

# PHYTOMEDICINES - CURRENT APPLICATIONS IN ENDODONTICS

## ABSTRACT

The success of root canal depends on effective disinfection of the entire root canal system. There is no single irrigating solution that alone sufficiently covers all the functions required from an irrigant. Herbal alternatives have come into existence due to the potential side effects, safety concerns and ineffectiveness of the chemical irrigants available now. This review highlights the antimicrobial properties of commonly used herbal medicaments such as *Camellia sinensis*, *Azadirachta indica*, *Aloe barbadensis miller*, *Triphala*, *Morindacitrifolia*, *Propolis*, *Arctium lappa*, *Tachyspermum ammi*, *Curcuma longa*, *Chamomilla recutita* and *Salvadora persica* in endodontics.

**Key Words:** Phytomedicines, endodontics, *Camellia sinensis*, *Azadirachta indica*, *Aloe barbadensis miller*, *Triphala*, *Morindacitrifolia*, *Propolis*, *Arctium lappa*, *Tachyspermum ammi*, *Curcuma longa*, *Chamomilla recutita*, *Salvadora persica*.

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## INTRODUCTION

The success, longevity and reliability of modern endodontic treatment depends on the effectiveness of mechanical instrumentation, irrigating solutions, intracanal medicaments and chelating agents to clean, shape and disinfect root canals. The role of microorganisms in the development and perpetuation of pulp and periapical diseases has clearly been demonstrated in animal models and human studies.<sup>1</sup>

Elimination of microorganisms from infected root canals is a complicated task. Primary root canal infections are polymicrobial, typically dominated by obligatory anaerobic bacteria.<sup>2</sup> The most frequently isolated microorganisms before root canal treatment include Gram-negative anaerobic rods, Gram-positive anaerobic cocci, Gram-positive anaerobic and facultative rods, Lactobacillus species, and Gram-positive Streptococcus species. The obligate anaerobes are rather easily eradicated during root canal treatment. On the other hand, facultative bacteria such as Staphylococcus, Enterococci, once established, are more likely to survive chemo mechanical instrumentation and root canal.<sup>3</sup> The use of chemical agents during instrumentation to completely clean all aspects of the root canal system is essential for successful outcome of endodontic treatment.<sup>2</sup>

A wide variety of synthetic antimicrobial agents have been used over the years as endodontic irrigants and intracanal medicaments. But because of their increased antibiotic resistance, toxic and harmful side effects there is a need for alternative agents which are affordable, nontoxic, and effective.<sup>4</sup> The use of herbs as irrigants and intracanal medicaments is an emerging trend in endodontics.

In Indian culture, the knowledge regarding medicinal plants has been assimilated in the due course of many centuries. The Rigveda has been source of evidence of 67 medicinal plants; 81 species of medicinal plants have been recorded in the Yajurveda, 290 species of medicinal plants have been described in the Atharvaveda, 1,100 species of medicinal plants have been described in the Charak Samhita, and the Sushruta Samhita has been the source

of 1,270 species of medicinal plants and these descriptions form the basis of the classical formulations till date.<sup>5-7</sup> WHO has defined herbal medicine as plant derived material or preparation which contains raw or processed ingredients from one or more plants with therapeutic values.<sup>8</sup>

In this review an attempt has been made to understand the role of various phytochemicals such as Camellia sinensis, Azadirachta indica, Aloe barbadensis miller, Triphala, Morinda citrifolia, Propolis, Arctium lappa, Tachyspermum ammi, Curcuma longa, Chamomilla recutita and Salvia rosmarinifolia in endodontics.

## GREEN TEA

Scientific name : Camellia sinensis

Pharmacological actions : antioxidant, anticariogenic, anti-inflammatory, thermogenic, probiotic and antimicrobial.<sup>5</sup>



Fig. 1: Green tea (Camellia sinensis)

An in vitro study conducted to evaluate the antimicrobial efficacy of triphala, Green tea polyphenols (GTP), MTAD, and 5% sodium hypochlorite against *E. faecalis* biofilm formed on tooth substrate showed maximum antibacterial activity with NaOCl and statistically significant antibacterial activity with triphala, GTPs and MTAD. NaOCl and MTAD achieved 100% killing of *E. faecalis* 2min, whereas triphala and GTP took 6min. The study concluded that green tea polyphenols has potential to be used as an endodontic irrigant.<sup>9</sup>

## NEEM

Scientific name : Azadirachta indica



Fig. 2: Neem (Azadirachtaindica)

Pharmacological actions: antihelminthic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative.

The antimicrobial efficacy of 2.5% sodium hypochlorite and 0.2% chlorhexidine gluconate were compared with an experimental irrigant formulated from *A. indica* and found that neem irrigant has antimicrobial efficacy and can be considered for endodontic use.<sup>10</sup> Another study evaluated the antimicrobial efficacy of neem against *E. faecalis* in which neem positively showed inhibitory zone comparable to sodium hypochlorite proving that it can be considered as root canal irrigating solutions.<sup>11</sup>

## ALOE VERA

Scientific name :Aloe barbadensis miller

Pharmacological actions : antibacterial, moisturizing, anti inflammatory, wound healing.



