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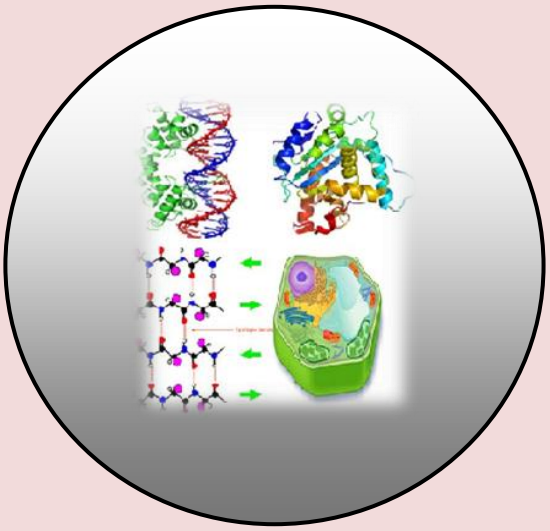

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Comparative Analysis of Essential Oil Extracted from Scent Leaf "*Ocimum gratissimum*" by Cold and Soxhlet Extraction Methods

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ABSTRACT

The quality of any oil is indicated by some physicochemical properties which provide an indication of both the nutritive quality and purity of the oil. This study investigated the comparative analysis of essential oil extracted from scent leaf, Ocimum gratissimum by cold and soxhlet extraction methods. The essential oil was extracted using petroleum ether via cold and soxhlet extraction methods, and their physicochemical properties evaluated using standard methods. The physicochemical parameters compared were; colour, state of matter at room temperature, acid value, peroxide value, free fatty acids, and iodine value. For both methods, the essential oil was dark green and semi-solid at room temperature (25 ^{O}C). The acid value, percentage free fatty acid, peroxide value, and iodine value for cold extraction method were: 6.18 ±. 25 mg KOH/g, 3.09 ±. 13%, 12.6 0 ±. 85mleq/kg and 59.22 ±. 14gI_2/100 g respectively, whereas, for soxhlet method, they were: 7.03 ±. 01 mg KOH/g, 3.51 ±. 14%, 14.2 ±. 28 mleq/kg, and 56.68 ±. 11gI_2/100 g respectively. Though there was no change in colour or state of the extracted oil, it was observed that acid value, peroxide value and free fatty acid increased for soxhlet extraction method in relation to cold extraction, whereas there was decrease in iodine value for soxhlet extraction method in relation to cold extraction. The chemical characteristics of any oil depend on the method of extraction.

Keywords: Physicochemical properties, Scent leaf, Ocimum gratissimum and Soxhlet extraction.

INTRODUCTION

African basil, *Ocimum gratissimum,* is an aromatic, perennial herb, 1-3 m tall, stem erect, round-quadrangular, much branched, glabrous or pubescent, woody at the base, often with epidermis peeling in strips. In Nigeria and several other countries, the plant is used as season and plays an important role in traditional medicine preparations, including use as a stomachic and for treatment of sunstroke, headache and influenza. In the coastal areas of Nigeria, the plant is used in the treatment of epilepsy, high fever and diarrhea (Effraim *et al*., 2003), while in the Savannah areas, leaf decoctions are used to treat mental illness (Akinmoladun, *et al*., 2007). Other uses include the treatment of fungal infections, fevers, colds, and catarrh (Ijeh *et al*., 2005).

An essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds from the plant (Hesham *et al*., 2016).

Essential oil from leaves is constituted by aromatic compounds, with eugenol as the most abundant compound (Saliu *et al*., 2011). Other notable constituents are cis-ocimene, germacrene D, β-pinene, α-farnesene, and camphor (Saliu *et al*., 2011). Studies on the pharmacological properties of the essential oil reported its activity against several high pathogenic microorganisms such as: *Staphylococcus aureus*, *S. typhimurium*, *Escherichia coli* and *Salmonella typhi*, bacteria that cause diarrhea (Adebolu and Oladimeji, 2005). It also showed larvicide action against *Aedes aegypti* - major vector of dengue fever, and repellent action against *Simulium damnosum* - the causative agent of *Onchocerca volvulus* in Nigeria (Pessoa et al., 2015). The world production and consumption of essential oils are increasing very fast. Production technology is an essential element to improve the overall yield and quality of essential oil (Handa *et al.,* 2008). Essential oils are obtained from plant raw material by several extraction methods. There are so many methods that can be used to extract essential oil (Hesham *et al*., 2016). However, in quest to optimize profit, save time, increase yield, different extraction methods had been employed with no much emphasis on the quality of the essential oil. Two extraction methods, soxhlet and cold extraction, are evaluated in this study, comparing the physicochemical properties of the oil. Physicochemical analysis determines the quality, purity and identification of substances. These analyses are used to characterize oil, irrespective of location or sources of origin to ascertain its industrial application. Examples of these properties are iodine value, acid value, peroxide value, free fatty acid value and color.

