

BENEFITS AND USES OF LAVENDER ESSENTIAL OIL AS A COMPLEMENTARY AND ALTERNATIVE THERAPY– A SHORT REVIEW

Mariana GRECU⁸, Madalina Elena HENEA¹, Mara TRIFAN¹, Cristina Mihaela RIMBU¹

e-mail: marygrecu@gmail.com

Abstract

The use of natural extracts as complementary and alternative therapies in human medicine to treat various ailments is presently growing, as many specialists all over the world have showcased an heightened interest in the therapeutic potential of plants. A variety of therapeutic methods are known to use essential oils extracted from various plants and herbs. Essential oils are complex mixtures of volatile compounds that are abundant in herbs and result from secondary plant metabolism. Due to their chemical composition, essential oils have many biological activities of great interest in the fields of health, food, and cosmetics. Lavender essential oil is one of the most used natural products for its anti-inflammatory, antimicrobial, relaxing, calming, anxiolytic, antioxidant, anticonvulsant, etc. therapeutic effects. In veterinary medicine, the therapeutic potential of lavender essential oil is not fully known and, therefore, is only used experimentally or sometimes as a supplement in animal feed for animals of economic interest. This has led us to publicize its beneficial effects in wound healing by presenting information from the scientific literature in order to expand the current repertoire of cost-effective wound healing options available to physicians and animal owners, especially in the current context of imposing a rational use of antibiotics in dogs and cats.

Key words: lavender, essential oils, anti-inflammatory effect, treatment of lesions

INTRODUCTION

The use of plant extracts in the treatment of human and animal diseases is an ancient tradition that began centuries ago, practiced by various civilizations around the world. All over the world there is a great variety of therapeutic plants of different shapes, colors, sizes, perfumes and active ingredients with beneficial effects on the body.

The largest proportion of active principles is found in the flowers, leaves, seeds, roots, stem, or bark of a plant. These volatile compounds, called essential oils, volatile oils, or aromatic substances, are found in high concentration and have a strong effect, sometimes even toxic, on the major functions of the body. The role of these essential oils is to give the plant its own flavor, to protect it from adverse environmental conditions, to protect it against harmful insects, but they also play an important role in pollinating the plant.

Essential oils are fatty aromatic compounds extracted from different plants and, in order to be used in various therapies, are distilled in a wide range of concentrations, from 100% pure essential oil to concentrations between 1 - 20%, which are diluted with a non-aromatic carrier oil (Aziz Z.A.A., *et al.*, 2018).

Lavender has been used since ancient times for its unmistakable aroma, and later, with the discovery of its therapeutic qualities, it was used for its benefits on the body. Since ancient times, there are pieces depicting the use of this plant by the Egyptians and Romans for baths as a relaxant, for cooking due to the active principles, but also as a perfume by virtue of its strong aroma.

Lavender, scientifically named *Lavandula angustifolia*, is part of the Lamiaceae family, related to mint, being very easy to identify due to the purple flowers and its sweet, floral scent. This plant is thought to have originated in the Mediterranean area, North Africa, the Middle East and India, and has a history dating back over 2,500 years. In ancient times, lavender was used as a sacred plant, its name coming from the Latin word "lavare" which means "to wash", which is why the plant was used in certain parts of the world to perfume baths, beds, clothes, and even hair. Later, its therapeutic qualities were discovered.

The active ingredient in lavender flowers is volatile oil, the content of which differs depending on the species, variety, time of harvest, or form of conditioning. Fresh flowers contain up to 0.8% volatile oil and dried flowers up to 1.5%. From a quantitative point of view, the main components of the *Lavandulae aetheroleum*

⁸ Department of Preclinics, Faculty of Veterinary Medicine, Iasi University of Life Sciences (IULS), 3 M. Sadoveanu, 700490 Iasi, Romania

product are linalool (20-35%) and linalyl acetate (30-55%), but the aroma is also determined by a share of cineole, camphor or geraniol. Lavender acetate, cis- and trans-ocimen are the characteristic compounds of lavender oil, and peril-alcohol is important due to its pharmacological action. (Cavanagh H.M., et al., 2002). Lavender flowers also have slight sedative, spasmolytic, and carminative properties.

