relative density) and 1.460 refractive indexes.

Keywords: Essential oil; Japanese mint; peppermint; Physical; Spearmint

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 species, citronella, lemongrass, lavender and sage [3].

Spearmint (*Mentha spicata* L.) is an aromatic plant belongs to the genus mentha, the family Lamiaceae and it is the most common herb in the Mediterranean region, widely used as a source of essential oils for flavoring and recently has been used as a valuable source of the potent antioxidant for the nutraceuticals and also used cosmetic industries [4]. The plants of this family are a rich source of polyphenols and hence could possess strong antioxidant properties [5]. *Mentha spicata* L. is characterized by its volatile oil of economic importance. It is widely cultivated in many places around the world for the production of essential oil [6-8].

Peppermint (*Mentha piperita* L.), a perennial aromatic herb belonging to the Lamiaceae (Labiatae) family, is a natural hybrid between spearmint (*Mentha spicata* L.) and water mint (*Mentha aquatic* L.) [9,10]. Although it is a native genus of the Mediterranean regions, it cultivated all over the world for its use in flavor, fragrance, medicinal, and pharmaceutical applications [11]. Members of the mint genus are characterized by their volatile oils which are of great economic importance, being used by the flavor, fragrance, and pharmaceutical industries [12]. Peppermint oil is composed primarily of menthol and menthone as well as several other minor constituents, including

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menthofuran, 1,8-cineole, and limonene. The chemical composition of peppermint leaves may vary with plant maturity, geographical region, and processing conditions [13].

Japanese mint (*Mentha arvensis* L.) belongs to the genus mentha, the family Lamiaceae is an aromatic species originated from South China and its essential oil is rich in menthol, which is used in the pharmaceutical, food and cosmetic industries [14].

This study aimed to evaluate the physical properties of the essential oil extracted from released and improved mint species namely spearmint varieties, peppermint, and Japanese mint.

MATERIALS AND METHODS

Sample collection and preparation

The Experiment was carried out in the Wondo Genet Natural Product Laboratory. The samples of three released spearmint varieties namely Liyu, WGSM03 and WGSPM Fran (java), peppermint and Japanese mint 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., 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 and further analysis.

Essential oil extraction

The essential oil was extracted from fresh leaves using the Clevenger type apparatus for 3 hours by the hydro-distillation method and dried with anhydrous Na_2SO_4 according to Tepe et al. [15].

Physical quality parameters of essential oils

Essential oil content: From the extracted essential oil, EOC (Essential Oil Content) of mint species samples was calculated using equation 2.1.

Oil content (w/w (%) = (Mass of extracted oil (g))/(Mass of extracted sample (g)) × 100.....2.1

The specific gravity of the essential oil: The specific gravity (relative density) was determined according to the method described by Chophi et al. [16]. The 5 mL 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 (Moil). Finally, specific gravity or relative density was calculated using equation 2.2.

Refractive index determination

The refractive indexes of the essential oils were measured by Refractometer (Reichert, AR200) according to the method described by Chophi and Pirbalouti [16,17]. The prism of the Digital refractometer was cleaned and the red button was pressed first to make sure that it is cleaned well. The sample was applied to the prism of a Digital refractometer 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.

Data analysis

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

RESULTS AND DISCUSSION

The physical quality parameters of aromatic plants essential oil in this study like EOC (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 1 and 2.

Table 1: Physical quality parameters of spearmint varieties (n=3).

Variety type	EOC% (w/w)	Specific gravity	Refractive Index	Appearance	Color	Odor
Liyu	0.8%	0.9210	1.485 ± 0.002	Clear liquid	pale greenish-yellow	Pleasant odor
WGSM03	0.8%	0.9210	1.487 ± 0.002	Clear liquid	pale greenish	Pleasant odor
WGSPM fran (java)	0.8%	0.9210	1.489 ± 0.002	Clear liquid	pale greenish	Pleasant odor

From Table 1 all three released varieties of spearmints namely Liyu, WGSM03 and WGSPM Fran (java) have the same (equal) EOC and Specific gravity with value 0.8% and 0.9210 respectively. The value of essential oil content of all spearmint varieties in this study was within the range [18,19]. The difference was maybe because of the difference in sample location and agroecology between two samples. Analysis of Variance (ANOVA) shows that oil content, specific gravity, and refractive index were significantly different from variety to variety because of $F_{calculated} > F_{critical}$.

In case of refractive index WGSPM Fran (java) have the largest refractive index with the value 1.489 ± 0.002 followed byWGSM03 (1.487 ± 0.002) and Liyu (1.485 ± 0.002). The value of the refractive index of two spearmint varieties in this study namely Liyu and WGSM03 was found within the range [20] whereas the third variety namely WGSPM Fran (java) has slightly greater refractive index than the Liyu and WGSM03 [20]. The value of the specific gravity of all spearmint varieties essential oil in this study was equal [21]. The difference was maybe because of the difference in sample location and agroecology between two samples.

Table 2: Physicochemical parameters of peppermint and Japanese mint (n=3).

Plant name	EOC % (w/w)	Specific gravity	Refractive index	Appearance	Color	Odor
Pepper mint	1.3%	0.9215	1.462	Clear liquid	pale greenish	Pleasant odor
Japanese mint	0.70%	0.9210	1.460	Clear liquid	amber yellow	Pleasant odor

From Table 2 peppermint contains 1.3% EOC, 0.9215 specific gravity and 1.462 refractive indexes. The value of the essential oil content of pepper mint in this study was greater than the value in the report of Japanese mint [22]. Again the result of specific gravity of pepper mint in this study was greater than the report of Japanese mint [23]. But the value of the refractive index in this study was within the range [23]. The difference in the case of EOC and specific gravity was because of the difference in sample location and agroecology between two samples.

Japanese mint has 0.7% EOC, 0.9210 relative density (specific gravity) and 1.460 refractive index. The value of essential oil content of this study (0.7%) was found within the range of the research finding (0.36-1.36%) [24].

CONCLUSION

In this study the physical quality parameters analysis of three spearmint varieties, peppermint and Japanese mint were analyzed. The parameters were essential oil content, refractive index, specific gravity, appearance, color, and odor. The values of these physical quality parameters were significantly different from one variety to the other in spearmint.

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