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Essential oils: Characteristics, extraction and pharmacological activities

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Abstract

Herbs used medicinally have a vital role in both treatment and wellness. Compared to produced medications, medicinal plants' bioactivity had less adverse effects, and their many therapeutic benefits can be attributed to their antioxidant characteristics. Consumer interest in natural items as substitutes for synthetic additives or pharmacologically significant drugs has grown significantly in recent years. The public benefits from their uses in the fields of medicine, aromatherapy, microbiology, agriculture, cattle, and the food and pharmaceutical industries. Essential oils are aromatic, volatile liquids that are generated from plant material by steam distillation and are given their name based on the plant from which they originate. The oils were deemed "essential" because it was believed they could capture the essence of a plant's flavour and fragrance. They give plants their unique scent. Because of the concentration of healing chemicals gathered in the oil, essential oils function as the original plant's defence mechanism and have more potency. Aromatherapy uses essential oils extensively to help people unwind, lower stress, get rid of headaches, better sleep, and feel happier. They are beneficial for boosting the immune system and treating mild illnesses because they also have antibacterial, antiviral, and anti-inflammatory qualities. They are a well-liked option for individuals looking for complementary and alternative approaches to health and wellbeing because of their natural origin and efficacy. The purpose of this study is to assess the literature on the nature of essential oils, their potential as therapeutics, and the constituent parts of different types of essential oils.

Keywords: Aromatherapy; Natural remedies; Antibacterial properties; Holistic health; Skincare; Anti-inflammatory properties.

1. Introduction

Throughout ancient times, essential oils have been utilized for therapeutic and health-related purposes in several civilizations. A concentrated hydrophobic liquid with volatile plant-based chemical components that evaporate easily at room temperature is called an essential oil. Because it retains the essence of the plant's smell, that is, the distinctive fragrance of the plant from which it is derived, an essential oil is considered essential [1]. Essential oils, sometimes referred to as essences, volatile oils, etheric oils, or aetheroleum, are intricate, naturally occurring blends of odorous, volatile, and lipophilic compounds that are frequently present in aromatic plants. A definition of essential oils has been attempted by numerous writers [2].

The definition of a "essential oil" is a "product obtained from a natural raw material of plant origin, either by distillation with water or steam, or from the epicarp of Citrus spp. fruits by a mechanical process, or by "dry distillation," according to the "Association Française de Normalisation" and the European Pharmacopoeia (Ph. Eur.). Next, physical methods are used to extract the essential oil from the aqueous phase [3]. Plants are able to synthesise essential and fixed oils. Known also as triacylglycerols or triglycerides, fixed oils are esters of a glycerol molecule joined to three fatty acids.

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Essential oils are derived from a variety of aromatic plants that are primarily found in warm, temperate regions such as the Mediterranean and tropical regions, where they form a significant component of conventional pharmacopoeias. Over 3000 essential oils have been found and extracted from the enormous variety of plant species; several hundred of these have been manufactured on a commercial basis [4]. The percentage oil yield from the plant species, its availability, and above all its demand all affect the price of any given commercial essential oil. They have a density that is often lower than that of water and are liquid, volatile, limpid, and infrequently coloured. They are also soluble in lipids and organic solvents [5]. These are stored in secretory cells, cavities, canals, epidermal cells, or glandular trichomes. All plant parts, including buds, flowers, leaves, stems, twigs, seeds, fruits, roots, wood, or bark, can synthesise them. Essential oils that are synthetic are not regarded as genuine. Though essential oils have long been there, their highly concentrated form of the natural oils found in plants inspired people and gave rise to a plethora of research and experimental activities. In order to preserve the original flavours and textures of their products, the food industry is currently moving toward the use of moderate preservation techniques [6].

The use of EOs offers a potential remedy for the lack of a scientific field that describes how to handle, prepare, and store food in a way that prevents food-borne illness [7]. Because of their many applications, main ingredients, and unique qualities, essential oils have become increasingly popular in a variety of industries in recent years, including aromatherapy, food flavouring, and natural pharmaceutical treatments. As a result, a number of uses, including their antibacterial, analgesic, anti-inflammatory, and antioxidant qualities, have been researched. In the medical field, essential oils are utilised to treat particular illnesses or ailments. They can be used to reduce the symptoms of illnesses like Alzheimer's, heart problems, insomnia, stress, and labor pain. Since commercially available essential oils are not considered medications and are not governed by the Food and Drug Administration (FDA) in the United States, it is not known that these oils can be used to treat, cure, or prevent any ailments [8-11]. Nonetheless, the FDA has the authority and will enforce legal measures that forbid businesses from marketing goods like essential oils as medicines with therapeutic benefits. Even though essential oils are not pharmaceuticals, continuing, preliminary research is being done to determine whether any particular essential oil may have medicinal effects. It's crucial to remember that, in comparison to essential oils sold commercially, the essential oils utilized for research can differ significantly in terms of purity, potency, dosage, and other factors [12].