Other compounds identified in the plant product are: flavonoids (mainly accumulated in the leaves), coumarins, phytosterols and tannins (5-10%), among which the pharmacological importance of rosmarinic acid is distinguished, which is a depsid formed by the esterification of α -hydroxy-dihydro-caffeic with caffeic acid. The product also contains oleanolic acid and ursolic acid.

All these elements give it effective therapeutic properties for various ailments. Most frequently, lavender is recommended for oral administration, but it is also regularly used in aromatherapy by inhalation, massage or bath. Unlike other essential oils used in aromatherapy, Jager et al., 1994, suggested that lavender essential oil can be applied undiluted, being quickly absorbed through the skin.

Chemical composition of lavender essential oil

Recently, and especially in the last two decades, human medicine has renewed interest in curing diseases with natural products or essential oils from plants, using them as alternative or complementary therapies that have been accepted (Bergh A., et al., 2021), becoming popular around the world.

The use of essential oils is an ancient tradition that dates back centuries, in different civilizations around the world, being thousands of years older than conventional medicines used today, proving its therapeutic effects on both the internal balance of body, as well as externally.

Lavender volatile essential oil can be extracted by various methods, the most common of which is cold pressing, but it can also be extracted by steam distillation, solvent extraction, grease extraction and filtration. It is considered that the purest essential oils are only those obtained by steam distillation or cold pressing, because by these methods the therapeutic properties of the oils remain intact and unaltered.

The chemical composition of *Lavandula angustifolia* volatile oil consists of: 47.52% monoterpenes alcohols; monoterpene hydrocarbons 5.09%; hydrocarbons 5.09%; linalool 43.00%; trans- β -ocimen 1.92%; borneol

1.80%; cis- β -ocimen 1.47%; α -terpineol 1.02; esters 34.81%; sesquiterpene hydrocarbons 4.58%; linalyl acetate 32.09%; 2.80% β -caryophyllene; lavender acetate 1.29%; β -farnesen 1.46%; 1-octen-3-yl acetate 0.59%; hexyl acetate 0.40%; ketone 2.05%; 3-octanone 1.22%; camphor 0.83% (Woronuk G., et al., 2010). Thus, phytochemical studies (Umezu T., et al., 2006) have shown that the major constituents of lavender essential oil are esters (40-50%), monoterpenols (30-40%) and monoterpene hydrocarbons (7-13%). However, the composition of lavender essential oil may vary depending on the geographical origin of the plant material and environmental factors such as geographical conditions, climate, seasonal variations and the growth stage of the plant and the methods of extraction and detection influence also the composition (Demasi S., et al., 2018).

Properties and benefits of lavender essential oil

Lavandula angustifolia extracts and essential oil have various pharmacological effects described in literature, such as anticonvulsant (Gilani A.H. et al., 2000; Yamada K., et al., 1994), anxiolytic (Antonelli M., et al., 2019), antioxidant (Ben Djemaa F.G., et al., 2016; Kozics K., et al., 2017), anti-inflammatory (Cardia G.F.E., et al., 2018), antimicrobial and antifungal activities (Ebani V.V., Mancianti F., 2020).

Although the list of benefits of lavender essential oil is impressive, it has several valuable pharmacological properties that make it increasingly useful in alternative and complementary medicine:

Considering its antibacterial and anti-inflammatory properties, lavender essential oil is effective for opening pores and reducing acne-induced inflammation (Sarkic A., Stappen I., 2018; Winkelman WJ., 2018). Due to its high content of antioxidants, it is a good skin moisturizer (Seo YM, et al., 2015). Lavender oil also improves blood circulation (Eguchi E., et al., 2016), which will facilitate nutrient transfer to the face, stimulating the healing process, thus reducing the inflammation caused by episodes of acne, insect bites, allergic reactions and skin diseases (Sindle A. et al., 2021). Due to its antifungal and anti-inflammatory properties, lavender can prevent eczema, reduce depigmentation, and reduce the appearance of blemishes and redness on the face (Blamey C., 1999; Ebani V.V., Mancianti F., 2020).

