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STUDY ON TYPES OF EXTRACTION FOR OILS ESSENTIALS AND VEGETABLE OILS

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SUMMARY

Studies show that for each type of oil there is an appropriate extraction, we want to test another method for each oil and analyze the effectiveness and yield of the extraction if it actually occurs. Therefore, we will carry out scientific research, with the aim of verifying the efficiency of the mechanical and solid-liquid process in the extraction of lipids for the production of essential and vegetable oils, being characterized as a qualitative process. We will use the avocado fruit as a sample, which, according to research, has been shown to be a fruit rich in lipids, as in addition to being easy to extract, it has several possible extraction methods. To analyze the optimization of extraction and quantity of lipids removed, we will use two diversified methods, a mechanical process that will take place through cold pressing, centrifugation and decantation of the fruit pulp and a solid-liquid process in which We will subject the sample to a specific solvent, located inside a volumetric flask that will be connected to a Soxhlet apparatus and a condenser and will be heated with the help of a heating blanket. The fruits will be harvested while still unripe and have reached their maturation process at room temperature, with little humidity and light, so that the pulp can be removed in its best quality. The use of cold pressing extraction allows the oil removed to have no toxic chemical compounds, thus having greater purity over the solid-liquid process that uses toxic non-polar solvents that possibly contaminated the sample even if in small quantities.

Key words: Extraction. Essential oil. Vegetable oil. Cold pressing.

ABSTRACT

Studies show that for each type of oil there is a proper extraction, we want to test another method for each oil and analyze efficiency and yield of the extraction if it does occur. So, we will carry out scientific research, with the

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objective of verifying the efficiency of the mechanical and solid-liquid process in the extraction of lipids to produce essential and vegetable oils, being characterized as a qualitative process. We will use as a sample the avocado fruit, which according to research, proved to be a fruit rich in lipids, since it is easy to extract, it has a lot of possible extraction methods. For the analysis of the optimization of the extraction and quantity of lipids removed, we will use two diversified methods, a mechanical process that will take place through cold process, centrifugation and decanting of the fruit pulp and a solid-liquid process in which we will subject the sample to a certain solvent, located inside a volumetric flask that will be connected to a Soxhlet device and a condenser and will be heated with the aid of a heating blanket. The fruits will be harvested when not yet ripe and have reached their maturation process at room temperature, with little humidity and light, so that the pulp is removed in its best quality. The use of cold pressing extraction allows the oil removed to have no toxic chemical compounds, having so greater purity in relation to the solid-liquid process that uses nonpolar solvents that possibly contaminated the sample even in small quantities.

Keywords: Extraction. Essential oil. Vegetable oil. Cold pressing.

1. INTRODUCTION

Lipids are organic substances, insoluble in water, whose fundamental unit is fatty acids and their derivatives, which exactly defines the characteristic of being hydrophobic, oily and fatty (LEHNINGER, 1989). Within the existing groups of lipids, the group of oils and greases (OG) stands out, an important group, both for the food industry and for the human diet, which are made up of triacylglyceride molecules and free fatty acids.

According to ANVISA-RDC 270 of 2005, the classification of fatty lipids into oils and fats depends on the melting point of the mixture at a temperature of 25°C, oils are liquids while fats are solid or pasty. This explains the difference between the two better, putting an end to the idea that oils come from vegetables while fats come from animals.

Essential oils, for example, are volatile, dense and viscous substances that are present in the structures of plants, fruits, flowers, seeds, roots, leaves, bark and stems. These are the organisms from which the oil is extracted. For vegetables, they have functions such as protection with antioxidant and microbial action. In addition to helping in the pollination of species, due to its characteristic odor that is released into the environment.

Vegetable oils are products made up mainly of fatty acid glycerides from plant species(s). They may contain small amounts of other lipids such as phospholipids, unsaponifiable constituents and naturally present free fatty acids.

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The type of plant extraction varies as it depends on the characteristics of the oil source. However, it is possible to identify some basic extractions such as: mechanical pressing, solvent extraction or autoclaving. Generally, at the end of the process, the oil or fat goes through a purification process so that its properties can be adjusted.

2 THEORETICAL FRAMEWORK

2.1 EXTRACTION

Extraction is a unitary operation based on the mass transfer of a solute and a substance that can be liquid or solid. There are three types of liquid-liquid or solid-liquid extraction. It can be done by several methods. The choice of this is directly related to the characteristics of the plant and the application given to the extract. The most commonly used extraction methods are mechanical pressing, steam extraction and organic solvent extraction.