When treating illnesses, you should not use essential oils in place of seeing a physician with the appropriate training and licensure from the state. There isn't a governing body in the United States that currently certifies or approves essential oils for purity and quality [13]. Many marketing words, such as "therapeutic grade" or "pure," are used by manufacturers to promote their goods. But the quality of the product is not reflected in those terms. Before buying an essential oil, it's crucial to check the manufacturer and study the ingredient labels to be sure you know what's in it. Essential oils do not have a certificate, but trustworthy suppliers will specify the plant component and the method of extraction (usually by using the formal Latin term). A deeper comprehension of essential oils' mode of biological action is necessary for novel uses in human health, agriculture, and the environment, given the growing popularity of these natural products despite their widespread use and familiarity as scents. Without exhibiting the same side effects, several of them make up useful complements or substitutes for synthetic substances used in the chemical industry [14-16].

1.1. History of essential oils

Essential oils have been utilized for millennia in religious rites, as well as for cosmetics and health support. Essential oils have been utilized in folk medicine for millennia, and they have a special position in world history [17-19].

- **Mesopotamia**
- 3500 BC
- Tepe Gawra, in modern-day northwest Iraq, is home to the first-known distillation apparatus.
- **CHINA**
- 3000 BC
- A ground-breaking book with details on over 300 plants and their applications is published by legendary emperor Shen Nung.
- **EGYPT**
- 1470 BC
- Egypt's queen, Hatshepsut, sets out on a fabled journey to Punt. A grove of myrrh trees is the most valuable treasure her army has returned with.
- 1300 BC
- Designed to store the priceless aromatic fragrances that the dead monarch would use in the afterlife, monarch Tutankhamun is interred with alabaster jars.
-

- **MACEDONIA**
- 345 BC
- In his youth, Alexander the Great despised incense and was even chastised by his teacher, Leonidas of Epirus, for using it excessively.
- **ISRAEL**
- 0 AD
- The most priceless gifts, including frankincense and myrrh, are brought to the Christ child by wise men, according to the Bible.
- **ITALY**
- 100 AD
- The usage of herbs and essential oils are described in Pliny the Elder's Natural History, a work of Roman history.
- **PERSIA**
- 1000 AD
- Aromatherapy began with the production of floral essential oils by physician Avicenna by steam distillation, such as rose essence.
- **FRANCE**
- 1930 AD
- Dr. René-Maurice Gattefossé starts his groundbreaking study on the therapeutic applications of essential oils, which culminates in the release of his book on aromatherapy.
- **FRANCE**
- 1980 AD
- The health benefits of essential oils and their constituent elements are the subject of extensive research by Dr. Jean-Claude Lapraz.
- **USA**
- 1985 AD
- Young Living was founded as a result of D. Gary Young's initial investigation into essential oils.

1.2. Manufacturing of essential oils

According to Bruneton (1995), essential oils are highly prized plant products that are mostly composed of volatile principles found in plants and undergo some modification during manufacture. Either breaking the cell wall or speeding up diffusion through the cell wall will release the oil droplets that are being held in the oil glands or sacs. The extracted oil's stability in the presence of heat, its chemical reaction susceptibility, and the portion of the plant from which it is to be taken all influence the techniques used [20].

1.2.1. Hydrodistillation

Water that comes into direct touch with fresh or occasionally dried macerated plant components is distilled using this approach. Plant material is placed in the Clevenger setup after being ground and weighed. Using direct steam, plant material is heated to a temperature two to three times its weight in water [21]. A water-cool condenser removes the oil and water vapour from the distillation vessel after it has been heated over a heating mantle.

1.2.2. Hydrodiffusion

By passing steam through plant material at atmospheric pressure (low pressure steam <0–1 bar) from the top of the extraction chamber, a process known as hydrodiffusion is used to extract essential oils while preserving the original aroma of the plants [22].

1.2.3. Enfleurage

This method works with flowers that are so delicate and have minimal essential oil content like jasmine or tuberose that boiling them would damage the blossoms before the essential oils are released. The essential oil of the flower is absorbed by placing flower petals on trays filled with odorless vegetable or animal fat. The worn-out petals are taken off and replaced with new ones every day or every few hours once the vegetable or fat has absorbed as much essential oil as possible. This process is repeated until the essential oil is fully saturated in the fat or oil. Enfleurage mixture is the term for this. The essential oil and the fatty compounds can be separated with the addition of alcohol [23]. In order to extract the essential oil from a flower or its petals, the best way is the enfleurage method, as the alcohol evaporates and only the essential oil remains.

1.2.4. Cold pressing

Cold pressing is an additional technique for essential oil extraction that has not seen much use in scientific studies. Oils from citrus fruits, such bergamot, grapefruit, lemon, lime, etc., are extracted using it. The to-be-extracted fruits are rolled over a trough that has pointed edges that pierce the peels and tiny pouches holding the essential oil [24]. The juice is extracted from the whole fruit by pressing it and then centrifuging it.