Rai V.K. et al., 2020, confirms the relief of psoriasis, a condition that is difficult to fight and

necessitates long-term treatment with the help of lavender oil.

Known for its antibacterial properties, lavender oil has been proven effective in treating wounds for centuries. There are numerous studies (Han X., et al., 2017; Winkelman WJ., 2018; Mori H.M., et al., 2016) that have proven its effectiveness in accelerating the healing process. Thanks to its antibacterial properties, lavender essential oil can speed up the healing process of cuts, burns, scratches, and wounds. A study conducted in 2016 by Mori H.M., et al., showed that lavender oil accelerates the healing process of experimentally induced wounds in mice, compared to other products applied for skin healing. The conclusion of the study was that "Applying lavender oil stimulates collagen synthesis", accelerating the healing process.

The main active compounds in lavender essential oil such as linalool and linalyl acetate are known for their analgesic and anesthetic properties. At the same time, the oil also contains a small amount of beta-caryophyllene, which also induces anti-inflammatory effects. All these properties turn lavender oil into a treatment used to relieve pain and reduce inflammation from burns or injuries, also having an antiseptic role, accelerating healing and reducing scarring of the skin (Mori H.M., et al., 2016; Samuelson R., et al., 2020). Due to its ability to stimulate wound healing, lavender essential oil, through its role of improving blood circulation, causes the formation of new skin cells.

In various studies (Hay I.C., et al., 1998; Lee B.H., et al., 2016.) it has been shown that lavender oil is effective in ameliorating hair loss and stimulating its growth, which is why we find it in shampoos or hair conditioners. Due to its anti-inflammatory and anti-fungal properties, lavender oil also helps reduce dandruff and supports scalp health, while also giving the hair a pleasant smell. Hay I.C., et al., 1998 in their study have shown that people with alopecia can be treated using a combination of lavender oil and other essential oils, all mixed with a nourishing carrier oil. It has been reported that over 40% of those tested experienced an improvement after applying this mixture. Thus, many dermatologists recommend adding lavender essential oil to the specific shampoo for scalp conditions. According to a 2016 study of mice by Lee B.H., et al., it was found that lavender oil stimulated the growth of hair, which became thicker and grew faster than normal. According to these studies, lavender essential oil can be very helpful for people with alopecia (hair loss), but human studies are also

needed to demonstrate this, although people can apply lavender oil to their hair without care.

Other research (Nasiri A., et al., 2016) has shown that this oil has pain relieving effects due to its analgesic and anti-inflammatory properties, especially joint pain, muscle aches and headaches. A 2004 study by Yip Y.B. and Tse S.H. in Hong Kong, concluded that lavender oil acupressure reduces pain in the lower back by at least 39% and "improves travel time" and "spinal flexion capacity". Another study (Kim J.T., et al., 2006.), performed on 50 patients who underwent surgery, specified that 50% of them were given to inhale oxygen and the other half were given to inhale lavender essential oil. The conclusion was that "patients who received lavender essential oil had better pain control than patients who received oxygen." Another study (Bakhtshirin F., et al., 2015) performed on women, young students, showed that massage with lavender essential oil helped to relieve pain caused by dysmenorrhea. The result was that "Massage with lavender essential oil reduces primary dysmenorrhea and can be used as a natural remedy."

Aromatherapy with lavender essential oil calms and relaxes muscles and nerves, improving blood circulation and relieving various pains. It has been shown (Sasannejad P., et al., 2012) that it can significantly help relieve migraine pain if inhaled for 15 minutes. Another study (Rafie S., et al., 2016) showed that out of 129 people with headaches, 92 reported a total or partial relief of pain due to lavender oil. This oil acts both for its analgesic properties and for its relaxing effects, calming agitation and releasing nervous tension.

