

# The Effects of Lavender Essential Oil and its Clinical Implications in Dentistry: A Review

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## ABSTRACT

Essential oils have been known to have many medicinal properties. They have been utilized by medical practitioners since the medieval ages. Lavender essential oil is known to be rich in medicinal properties like antimicrobial activity, anxiolytic, anti-inflammatory, antinociceptive, and antioxidant properties. Utilization of herbal products like lavender essential oils will benefit the patients in many ways. Incorporation of these properties in the field of dentistry has ample advantages.

The purpose of this review article is to enlist the current and prospective uses of lavender essential oils in the field of dentistry and to identify the lacunae using which research regarding this topic can be taken one step closer to clinical practice.

**Keywords:** Antimicrobial, Antinociceptive and antioxidant, Anxiolytic.

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## INTRODUCTION

Essential oils have been used by people all over the world for several years as a part of alternative medicine. Currently, there is a trend to adopt more natural alternatives over synthetic ones. Essential oils offer a new, organic, and safe alternative to relatively risky pharmacological agents. Lavender or *Lavandula* belonging to the Lamiaceae family, is one of the commonly researched medicinal herbs.<sup>1</sup> Flower of the shrub, purple-blue in color, has been used to cure various ailments since olden times. Most commonly used species of lavender include *Lavandula angustifolia*, *Lavandula latifolia*, *Lavandula stoechas*, and *Lavandula intermedia*.<sup>2</sup>

It is cultivated all over the world for its commercial use. In India, it is cultivated in Himachal Pradesh, Uttar Pradesh, and also in the Kashmir valley region. It has been known to have anxiolytic, anti-inflammatory, antinociceptive, antioxidant, and antimicrobial effects.<sup>2-4</sup> Herbal products like lavender essential oils may offer a solution to the problem of antibiotic resistance, invasive treatments, side effects, or even drug addiction. These properties make lavender a very useful medicinal herb in modern times due to the advent of drug resistance.<sup>5</sup>

Research has been going on regarding the utilization of herbal essential oils in the field of medicine as well as in dentistry. Lavender species offer a promising alternative to some of the synthetic materials in the field of dental sciences.<sup>6</sup> It may be used to treat local infections, as an alternative to antibiotics, in reducing dental anxiety, or to prevent the formation of biofilm on teeth. It may be used in oral formulations, as vapor, or as a local medicament. Due to the vast applicability of the lavender species due to its medicinal properties, there is a need for focused attention to its use in the field of dentistry.<sup>6</sup> Hence, the purpose of this review article is to enlist the current and prospective uses of lavender essential oils in the field of dentistry (Table 1).

## Composition and Properties

Phytochemical analysis shows that lavender essential oils contain linalool, linalyl acetate, 8-cineole-ocimene, terpinen-4-ol and camphor as the main components.<sup>7</sup> The mechanism of action of

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its various properties is based on this structure. The properties which need to be understood for appropriate usage of this herb are given below.

### Antimicrobial Property

Lavender essential oils have been used since medieval times in medicine. Bactericidal properties of essential oils were first tested by de la Croix.<sup>8</sup> Various studies certainly indicate the antimicrobial property of lavender mainly due to its chemical composition. Although numerous studies state linalool as the main component for antimicrobial efficacy, some studies suggest antimicrobial efficacy exists even in the absence of linalool or linalyl acetate.<sup>9</sup> Even though the efficacy of lavender essential oils has been seen predominantly against gram-positive microorganisms, few studies have found it otherwise.<sup>3,4,10</sup>

*Lavandula coronopifolia* essential oil has been found to possess high antimicrobial activity against the gram-negative bacteria with minimal inhibitory concentration (MIC) values between 1% and 4%.<sup>11</sup> Lavender essential oil has been found to be effective against microorganisms like *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans*, *Aspergillus nidulans*, and *Trichophyton mentagrophytes*.<sup>10,2</sup> The main mechanism of action against bacteria has been stated to be to the cell wall of the organism, leading to leakage of cytoplasmic content.<sup>2</sup>

