

SELECTED COMMODITY CHARACTERISTICS OF ESSENTIAL OILS USED FOR HEALING PURPOSES

doi: 10.2478/czoto-2022-0018

Date of submission of the article to the Editor: 20/12/2021

Date of acceptance of the article by the Editor: 15/07/2022

Maria Radziejowska – *orcid id: 0000-0002-9845-390X*

Marta Niciejewska – *orcid id: 0000-0002-9530-3455*

Czestochowa University of Technology, **Poland**

Abstract: The use of an essential oil with a therapeutic purpose depends on many conditions. First of all, only substances whose quality meets the guidelines of the modern, current Polish standard PN-EN ISO 9235: 2021-12 (ICS 71.100.60 - Essential oils) and which are classified as essential oils can be used in aromatherapy, i.e. for therapeutic purposes. A very important role in obtaining essential oils of high therapeutic quality is played by the place and method of cultivation of the plant from which the oil is extracted, safety in maintaining the purity of the essential oil during its extraction, and compliance with the special requirement to label the essential oil package. Fragrance, synthetic and natural oils do not meet these requirements and cannot be used for therapeutic purposes.

Keywords: aromatherapy, method of extracting essential oils, labeling of essential oils packaging

1. INTRODUCTION

Aromatherapy uses essential oils, vegetable oils and hydrolates produced in the distillation process (Adaszyńska and Swarcewicz, 2012; Król et al., 2013). They are used as room fragrances, massage oils, healing oils, they are an excellent addition to inhalation and bathing. The smell of essential oils has a multidirectional effect (Romer, 2010). Essential oils have many healing properties: toning, virucidal, bacteriostatic, relaxing. Due to the similarity of aromatherapy and herbal medicine and the possibility of explaining its effects by examining the constituent substances of essential oils, this field is of interest to doctors, pharmacists and physiotherapists. Aromatherapy is not a modern invention, but a proven and effective form of therapy that has been successfully used for hundreds, if not thousands of years (Grabowska et al., 2013; Najda, 2015; Kaniewski et al., 2016).

Aromatherapy is still growing in popularity in Europe. A conscious and critical approach to pharmacological agents and the need to look for therapies that carry the lowest possible risk of side effects result in willingness to use methods that have been

proven for years. A large role in confirming the effectiveness of essential oils and thus in strengthening the position of aromatherapy has been played by scientific research carried out in recent years (Ćwirlej et al., 2005; Radziejowski and Radziejowska, 2017; Radziejowski, 2018; Jurowski and Piekoszewski, 2019; Radziejowska et al. 2020; Radziejowski et al., 2020).

Essential oils are lipophilic, volatile secondary metabolites, natural mixtures of compounds, characterized by intense fragrances, present in aromatic plants (Kucharska et al., 2018). They consist of a mixture of several to several hundred compounds, mainly hydrocarbons (terpenes and sesquiterpenes) and oxidized compounds (aldehydes, ketones, alcohols, acids, phenols, esters and others). Due to the fact that terpenoids (such as geraniol or citronellol) are volatile and thermolabile, they easily undergo oxidation and hydrolysis. Therefore, the chemical composition of the oil is closely related to the conditions in which it is stored, as well as the environment in which the starting material was stored before it was subjected to distillation or other extraction method. The essential oil content is only a small percentage of the total weight of the plant. Oils can be found in the cell tissue of plants, glands or channels located in several of its parts (leaves, bark, roots, flowers, fruits, seeds). Essential oils, if they are to be effective, should have a high concentration of active ingredients. To achieve this, plants must be grown in optimal conditions, and their harvesting and oil extraction processes must be carried out properly. In order to ensure optimal therapeutic effects, many requirements must be met (Girek et al. 2020).

The aim of the study was to determine selected commodity characteristics, allowing to include the oil obtained from the plant, with a specific method of cultivation, among those that qualify as therapeutic agents.

2. METHODOLOGY OF RESEARCH

The current professional literature was analyzed based on a review of the databases, including Pubmed and Google Scholar. In this case, 34 items of current professional literature were distinguished, which concerned the information on the method of growing plants from which essential oils are obtained, methods of obtaining essential oils, methods of proper labeling of oils, used for therapeutic purposes.