Lavender has been used since ancient Rome to relax and soothe. Due to its aroma and other properties, inhalation of lavender essential oil has been shown to be effective in maintaining the proper functioning of the nervous system, helping to reduce stress and anxiety, relieving headaches, reducing depression and fatigue, ensuring well-being. Different studies (Generoso M.B. et al., 2017; Greenberg M.J., Slycer J.T., 2018) showed that a placebo with lavender oil, known as Silexan, was more effective than a prescription drug, Paroxetine, when it came to anxiety. The conclusion was that "Silexan has been shown to have a strong antidepressant effect, improving mental health, overall health, and quality of life." In a study conducted in 2016 (Kianpour M., et al., 2016), several women with postnatal depression were treated with aromatherapy, lavender oil, for 4 weeks. The conclusion was that there was a significant reduction in postnatal depression and the aromatherapy protocol was proposed as an effective method of treatment and as a

"complementary therapy useful for both anxiety and depression". In another study (*Generoso M.B. et al, 2017*), it was shown that daily use of lavender essential oil could reduce the symptoms of depression by 32.7% in 47 patients with post-traumatic stress disorder. At the same time, lavender oil therapy has improved their mood and sleep quality.

Lavender is famous for its ability to induce relaxation. In fact, one of the most important benefits of lavender is that it can provide peace of mind without sedation. Lavender can relieve anxiety by having a positive effect on the body's response to "fight or flight". According to studies (*Donelli D., et al., 2019; Fayazi S., et al., 2011*), lavender essential oil can reduce: nervousness, anxiety, symptoms of depression, agitation, and sleep problems. A study (*Kazeminia M., et al., 2020*) has shown that lavender aromatherapy can reduce anxiety in women in labor. Lavender can have several beneficial effects that help relieve anxiety, such as: lowering heart rate, improving mood, improving sleep quality, regulating breathing, lowering adrenaline levels. Lavender essential oil, through its antioxidant content, also contributes to the detoxification of the body, being very effective in insomnia.

Research in recent years (*Sayorwan W., et al., 2012*) has shown that lavender oil can stimulate optimal brain function. Laboratory tests on mice have shown that lavender oil aromatherapy can improve cognitive function and reduce oxidative stress, which is a promising starting point in finding alternative treatments for Alzheimer's or dementia (*Kashani M.S., et al., 2011*). A study designed by *Jimbo D. sicolab., 2009*, found that linol, an active ingredient in lavender oil, "may have the potential to be used in a drug designed to prevent cognitive impairment from Alzheimer's disease."

It has also been shown that this oil calms and induces sleep. A study (*KaradagE., et al., 2017*) of elderly patients concluded that lavender oil has a "sedative effect" that improves sleep. The results of the study showed that their condition improved after the use of lavender oil. In another study (*KeshavarzAfshar M et al., 2015*), several women in the postpartum period were divided into 2 groups, and one of the groups was recommended to inhale lavender oil 4 times a week for 2 months, the result being that they experienced an increase in sleep quality. Unlike various medications that can have side effects, lavender essential oil is a much safer alternative for better sleep, including in terms of duration.

Lavender, through its strong aroma, has the ability to remove insects such as mosquitoes or

moths, but can also reduce irritation, itching and inflammation associated with insect bites. Owing to its antibacterial, anti-inflammatory and analgesic properties, lavender essential oil is excellent for preventing infections, reducing redness and pain caused by insect bites.

Being a natural antimicrobial, it has a great cleaning power, but it also serves to refresh the air, without using harmful chemicals. The cosmetics industry uses lavender in various soaps, cleaning solutions, perfumes, because it gives a pleasant aroma to these products and they have an antiseptic effect.

With a sweet and mild aroma, lavender oil will harmonize well with various essential oils in the diffuser to refresh and purify the air. Combined with eucalyptus oil, it is especially effective during winter viruses (*Horváth G., Ács K., 2015*). This oil is useful for treating various respiratory ailments, including colds and coughs, nasal congestion, sore throats and more when inhaled.