The mechanical pressing process for extracting vegetable oils is one of the oldest and even after all technological developments, this means of extraction is still carried out using rudimentary means. In modern industrial processes, continuous presses are used, in which the fruits are taken on conveyors to screws that promote their squeezing. At the end of this process, two products are obtained, the so-called cake, which is the solid part left over from pressing, and the oil. or raw fat, which may still contain solid particles. Then the raw oil or fat obtained goes through filtration to remove these particles in equipment called a filter press. After this process, the cake goes to the solvent extraction process while the filtered oil or fat will be purified.

The steam extraction process is a medium-cost process and is widely used in oils that are used in food and cosmetology, as there is no need for post-extraction treatment. It occurs as the fruit, leaves or flowers are subjected to a stream of water vapor that causes the volatile substances present, which are lighter than water vapor, to be taken to a condenser that cools the vapors. making them liquid again so they can be separated by the difference in density.

This process can occur with the plant immersed in water and the water vapor, when boiling, will subject it to evaporation with its molecules. Or it can occur with the material on a vat that will allow the water to boil and the vapor from it will transport the vegetable molecules to the condenser.

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In a modern industrial system thesolvent extraction occurs in a continuous regime (there is no need for the process to add matter or solvent), which consists of an extractor that has baskets that are rotated, with a perforated bottom. In the upper part of the flow, next to the extractor, the load of solid material that will be extracted and an unsaturated solution is added. The solution will descend by gravity and pass through the baskets and will be collected already saturated at the bottom of the extractor. This saturated solution of oil in the solvent is called a micelle. When the baskets reach the upper part, they receive a load of pure solvent that descends by countercurrent gravity onto the baskets and is collected partially saturated at the base, being sent to the extractor, at the top of the system belt, and locks. The bran is discharged from the basket, the micelle that leaves the extractor is taken to continuous evaporators in which it separates the crude oil from the solvent, which will return to the process in the extractor. The bran will also go through this process and the solvent that comes out of it will also return to the process in the extractor.

The oil from extraction is called crude oil and to be consumed it needs to go through refining processes, as in crude form it can contain various contaminants. The solvent extraction process is recommended for fruits with low moisture and oil content, providing a yield of up to 99%. Being more economically viable.

The most used solvent is hexane, as it has a lower boiling point, which reduces the decomposition of the oil, and as it is a non-polar compound, it has a greater affinity with the non-polar part of the oil. However, this type of process is more harmful to the environment, taking into account the amount of pollutants released incorrectly and is a high-cost and flammable solvent, which may result in the choice of other solvents.

2.2 ESSENTIAL OIL

The same substance can be applied to humans and has similar functions, strengthening the immune system and alleviating pain and symptoms. The science responsible for the study of essential oils is Aromatherapy. According to the International Federation of Aromatherapy (IFA), it can be defined as “Aromatherapy is the ancient art and science of blending naturally extracted essential oils to balance, harmonize and promote the health of the body, mind and spirit” (IFA, 2020)

The characteristic odor of this type of oil is due to its chemical structure, which can be composed of terpenes, which are organic compounds that can be formed from carbon atoms and

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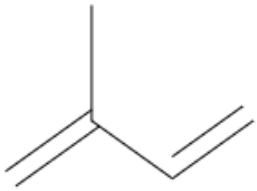
hydrogen. Or terpenoids when there is the presence of the oxygen atom, which originates functions such as alcohols, ketones, phenols, aldehydes and ethers (PAVIA, 2012).

They have a basic structure that is called isoprene (Figure 1). Isoprenes are carbon chains of five carbons and eight hydrogens (C_5H_8) which have two unsaturated bonds, when there is the presence of a double bond between the carbon atoms, at their ends.



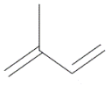
Isopreno

And they must follow the isoprene rule for their classification, this rule is ordered by the repetition of the isoprene unit as shown in table 1, so that from one repetition it is called monoterpene and more than eight repetitions $(C_5H_8)_{n>8}$is named as polyterpenes.

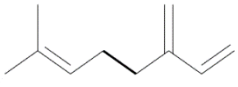
Classification:	Isoprene repeats:	Amount of Carbons:
Monoterpene	two	10
Sesquiterpene	3	15
Diterpene	4	20
Triterpene	6	30
Tetraterpene	8	40
Polyterpene	> 8	> 40

Table 1: Classification of terpenes.