Fig. 3: Aloe vera (Aloe barbadensis miller)

Aloe Vera gel has inhibitory effects on *Streptococcus pyogenes* and *E. faecalis* because of anthraquinone. Its bactericidal activity is found to be less than  $\text{Ca(OH)}_2$ .<sup>12</sup> Saturated hydroalcoholic extract of *A. vera* has shown highest zone of inhibition against *E. faecalis* when compared with garlic.<sup>1</sup> Hence *A. vera* can be said to have qualities as an endodontic irrigant and medicament.

## TRIPHALA

Scientific name : consist of dried and powdered fruits of three medicinal plants - Amalaki (*Emblica officinalis*), Bibhitaki (*Terminalia bellerica*), and Haritaki (*Terminalia chebula*)

Pharmacological actions : immune system stimulation, carminative, anti diabetic.



Fig4: Triphala

Triphala has shown statistically significant antibacterial activity against 6 week biofilm of *E. faecalis* proving it to be advantageous as an endodontic irrigant.<sup>9</sup> It also has been found to aid in the removal of smear layer, thereby acting as a chelating agent.<sup>12</sup>

## NONI

Scientific name : Morinda citrifolia

Pharmacological actions : antibacterial, antiviral, antifungal, antitumor, anthelmintic, analgesic, hypotensive, anti-inflammatory, and immune-enhancing effects

Murray et al. (2008) compared the effectiveness of noni with NaOCl and Chlorhexidine to remove the smear layer from the root canal walls of instrumented teeth and concluded



Fig 5 : Noni (Morindacitrifolia)

that the efficacy of noni was similar to NaOCl in conjunction with EDTA as an intracanal irrigant.<sup>13</sup>

### PROPOLIS

Propolis is a resinous yellow brown to dark brown substance which is collected by honey bees (*Apis mellifera*) from tree buds to seal their hives.

Pharmacological actions : antibacterial, antifungal, antiviral, antioxidant, anti-inflammatory properties.



Fig.6:Propolis

The antimicrobial activity of propolis with Ca(OH)<sub>2</sub> as intracanal medicament against *E. faecalis* found that propolis was effective in eliminating the microorganisms. Though propolis has shown very promising results, the clinician should be cautious while using this material due to its allergic reactions shown in some patients.<sup>14,15</sup>

Al-Qathami and Al-Madi compared the antimicrobial efficacy of propolis, sodium hypochlorite and saline as an intracanal irrigants. Microbiological samples were taken

from the teeth immediately after accessing the canal and after instrumentation and irrigation. The results of this study indicated that the propolis has antimicrobial activity equal to that of sodium hypochlorite.<sup>16</sup>

### LAPPA

Scientific name: *Arctium lappa* - native flower of Japan.

Pharmacological actions :antibacterial, antifungal, diuretic, antioxidant, anxiolytic, platelet antiaggregating effect, and human immuno deficiency virus (HIV)-inhibitory action.



Fig. 7 :Lappa (*Arctium lappa*)

An in vitro study showed that *Arctium lappa* exhibited antimicrobial potential against tested pathogens such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Bacillus subtilis*, and *Candida albicans*. Thus, it opens new vistas for its use as an intra canal medicament.<sup>17</sup>

### AJWAIN

Scientific name :*Tachyspermum ammi*

Pharmacological actions : antioxidant, antiseptic, carminative, antifungal, antibacterial.

Amanthi Ganapathi et al had compared the antimicrobial efficacy of ajwain on oral microbes and concluded that ajwain has very effective antimicrobial property against *E. faecalis* and *S. mutans*.<sup>18</sup> Ajwain has potential



Fig. 8 :Ajwain (Tachyspermum ammi)

to be used as endodontic medicament and irrigant.<sup>19</sup>

## TURMERIC

Scientific name :Curcuma longa

Pharmacological actions : antioxidant, anti-inflammatory, anti mutagenic, antiplatelet, antibacterial, antiparasitic.



Fig. 9:Turmeric (Curcuma longa)

Curcumin has shown to exhibit phototoxic effects against gram positive and gram negative bacteria, hence they can be used for photo dynamic therapy in root canal treatment.<sup>20</sup>

Studies also have shown that curcumin inhibits E.faecalis bio film formation showing that it has potential to be used as an irrigant in endodontics.<sup>21</sup>

## GERMAN CHAMOMILE

Scientific name : Chamomillarecutita

Pharmacological actions: anti-inflammatory, analgesic, antimicrobial, antispasmodic, sedative

Chamomile has been effective in removing the smear layer significantly when compared to distilled water and tea tree oil.<sup>22</sup>



Fig. 10 :  
German chamomile (Chamomillarecutita)

## MESWAK

Scientific name :Salvadora persica

Pharmacological actions : antiplaque, antiperiopathic, anticaries, anti-inflammatory, antimycotic.



Fig. 11:Meswak (Salvadora Persica)

Al-subawi et al conducted a study to compare anti microbial activity of meswak and found that it has equal effectiveness as that of sodium hypochlorite and chlorhexidine when used as an endodontic irrigant.<sup>23</sup>

## CONCLUSION

Herbal medicines are gaining popularity as they are generally safe if used with proper knowledge. Herbal formulations are showing promising results as irrigants and intracanal medicaments and can be used for endodontic procedures with minimal risks involved. However further research is necessary to incorporate these phytomedicines into oral health care products.

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