Research (*Hamzeh S., et al., 2020; Kim S., et al., 2011; Perry R., et al., 2012*) has shown that lavender essential oil can harmonize the hormonal balance, stimulate blood circulation, treat respiratory ailments or even provide support in the fight against cancer. The oil is widely used in aromatherapy to relieve the side effects of cancer treatments. Studies have shown that lavender oil can reduce stress in cancer patients. A 2012 study (*Perry R., et al., 2012*) found that inhaling essential oils, especially lavender, can help cancer patients get over the effects of specific treatments, including nausea, pain, and exhaustion and depression. Lavender oil aromatherapy has also helped patients with malignant brain tumors feel more "relaxed" and "less tense", as well as those who perform hemodialysis (*Dehkordi A.R., et al., 2016*). In another study (*Karadag E., et al, 2017*), it was shown that 20-30 minutes of aromatherapy massage sessions with lavender essential oil help relieve pain and "significantly reduce inflammation" in breast cancer patients.

Another study (*Lee Y.-L. et al., 2011*) showed that lavender oil aromatherapy improved circulation and caused heart relaxation in 1/3 of participating young people and adults. In addition, by inhaling or massaging, the oil lowers blood pressure and is, therefore, effective for people with high blood pressure.

Lavender oil is also effective for diabetes. A 2013 study (*Sebai H., et al., 2013*) tried to show that it could be possible. In a 15-day laboratory test on mice, researchers found that lavender oil "provided increased protection against high blood

glucose levels" and helped reduce oxidative stress due to its "powerful antioxidant" properties".

Although further research is needed to understand how lavender oil can be used to prevent or alleviate the symptoms of diabetes, the study promises to prove that even natural treatments, such as those with essential oils can be helpful in combating serious ailments.

The safety and efficacy of lavender essential oil for use in veterinary medicine

In human medicine, the use of essential oils as a remedy for various pathologies is growing in popularity. In veterinary clinical practice, data on the use of lavender oil for various ailments or in vitro susceptibility testing are not as complete as in human medicine. The use of essential oils to improve the health of animals remains a controversial topic, as their benefits are not known or accepted. Some holistic veterinarians and alternative medicine practitioners use various essential oils to treat some ailments, but most veterinarians recommend pet owners to avoid them. There have always been controversies regarding the safety of the use of essential oils, but to date there are no studies showing that they are harmful to animals.

In general, essential oils are safe, with no known side effects, which is confirmed by the fact that some of them have been approved as flavoring agents in food, being considered safe by the US Food and Drug Administration (FDA). The most common side effects reported by various users are irritation to the eyes and mucous membranes in the case of permanent use and use of oils containing aldehydes and phenols.

Skin sensitization by contact with an essential oil may occur due to oxidation of monoterpenes, in conditions of improper storage. At the same time, it is possible to interfere with other essential oils or certain foods. Allergies can sometimes be caused by inhaling the aromas of essential oils.

However, data on adverse reactions depending on the degree of exposure are limited and most of them refer to perfumes rather than essential oils (Bingham L.J., et al., 2019). Essential oils are not exempt from oxidation reactions over time and changes in their chemical composition have been reported.

No side effects have been reported in humans or animals regarding lavender essential oil. Many pet owners have stated that they have been using lavender oil as an inhalation aromatherapy for a long time and have not noticed any respiratory or other conditions in animals.

Many of them even underwent beneficial changes in the behavior of the quadrupeds, making them more relaxed.

There is growing evidence (Komiya M., et al., 2009; Lans C., 2019) which suggests that lavender oil may be effective in treating several neurological disorders in pets, which has indicated the possibility of using this oil in the form of aromatherapy, with the purpose of calming animals with nervous disorders.