**Table 1:** Table showing recent studies utilizing Lavender essential oils

Sl No.	Author, Year	Effect	Mode of usage
1.	Cai H et al., 2021 <sup>23</sup>	Anxiety reduction	Lavender fragrance
2.	Ahmed, 2020 <sup>25</sup>	Antioxidant effect against aphthous ulcer	Lavender oil
3.	Pathan et al., 2020 <sup>24</sup>	Topical analgesic	Lavender oil
4.	Karan, 2019 <sup>18</sup>	Anxiety reduction	Lavender fragrance
5.	Kritsidima et al., 2010 <sup>4</sup>	Anxiety reduction	Lavender fragrance

It has also shown its inhibitory effects in solution as well as vapor form on various fungi. These effects are due to the constituents of Lavender essential oils on spores of the fungi. Linalyl acetate was found to suppress spore formation, while linalool was found to be effective for the inhibition of germination and fungal growth.<sup>2</sup> This property may be utilized in treating candidal infections, which may occur in geriatric patients or immune-compromised patients. Inhibition by lavender essential oils was found to be sufficient to treat disseminated candidosis.<sup>12</sup>

Drug resistance has become a nuisance to medical and dental practitioners. Due to this, the antimicrobial properties of herbal essential oils like *L. angustifolia* may provide an alternative to antimicrobial medications. Independently lavender essential oil may be delivered with hydroxyapatite.<sup>8</sup> The main advantages of this are efficient drug release, elevated stability, protection from interactions, decreased volatility, enhanced bioactivity, and less toxicity. It was found that hydroxyapatite did not interfere with the antimicrobial property of lavender essential oil.<sup>8</sup> In one of the studies conducted to check for antimicrobial efficacy; the lavender essential oil was incorporated in antimicrobial drugs like ciprofloxacin.<sup>13</sup> Ciprofloxacin has been used as an agent of local delivery in dentistry. Study revealed that lavender essential oil potentiated the antimicrobial activity of ciprofloxacin.<sup>13</sup> This may be an effective way to avoid the development of resistance to an antimicrobial agent. The local antimicrobial property may be utilized to develop an effective root canal sealer.

#### Preservative

It has been proven that lavender essential oils can be used as a preservative for strawberries. Herman et al. has studied the use of essential oils in cosmetics.<sup>14</sup> Lavender essential oil may also be used as a preservative in local anesthetic solutions as an alternative to methylparaben.<sup>6</sup>

#### Anti-inflammatory and Antinociceptive Properties

The lavender essential oil shows a significant anti-inflammatory effect. Lavender oil has been used in dermatitis and eczema. In an animal-based study, lavender oil showed anti-inflammatory activity compared to dexamethasone. It has been suggested that the mechanism involved is related to a G protein-coupled receptor or interference in the system of one of the intercellular second messengers.<sup>15</sup>

Antinociceptive properties and anti-inflammatory activity are closely related. Often there is the presence of pain along with inflammation. Non-steroidal anti-inflammatory drugs have been amply used in dentistry for nociception. Due to the side effects they carry, alternative pain-relieving strategies are being developed. The lavender essential oil has been tested positive for antinociceptive action. Studies on animals using the formalin-induced pain model show that oral treatment with lavender oil shows considerable pain

reduction in the rats.<sup>15</sup> The exact mechanism is not known; however, it seems to be similar to opioid analgesics. Due to this similarity, it may be used to replace opioid analgesics to solve the problem of addiction that comes with these drugs. Nevertheless, lavender essential oil seems to have no effect on the COX pathway. Research is needed to elaborate on this point further. In dentistry, even though this property may be advantageous, its applicability as an antinociceptive and anti-inflammatory agent has yet to be studied.

#### Anxiolytic Property

The fragrance of lavender is probably the most promising property, which has also been amply researched in the field of dentistry. The prevalence of anxiety in dental clinics all over the world is substantial. Behavior management of the patient requires expertise as well as time. Pharmacologically, several options are available to reduce the anxiety, but it may have side effects on the patient and may, in turn, become a costly affair. Recently, dental practitioners have been researching cost-effective and simple ways of behavior therapy. One of the newly accepted therapies is aromatherapy.

