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Herbal Dental Powder as an Oral Care Agent

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Abstract: *Herbal dental powders are increasingly recognized for their safety and effectiveness.as compared to conventional synthetic dentifrices due to its antimicrobial anti-inflammatory andoral hygiene benefits. Many studies have pointed out their efficiency in plaque removal.It prevents gingivitis and maintains gum health and has few side effects. ThisReview synthesises research evidence on formulation, pharmacological properties, clinicalutility, and future research directions of the dental powders derived from herbs.*

Herbal dental powders are being increasingly recognized as the safe and effective.alternatives to conventional synthetic dentifrices, due to their varied pharmacologicalAntimicrobial, anti-inflammatory, and oral hygiene properties, among other benefits.Review synthesizes research evidence on the formulation, phytochemical investigation,Clinical utility and future research directions for these natural oral care agents are discussed.

The popularity of herbal dental powders represents a widening range of consumer interest.preference for chemical-free, eco-friendly products and their generally favorable safetyprofile. Traditional formulations contain powdered natural products withinclude abrasive, cleansing, and therapeutic effects, such as clove-analgesic, neemThis includes herbs such as antimicrobial, babool (gum strengthening), mint/tulsi (mouth freshener), and licorice.(foaming/healing), rock salt (scrubbing), and charcoal (bleaching). Phytochemical

Phytochemical screening confirms the presence of beneficial compounds like alkaloids, saponins, andFlavonoids, which collectively enhance oral health outcomes.Clinical evidence strongly supports the use of herbal powder, documentingsignificant reductions in oral pathogens and plaque scores. Various ingredients include neem, clove,and triphala are underlined because of their particular effectiveness. Besides, thesePreparations have anti-inflammatory and therapeutic effects; gum tissue is the purposes of such dressings are protection, reduction of bleeding, and minimization of swelling.

More importantly, trialsreport minimal adverse effects compared to chemical dentifrices and meta-analysesIt explains various powdered formulations that are as effective as conventional toothpastes and mouthwashes, although with less risk of developing side effects.Practical benefits include affordability, ease in transport, andthe fact is that farming will probably become environmentally low-impact, requiring minimal packaging.

However, key challengesremain, including the variable consistency of raw materials, lack of formulationStandardization and the need for more robust, blinded, long-term clinical trials adheringAccording to CONSORT guidelines, in order to confirm the efficacy across different populations.

Conclusion: Herbal dental powders represent natural, effective, and welltolerated alternatives for oral hygiene, with proven antimicrobial and anti-inflammatory benefits. As the body of evidence builds up, standardized formulations and large-scale Clinical trials will further establish their therapeutic value..

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Keywords: Herbal dental powder, Oral hygiene, Antimicrobial activity, Anti-inflammatory properties, Phytochemical analysis, Herbal dentifrice, Natural oral care, Plaque reduction, Gingivitis prevention, Medicinal plants, Standardization of formulations, Traditional medicine, Neem (Azadirachta indica), Clove (Syzygium aromaticum) ,Dental plaque control

I. INTRODUCTION

Herbal dental powders are essentially powdered natural substances with abrasive,Medically, these mushrooms are used for cancer preparation, cleansing, and therapeutic effects. They are popular due to the growing consumerpreference for chemical-free and eco-friendly oral care, and perceived safety profile[4][1].

Traditional powders normally include ingredients like clove, neem, babool,It contains mint, tulsi, licorice, charcoal, and rock salt, offering antibacterial, anti-inflammatory, andwhitening benefits [5][1].

Unlike toothpaste, powders often avoid synthetic flavors and preservatives, providing sensitive users with what they need. [1]

Herbal dental powders - traditional preparations comprising powdered plants minerals and natural abrasives — have been used for centuries across Asia, Africa, and the middle East as alternatives or complements to modern dentifrices. Interest in these products has resurged owing to consumer demand for "natural" oral-care solutions,

concerns over side effects from some of the synthetic ingredients, and emerging evidence thatcertain botanicals possess relevant antimicrobial, anti-inflammatory and analgesic activity.properties[16].