Many animal experiments suggest the anxiolytic effect of lavender oil (Lis-Balchin M., Hart S., 1999; Shaw D., et al., 2007). This has been demonstrated in mice that have undergone an experiment by continuously inhaling lavender essential oil for 7 days. Thus, it was shown that anxiety and other depression-like behaviors were significantly inhibited, which occurred after a maze test and a forced swimming test. In another study (De Sousa D.P., et al., 2015), lavender oil produced significant anxiolytic effects in the Geller conflict test and the Vogel test in mice. The effects of lavender oil have been compared with anxiolytic drugs such as chlordiazepoxide (as a reference anxiolytic), and the oil has been shown to have anxiolytic properties similar to those of chlordiazepoxide (Shaw D. et al., 2011). The anxiolytic effect of lavender oil was also compared to diazepam in a test on the Mongolian gerbil, which underwent a stressful maze experiment. Exposure to aromatherapy by inhaling lavender oil showed a diazepam-like anxiolytic profile in gerbil females (Bradley B.F., et al., 2007). Investigation of the effects of lavender essential oil on anxiety, aggression and social interaction in a group of mice showed that by inhaling this oil in the form of aromatherapy proved anxiolytic properties in the light / dark test, by increasing social interaction and decreasing aggressive behavior (Malcolm B Tallian K., 2018).

Lans C. et al., 2007, showed the effectiveness of essential oils in treating skin infections in ruminants (cattle and goats), in the context of the legislatively enforced waiver of antibiotic therapy for the protection of the consumer and the environment. Lavender oil has been shown to have an anti-inflammatory and healing effect on skin wounds in the species in which it was used. In other studies (Choi W.S. et al., 2002; Traboulsi A.F. et al., 2002), lavender oil was used in herbivores in the form of skin drops administered to remove insects. Due to its repellent activity against them, lavender essential oil has proven to be highly effective as an insecticide (Ellse L., Wal R.L., 2014).

The local anesthetic effect of lavender and its constituents (linalool and linalyl acetate) has been reported both in vivo and in vitro in animal experiments (*Ghelardini C. et al., 1999*). In rabbit conjunctivitis, treatment was instituted by instilling diluted lavender essential oil and a dose-dependent increase in the number of stimuli needed to provoke the reflex was observed.

An alternative to reducing antibiotic use on pig farms is essential oils. These, including lavender, have proven their effectiveness, feasibility, and potential mechanisms for their application in pig production (*Omonijo FA et al., 2018*), thus reducing the amount of antibiotic required for various infections (usually respiratory and digestive). Due to their lipophilicity, volatile oils are absorbed more quickly in the gut, and their effects on the microbiome have led to better performance in the production of animals fed essential oils in a number of studies. Although there are numerous studies (*Shahdadi H., et al., 2017*) that show that essential oils have several properties, such as antimicrobial, antioxidant and anti-inflammatory effects, improving the palatability of feed and improving growth and intestinal health, further investigations are still required to elucidate the mechanisms underlying their functions.

Lavender essential oil has been shown to have a beneficial effect on wound healing, with several reports of this effect being reported. Several experimental animal studies have been performed to investigate the role of lavender essential oil in the healing of skin lesions. *Altaei, in 2012*, showed that lavender oil helped heal the wounds of the oral mucosa in rabbits. In a randomized, double-blind study, oral lesions treated with 2% lavender essential oil twice daily for 5 days had a higher rate of mucosal repair ($p = 0.001$) compared to a group treated with another product (glycerol). Clinical and histological healing was determined by measuring the area of the ulcer and the levels of inflammation in each test group. Clinical efficacy was assessed by the level of inflammation, erythema, edema, duration of ulcer, ulcer size, mean area under the ulcer curve, healing time, and intensity and reduction of associated pain. Animals treated with lavender oil showed a significant reduction in ulcer size, an increased rate of mucosal repair, and healing within 3 days of treatment compared to baseline and placebo groups.

Another randomized clinical trial designed by *Baccaglioni L., 2013*, showed similar results in topical treatment with lavender oil on canker sores that showed a significant reduction in ulcer size, suggesting the beneficial effect of lavender oil on

wound healing. Furthermore, there is a report evaluating the mechanism of lavender oil's effect on skin wound healing in animal experiments (*Kerr J., 2002*). This report showed that wound closure progressed faster with the topical application of lavender oil compared to the control group, accompanied by increased expression of epidermal growth factor (EGF), which plays an important role in the healing process wounds as well as tissue remodeling and reepithelialization.