3. RESULTS AND DISCUSSION

The current Polish standard of December 3, 2021, PN-EN ISO 9235:2021-12 and published on December 27, 2021 (ICS 71.100.60 - Essential oils) replaces the Polish standard ISO-PN-86497 of 1998 "Natural fragrance and aromatic raw materials. Terminology" but also emphasizes that an essential oil is a product obtained from plants or their parts: by distillation with water (hydrodistillation); water-steam or steam distillation, mechanically from the pericarp (pericarp) of citrus fruit, known as the peel, or by dry distillation, separated from the aqueous layer by physical means.

The quality of an essential oil depends on the place of cultivation of the plant from which the oil is extracted. The location of the growing area, sun exposure, and soil composition are important factors influencing the quality of an essential oil. For example, the best lavender grows wild in the highlands, where it is harvested with great effort (Adaszyńska et al., 2013). The fact is that plants growing wild or on Demeter-certified plantations

are the source of oils of the highest quality. Cultivation on large areas is not possible without the use of pesticides and artificial fertilizers, which affects the quality of essential oils (Seidler-Łożykowska et al., 2006; Seidler-Łożykowska et al., 2007).

Another variety of cultivation of plants used to obtain essential oils, further used for medicinal purposes, is biologically controlled cultivation (kbA certificate) without the use of insecticides, herbicides and artificial fertilizers. These substances are not only harmful to human health, but also affect the composition of essential oils, reducing their quality (Romer, 2010).

In the cultivation of plants used to obtain essential oils for medicinal purposes in biodynamic breeding (Demeter products), the quality of the substrate is improved with decoctions of herbs and horn flour and bone flour. Sowing and harvesting takes place only at a specific time. Products with the Demeter mark meet the highest quality and effectiveness requirements (Vostinaru et al., 2020).

Plants that grow in extreme conditions, such as lavender in the highlands of France, are the source of exceptional quality oils. Of course, the collection of plants is cumbersome, and the price of such oils is high. Sowing in lower-lying areas will result in the growth of less valuable plants, which will produce oils with a different, definitely worse composition (Turek et al., 2013; Boren et al., 2015).

Essential oils at a very high price are a commodity that is difficult to sell. Therefore, it is easy for producers to dilute them with other, cheaper oils in order to lower the price (Chyc, 2020). When buying an oil, pay attention to whether it has any admixtures. It is important to consciously distinguish between additives that only reduce the concentration of the oil and those that affect the effect of the oil. For example, rose oil is often diluted with jojoba oil. It is neutral in therapeutic use, so it does not diminish the excellent healing effect of rose oil. Verbena, on the other hand, is often mixed with lemongrass, which itself has a healing effect. As a result, the properties of verbena are changed and are no longer comparable to the effects of pure oil. Choose oils that are 100% pure on the label. In addition to the purity of the oil, you should also check the name of the plant it comes from. Cedar oil can come from Atlantic cedar as well as from Virginia cedar, which is actually not cedar but juniper. It is obvious that the compositions and thus the properties of these oils will be different (Kowalski et al., 2019; Sharmeen et al., 2021;).

Many producers of essential oils offer their products, and the amount of low-quality oils far exceeds the amount of valuable ones. Low quality is recognized primarily by the price. When extracting essential oils, the most important thing is to obtain high-quality ingredients. This means that the most harmless extraction methods should be chosen (Góral and Kluza, 2008; Rudy et al., 2011; Król and Kiełtyka-Dadasiewicz, 2015;). The easiest way to obtain essential oil is from citrus fruits. It is located in reservoirs in the skin of the fruit and can be pressed mechanically. Complex methods such as distillation are required to extract essential oils from flower petals and seeds (Girek et al., 2020).

The most important methods of extracting essential oils include:

- cold pressing;
- steam distillation;
- solvent extraction;

- odorization.

The cold pressing process is used to obtain citrus oils. The skins of the fruit are squeezed or incised with sharp metal needles, and the oil is rinsed with a small amount of water. The oil is then separated from the water in a centrifuge. All pressed oils contain a large amount of additives. Some of them affect the effect, others accelerate spoilage and are responsible for the short shelf life of citrus oils. Since insecticides and herbicides can get into the oil during pressing, make sure that it comes from biologically controlled crops (Romer, 2010; Vostinaru et al., 2020).