MATERIALS AND METHODS

Sample collection and preparation

The scent leaves were collected from Galaxy lodge, Unizik Tempsite Awka, Anambra state, Nigeria. The scent leaves were collected in the month of June, 2018. The leaves were identified as *Ocimum gratissimum* and authenticated at Nnamdi Azikiwe University, Department of Botany by Dr. Mrs. Aziagba. The leaves were sun dried, and manually grinded.

Reagents

All chemical and reagents used were of high analytical grade.

METHODS

Cold extraction

The cold extraction was performed according to a modified method described by Norsyamimi *et al*. (2014). 300g of the sample was immersed in 1.5L of Petroleum ether in an amber bottle at room temperature. After three days, the mixture was filtered using Whatman filter paper. The filtrate was evaporated using Rotary evaporator at 40^{O}C to yield a viscous mass. This was stored in amber bottle in the dark for further analysis.

Soxhlet extraction

The extraction method was modified from the method describe by Tesfaye and Tefera (2017).

Determination of Iodine value

The iodine value was determined using Wiji's solution as described by Pearson (1991).

Determination of Peroxide value

The peroxide value was determined by the method described by Pearson (1991).

Determination of Acid value

The acid value was determined by the method of Pearson (1991).

Determination of Free fatty acid value

Free fatty acid value was determined based on the method of Pearson (1991).

RESULTS

Physical parameters

The results of the physical parameters of the extracted essential oil for cold and soxhlet extraction methods are presented in table 1. The color and state of the extracted essential oil were the same for both extraction methods.

Table 1. Physical properties of the essential oil obtained by cold and soxhlet extraction methods.

PARAMETER	COLD EXTRACTION	SOXHLET EXTRACTION
Colour	dark green	dark green
State of matter at room temperature (25°C)	semi solid	semi solid

Chemical parameters

The results of the chemical parameters of the extracted essential oil for cold and soxhlet extraction methods are presented in figure 1. It was observed that acid value, peroxide value, and free fatty acid increased for soxhlet extraction method in relation to cold extraction, while there was decrease in iodine value for soxhlet extraction method in relation to cold extraction.