When joining isoprene units we obtain new compounds, so the bond made between them is called a 1-4 bond (head-to-tail). This type of bond will allow the chain to elongate. It occurs by the joining of carbon 1 of one molecule with carbon 4 of another, thus (explanation of the opening of the double bond...)



Isopreno



Ligação 1-4

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Figure 2: Joining two isoprene units through connection 1-4.

D-limonene is the monoterpene, two isoprene units, the main one that gives rise to orange essential oil and is mainly extracted from the peel of this fruit. It can be used in the food and fragrance industries to give odor and flavor to products related to this fruit. But direct contact of the oil with the skin or eyes can cause irritation, which is why it is solubilized in its manufacturing process.

Limonene can be presented in two forms: D-limonene and L-limonene. When a chemical chain presents this variation, it is called stereoisomers. They have a molecular formula, but they differ in terms of their chemical structure, as seen in figure 3.

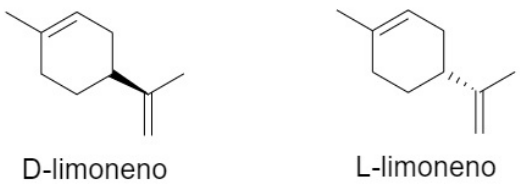

Figure 3: Structures of D-limonene and L-limonene stereoisomers.

Orange is a fruit rich in fiber, vitamins A, B and C, it has anti-inflammatory properties. inflammatory and antioxidants, helping to combat aging, reduce bad cholesterol and strengthen the immune system. Which can be applied to the skin or ingested in its essential oil form.

The highest incidence of citrus fruit origins is in the east of the Asian continent and is no different from oranges. It was cultivated in the Ancient Age (20th century BC) and spread throughout the world through colonization, where it was used to cure illnesses among ship crews. (FERNANDES, 2010). It arrived in Brazil in the mid-16th century, but in 1800 it established itself in the country's territory and climate. As coffee was cultivated in Brazilian lands, oranges followed it and as the state of São Paulo was the main planting area, it was here that it developed (FERNANDES, 2010).

2.3 VEGETABLE OILS

Vegetable oils or carrier oils (as they are called in natural cosmetology and aromatherapy) are made up of fatty acids, that is, they are fatty, non-volatile and nutritious.

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Therefore, they are formed by triglycerides (3 fatty acids and a glycerol molecule) of a non-polar chemical nature, that is, they are insoluble in water and soluble in organic solvents.

Triglycerides, as the main structure of vegetable oils is called, are formed by a glycerol molecule and three fatty acid molecules, as shown in the figure**,It is non-polar chemical in nature (not soluble in water) but soluble in organic solvents.

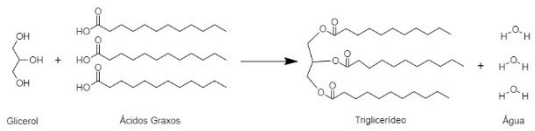

Figure 3 - Triglyceride synthesis reaction

The set of fatty acids is what differentiates one from the other and its therapeutic, medicinal and cosmetic properties such as bactericidal, antiseptic and anti-inflammatory. By applying vegetable oils, they can moisturize skin and hair, treat wounds, allergies and stretch marks and provide vitamins. They are used for food, cosmetic, fuel and therapeutic purposes.

2.4 ESSENTIAL OIL

Essential oil is much more liquid and volatile, which allows the aromatization of environments and their aromas used for therapeutic purposes. Its molecules are smaller and “lighter”, therefore, they are less viscous and more volatile, that is, they evaporate easily.

Vegetable oils do not have a strong aroma and do not evaporate as easily, they are more viscous due to their composition. Its molecules are longer and “heavier”, causing the molecules to stick together more, making the liquid thicker.

Some essential oils can be ingested, but in small quantities due to their high concentration. It is often necessary to dilute them in vegetable oils (carriers) so that they can be used on the skin and avoid irritation.

FINAL CONSIDERATIONS

With the preparation of this article, we can conclude that the best extraction methods for vegetable oil and essential oil are mechanical pressing and steam extraction methods, respectively. These produce oils with the best properties and greatest

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yield, being analyzed qualitatively and quantitatively, taking into account the quality and quantity that the methods provide us. To reach this conclusion, the yield, purity and impact on the environment were analyzed, as solvent extraction generates major environmental impacts and can cause contamination of the oils. In order to choose the most appropriate method for carrying out the procedure, an analysis of the location being harvested and the type of fruit, flower, leaf or seed must be carried out, as the properties vary depending on these characteristics.

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