According to a study conducted at King's College London, the state-trait anxiety score of the patients who were subjected to aromatherapy using lavender essential oil during dental procedures was decreased as compared to those without the therapy showing promising properties of lavender essential oil. In another study, the mood, alertness, calmness, and anxiety were assessed using lavender fragrance against music therapy, in which aromatherapy using lavender fragrance gave superior results. The mechanism of action of this may be attributed to the action of lavender essential oil in serotonin neurotransmission through 5-HT receptors.<sup>16</sup> Studies have also found a correlation between vital signs and aromatherapy using lavender.<sup>17-19</sup> There is a decrease in blood pressure postoperatively on using aromatherapy in patients undergoing dental treatment.<sup>18</sup> Intranasal spray of lavender and fennel has also shown to decrease the salivary cortisol levels, which get elevated in case of anxiety.<sup>19</sup>

#### Toxicity

Toxicity may accompany the use of marketable essential oils. Factors involved may be product management, ingredients, excessive use or inappropriate use, sensitization/anaphylaxis, and lack of scientific evidence.<sup>20</sup> It is wise to know the adverse effects along with their uses. Some of the studies have shown additional side effects of lavender essential oils like contact dermatitis, acute eczema, and facial dermatitis allergic reaction.<sup>21</sup>

## CLINICAL IMPLICATIONS IN DENTISTRY

Lavender essential oils have the potential for future application in the field of dentistry. Further *in vivo* studies are indicated for the same. Some of the applications are stated below:

## Anxiolytic Property during Surgeries

Behavior and pain management are currently gaining importance in the field of dentistry. Aromatherapy, as has been mentioned above, is fast gaining popularity. Karan et al. and Nardarajah et al. have studied the use of lavender oil during the extraction of third molars and found it a useful adjunct.<sup>18,22</sup>

The development of dental anxiety may also be taxing on the patient during the waiting period before treatment. The use of the essence of lavender has been found to reduce the overall anxiety during this waiting period.<sup>4</sup>

## Adjunct to Other Antimicrobial Agents

Since lavender oil is majorly biocompatible and least cytotoxic, it may be applied as an antimicrobial agent.<sup>6</sup> It has antifungal properties which can be utilized in *Candida* infections, although much evidence is not yet available in the field of dentistry.<sup>12</sup>

Many medicinal plants have been used, which are being rediscovered in a new light. *Lavandula* is an upcoming medicinal plant that may also be utilized in dentistry as an antiplaque agent and in treating local periodontal lesions in periodontology. Further, it may also be used postimplant placement to avoid biofilm propagation.

In the field of endodontics, it finds its niche in root canal sealers due to its action against a variety of bio flora. In oral surgery, in addition to being an antinociceptive and anxiolytic agent, it may also be used as a preservative in local anesthesia. In case of a history of allergic reaction to preservative methylparaben, lavender can be used as a replacement.

Resistance development has brought the advent of newer, herbal antimicrobial agents. Since then, lavender has been researched as an antimicrobial agent. Not only can it be used as an independent agent, but it also finds its use in conjunction with the commonly used antimicrobial agents.

## Anti-inflammatory and Antinociceptive Effect

The host immune reaction may cause damage in dentistry to structures of the periodontium.<sup>13</sup> In periodontology, lavender essential oils find their potential place. Due to the inhibition of prostaglandins, lavender also serves to relieve pain.<sup>13</sup> Due to these inherent effects, lavender essential oils can be a prospective replacement for non-steroidal anti-inflammatory drugs in dentistry. It can also be used locally as an ointment for gingivitis. In a study by Pathan J et al., lavender oil has also been used as an adjunct to topical benzocaine anesthesia.<sup>24</sup> They found the oil efficacious in reducing pain. It has also found its use in treating aphthous ulcers, where its antioxidant properties are utilized.<sup>25</sup>

## CONCLUSION

Herbal therapeutic alternatives are rapidly becoming important in the medical research field. It is not long till they overtake the synthetic products. Lavender essential oils have been extensively studied in various fields and have been proved to have many medicinal properties, as listed in this review. The utilization of lavender can be amply done in the field of dentistry. Awareness regarding this is necessary among dental practitioners. Further *in vitro* and *in vivo* studies may prove to be successful in bringing lavender essential oils into clinical dentistry.

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