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Review Article

Using essential oils of weeds in aromatherapy for healing and medication

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ABSTRACT

Most of the people think that weeds are not useful, so they should be eradicated in any case. However weeds have numerous secondary metabolites of medical utility. These secondary metabolites serve as a treatment for many psychological, physical and pharmacological disorders of human body. The essential oils (EOs) extracted from weeds could be utilized as aromatherapy to cure several ailments. This review highlights the role of EOs in aromatherapy, health benefits of aromatherapy by essence or EOs of weeds, methods to extract aroma or EOs, their mode of action, quality and storage issues of EOs, scope and future trends in aromatherapy.

Introduction

Invasive weeds are considered as significant threat to major crops as they compete with them and replace larger part of vegetation in any agro ecosystems (Agarwal, 2002). Despite of economic losses, many of these noxious weeds have numerous secondary metabolites of pharmaceutical importance (Gonçalves, 2019). It is well documented that 80% of world population is dependent on traditional medical health care system. In modern era 20% of pharma industry products are manufactured from plant extracts. It includes some sedatives, tranquilizes, cardiovascular tonic, skin care products, respiratory and gut ailments curing drugs (Khalid et al. 2012). In 1928,

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Gattefosse was the first person who introduced the term "Aromatherapy". Later on Dr. J. Valnet cured psychiatric disorders by utilizing the essential oils and published his findings as "Aromatherapie" in 1964. It could be defined as "inhalation of fragrance or topical application of essential oils and extracts for the purpose of healing and medication (Lawless, 2002). Usually all plant parts (i.e. flower, herb, root, seed, bark etc.) could be used for extraction of essential oils. They are synonyms to fragrance and plant essence. However, not all types of fragrance and essence fall under the heading of essential oils. Thus they should not be confused with other chemical compounds (Willwood, 1996). Besides this, they are volatile organic compounds which are called secondary metabolites such as terpenoids, ketones, aldehydes, polyphenols and ether (Bilia et al. 2014). Phytochemical analysis of weeds disclosed that these secondary metabolites (Alkaloids, polyphenols, terpenoids, flavonoids etc.) are also present in weeds as well (Chavan et al. 2013). Due to the presence of such organic metabolites essential oils extracted from weeds could also be used as aroma-therapeutic agents to cure various ailments by inhalation or topical application (Bajpay et al. 2018).

Modes of Action of Essential Oils

Aromatherapy, also called essential oil therapy, is considered alternative method of treatment that depends upon aromatic plants. Based on methods of utilization and application of essential oils, aromatherapy involves several classes, such as pharmacological aromatherapy, emotion/psycho aromatherapy, olfactory aromatherapy, cosmetics aromatherapy and massage aromatherapy (Ali et al. 2015). It would be easier for us to choose the right kind of essential oil based on its mode of action. The constituents of essential oils interacts directly with the chemistry of human body effects the performance of body organs or organism as a whole. Thus, it is necessary to identify the modes of action in relation to our body. Keep in mind that always seeks the advice of professionals if you have planned long term aromatherapy (Nordqvist, 2017). There are three modes of action of essential oils given below.

Pharmacological Action

The pharmacological mode of action consequences the chemical changes and reaction with the hormones and enzymes after the essential oil pass into the blood circulatory system (Lawless, 2002; Boehm et al. 2012). The topical application of oils helps in absorption of their constituents via small pores in skin from where they are transported throughout the body after entering into bloodstream. For example, rubbing garlic oil on sole of feet, the volatile organic constituents of oil are transported into blood and bad smelling will observe on breathing (WebMD, 2018). The massage application of essential oils also helpful in boosting blood circulation and improve absorption through skin. Some researchers

believe that sweat glands and hair follicles absorb oil more effectively. Cosmetics contain essential oils that are also absorbed by skin are helpful for toning, moisturizing and cleansing the skin. They have antibiotic action and treat skin disorders. However, they are not applied directly but after dilution with carrier oil e.g. olive oil (Nordqvist, 2017).

Physiological Action

This mode of action is concerned with the patterns by which oil can affect the body systems. This action could be stimulated or sedated (Lawless, 2002; Boehm et al. 2012). According to experts when essential oils are applied on skin and joints they cause significant responses. However, sometimes using aromatherapy alone instead of medical treatment is not a good option. But research shows that aromatherapy have healing and medicinal effects (WebMD, 2018). The topical or massage application of essential oils improves the blood circulation of target area. They are used to relax the body muscles and helpful in relieving the pain and discomforts. They can also cure back pain, headaches and stress (Drain, 2016).