KocaKutlu et al., 2013, induced incision wounds in rats and compared the effects of different ways of healing wounds. In four groups of rats ($n = 4$ in each group) the skin lesions were treated by transcutaneous electrical nerve stimulation, with saline, povidone/iodine and lavender essential oil. In addition, another group of rats suffered untreated lesions and another group was left without incision wounds. After the 5-day treatment period, researchers excised the incision sites and the surrounding skin to analyze the expression of growth factor, including epidermal growth factor (EGF), which is observed predominantly during active wound contraction, growth factor A. platelet-derived (PDGF-A), observed in all stages of wound healing and fibroblast growth factor-2 (FGF-2), observed during granulation tissue formation. Wound closure progressed much faster in the group where transcutaneous electrical nerve stimulation was used and in the group where the lesions were treated with lavender oil than in the control group and other study groups.

Another study by *Ben Djemaa et al., 2016*, investigated the effectiveness of healing rats experimentally induced in rats. The rats were divided into five groups, 6 per group. The test groups were treated locally with vehicle, lavender oil (4%) and a reference medicine, while the control group was left untreated. The effectiveness of wound healing was determined by monitoring morphological and biochemical parameters and histological analysis of the skin. Wound contraction and protein synthesis were also determined. At 14 days, the rate of wound contraction in the group treated with 4% lavender essential oil showed a complete closure, similar to the lesions treated with reference drugs. Untreated and vehicle-treated wounds were incompletely closed at 14 days. It has also been reported that lavender oil has anti-inflammatory and antimicrobial action, as there was no evidence of edema, suppuration or local infection. Lavender oil treatment has been found to significantly improve wound contraction rate (98%) and protein synthesis. Overall, the results provided

strong support for the effective wound healing activity of lavender oil, making it a promising candidate for future application as a therapeutic agent in tissue repair processes associated with skin lesions (Woollard A.C., et al., 2007).

Mori et al., 2016, used in an identical study on rats lavender essential oil in a concentration of 1%, permanently applied for 14 days on lesions. The area of lesion in rats treated with lavender oil was found to be significantly smaller compared to rats in the control group at 4, 6, 8 and 10 days after the lesion (on days 4, 6, 8: $p < 0.01$ versus on day 10: $p < 0.05$ versus control). Thus, in the group treated with lavender, compared to the untreated one or with the control group, the lesion regenerated faster and the histopathological examination on scar tissue showed the production of thinner and better-structured epidermal layers.

Kacaniova et al., 2017, conducted a study of veterinary interest, testing the antimicrobial activity of several essential oils against ten different strains of *Pseudomonas* grown from freshly caught freshwater fish. All isolates belonging to the species *P. agglomerans*, *P. antarctica*, *P. brassicacearum*, *P. frederiksbergensis*, *P. koreensis*, *P. lundensis*, *P. mandelii*, *P. proteolytica*, *P. synxantha* and *P. veronii* with 21 species were tested. Essential oils: *L. angustifolia*, *C. zeylanicum*, *Pinus montana*, *M. piperita*, *Foeniculum vulgare*, *Pinus sylvestris*, *Satureja hortensis*, *O. vulgare*, *Pimpinella anisum*, *R. officinalis*, *S. officinalis*, *Abies alba*, *Citrus aurantium* var. *dulce*, *Citrus sinensis*, *Cymbopogon nardus*, *Mentha spicata* var. *crispa*, *T. vulgaris*, *Carum carvi*, *Thymus serpyllum*, *O. basilicum* and *Coriandrum sativum*. All essential oils tested showed good antimicrobial activity, although *C. zeylanicum* oil was most effective against *Pseudomonas* spp. This investigation provided data that was useful in finding an alternative treatment against bacterial species frequently isolated from skin, gills, and intestines of fish, and in determining the spoilage processes of freshly caught and processed fish.

Bovine mastitis caused by *S. aureus* is a major concern in veterinary medicine for its high economic impact. Abboud et al., 2015, observed in an in vivo study a strong antibacterial activity of the essential oils of *T. vulgaris* and *L. angustifolia* against *Staphylococcus* sp. and *Streptococcus* sp. Intramammary application of these oils and a mixture of them has led to a drastic decrease in the number of bacteria in various milk samples after 4 consecutive days of treatment. In the same study, the strongest antibacterial activity was achieved by externally

applying these oils in vaseline with a recovery rate of 100% with essential oils.