1.2.5. Steam distillation

It is the oldest and most widely used technique for obtaining essential oils. The desired plant, which may be fresh or occasionally dried, is first put into the jar using this approach. After this, the plant's aromatic molecules, or oils, are introduced and circulated through the plant with steam. Occasionally, the plant releases these fragrant molecules, which then move in a closed system in the direction of the cooling apparatus. Steam is cooled using cold water. They become liquid as they condense and cool.

1.2.6. Solvent extraction

Through the use of a solvent, the oils are extracted from the materials that contain oil. Which plant portion is to be used for extraction determines which solvent is used. As an illustration, benzene is used to extract leaves, roots, and fruits, either in the cold or at boiling temperature, with or without a mixture of acetone and petroleum ether; ethers are used to extract flowers. Oil, wax, and color are dissolved by the solvent when it enters the plant. The semisolid concentrate is extracted using 100% ethanol, and the solvent is eliminated following the extraction process through distillation at low pressure. In order to precipitate the waxes, the second extract is chilled and subsequently filtered. Alcohol is extracted by distilling this wax-free alcoholic solution at a lower pressure [25].

1.2.7. Microwave Assisted Process (MAP)

Utilizing microwaves to stimulate water molecules in plant tissue, the MAP process causes the cells to burst, releasing the essential oil that has been trapped in the extracellular tissue of the plants. To extract essential oils with a high yield and in less time, this method has been developed and documented by numerous authors. Additionally, saponins from a few medicinal plants have been extracted using this process.

1.2.8. Carbon-dioxide extraction

Using this method, carbon dioxide is pumped through plant material that is contained in a high-pressure container. To extract the essential oil from the plant material, the carbon dioxide condenses into a liquid and serves as a solvent. The carbon dioxide transforms back into a gas when the pressure is reduced, leaving no trace of its presence. The chemical composition of the oil determines the qualities of essential oil extracted using any of the above-discussed processes [26].

2. Some of the important essential oils and their characteristics

Essential oils are generally very complicated blends that contain hundreds of different scent components. These significant essential oils and their attributes are listed below

Figure 1 Some Important Essential Oils.

2.1. Carrot seed oil

Carrot seed essential oil (CSEO) is mostly derived from the seeds of wild carrots (Daucus carota L. ssp. carota, Apiaceae), which are primarily found in Europe (Khan and Abourashed, 2010). This essential oil has a somewhat sweet scent with undertones of earthiness and herbaceousness [27]. This flowering plant is also known as wild carrot or queen Anne's lace. It is noted for its white blooms and carrot-scented roots. Carrot oil, which is prepared by mixing crushed carrot roots with a carrier oil like coconut or olive oil, is occasionally mistaken for carrot seed oil. But carrot oil isn't an essential oil. It's an oil made from vegetables. Cold-pressed carrot seed oil is a third kind of oil that is extracted from carrot seeds without the need for an essential oil [28]. In cosmetics and fragrances, carrot seed essential oil is frequently used as a fragrance ingredient. Additionally, it is included in several food product categories as a flavoring agent that is often utilized in amounts less than 0.003%. Skin rejuvenation and wrinkle-fighting cosmetic products include carrot seed oil. Because of its formative activity on epidermal cells, it also helps to remove age spots and provides the skin a more youthful color.

Figure 2 Carrot Seed Oil.

2.1.1. Characteristics of carrot seed oil

- Botanical Source - Daucus carota
- Family - Apiaceae
- Part of the plant used - Seeds
- Appearance - Fluid liquid and Light yellow to Pale yellow.
- Odour - Fresh with a hint of sweetness.
- Storage - In a well-fitted container in a cool and dark place.
- Solubility - Soluble in Alcohol, insoluble in water.
- Extraction Process - Simple Steam distillation.

2.2. Medicinal properties of carrot seed oil

2.2.1. Antibacterial activity

It contains substances whose antibacterial properties have been researched, including beta-caryophyllene and carotol [29]. Certain strains of Staphylococcus aureus and Escherichia coli have been demonstrated to be susceptible to the antibacterial effects of carrot seed oil.

2.2.2. Antifungal activity

To investigate whether the observed activity was due to the synergistic action of daucol, β-caryophyllene, and carotol alone, experiments were conducted with these chemical compounds. Fungal growth was considerably suppressed and colony radial size was decreased by carbotol. In contrast to carotol, daucol had a somewhat smaller inhibitory impact [30]. "β-caryophyllene" had no effect. According to the findings, carrot seed oil extracts' anti-fungal properties are mostly due to the presence of carotol.

2.2.3. Anti inflammatory activity

The anti-inflammatory benefits of carrot seed oil are thought to be attributed to a variety of chemicals, including beta-caryophyllene and carotol. The potential of these chemicals to lessen inflammation and ease skin irritations has been investigated.Carrot seed oil has the potential to reduce inflammation brought on by skin disorders such dermatitis, eczema, and sunburn [31].