Psychological Action

This mode of action deals with the psychological or emotional responses when an odor of essential oils is inhaled. The essential oils stimulate the olfactory system, the pat of brain including nose. Many researchers have investigated that smelling the essential oil stimulates the olfactory receptors and sensory nerves pass signals to nervous system. The volatile contents of odor activate the nervous system which affects emotions. They affects hypothalamus which produce feeling well chemicals e.g. serotonin (WebMD, 2018). The molecules of essential oils after entering into the brain affect our limbic system which is associated to cardiac health, blood pressure, breathing, memory, emotions and hormonal balance (Lawless, 2002; Boehm et al. 2012). Olfactory aromatherapy involves smelling essential oils either by inhalation or by diffusion. For inhalation, essential oils are dispensed into cloth or handkerchief and breathe in or spray a mixture of essential oil and distilled water into air and breathe in. Diffusion involves evaporated aromatic oils using some tools or equipment. The oils evaporate into the air using a diffuser container or spray. These volatile components pass to lungs through air passage and to all other body parts (Nordqvist, 2017).

Methods of Extraction of Essential Oils

The inappropriate extraction techniques deteriorate the quality of essential oils. The loss of bioactive constituents, undesirable physical appearance and bad smell could develop due to poor extraction method. Thus extraction method is the main factor that ensures the quality (Tongnuanchan and Benjakul, 2014).

Solvent Extraction

The organic solvents (Acetone, Ether, Ethanol, etc.) are used in these techniques to extract the essential oils. Plant material is mixed with solvent on low flame, after that filtration and evaporation is needed. The filtrate is mixture of fragrance and essential oil. Alcohol is added to dissolve oil contents and then followed by distillation. The fragrance along with alcohol evaporates while oil remains in flask as a residue (Li et al. 2009; Tongnuanchan and Benjakul, 2014). In this technique the setup involves perforated trays where plant material is washed repeatedly to recover essential oil. It is commonly used on delicate plant material to extract higher amounts of essential oils. The quality as well as quantity of extracted mixture depends upon heating since this method is limited by solubility of compound in specific solvent. This simple and efficient extraction method consumes high quantity of solvents (Dawidowicz et al. 2008).

Hydro Distillation

This method is used for extraction of water soluble contents with high boiling point. This method is able to protect the essential oil without being overheated. This method isolates the material below 100°C (El-Asbahani et al. 2009). It is normally a conventional technique for extraction of essential oils. The oil contents are evaporated by heating the mixture of plant material and distilled water followed by liquefaction of the vapors in a condenser. The time required for distillation depends upon plant material used. Extended time duration results small quantities and unwanted compounds of higher boiling points (Rassem et al. 2016).

Steam Distillation

This is the broadest technique which extracts 93% of oils and remaining can be extracted by some other method (Masango, 2005). Heating the plant material breaks down the structures and releases the aromatic essential oils (Babu and Kaul, 2005). In this method the steam passes through the plant material for oil extraction. The steam breaks down the raw material and extracts the oil contents, yielding mixture of water and essential oils. This mixture is subjected to condensation to obtain essential oils from mixture. In this technique the ambient pressure combined with temperature in way those volatile components with the boiling point between 150-300 °C evaporated at temperature close to the boiling point of water (Rassem et al. 2016).

Expression

Expression is the most ancient and easy method for oil extraction. This is done mechanically or manually pressing until all oil contents are retrieved (Joy et al. 1998). It involves any physical procedure by which the plant materials are crushed to release essential oil. In this technique the oil is removed either by pressing the plant material against a hard object or stone. The oil contents are absorbed by

sponge placed under baked clay setup. The oil could be released by squeezing the sponge and stored in containers (Handa, 2008).

Health Benefits of Essential Oils of Weeds

The essential oils extracted from weeds could be used to ease the mental stress, depression and anxiety. They stimulates nervous coordination to improve sleeping period and boost psychological emotions and relaxation (Cho et al. 2013; Soto-Vasquez and Alvarado-Garcia, 2017; James, 2019). They improve the memory and treatment for dementia (WebMD, 2018). They are analgesics, ease in arthritis, labor pains, cancer and muscle pain etc. (Zahra and Leila, 2013; Lakhan et al. 2016). They are antimicrobial, insect repellent and anti-inflammatory (Lawless, 2002; Al-Snafi, 2017). They fight with abdominal and respiratory disorders, cancer and protect liver damage (Al-Snafi, 2017; Ibrahim et al. 2007; Aziz et al. 2018). They are used as cosmetics that protect the skin and improve hair growth (WebMD, 2018). Detailed aroma therapeutic potential of some weeds as an example is given in table 1.