Steam distillation is a good method for oils that are not destroyed by high temperatures. It belongs to the gentle methods of obtaining. Volatile components are extracted from the plant by means of steam, along with which they are transferred to the distillation cooler. There they re-condense and flow as a mixture of oil and water into the receiver. Due to the different physical properties of the water (hydrolate) and the oil, the two substances separate quickly and can be collected separately. The hydrolate is not rejected, because it contains up to three percent of essential oil, similarly water-soluble substances that found themselves in steam during distillation. Hydrosols, like oils, have excellent healing properties and are used whenever mild therapy is recommended. They are therefore intended, for example, for children, pregnant and lactating women (Kucharska et al., 2018).

The yield in the distillation process is very low and depends on the type of plant. For example, rose petals yield 0.025 percent of the essential oil, which means that 4,000 kilos of flower petals are needed to extract one liter of the precious substance. In the case of a clove, six kilos is enough, which is an eighteen percent yield. With such varying yields, it's understandable that some oils are almost priceless (Girek et al., 2020).

Extraction is a suitable method for heat-tolerant plants or those whose distillation yield is too low. These include, for example, jasmine, rose and tuberose. The so-called resinoids and absolutes are distinguished.

Resinoids are obtained by processing the resin of a tree, such as frankincense or myrrh. First, the wood is cut and the fragrant resin that comes out of it is collected. To separate the oil from other substances, the resin is mixed with alcohol or another solvent, extracted, and then filtered. Finally, distillation is carried out so that the product does not contain the slightest amount of solvent. According to the Polish Standard (in accordance with the ISO standard), the term "essential oil" applies only to plant fragrances obtained by steam distillation or extrusion of citrus fruit peels. Resinoids, concretes, tincture absolutes are obtained by extraction methods. Unfortunately, cheap products solvent residues can often be found, so pay attention to the quality aspect when buying an oil (Olkiewicz et al., 2015; Ulewicz et al., 2015; Dereń, 2016; Feliczek, 2016; Girek et al., 2020; Skalski et al., 2020; Krot, 2021).

Hexane, methanol and ethanol are used to produce absolutes. The temperature-sensitive flowers are placed with the solvent in a container and heated. The volatile fragrances pass into the solvent, which is then removed by distillation. In this way, we obtain a substance with the consistency of an ointment called concrete. In addition to fragrances, it contains coloring agents and waxes. To remove the waxes, the concretes are dissolved with alcohol and the solids are filtered out. Finally, the fragrances are separated from the alcohol by distillation. The product remaining after

this process is called absolute. As with resinoids, when purchasing these types of products, special attention should be paid to whether they are free from residual solvents (Romer, 2010).

Known absolutes include jasmine, rose, neroli, tonka and vanilla. With the exception of neroli and rose, they cannot be obtained by distillation (Król et al., 2013).

The most delicate but also the most expensive method of obtaining oils is enfleurage (odorization). This process is extremely tedious, and the oils produced in this way are very expensive, so this method has almost been discontinued. It consists in spreading fat, e.g. pork, on a glass plate, and then arranging a thin layer of flowers on it. They stay there for about two days, after which they are replaced with new ones. The fat dissolves some of the components of the flowers and absorbs them. This operation is repeated until the fat is saturated with aromatic substances. Then the absolute is separated from the fat with alcohol. The whole process ends with distillation, thanks to which the alcohol is removed (Najda, 2015).

When buying an essential oil, especially for its later use for medicinal purposes, it is absolutely necessary to pay attention to its quality. What it is like can be deduced from the label on the bottle. In addition to essential oils with 100% purity, we also distinguish between natural-identical and synthetic oils. Only 100% pure essential oils contain a whole range of naturally occurring substances. Usually only a few of these ingredients, sometimes only one of them, is responsible for the unique smell of a plant or oil. All other components of the oil, and there may be even several hundred of them, cause small but significant differences. Various fragrance notes and modes of action are the result of the type and concentration of other constituent substances (Chyc, 2020; Girek et al., 2020).