2.2.4. Wound healing activity

It promotes the skin's natural regeneration process and speeds up the healing of wounds because it is high in antioxidants, vitamins, and minerals. Because the oil is nutritious and hydrating, it helps maintain the wound area's moisture content, which is essential for healing. Furthermore, by lowering swelling and redness around the area, carrot seed oil's anti-inflammatory qualities might facilitate a more comfortable healing process [32].

2.2.5. Antioxidant activity

Rich in antioxidants like beta-carotene, vitamin E, and vitamin C, it helps shield the skin from oxidative stress brought on by free radicals. Free radicals, which can harm skin cells and cause early aging signs like wrinkles and fine lines, are countered by antioxidants [33].

2.3. Coconut oil

The coconut tree, or Cocos Nucifera, is a tree with numerous nutritional and therapeutic benefits that has sparked attention in western medicine. Natural compounds called lipids resemble fat and are soluble in non-aqueous solvents like alcohols, hydrocarbons, and chloroform but insoluble in water. Depending on how unsaturated the fatty acid components are at room temperature, lipids can be either fat or oils. When the body needs more calories than it is getting, lipids can act as food [34]. It is a commercial crop that is essential to diets and livelihoods in many tropical nations. The main uses of coconut oil are in the home and business, including baking, confections, cosmetics, pharmaceuticals, and cooking. Approximately 70% of the saturated fatty acids in coconut oil are medium chain fatty acids (MCFAs), while the remaining 92% are saturated fatty acids [35].

2.4. Characteristics of coconut oil

- Botanical Source - Coccus nucifera
- Family - Arecaceae
- Part of the plant used - kernels

- Appearance - White or Almost White.
- Odour - Coconutty or neutral scent.
- Storage - In a well fitted container in a cool and dark place.
- Solubility - Very slightly soluble in Ethanol (96%) and soluble in light petroleum.
- Extraction Process - Cold Pressing Method.

2.5. Medicinal properties of coconut oil

2.5.1. Antibacterial activity

Lauric acid, an ingredient found in coconut oil, has been demonstrated to have antimicrobial effects. Bacteria's cell membranes can be damaged by lauric acid, which may prevent the bacteria from growing and surviving. There are additional substances in coconut oil that might further enhance its antibacterial properties.

2.5.2. Antifungal activity

It is mostly because medium-chain fatty acids, such caprylic and lauric acid, are present.A common option for natural antifungal therapies, lauric acid, which makes up around 50% of coconut oil, is converted by the body to monolaurin, which is very powerful against fungus-related infections [36].

2.5.3. Antiulcer activity

Inflammation in the body can be reduced by the chemicals in coconut oil, which is advantageous for treating and preventing stomach ulcers. An important component in the onset and aggravation of ulcers is inflammation.

2.5.4. Anti hepatoprotective activity

It alludes to the capacity to shield the liver from harm. Its high proportion of medium-chain triglycerides (MCTs), which are metabolised differently from other types of lipids, is principally responsible for this beneficial impact. MCTs are absorbed from the gut straight into the bloodstream and are then delivered to the liver, where they are instantly utilized for energy, minimizing the fat load on the liver and possibly the risk of liver disease [37].

2.5.5. Wound healing activity

In order to keep the area from drying up and developing a hard scab, which could slow the healing process, coconut oil helps to keep the wound moisturised. In addition to providing the ideal environment for the body's natural healing processes, the oil serves as a barrier to shield the wound from outside irritants and infections [38].

2.6. Grape seed oil

Grapeseed oil or grape oil are other names for grape seed oil. It is made of vegetable oil extracted from grape seeds. As a waste product of the winemaking process, grape seed's oil content is often removed mechanically or with the use of an organic solvent. The food, cosmetic, and pharmaceutical industries value grape seed oil for its abundance of phenolic compounds, fatty acids, and vitamins [39]. High levels of vitamin E and polyunsaturated fats, primarily omega-6, are the foundation for grapeseed oil's health claims. Grapeseed oil contains 10% saturated fat, 16% monounsaturated fat, and 70% polyunsaturated fat.

2.7. Characteristics of grape seed oil [40]

- Botanical Source - Vitis vinifera
- Family - Vitaceae
- Part of the plant used - Seeds
- Appearance - Fluid liquid and Dark yellowish, brown or olive brown.
- Odour - Sweet orange with a flowery undertone and a rich Neroli reflection.
- Storage - In a well fitted container in a cool and dark place.
- Solubility - Soluble in Alcohol, other Organic solvents and insoluble in water.
- Extraction Process - Cold Pressing Method.

2.8. Medicinal properties of grape seed oil

2.8.1. Antimicrobial activity

Resveratrol is one of the phenolic compounds that have antimicrobial activity. It works by causing oxidative damage to the membranes of bacteria, particularly E. Coli, without harming the host blood cells [41].

2.8.2. Anti-inflammatory activity

Globally, chronic diseases are linked to higher rates of mortality and morbidity due to inflammatory processes that are frequently challenging to manage with current treatments and interventions [42].