Table 1. Aroma therapeutic effects of essential oils extracted from different common cropland weeds.

Botanical Name	Therapeutic Uses	Reference
Solanum nigrum	used for inflammation of the stomach and intestines and colic pain	Eltayeb et al. (1997)
Parthenium hysterophorus	anti-inflammatory, analgesics, remedy for urinary and digestive tract infections and diseases, malaria and aching head etc.	Patel (2011)
Hierochloe odorata	antiseptic, soothes respiratory tract and cures cough, relax aching joints	Smith (2017)
Cannabis sativa	Inhalation improve nerve activity as it act as neuromodulator that relax stress and anxiety	Andre et al. (2016); Gulluni et al. (2018)
Cynodon dictylon	analgescis, diuretic, anti-inflammatory, antimicrobial, hepatoprotective and anti-convulsive	Asthana et al. (2012)
Cyperus rotundus	anti-diabetic, anti-diarrheal, anti-mutagenic, anti-microbial, anti-oxidant, anti-pyretic and analgesic	Lawal and Oyedeji, (2009); Bajpay et al. (2018)
Chenopodium album	Prevent epilepsy and anti-inflammatory	Usman et al. (2010)
Chenopodium murale	analgesics and protect liver damage	Ibrahim et al. (2007); Saleem et al. (2014)
Datura stramonium	analgesic, anti-asthmatic, antioxidant, antibacterial, insecticidal	Al-Snafi (2017)
Datura fastuosa	Anti-microbial, insecticidal, anti-diabetic, anti-oxidant, analgesic, anti-pyretic, wound healing,	Al-Snafi (2017)

Issues and Risks Associated with Aromatherapy

Storage Issues

Fresh essential oils are light colored or colorless and flows free. When stored for a long time, they turned darker and more viscous as a result of oxidation, polymerization and resinification. These chemical reactions are activated by air, moisture and high temperature. These reactions are catalyzed by light energy and metals (Tisserand and Balacs, 1995). They should be stored in air tight glass vessels in a cool, dark and dry place to avoid such bad consequences. Large quantities are stored in containers lined with aluminum foils and air inside the container is replaced with N_2 gas prior to sealing. For small quantity, anhydrous sodium sulphate or calcium chloride is added to dehydrate the oil (Joy et al. 1998).

Safety and Quality Risks

It is generally considered that essential oils are safe to consume, however, they may have some side effects and these should be taken into account. The common side effects includes eye and skin irritation problems specially those essential oils which are rich source of polyphenols and aldehydes. The other phytotoxic effect is contact sensitization due to oxidation of monoterpenes (Tisserand and Balacs, 1995). Cross sensitization in food material is also reported in some cases. Allergic reaction of essential oils has been reported in some studies when applied to skin and mucous membrane for aromatherapy (Schaller and Korting, 1995). When stored for long duration, oils undergo biochemical composition changes which have been reported to affect badly e.g. repeated use of *lavandula* sp. essential oils enlargement of the breast before the onset of puberty (Henley et al. 2007). So there is need to ensure the safety claims of essential oils.

Scope and Future Perspective

The essential oils constitute almost 17% share in flavor and perfume industry. Their production is 60000 tonnes/ annum and demand is two thousand annually. About 1500 aromatic species are the source fragrance and perfumery. Out of these, fifty species are commercially used as oils and aroma. They are additives of soaps, pharma industry, cosmetics, perfumery, bakery products and many other related industries (Joy et al. 1998). In agriculture industry, they are being used as insect repellents, organic insecticides and herbicides. Agriculture sector opens the new area of research in production of secondary metabolites and cell/ tissue culture technology. This also involves research to improve the quality by grading and standardization (Khalid et al. 2012).

In our everyday life a large quantities of essential oils are used as traditional medicines. They are popular in Japan and Europe as therapeutic agents. There is bright future for production of essential oils due to their multi industrial applications (Joy et al. 1998).

Conclusion

Overall, if essential oils are combined with traditional healthcare system, they can effectively use as treatment for many ailments. The presences of secondary metabolites highlight the importance of weeds as medicinal plants. Moreover, aromatherapy by utilizing essential oils extracted from weed, is a preferred remedy among Ayurvedic, traditional and ancient practitioners for treatment of various ailments. These essential oils are useful for soap, perfume, bakery, cosmetics, pharmacology and related industry. Because of it's their wide and common distribution, there is dire need to do some applied research to explore valuable output from weed flora.

Conflicts of Interest

No conflicts of interest have been declared.

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