Natural-identical oils are substances that are supposed to imitate the products of nature as faithfully as possible. Unfortunately, they match their prototypes only in terms of the main ingredients that give the oils their fragrance. Reproduction of the remaining substances would be unprofitable and inconsistent with the intention of producers who want to market products at the most attractive prices. In order to obtain the perfect, sophisticated fragrance and the fullness of healing properties, it is necessary for many different ingredients to work together. It can therefore be concluded that nature-identical oils are useless as therapeutic agents (Chyc, 2020; Girek et al., 2020).

The scent of a synthetic oil is produced by chemical processes and has nothing to do with the natural essential oil of the plant. Unlike oils identical to natural oils, nature is not a role model here. Synthetic oils are products of the imagination of chemists. In their test tubes, they create compounds that bear no resemblance to what can be obtained from the plant. Oils that cannot be obtained naturally, but which are nevertheless available as synthetic products, include lily of the valley, apple blossom, violet, lilac and peach. Synthetic oils often have a penetrating smell, and their beneficial effect on the human system is questionable (Kołodziej et al., 2014).

Fragrance oils are innovative mixtures of natural oils and synthetic fragrances or completely synthetic fragrances, produced using modern chemical technologies. Fragrance oils do not have medicinal properties, but their main use is to aromatize rooms by using them in a scented fireplace, incense sticks or in an air fresheners (Kołodziej et al., 2014; Chyc, 2020; Girek et al., 2020).

The shelf life of an oil depends on its composition and storage method. It is the shortest in the case of citrus oils. They contain waxes and other accompanying substances that are released during the pressing of the skins, accelerate spoilage, change the smell and can irritate the skin. For these oils, the maximum shelf life is one to one and a half years. After that, they can under no circumstances be used for therapeutic purposes. The durability of distilled oils is very different, and it depends on the composition of the oils. Rose oil can be stored for years and does not spoil. Others, on the other hand, keep freshness for up to three years and this should be followed in the case of distilled oils. However, for therapeutic purposes, oils not older than a year are used for safety (Adaszyńska and Swarcewicz, 2012; Girek et al., 2020).

Mixtures with vegetable oils should be used within six months. When it comes to storing blends, we follow the rules that apply to essential oils (Romer, 2010).

Most essential oils are sensitive to light and heat because these factors accelerate chemical processes, causing the oil to age. The optimal storage temperature is 18 to 20°C. Oils should therefore be stored in cool places, out of light, making sure that the amount of air in the bottle is as small as possible, because oxygen also contributes to the deterioration of the oil's quality. Close the bottle immediately after use. Rarely used oils should be poured into smaller bottles so that the level reaches the neck. To increase the oil level by pouring glass beads into the bottle (Kołodziej et al., 2014). Before each use, it is absolutely necessary to check the fragrance of the oil. A spoiled product can be recognized immediately by smell. If in doubt about the freshness of the oil, it is better to refrain from using it for therapeutic purposes (Kucharska et al., 2018).

Essential oils used for medicinal purposes or for perfuming rooms must always be of high quality. Regardless of whether the oil is inhaled with the air, applied to the skin or taken during an aromatic bath, the components of the oil are always absorbed through the skin or lungs and introduced into the bloodstream. Oils diluted with synthetic additives or containing residues of solvents and insecticides can cause more harm than good. Therefore, you should choose good quality products even when their cost is higher (Król et al., 2013; Chyc, 2020).

Labels placed on good oils from reliable producers always contain all the necessary information. The following list illustrates how a product should be described. If not all of the information fits on the label, as is often the case with the tiny 10ml bottles, it should be on an additional label or attached list (Romer, 2010; Kołodziej et al., 2014; Girek et al., 2020):

- Polish and Latin name of the oil (plant from which it was obtained);
- origin of the oil - country;
- part of the plant from which it is obtained, chemotype;
- method of acquisition;
- in the case of extraction products: the solvent used and information on the control carried out for solvent residues;
- type of cultivation (eg wild harvesting, biologically controlled cultivation, etc.);
- for diluted oils: the substance used (eg jojoba oil);
- amount of oil;
- production date or shelf life;

- information on safe use and possible hazards (eg flammability).