2.8.3. Antioxidant activity

Antioxidative ability is the most prominent bioactive characteristic of phenolic compounds.Due to the high concentration of procyanidins, epicatechin, gallic acid, and proanthocyanidins in grape seed oil, this oil has a strong antioxidant activity [43].

2.8.4. Anti-platelet activity

Polyphenols, especially proanthocyanidins, which have strong antioxidant qualities, are abundant in grape seed oil [44]. By reducing oxidative stress and scavenging free radicals, these substances may be able to inhibit platelet activation and aggregation.It also describes its capacity to lessen or prevent platelet aggregation, which is an essential stage in the formation of blood clots.

2.8.5. Collagen production

It's been proposed that grape seed oil increases the synthesis of collagen, a protein that supports skin regeneration and provides structural support for wound healing [45].

2.9. Orange oil

Orange oil is an essential oil that is generated by the cells that make up the orange fruit's rind. It is extracted as a by-product of orange juice production by centrifugation, which yields a cold-pressed oil, unlike other essential oils. It is frequently substituted for pure d-limonene since it contains more d-limonene (around 90%). Distillation is a method for removing D-limonene from oil. Green insecticides with biological pest control can contain orange oil. By erasing or dissolving the exoskeleton of ants and other insects, it can eradicate or control infestations or prevent re-infestations [46]. It also erases scent-pheromone trail indicators. As a cleaning, orange oil is employed.

2.10. Characteristics of orange oil [47]

- Botanical Source - Citrus sinensis
- Family - Rutaceae
- Part of the plant used - Fruit
- Appearance - Mobile liquid and Clear Pale yellow to orange mobile liquid.
- Odor - The Characteristic odor of fresh orange peel.
- Storage - In well-closed containers in the cool and dry storage area.
- Solubility - Soluble in oil & ethanol and insoluble in water.
- Extraction Process - Steam Distillation method.

2.11. Medicinal properties of orange oil

2.11.1. Anti microbial activity

Bacteria like Salmonella Typhimurium, Staphylococcus aureus, and Escherichia coli can be inhibited from growing by orange oil. It has also shown antifungal action against Aspergillus niger and Candida albicans. However, factors including concentration, formulation, and the particular microbe targeted can affect orange oil's efficacy as an antibacterial agent.

2.11.2. Anti cancer activity

Orange essential oil contains limonene, which has been studied as a possible cancer therapy [48]. According to a 2012 Trusted Source study, limonene-rich orange oil both slowed the growth and accelerated the death of colon cancer cells in vitro.

2.11.3. Antioxidant activity

Several substances having antioxidant qualities, such as limonene, myrcene, and alpha-pinene, are found in orange oil that is derived from orange peels [49]. The body's oxidative stress and inflammation are decreased by these antioxidants' ability to neutralise dangerous free radicals.

2.11.4. Anti inflammatory activity

It has ingredients including limonene, which several studies have demonstrated to have anti-inflammatory properties. By lowering the body's synthesis of inflammatory mediators and cytokines, limonene has been shown to suppress inflammation.

2.11.5. Antifungal activity

Numerous fungus, such as Aspergillus niger, Penicillium digitatum, and Candida albicans, can be inhibited by orange oil. Studies conducted in vivo and in vitro have both shown its efficacy as an antifungal agent [50].

2.12. Rosehip seed oil

Rosa rubiginosa, a wild rose bush found in the southern Andes, yields seeds that are used to make rosehip seed oil [51]. A wild rose species native to Europe, northwest Africa, and western Asia is called Rosa canina, from which rosehip seed oil can also be produced. Folk medicine has traditionally utilized rosehip fruits. Essential fatty acids, tocopherols, sterols, and phenolics with functional properties are found in rosehip oil, which is why it is thought to be advantageous. Omega-3, omega-6, and omega-7 fatty acids are the main essential fatty acids. Plus, the main phytosterol molecule is β-sitosterol. Tocopherol, namely γ-Tocopherol, is most abundant in rosehip seed oil.

Figure 3 Rosehip Seed Oil

2.13. Characteristics of rosehip seed oil [52]

- Botanical Source - Rosa canina
- Family - Rosaceae
- Part of the plant used - Seeds (specifically the hips or fruits)
- Appearance - Amber to orange coloured oil
- Odour - Mild, slightly earthy aroma
- Storage - Store in a cool, dark place away from direct sunlight.
- Solubility - Soluble in oil & fats and insoluble in water.
- Extraction Process - Cold Pressed method.

2.14. Medicinal properties of rosehip seed oil

2.14.1. Anti aging activity

Its capacity to moisturize, enhance skin texture, lessen wrinkles, and encourage collagen formation is what's thought to give it anti-aging qualities. Over time, these effects can help lessen the visibility of fine lines and wrinkles [53].

2.14.2. Antibacterial activity

Rosehip oil demonstrates antibacterial properties against a range of bacteria and fungi, such as Aspergillus niger, Candida albicans, Escherichia coli, and Staphylococcus aureus. Rosehip oil contains bioactive substances such as polyphenols, flavonoids, and vitamin E, which are responsible for its antibacterial properties.