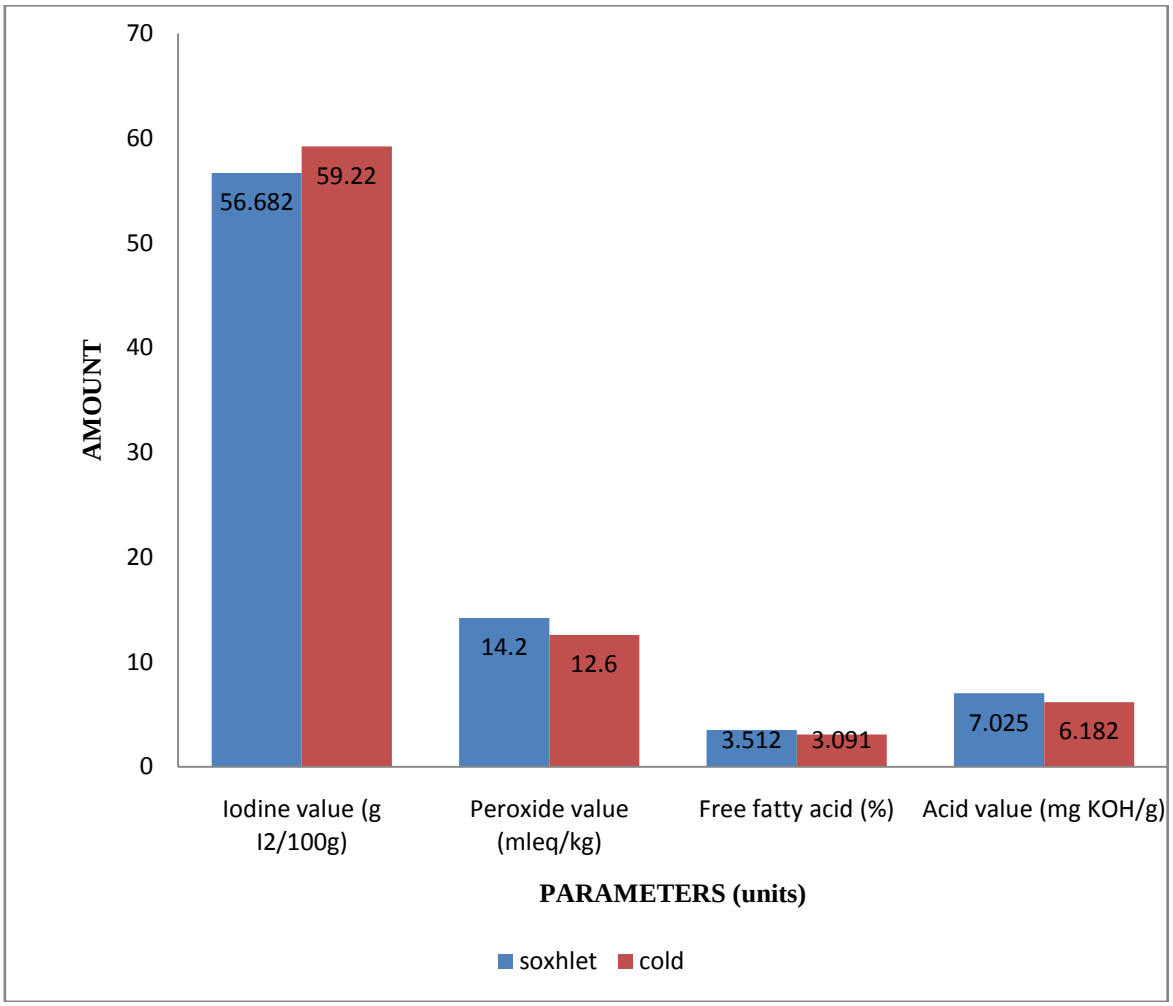

Figure 1. The chemical properties of the essential oil obtained by cold and soxhlet extraction method.

DISCUSSION

Physical and chemical parameters greatly influence the properties of oil and can also be used to assess the purity or quality of lipids in reference to known standards or preferred characteristics. The method of extraction influences the quality of oil. Physical and chemical properties of scent leaf essential oil extracted using cold and soxhlet extraction methods were investigated, and the results shown in Table 1 and Figure 3 respectively.

The essential oil was dark green semi-solid at room temperature (25^{O}C) for both soxhlet and cold extraction method (Table 1). This suggests that the method of extraction has no significant effect on the physical properties of the essential oil.

The acid value, which is an indication of level of free fatty acid formed from hydrolytic decomposition of glycerides to free fatty acid, was increased for soxhlet extraction method when compared with cold extraction method which is similar to result obtained by Ayodeji and Ganiyu (2015), who reported that temperature affects the acid value of oil. The increase in acid value observed in the soxhlet extracted oil may be a result of thermal oxidative cleavage of triglycerides, leading to the formation of free fatty acids (FFAs) in the oil (Ayodeji and Ganiyu, 2015). Oils with high acid value are not suitable for cooking but can be utilized in the soap making and paint industries, whereas, Low acid values indicate stability over long periods of storage and suitability for consumption (Mweta and Magombo, 2017). Hence, soxhlet extraction is preferred when the oil is for soap making and paint industries, while cold extraction is more suitable for edible oil and easier to be stored.

Oxidative stability of the oil can be determined by its peroxide value (Jabar *et al*., 2015). Peroxide value is the measure of oxidative rancidity of oil. Oxidative rancidity is the addition of oxygen across the double bonds in unsaturated fatty acids in the presence of enzymes (lipase) or certain chemical compounds. High peroxide value is associated with higher rate of rancidity. The result shows that essential oil from scent leaf has less chance of rancidity because it is less than 30mleq/kg (Chakrabarty, 2003). However, the peroxide value of the essential oil obtained by soxhlet extraction was more prone to rancidity when compared with that obtained by cold extraction (Table 1). This is in line with the result obtained by Oboh, *et al*. (2014), who reported that peroxide value increases with temperature increase. This implies that cold extraction help increase the shelf life of oil when compared with soxhlet extraction method.

Iodine value is a measure of the degree of unsaturation of triglyceride oil (Jabar, *et al*., 2015) and the iodine values obtained shows that scent leaf essential oil has appreciable level of unsaturated fatty acids. However, the Iodine value of the essential oil obtained by soxhlet extraction method decreased when compared to the value from cold extraction method. This is similar to what was observed by Oboh *et al*. (2014) on palm oil as Iodine value decreases with temperature. Iodine value decreases with increase in temperature (Ayodeji and Ganiyu, 2015, Jabar *et al*., 2015), which can be as a result of hydrogenation of carbon doubles to form carbon single bonds. A decrease in iodine value as observed in this study indicates an increase in the degree of saturation of fatty acids which is a risk factor for hypercholesterolemia and some types of cardiovascular diseases (Ayodeji and Ganiyu, 2015).

CONCLUSION

The method of extraction affects the quality of essential oil obtained. Though no visible change in colour or state of matter for the essential oil extracted via the two methods, it was observed that acid value, peroxide value and free fatty acid increased for soxhlet extraction method in relation to cold extraction, whereas, there was decrease in iodine value. From the study, cold extraction method is better than soxhlet extraction in terms of oxidation parameters, and quality of the extracted oil.

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