The active botanicals most commonly included in herbal tooth powders are,

- for instance:Azadirachta indica [neem],
- Salvadora persica [miswak],
- Syzygium aromaticum [clove],

Curcuma longa [turmeric], and plant-derived charcoal) have a range of bioactivities that are related to oral health. Neem extracts exhibit broad-spectrum antibacterial and anti-plaque properties both in vitro and clinically, which justifies their traditional uses in periodontal care[18].

The miswak (chewing stick from Salvadora persica) and clove have long been used in traditional medicine.use-cases and an evidence base suggesting anti-plaque, anti-gingivitis and analgesic benefits. Systematic and narrative reviews reveal that miswak can reduce plaque and gingival inflammation when used properly-often as an adjunct-while clove and its main.

The constituent eugenol exerts antimicrobial and local analgesic effects relevant to minor dental pain and infection control.

However, not all of the claimed benefits are uniformly supported. Recent controlled studies have shown that the whitening effect of activated charcoal is small and its abrasivity may risk enamel wear; clinical outcomes between herbal powders and fluoride toothpastes vary

It varies across studies depending on formulation, usage and study quality.Overall, the literature points to promising pharmacologic properties for several herbal ingredients but underlines heterogeneity in formulations, inconsistent clinical trial designs and a lack of long-term Safety and standardization information [20]

Herbal dental powders have been used for centuries in traditional medicine to improve oral health and prevent dental diseases. These powders are derived from plants.based ingredients, like herbs, spices, and botanicals, which possess antimicrobial,Anti-inflammatory and antioxidant activities have been attributed to it.

Traditional Use and Benefits

Herbal dental powders are a natural option for the artificial chemical-based toothpastes, which some may contain harsh chemicals and abrasives. Herbal dental powders can aid in: Reducing plaque and gingivitis Prevention of tooth decay and cavities Freshening breath and reducing bad breath (halitosis) Soothing gum inflammation and bleeding Promoting healthy oral microbiota

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Common Herbal Ingredients

Common herbal ingredients used in dental powders include:

These include the following:

- Neem (*Azadirachta indica*)- antimicrobial and anti-inflammatory
- Turmeric (*Curcuma longa*)- anti-inflammatory and antioxidant
- Clove (*Syzygium aromaticum)*- analgesic and antimicrobial
- Peppermint(*Mentha piperita)*- antibacterial and anti-inflammatory
- Licorice root (*Glycyrrhiza glabra)*- anti-inflammatory and antimicrobial

Scientific Evidence

Herbal dental powders, on the other hand, have proven to be effective plaque reducers gingivitis, and oral bacteria. However, this complex process is not fully understood and requires further investigation

II. FORMULATION AND STANDARDIZATION

The preparation involves triturating weighed herbal ingredients, their efficacy and safety.

sieving for fineness and combining agents with specialized oral health attributes [1] [5]:

1. Clove –(*Eugenia caryophyllus*): Analgesic, gum health
2. Neem (*Azadirachta indica*): Antimicrobial, anti-inflammatory
3. Babool (*Acacia arabica*): Gum strengthening
4. Mint and Tulsi (*Pudina, Ocimum sanctum*): Mouth freshener, anti-ulcer.
5. Licorice (*Glycyrrhiza glabra*): Also, foaming, sweetening, ulcer healing
6. Rock Salt: Abrasive
7. Charcoal: Whitening agent

Phytochemical screening confirms the presence of beneficial compounds like alkaloids, saponins, steroids, triterpenoids, flavonoids, and carbohydrates, which collectively improve oral health outcomes [1] [5].

Standardized physical properties these properties include good flow, optimal moisture content, and pH compatible with the oral tissues. The properties should include good flow, optimal moisture content, and a pH compatible with oral tissues [1].