2.14.3. Antifungal activity

Due to its high concentration of fatty acids, especially oleic and linoleic acid, as well as other bioactive substances including tocopherols, carotenoids, and phenolic components, rosehip seed oil has antifungal qualities. Rosehip seed oil is helpful in treating fungal diseases like ringworm and athlete's foot because these ingredients have been shown to suppress the growth of specific fungus species [54].

2.14.4. Antioxidant activity

Because rosehip oil has a significant amount of vitamins, especially C, E, and A, it is well known for having antioxidant qualities. These antioxidants aid in shielding the skin from free radical-induced oxidative stress, which can result in early aging and skin damage [55].

2.14.5. Anti inflammatory activity

It is mostly ascribed to the high concentration of vitamins, vital fatty acids, and antioxidants in it. By neutralizing free radicals, which are chemicals that cause tissue damage and inflammation, these ingredients can aid in the reduction of inflammation. Furthermore, substances like linoleic and linolenic acids, which have been shown to have anti-inflammatory properties, are present in rosehip oil [56-58].

2.15. Raspberry seed oil

A useful botanical extract made from raspberry seeds is called raspberry seed oil. Because of its complex makeup, which includes a strong combination of vitamins, vital fatty acids, and antioxidants, it is a common ingredient in many skincare products. This oil is especially valued for its moisturizing qualities, which aid in nourishing and hydrating the skin and encouraging a dewy, smooth complexion. Moreover, anti-inflammatory properties of raspberry seed oil help reduce redness and irritation, which makes it appropriate for skin types that are sensitive or troublesome.The ability of raspberry seed oil to offer organic sun protection is among its most noteworthy advantages [59]. It has a lot of ellagic acid, a polyphenol that may aid in absorbing UV rays and shielding the skin from sun damage.

2.16. characteristics of raspberry seed oil [60]

- Botanical Source - Rubus idaeus
- Family - Rosaceae
- Part of the plant used - Seeds
- Appearance - Pale yellow to golden oil
- Odour - Mild, fruity aroma
- Storage - Store in a cool, dark place away from direct sunlight.
- Solubility - Soluble in oil & fats and insoluble in water.
- Extraction Process - Cold Pressed method.

2.17. Medicinal properties of raspberry seed oil

2.17.1. Anti inflammatory activity

The anti-inflammatory benefits of raspberry seed oil are attributed to the presence of substances such phytosterols and alpha linolenic acid. By lowering inflammation and redness, these substances aid in the calming and soothing of inflamed skin [61].

2.17.2. Antioxidant activity

Due to the high concentrations of vitamin E, vitamin A, and other phytonutrients including ellagic acid, raspberry seed oil has strong antioxidant activity and can effectively fight oxidative stress [62]. Free radicals are unstable molecules that can harm cells, leading to aging and other skin issues. These antioxidants aid in counteracting free radicals.

2.17.3. Anti aging activity

A, E, and ellagic acid are among its components. The oxidative stress brought on by free radicals can produce wrinkles, fine lines, and loss of suppleness in the skin. These antioxidants aid in shielding the skin from this damage.Free radicals are enemies of collagen and elastin fibers in the skin, which are responsible for keeping the skin tight and elastic. Raspberry seed oil works to stop damage to these fibers by neutralizing them [63].

2.17.4. Non-comedogenic

All skin types, especially oily and acne-prone skin, can benefit from raspberry seed oil because it is non-greasy and lightweight. It's easy absorption into the skin without clogging pores makes it a great option for skincare products intended for the face.

2.17.5. Moisturizing and emollient

Emollient qualities of raspberry seed oil contribute to skin softness and moisture, making it a good choice for skin types that are dry, dehydrated, or sensitive [64]. It creates a shield to shield the skin from the elements, retaining moisture and promoting skin hydration [65-66].

2.18. Olive oil

Olive oil is an ancient liquid gold that is valued for its culinary, medical, and cultural uses. It is made from the fruit of the Olea europaea tree. An amazing source of healthy fats and chemicals that promote health is olive oil [67]. It is a heart-healthy option because of its high concentration of monounsaturated fats, antioxidants, and anti-inflammatory components, which lower the risk of heart disease and inflammation-related illnesses. More than 200 plant chemicals, such as hydroxytyrosol (HT) and hydroxytyrosol acetate (HT-ac), carotenoids, sterols, and polyphenols, are found in olive oil and function as potent antioxidants in the body. Additionally, vitamin E, which is essential for immune system performance and cell protection against oxidative damage, may be found in olive oil.

2.19. Characteristics of olive oil [68]

- Botanical Source - Olea europaea
- Family - Oleaceae
- Part of the plant used - Pulp
- Appearance - Transparent liquid and Clear colorless or greenish yellow , transparent liquid.
- Odor - fruit or vegetable aroma, maybe with grassy and/or olive notes
- Storage - In a well fitted container in a cool and dark place.
- Solubility - Insoluble in ethanol 96%, miscible with light petroleum.
- Extraction Process - Cold Pressing Method.

