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Propolis: A Wonder Bee Product and Its Pharmacological Potential in Dentistry

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Abstract: The use of natural products in the treatment of sickness has long been emphasised in the medical field. Today's biomedical applications employ a vast range of natural ingredients to treat a wide range of systemic disorders. Researchers have been interested in the natural product "propolis" because of its potential for use in bio-dental applications. Propolis is a non-toxic resinous material with therapeutic qualities like antibacterial, anticancer, antifungal, antiviral, and anti-inflammatory effects. The purpose of this research is to investigate the chemistry and characteristics of propolis in connection to its uses in dentistry and biomedicine. Furthermore, the present and prospective uses of propolis in biodental applications have been examined, along with its status and extent. This review gives the reader some insight into the potential use of propolis in contemporary dentistry.

Keywords: Propolis, Dentistry, Oral Health

Introduction: Bees gather propolis, a resinous substance, from plants to seal cracks and holes in their colonies. Strong antibacterial, antiviral, anti-inflammatory, wound-healing, and anticancer qualities are present in propolis.[1]

Propolis is a highly complex combination, with different chemical components depending on where it comes from. Approximately 55% resinous chemicals and balsam, 30% beeswax, 10% ethereal and aromatic oils, and 5% bee pollen are revealed by a thorough study. The main ingredient responsible for propolis's qualities is bioflavonols. A study conducted at the Second Leningrad Scientific Conference on the Application of Apiculture (bee culture) in Medicine revealed that bee propolis is high in biotin, a variety of bioflavonoids (which are important for propolis' properties), 14 of the 15 minerals that the human body needs for normal function, and vitamins A (carotene), B1, B2, and B 3. It also includes other unknown substances that combine to form a nutrient-rich, well-balanced composition.[2,3]

One of the few remedies that have garnered attention over an extended length of time is propolis. This substance from the beehive has long piqued curiosity due to its potential as a natural antibiotic. Propolis is still one of the most widely utilised drugs in the Balkan states to this day. It has been used recently in a number of formulations for medicine, gynaecology, odontology, dermatology, and otorhinolaryngology including the treatment of oral infections and dental caries.[4]

This review paper looks at propolis's possible applications in oral health care and general dentistry.

Features, Origin, and Bioactive Composition of Propolis: When propolis is heated, it changes from being a hard, brittle, lipophilic substance to a soft, flexible, gummy, and extremely sticky substance. Depending on its origin and age, it can have a distinctive, pleasant, aromatic smell and range in colour from yellow green to red and dark brown. It can also vary from yellow to dark brown, depending on where the resins are from. It has been observed that propolis can even be transparent.[5,6]

Compounds from plants and secreted by bees combine to form the complex mixture known as propolis. Roughly 50% resins, 30% waxes, 10% essential oils, 5% pollen, and 5% other organic components make up raw propolis in general. When new forms of propolis are chemically characterised, more than 300 ingredients have been found in various samples, and more are continually being discovered. The location and timing of the propolis's collection determine the relative amounts of the different components.[7,8]

It has been demonstrated that propolis possesses cytotoxic, antibacterial, and antidepressant-like qualities as well as a protective impact against cholestasis-induced liver damage. Propolis contains polyphenols that have anticancer, chemopreventive, and immunomodulatory properties. They work as chemopreventives by interfering with the apoptotic signalling pathways in cancer cells through a variety of molecular processes. It has been demonstrated that propolis-derived polyphenols and EEP make cancer cells more susceptible to TRAIL-induced apoptosis.[9]

Application of Propolis in Dentistry:

Propolis in caries prevention: Hayacibara et al. evaluated the impact of propolis on glucosyltransferase activity, caries extension in rats, and Streptococcus mutans survivability. According to their findings, propolis was an effective cariostatic compound that reduced this

enzyme's activity. Propolis was gathered by Selvan et al. from various locations in Hunasamaranahalli Village, which is close to Bangalore. They found that bee propolis has strong antibacterial activity against Streptococcus mutans when combined with chlorhexidine. By preventing cariogenic Streptococci from adhering to and building up on the surface of teeth, propolis and chlorhexidine together can reduce the pathogenic potentials of dental plaque. Propolis may be used to treat dental caries since small amounts of it have been shown to prevent the growth of clinical stress.[10]