Crude Drugs used for herbal dental powder

1. CLOVE

(*Syzygium aromaticum*), tropical evergreen tree of the family Myrtaceae and its small, reddish-brown flower buds used as a spice. Cloves played a part in some of the earliest spice trade and are believed to be native to the Moluccas, or Spice Islands, of Indonesia. Cloves are pungent and hot flavored and odored and are used to flavor many foods, esp meats and bakery products; in Europe and the US the spice is a characteristic flavoring in Christmas holiday fare, like wassail and mincemeat. It is one of the five dried spices-including fennel, cassia, star anise, and Sichuan pepper-that make up the fabled Chinese five-spice powder24.

The clove tree is an evergreen that grows to about 25–40 feet (8–12 meters) in height.Its leaves are small, simple, and opposite, regularly dotted with glands. Trees are usually propagated are grown from seeds that are planted in shaded areas. Flowering begins around the fifth year; a tree can yield up to 75 pounds (34 kg) of dried buds annually. The buds are hand-picked in late summer and again in winter and then sundried. Cloves vary in length from about 0.5–0.75 inches (13–19 mm). The buds contain 14–20 percent essential oil, the principal component of which is the aromatic oil eugenol. Cloves are strongly pungent owing to eugenol, which is isolated by distillation to provide oil of cloves[24].

Uses

Cloves find their application in food, medicine, and personal care, either whole, ground, as such as oleoresins, which are plant extracts and are used as a flavouring agent, or as essential oils. In cookery, they are an integral part of spice mixtures, an addition to various baked foods, and serve as a natural preservative. Cloves medicinally help digestion by reducing bloating and helping nausea and vomiting. They are used to soothe sore throats, suppress coughing, and numb

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toothaches. Clove oil is used in temporary dental fillings, and when applied externally it can help ease headaches and muscle pain. In industry, clove oil is found in toothpaste, mouth wash, antiseptics, perfumes, and soaps. Eugenol is antibacterial, antifungal, and with active antiviral properties, including effectiveness against MRSA bacteria, it is also utilized in the synthesis of vanillin (the flavoring constituent in vanilla) or as a sweetener/flavor component enhancer.

2. NEEM

(*Azadirachta indica*), fast-growing tree of the mahogany family, valued as an alternative medicine, a source of organic pesticides, and for timber. The neem is likely native to the Indian subcontinent and to dry areas throughout South Asia. It has been introduced to parts of Africa, the Caribbean and many counties in both South and Central America. It has been used in Ayurvedic and folk medicine for a long time and finds its application in cosmetic products and organic farming applications [23].

Description of the plant

Neem trees can grow to 15–30 metres (49–98 feet) in height and have attractive rounded crowns and thick furrowed bark. The compound leaves have toothed leaflets and are usually evergreen but will shed during severe drought conditions. The little aromatic white flowers are bisexual or staminate (male) and are borne in clusters in the axils of the leaves. The fruit is a smooth yellow-green drupe and has a sweet-flavored pulp 23.

Uses

Almost every part of the neem tree is useful, and most of its medicinal and cosmetic uses are based on its antibacterial and antifungal properties. Neem is used as an ingredient in the preparation of many products, including: that treat dandruff, soaps or creams for the skin in instances like acne.psoriasis, and athlete's foot. It is also an ingredient in various toothpastes and mouthwashes, particularly on the Indian sub-continent, and young twigs are used directly as crude toothbrushes in rural areas. Neem leaves have long been used as a traditional treatment for diabetes, and some clinical data suggest that it could be of benefit in control blood sugar levels. Neem oil and neem bark and leaves are unsafe to consume by pregnant women and leads to miscarriage.

3. MINT

Mint, (*genus Mentha*), genus of 25 species of fragrant herbs of the mint family (*Lamiaceae*). Mints, native to Eurasia, North America, southern Africa, and Australia,are widely distributed throughout the temperate areas of the world and have naturalized in many places. Many species, in particular peppermint and spearmint, are used as flavourings for foods - including candy and gum - and for liqueur and dentifrices. The essential oils of mints are used as fragrances in perfumery. Some species are commonly used in herbal medicine.peppermint, (*Mentha ×piperita*), strongly aromatic perennial herb of the mint family.