2.20. Medicinal properties of olive oil

2.20.1. Anti-inflammatory effects

Olive oil contains powerful anti-inflammatory polyphenols that may lower the chance of developing chronic illnesses like diabetes, arthritis, and some types of cancer. By preventing the body from producing pro-inflammatory chemicals, these substances function.

2.20.2. Antioxidant activity

Olive oil is rich in antioxidants, such as vitamin E, carotenoids, and phenolic compounds, which work to prevent oxidative damage to cells and neutralize dangerous free radicals. It is thought that this antioxidant activity contributes to both the slowing down of age-related illnesses and the aging process.

2.20.3. Antibacterial activity

It has been demonstrated that substances found in olive oil, such as phenolic compounds and oleuropein [69], have antimicrobial qualities. These substances have the ability to stop the growth of some bacteria, including Escherichia coli and Staphylococcus aureus.

2.20.4. Antimicrobial activity

Olive oil's antibacterial qualities can aid in halting the growth of a variety of pathogens, such as fungi, bacteria, and viruses. Infection prevention and skin health maintenance may benefit most from this.

2.20.5. Antifungal activity

It has been shown that olive oil possesses antifungal qualities, which enable it to effectively combat fungus like Candida albicans, which can lead to fungal infections in humans [70].

2.21. Sesame oil

Derived from sesame seeds, sesame oil is a popular and versatile oil that is used in many cultures for traditional medicine, cosmetics products, and cooking. Compared to many other vegetable oils, the oil has a higher concentration of unsaturated fatty acids. Pressed from roasted oilseeds, sesame oil is then consumed unrefined as a naturally flavorful oil. Because it contains tocopherols (vitamin E), it shows increased resistance to autoxidation [71]. It has anti-inflammatory and antioxidant qualities that help lower the risk of cardiovascular disease and atherosclerosis. Sesaminol and sesamol, two of its many antioxidants, help shield cells from oxidative stress and inflammation. Additionally, key fatty acids found in sesame oil, like omega-6 and omega-9 fatty acids, boost heart health by lowering cholesterol and enhancing blood circulation. It also has minerals like calcium, magnesium, and iron, along with vitamins E and K, all of which support general health. Only tiny amounts of free sesamol are present in sesame oil, which also includes 0.5–1.0% sesamin and 0.3–0.5% sesamolin [72].

2.22. Characteristics of sesame oil

- Botanical Source - Sesamum indicum
- Family - Pedaliaceae
- Part of the plant used - Seeds
- Appearance - Golden or amber in color.
- Odour - Distinct, nutty aroma.
- Storage - Store in a cool, dark place away from direct sunlight.
- Solubility - Soluble in organic solvents like ethanol and insoluble in water.
- Extraction Process - Cold Pressing Method.Cold Pressing Method.

2.23. Medicinal properties of sesame oil

2.23.1. Antioxidant activity

Antioxidants include sesamol, sesamin, and sesamolin are prevalent in sesame oil. By scavenging the body of free radicals, which can otherwise lead to cellular damage and aging, these substances help fight oxidative stress [73]. Sesame oil's effects to promote longevity are partly attributed to its antioxidant capabilities.

2.23.2. Anti-inflammatory activity

Sesame oil has anti-inflammatory qualities since it contains sesamol and other bioactive components. Sesame oil consumption may assist in lowering inflammation levels throughout the body, which is linked to a number of chronic illnesses, including arthritis, cardiovascular disease, and several cancers.

2.23.3. Antibacterial activity

Because of its constituents, including sesaminol, sesamol, and sesamin, sesame oil has antimicrobial properties. It works well against a variety of germs, such as Staphylococcus mutans and aureus [74]. Used topically or in dental care products, it can prevent the growth of bacteria and lower the risk of illness.

2.23.4. Hair health

Because it strengthens and nourishes hair, sesame oil is utilized in hair care products. By massaging the scalp, sesame oil can enhance blood circulation, encourage hair development, and shield the scalp from infections and dandruff. Its abundance of minerals and vitamins, such as calcium, magnesium, and zinc, promotes the health of your hair overall.

2.23.5. Digestive support

In the past, people have used sesame oil to help with digestion and ease stomach pain. It may lessen digestive tract inflammation, control bowel motions, and ease the symptoms of ailments like irritable bowel syndrome (IBS), bloating, and constipation [75].

2.24. Almond oil

Almond oil is made from the seeds of the Prunus dulcis tree and is used in cooking and cosmetic products [76]. Ancient Greece, China, and India used it for its many health and cosmetic benefits. Almond oil has a modest quantity of vitamin K and is a great source of vitamin E. Both monounsaturated and polyunsaturated fats are abundant in the oil. It's an excellent supplier of copper, phosphorus, and magnesium. Vitamin E, found in abundance in almond oil, functions as a potent antioxidant shielding the skin from UV rays and oxidative stress. It also has important fatty acids like omega-3 and omega-6, which keep the skin moisturized and supple by supporting the function of the skin barrier.