4. CONCLUSION

The more information is published about aromatherapy, the more awareness grows about how to use essential oils for medicinal purposes. The choice of a specific oil depends on the type of ailment and the patient's preferences. The use of an essential oil with a therapeutic purpose depends on many conditions. First of all, only substances that meet the guidelines of the contemporary, current Polish standard PN-EN ISO 9235: 2021-12, published on December 27, 2021 (ICS 71.100.60 - Essential oils) and classified as essential oils can be used in aromatherapy, i.e. with the purpose of therapeutic. On the other hand, fragrance oils, synthetic and identical to natural ones, do not meet these requirements and cannot be used for therapeutic purposes.

REFERENCES

- Adaszyńska, M., Swarczewicz, M., 2012. *Olejki eteryczne jako substancje aktywne lub konserwanty w kosmetykach*. Wiadomości chemiczne, (66, 1-2), 139-158.
- Adaszyńska, M., Swarczewicz, M., Markowska-Szczupak, A., 2013. *Porównanie składu chemicznego i aktywności przeciwdrobnoustrojowej olejku eterycznego otrzymanego z różnych krajowych odmian lawendy wąskolistnej (Lavandula angustifolia L.)*. Post Fitoter, 2, 90-6.
- Boren, K.E., Young, D.G., Woolley, C.L., Smith, B.L., Carlson, R.E., 2015. *Detecting Essential Oil Adulteration*. J Environ Anal Chem 2:132. doi: 10.4172/2380-2391.1000132
- Chyc, M., 2020. *Wstępna ocena możliwości zafałszowania olejków eterycznych*. Science, Technology and Innovation, 11(4).
- Ćwirlej, A., Ćwirlej, A., Gregorowicz-Cieślak, H., 2005. *Masaż klasyczny i aromaterapeutyczny w bólach kręgosłupa*. Przegląd Medyczny Uniwersytetu Rzeszowskiego, 4, 366-371.
- Dereń, M. 2016., *Wybrane problemy zarządzania jakością w obszarze działalności leczniczej*. Gospodarka Materiałowa i Logistyka, (10), 25-33.
- Feliczek, P., 2016. *Systemowe zarządzanie jakością w branży wyrobów medycznych w obliczu zmian normatywnych*. Studia Oeconomica Posnaniensia, 4(12).
- Girek, B., Deska, M., Girek, T., 2020. *Bezpieczeństwo stosowania olejków eterycznych*. International Journal of Engineering and Safety Sciences, 1.
- Góral, D., Kluza, F., 2008. *Wybrane techniki zamrażania a zawartość olejków eterycznych w niektórych warzywach przyprawowych*. Acta Sci. Pol., Techn. Agr, 7, 1-2.
- Grabowska, K., Janeczko, Z., Pióro-Jabrucka, D., 2013. *Olejki eteryczne w preparatach farmaceutycznych*. Aromaterapia, 19(4).
- Jurowski, K., Piekoszewski, W., 2019. *Essential oils as cosmetic products from toxicologist and safety assessor point of view*. Medycyna Rodzinna, 22(2).
- Kaniewski, R., Pniewska, I., Świejkowski, M., 2016. *Możliwość wykorzystania olejków eterycznych, ze szczególnym uwzględnieniem olejku konopnego, jako substancji aktywnych i środków konserwujących kosmetyki*. Postępy Fitoter, 17(2), 125-129.
- Kolodziej, B., Sugier, D., Krol, B., 2014. *Wpływ opakowania i czasu przechowywania na jakość surowców zielarskich*. Opakowanie, 11.