Peppermint has a strong sweetish odor, a warm pungent taste with a cooling aftertaste.It is used as a fresh culinary herb, and dried flowers are used to flabor candy, desserts, beverages, salads, and other foods. Its essential oil is also widely used as a flavoring[25].

Physical Description

Peppermint possesses square stems, stalked dark green leaves with wavy or entire margins, and blunt oblong clusters of pinkish lavender flowers. The small flowers are not typical of other members of the family, having four instead of five united petals. As with like other mints, the plant can be quite aggressive, spreading through stolons - underground stems.

The volatile oils are contained in resinous dots present in leaves and stems.

Types

The peppermint plant is a hybrid between water mint, Mentha aquatica, and spearmint (*M. spicata*) and is especially cultivated in Europe, Asia, and North America.

Natural hybridization among wild species has produced many varieties of peppermint, but of these, however, only two are recognized by growers, the black and the white. Black peppermint, also called English peppermint or mitcham mint, is widely cultivated in the United States and possesses purplish stems. The white variety is less hardy and less productive, but its oil is considered more delicate in odor and obtains a higher price.

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Peppermint oil, the volatile essential oil distilled with steam from the herb, is strongly is used for flavouring confectionery, chewing gum, dentifrices, and medicines. Pure oil of peppermint is almost colourless. It contains mainly menthol and menthone. Menthol, Also known as mint camphor or peppermint camphor, it has long been employed medicinally as a soothing balm[25].

4. TULSI

Holy basil, (*Ocimum tenuiflorum*), flowering plant of the mint family (*Lamiaceae*) grown for its aromatic leaves. Originated on the Indian subcontinent, holy basil grows throughout Southeast Asia. The plant is widely used in Ayurvedic and folk medicine, often It is consumed as an herbal tea for numerous ailments and is considered sacred in Hinduism. It is also sweet basil is used as a culinary herb with a pungent flavor that intensifies with cooking. It is reminiscent of clove, Italian basil (Ocimum basilicum), and mint, with a peppery spiciness. It is considered an agricultural weed and invasive species in some areas outside its native range[26].

The holy basil is a small annual or short-lived perennial shrub, up to 1 meter.(3.3 feet) tall. The stems are hairy and carry simple toothed or entire leaves oppositely along the stem. The aromatic leaves are green or purple, depending upon the cultivar. The small Purple or white tubular flowers have green or purple sepals and are borne in terminal spikes. The fruits are nutlets and produce numerous seeds[26].

5. LICORICE

Licorice, (*Glycyrrhiza glabra*), perennial herb of the pea family, and the flavoring, confection, and folk medicine are made from its roots. Licorice resembles anise. (*Pimpinella anisum*) in flavor; both plants are somewhat sweet and slightly bitter. The One Greek name, glykyrrhiza, of which the word licorice is a corruption, means “sweet root.”[27]

Native to southern Europe, licorice is essentially grown along and around the Mediterranean and parts of the United States. The licorice is an effective mask for the taste of medicines,ingredient in cough lozenges, syrups and elixirs. It is a flavouring agent in candies and Tobacco. The plant is sometimes used in folk medicine to treat peptic ulcers and different other disorders. The roots are pulverised and then boiled to make a juice; the flexible stick shape Licorice candy, also called licorice paste or black sugar, is processed from this thickened juice. [27]

The herb may grow to 1 metre tall, with compound leaves containing four to eight oval leaflets. Licorice bears axillary clusters of blue flowers and produces flat pods that are 7 to 10 cm (3 to 4 inches) long. The roots used are about 1 meter in length, and about 1cm (0.4 inch) in diameter. They are soft, fibrous, flexible and coloured bright yellow inside. The distinctive sweetness of licorice is imparted by a substance called Glycyrrhizin[27].

6. ROCKSALT

Rock salt is primarily made up of sodium chloride and trace minerals such as calcium, magnesium, iron, zinc, sulphur, oxygen, cobalt and hydrogen. These essential minerals play a role in many body functions that keep you healthy[28,29,31].