Figure 4 Almond Oil.

2.25. Characteristics of almond oil

- Botanical Source - Prunus Amygdalus
- Family - Rosaceae
- Part of the plant used - Kernels
- Appearance - Clear liquid and Light yellow clear liquid
- Odour - Mild, nutty aroma
- Storage - Store in Well Closed containers, in cool and dry storage areas.
- Solubility - Soluble in organic solvents like ethanol and insoluble in water.
- Extraction Process - Cold Pressing or Solvent Extraction Method.

2.26. Medicinal properties of almond oil

2.26.1. Hair conditioning

Its nourishing and moisturizing qualities are advantageous for the health of hair [77]. It aids in hydration of the hair shaft, frizz reduction, and texture enhancement in general. Dandruff can be avoided and healthy hair development can be encouraged by massaging almond oil into the scalp.

2.26.2. Antioxidant activity

Almond oil naturally protects the skin from free radicals because of its vitamin E content. Free radicals are a known source of cellular damage and accelerated aging. Antioxidants aid in their neutralization. To prevent oxidative stress and preserve the health of your skin, use almond oil on a regular basis.

2.26.3. Anti-aging activity

Aging indications can be effectively reduced by almond oil because of its antioxidant-rich makeup. It contributes to a more youthful complexion, increases skin suppleness, and reduces the visibility of fine lines and wrinkles.

2.26.4. Anti-inflammatory activity

Almond oil's anti-inflammatory qualities make it helpful for treating a variety of skin issues, including acne, dermatitis, psoriasis, and eczema. Almond oil applied topically helps support healthier and more comfortable skin by reducing redness, swelling, and irritation.

2.26.5. Wound healing activity

Because of its emollient and anti-inflammatory qualities, almond oil has long been used to treat wounds. It can aid in the quick healing of small burns, scratches, and cuts as well as calm them [78].

2.27. Tea tree oil

Tea tree oil is made from the leaves of the Myrtaceae family tree Melaleuca alternifolia. It is well known for its many possible uses and adaptable qualities. Tea tree oil has long been used medicinally by aboriginal Australian populations to treat wounds, fungal infections, and respiratory conditions. These days, it is utilized in traditional medicine and can be found in a variety of home, skincare, and hair care products [79]. Terpene hydrocarbons, primarily monoterpenes and sesquiterpenes, along with the alcohols that elicit these compounds, make tea tree oil. For this reason, tea tree oil is a well-liked option for treating dandruff, athlete's foot, acne, and other skin and scalp issues. It works well as an ingredient in natural cleaning products because of its inherent antibacterial qualities, which assist to disinfect surfaces and get rid of odors without using harsh chemicals [80].

Figure 5 Tea Tree Oil.

2.28. Characteristics of tea tree oil

- Botanical Source - Melaleuca Alternifolia
- Family - Myrtaceae
- Part of the plant used - Leaves and Twigs
- Appearance - Colourless to Pale yellow liquid.
- Odour - Strong, medicinal aroma.
- Storage - Store in a cool, dark place away from direct sunlight.
- Solubility - Soluble in organic solvents like ethanol and insoluble in water.
- Extraction Process - Steam Distillation Method

2.29. Medicinal properties of tea tree oil [81]

2.29.1. Antimicrobial activity

Against a variety of bacteria, viruses, and fungi, tea tree oil demonstrates strong antibacterial action. It is a common element in medicines meant to treat fungal infections, acne, and even dandruff due to its potency against a variety of pathogens.

2.29.2. Antioxidant activity

Antioxidant-producing substances found in tea tree oil aid in the body's defence against dangerous free radicals. This characteristic helps it to shield the skin from oxidative stress and to support skin health.

2.29.3. Antiseptic activity

Tea tree oil can treat cuts and wounds and lower the chance of infection because it is a natural antiseptic [82].

2.29.4. Anti-acne activity

Tea tree oil's potential to treat acne is among its most well-known applications. It's a common ingredient in acne treatment treatments because of its antibacterial and anti-inflammatory qualities, which assist to fade away existing blemishes and stop new ones from forming.

2.29.5. Antifungal activity

It is useful against common fungal illnesses including athlete's foot and nail fungus due to its potent antifungal effects. Additionally, it can be used to treat fungal infections of the scalp and skin [83].

3. Conclusion

Essential oils are among the natural plant products that require extra consideration due to their widespread use in traditional medicinal systems. Because of their alleged health benefits, essential oils have become more and more popular, but it's still necessary to use them carefully. Further research is required to determine their usefulness, as some studies indicate they may have therapeutic qualities including inducing relaxation or lowering tension. Furthermore, essential oils have the potential to be strong and, in certain cases, undiluted or excessive usage may result in allergic responses or skin irritation. Moreover, quality and purity could differ among brands as the FDA does not regulate them for safety or effectiveness. All things considered, while some people find that adding essential oils to their wellness routine is enjoyable, it's important to use them properly and speak with a healthcare provider if you have any concerns or pre-existing illnesses.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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