- Kowalski R., Gagoś M., Kowalska G., Pankiewicz U., Sujka M., Mazurek A., Nawrocka A., 2019. *The effects of ultrasound technique on the composition of different essential oils*. Journal of Analytical Method in Chemistry, Article ID 6782495, 1-10.
- Krot, K., 2021. *Jakość i marketing usług medycznych*. Wolters Kluwer, Warszawa, Polska.
- Król, B., Kieltyka-Dadasiewicz, A., 2015. *Wpływ metody suszenia na cechy sensoryczne oraz skład olejku eterycznego tymianku właściwego (Thymus vulgaris L.)*. Żywność Nauka Technologia Jakość, 22(4).
- Król, S. K., Skalicka-Woźniak, K., Kandefer-Szerszeń, M., Stepulak, A., 2013. *Aktywność biologiczna i farmakologiczna olejków eterycznych w leczeniu i profilaktyce chorób infekcyjnych*. Postępy Hig. Med. Dośw, 67, 1000-1007.
- Kucharska, M., Szymańska, J. A., Wesołowski, W., Bruchajzer, E., Frydrych, B., 2018. *Porównanie składu chemicznego wybranych olejków eterycznych stosowanych w chorobach układu oddechowego*. Medycyna Pracy, 69(2).
- Najda, A., 2015. *Roślinne substancje lotne – olejki eteryczne*. Episteme, 2, 65-77.
- Naturalne surowce aromatyczne - Terminologia*. PN-EN ISO 9235:2021-12 - wersja angielska; 27-12-2021; 22 s.(ICS 01.040.71, 71.100.60).
- Olkiewicz, M., Bober, B., Majchrzak-Lepczyk, J., 2015. *Instrumenty zarządzania w ochronie środowiskowej*. Rocznik Ochrona Środowiska, 17.
- Radziejowska, M., Radziejowski, P., Romaniv, O., 2020. *Effects of massaging upper limb parts in different order on changing the level of blood circulation in the massaged area*. Journal of Physical Education & Sport, 20.
- Radziejowska, M., Radziejowski, P., Rutkowska, K., 2020. *Effectiveness of Chinese cupping massage during the initial stage of lipodystrophy (Case report)*. Journal of Physical Education and Sport, 20, 2239-2245.
- Radziejowski, P., Radziejowska, M., 2017. *Stamps massage in cosmetics and physiotherapy*. Medical and Health Sciences Review; 2017; 3(2): 61-66.
- Radziejowski, P., 2018. *Hot stone massage therapy-mechanisms of the influence on the human organism of selected methods of use*. Journal of Education, Health and Sport, 8(5), 335-348.
- Romer, M., 2010. *Aromaterapia: dla całej rodziny*. MedPharm, Wrocław, Polska.
- Rudy, S., Krzykowski, A., Piędzia, S., 2011. *Analiza wpływu sposobu suszenia na zawartość olejków eterycznych w suszu z liści pietruszki*. Inżynieria Rolnicza, 15, 237-243.
- Seidler-Łożykowska, K., Golcz, A., Kozik, E., Kucharski, W., Mordalski, R., Wójcik, J., 2007. *Ocena jakości surowca cząbrz ogrodowego (Satureja hortensis L.) z uprawy ekologicznej*. Journal of Research and Applications in Agricultural Engineering, 52(4), 48-51.
- Seidler-Łożykowska, K., Kozik, E., Golcz, A., Mieloszyk, E., 2006. *Zawartość makroelementów i olejku eterycznego w surowcach wybranych gatunkach roślin zielarskich z upraw ekologicznych*. Journal of Research and Applications in Agricultural Engineering, 51(2), 161-163.
- Sharmeen, J. B., Mahomoodally, F. M., Zengin, G., Maggi, F., 2021. *Essential oils as natural sources of fragrance compounds for cosmetics and cosmeceuticals*. Molecules, 26(3), 666.

- Skalski, D., Telak, J., Zieliński, E., Czarnecki, D., 2020. *Kultura fizyczna, medycyna, zarządzanie i bezpieczeństwo: współczesne aspekty*. Wydawnictwo uczelniane Akademii Wychowania Fizycznego i Sportu im. Jędrzeja Śniadeckiego w Gdańsku, Gdańsk, Polska.
- Turek C., Stintzing F.C., 2013. *Stability of essential oils: a review*. Comprehensive Reviews in Food Science and Food Safety, 12, (2013).
- Ulewicz, R. M., Klimecka-Tatar, D., Mazur, M., Niciejewska, M., 2015. *Wybrane aspekty zarządzania bezpieczeństwem i higieną pracy*. Oficyna Wydawnicza Stowarzyszenia Menadżerów Jakości i Produkcji, Częstochowa, Polska.
- Vostinaru, O., Heghes, S. C., Filip, L., 2020. *Safety profile of essential oils. Essential Oils-Bioactive Compounds. New Perspectives and Applications*, 1-13.