The benefits of rock salt include:

• Promotes digestion salt is considered one of the best home remedies for digestion-related ailments like loss of appetite,lack of appetite, constipation, heartburn, bloating, and stomach ache[28,34,31]. It is rich in minerals and vitamins, aid in digestion, promote bowel movement, and eliminate toxic materials from the intestines. Rock salt is also believed to stimulate the secretion of insulin production, helping to reduce the cravings for sweets and supporting weight management6.

• Improves metabolism

Rock salt can improve the body's metabolic rate to enhance physiological functions. It aids in the absorption of minerals and nutrients within the body and helps maintain the electrolyte balance, and maintains the blood pressure[28,31].

• Enhances the immune system

Rock salt improves your immunity, besides offering health to bones and connective tissues.which can help prevent a number of bone-related diseases and disorders.

• Relieves the Pain of Muscle Cramps

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A deficiency of potassium, among other minerals, predisposes a person to muscle cramps. Rock salt contains potassium, sodium chloride, and other minerals which may help alleviate muscle cramps to some extent [28,31,32].

• Provides relief from a sore throat

Saltwater gargling is one of the common remedies for a sore throat at home. When rock salt is used,as the main ingredient in salt water gargles, it also helps in treating respiratory illnesses including nose congestion, cold, chest disorders, and cough[30].

• Stabilizes blood pressure

It helps control blood pressure levels. Bathing with rock salt water can lower your blood pressure[28].

• Relieves stress

Take a bath in rock salt added to warm water to relieve your stress and anxiety and relax the mind[28,31].

• Healthy skin

According to the Ayurveda texts, rock salt can purify, nourish, and refresh the skin. It may also prevent oiliness, reduce acne, and exfoliate the skin to make it soft and smooth.It may help improve symptoms of eczema and dermatitis [28, 31, 33].

• Promotes healthy hair

Rock salt massage helps remove all dirt from hair and removes dead skin on the scalp. while preserving the essential natural oils that keep your hair healthy and balanced[28]. The It also prevents dandruff and hair fall[35].

III. PHARMACOLOGICAL AND CLINICAL EVIDENCE

Herbal powders encourage oral hygiene by removing plaque, preventing gingivitis, and combating halitosis [2][3]:

Antimicrobial Activity: The literature reports significant reductions in oral:pathogens and plaque scores. Among them, neem, clove, and triphala are particularly effective [5][2].

Anti-inflammatory & Healing:- Herbal preparations provide gum tissue protection, reduce bleeding, and minimize swelling [5][3].

Safety and Tolerability:- Patch tests reveal minimal irritation, redness, or swelling. Trials report minimal adverse effects compared to chemical dentifrices [1].

Comparative Efficacy: Meta-analyses have demonstrated that some powder formulations are as effective as conventional toothpastes, and mouthwashes, but with fewer side effect risks [2][3].

Example reference (from systematic review):

Mehta V., Mathur A., Tripathy S., Rizwan SA., Sharma T. "Effectiveness of herbal oral care products in reducing dental plaque and gingivitis: an overview of systematic reviews.".Can J Dent Hyg. 2024 Jun;58(2):120–134. [2]

Practical Advantages and Consumer Trends Herbal powders are appreciated for their travel-friendly nature, budget-friendliness, and low environmental impact. They use very minimal packaging and remain available in communities that do not have regular access to commercial toothpaste. Among users, it was pointed out that include effective plaque control, long-term safety, and absence of synthetic irritants as major benefits [1][4].

IV. CHALLENGES AND FUTURE DIRECTION

Key challenges that arise include variable consistency in raw materials and lack of formulation. Standardization is also lacking, and clinical trials are few and far between, with even fewer reporting long-term data. Thus, there is a dire need for strong CONSORT-guided blinded studies that validate efficacy and safety in diverse populations [2].

Further studies on optimization of bioactive ingredient further studies are necessary to standardize the drug concentrations and mode of delivery.

V. CONCLUSION

Herbal dental powders represent natural alternatives that are effective and well-tolerated. for oral hygiene, with effective antimicrobial and anti-inflammatory benefits. As evidence as it grows, standardized formulations Big clinical trials will further establish their therapeutic value.

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