Propolis as storage media for avulsed teeth: The length of time spent out of the alveolar socket and the storage media have a major impact on the avulsed teeth's long-term prognosis when they are replanted. As storage media for avulsed teeth, Pileggi and Martin used Hank's balanced salt solution (HBSS), milk, propolis, and salt. They found that propolis was preferable than HBSS, milk, and salt because it contained a higher number of survived periodontal ligament (PDL) cells.[11]

Propolis as intracanal medicament: Intra-canal medications (ICMs) are still benchmarked against the usual treatment of calcium hydroxide [$Ca(OH)_2$]. Nevertheless, $Ca(OH)_2$ has many drawbacks, such as its extended half-lives for action and its limited capacity to eradicate a broad range of microorganisms. Propolis is said to have a stronger inhibitory impact on Enterococcus faecalis than ethanol, saline, $Ca(OH)_2$, and a combination of three antibiotics. The propolis content, length of the study, E. faecalis strain, and antimicrobial testing methods, however, varied between different investigations. CHX and povidone iodine were found to be superior to propolis and $Ca(OH)_2$, despite propolis having stronger inhibitory effect against E. faecalis. As an ICM, both propolis and $Ca(OH)_2$ have similar physical properties, although propolis has been reported to be 10 times less cytotoxic to fibroblasts of the periodontal ligament and dental pulp.[12-15]

Propolis as intracanal irrigant: Propolis has been demonstrated to be useful in lowering endotoxins and suppressing E. coli, Streptococcus aureus, Candida albicans, and E. faecalis when applied intracanally.[16,17]

Propolis as pulpotomy agent: At a 24-month follow-up, Roja-Ramya KS et al. showed an 80% success rate with propolis.[18] Hugar et al. found a greater short-term success rate of 93.3% at 6 months of follow-up.[19] Propolis's antibacterial, anti-inflammatory, and biocompatible qualities, along with its capacity to create dentin bridges and promote wound healing, may be responsible for its effectiveness. Propolis has been shown in numerous trials to have strong antibacterial activity against Lactobacillus, S. mutans, and E. faecalis. Propolis's flavonoids, cinnamic acid, caffeic acid, and benzoic acid—which may act on the microbial membrane to cause structural and functional damage—are responsible for its antimicrobial effect.[20,21]

Propolis in periodontal disease: Because mouth rinses can prevent plaque from forming, a lot of them have been used. Propolis was found to be considerably more effective than a placebo in lowering the content of insoluble polysaccharide and the plaque index in a double-blind cross-over research. Propolis reduces insoluble polysaccharide may have an impact on plaque's cariogenic capacity in addition to lowering the plaque's overall mass.[22]

Propolis in management of recurrent aphthous ulcer: The aetiology of recurrent aphthous stomatitis (RAS), an oral cavity illness characterised by ulceration and discomfort, is unknown. There is no known treatment for ulcers; instead, local treatments are used to lessen discomfort, while systemic treatment - many of which have severe adverse effects - are used to lessen the frequency of outbreaks. Propolis taken orally (500 mg/day) has been shown to be beneficial in lowering the frequency of disease outbreaks and enhancing the quality of life for those with recurrent aphthous stomatitis.[23]

Safety concern: Propolis is thought to be a safe medication, although it can trigger allergic responses just like other honey-bee products. Therefore, before prescribing propolis to a patient, individuals with asthma, those allergic to bee stings, and those with a honey allergy should avoid propolis. Future studies are needed to identify the individual components of propolis responsible for causing allergic reactions.[24,25]

Conclusion: Compared to medications used to treat the same oral health conditions, propolis can be considered a single agent that can be used for multiple purposes with little to no side effects due to its proven anti-inflammatory, antibacterial, and antifungal activity as well as its stimulation of the immune system. But in this regard, more research is necessary.

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