Atopic dogs affected by recurrent dermatitis were successfully treated with a mixture of *Citrus aurantium* and *Lavandula officinalis* 1%, with *O. vulgare*, *Origanum majorana*, *M. piperita* and *H. italicum* 0.5%, which was administered by two or daily for one month without any recurrence after termination of therapy (Nardoni S., et al., 2014).

A recent study, of major importance for farmers, is presented by Adaszynska-Skwirzynska M. et al., 2021, which determined the immunostimulatory properties and influence of lavender essential oil (added to drinking water at concentrations of 0.4 ml/L) on the production parameters for broilers. The results of the experiment showcased that lavender essential oil exerts antimicrobial and antioxidant activity and a positive effect on the production results of broiler chickens. Thus, the biological activity of lavender essential oil is a property that can be applied in the diet of birds. The use of bioactive compounds is encouraged in many areas of industry and agriculture, as these substances have similar properties to growth promoters that have been withdrawn from the market. In addition, antibiotic-resistant bacteria are one of the most important current threats to animal health.

Studies on the effectiveness of lavender essential oil in therapy are much more extensive, because in recent years there is a growing trend of using natural products in the treatment of many diseases, but in this paper we have limited ourselves to that information to highlight the effect of lavender oil in the treatment of skin wounds, canker sores, reduction of nervous disorders, stimulation of growth in poultry and pig farms, etc.

Although essential oils and plant extracts have been used for centuries, they are just as relevant today. Thanks to advanced technology, improved quality, power and safety, essential oils are now more affordable and easier to use in everyday life. Although essential oils have often been used as an integral part of past cultural practices and traditions, we now have growing scientific evidence and studies showing the effectiveness and safe nature of essential oils today (Reddy K., et al., 2016; Silva GL, et al., 2015).

The pharmaceutical industry is striving to find environmentally friendly, natural and affordable alternatives that can be used for diseases associated with pathogens or metabolism. If essential oils are used, it is possible to improve the effects and bioavailability of the medicines. These essential oils, used correctly,

can have synergistic effects when used together with other drugs in case of pathologies in humans and animals.

The period in which the plant has the largest amount of a certain essential oil, which is rich in certain chemical compounds, is still being discussed. Essential oils are options to consider or can be combined with the steps already taken for certain health problems, provided that safety and quality standards are met.

The scientific community's focus on complementary and alternative medicine offers hope that the side effects of modern medicine can be reduced with the help of essential oils, and if they are properly explored to their full potential, aromatherapy can be considered a boon to anyone.

The literature suggests that lavender essential oil is a very promising substance, which has several pharmacological activities such as anti-inflammatory (*Cardia et al., 2018*), hepatoprotective (*Cardia et al., 2021*), antidepressant and anxiolytic (*Woelk and Schläfke, 2010*), cardioprotective (*Ziaee et al., 2015*), analgesic (*Silva et al., 2015*), efficient in wound healing (*Mori et al., 2016*), antimicrobial and antioxidant (*Cardia et al., 2021; Niksic et al., 2017*). Thus, with all these properties found in lavender essential oil, new research is important to expand the knowledge and use in clinical conditions to determine the therapeutic efficacy of lavender oils.

CONCLUSIONS

From the data presented it can be stated that aromatherapy is a natural and non-invasive gift for humans and animals. This form of therapy is not only used with a preventive role, but can also be used in the acute or chronic stages of a disease.

Most of the studies identified in this review support the use of lavender essential oil in the treatment of many pathologies, the most important of which is the healing of skin wounds, and suggest several unique mechanisms by which lavender oil can have beneficial effects on wound healing.

All these clinical and experimental animal studies obviously suggest the potential for the use of lavender oil and thus the benefits may increase the possibility of new approaches as complementary treatment in addition to conventional therapy.

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