

Formulation and evaluation of Herbal toothpowder

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Abstract

Herbal tooth powder has been about for centuries and many believe it to be an essential part of any teeth cleaning regimen . The aim of the present research was to formulate the herbal tooth powder for prevention of oral diseases. Different herbal drugs; Azadirachta Indica (Neem powder), Piper longum (Trikuta powder), Acacia nilotica (Babul), Chebulic myrobalan (Harada), Curcuma longa (Turmeric), Ocimumsantum Linn. (Tulsi), Cinnamomum camphora (Camphor), Eugenia caryophyllus (Clove oil). The organoleptic property showed a yellowish green colour characteristics odour with a sweet taste. The moisture content of the powder shows 1.64%. The powder has 4gm/ml of bulk density. The angle of repose was determined to find out the flow property and it shows good flow property. The ingredients are used in the present work, was screened and selected to possess anti-microbial effect and to maintain oral hygiene as it claimed by its results as effective tooth Powder. It does not cause any harmful effects, instead, it imparts good freshness and away from bad Odour. Oral hygiene can be maintained in a reliable, safe, and inexpensive way by using herbal tooth powder.

Key words: Toothpowder, Pippali, Ant -microbial, Ash value

INTRODUCTION

Oral hygiene is an important key to maintain good appearance, impression of an individual and gives confidence. Herbal tooth powders consisting of various ingredients that are available in the market in a wide range. Hence modern methods focusing on these aspects are useful for the standardization of herbs and their formulations. Consumers believed by using herbal-based diseases like toothpowders are safe, effective, and less toxic. Tooth powder promotes oral hygiene, serves as an abrasive that aids in removing the dental plaque and food from the teeth and also helps to prevents tooth and gum Gingivitis, cavity and stained teeth. Market value of herbal products in increasing day by day. Due to variability of phytoconstituents, substituent and adulterants in crude drugs it is essential to standardize these formulations for their quality and purity. Herbal tooth powder is available in market in a wide range, consisting various ingredients. Several pharmacopoeia monographs on plant materials are lacking in identification and quantification of active compounds. Hence modern methods focusing these aspects are useful for the standardization of herbs and their formulations.³

Tooth powders are using in combination with tooth brush to maintains the oral hygiene such as freshness of mouth and to avoid tooth decay. This work was carried out to prepare tooth powders which can be used as a tool for proper oral hygiene and to overcome the side effects of the conventional tooth powder prepared by synthesis ingredients. The tooth powders were prepared by using various herbal ingredients which posses the anti-bacterial,

antiseptic and cooling properties. The prepared tooth powder was evaluated for its organoleptic and physical characteristics such as colour, order, taste, formability, pH, moisture content, flow property, bulk density and in-vitro anti-microbial activity to ensure that it posses all the desired futures to uses against the dental diseases. The results were found to be within the permitted limits.²

The tooth consists of two parts, the crown and the roots. The crown of the tooth is covered by an outer surface called enamel and it is the hardest tissue in the tooth. The major composition of enamel is hydroxyl apatite other than that it consists of water and keratin. Dentine is the under part of the enamel which is a composite of hydroxyl apatite. Oral consists of not only tooth but also saliva for easy to consume the food. Saliva is the major element proposed for lubricate the food and to maintain an appropriate environment in the mouth. Saliva is formed by various glands such as labial, lingual, buccal, and palatal are the larger and smaller glands that produce saliva continuously to keep the tooth environment in the dynamic state.

Herbal tooth powder has been about for centuries and many believe it to be an essential part of any teeth cleaning regimen. Natural product have been recently investigated more thoroughly as promising agents for the prevention of oral diseases, especially plaque-related diseases such as dental caries due to side effects of the use of some hazardous chemicals in the most of the marketed toothpastes and powders which has created alarming situation, especially amongst the children.¹

INGREDIENTS USED IN THE FORMULATION⁶

1. NEEM POWDER



Fig No. 1 Neem powder

Synonyms: Neem tree, nimb, limba, margosa, nim tree.

Biological Source: It consist of dried powder of the leaves of the plant *Azadirachta Indica*.

Family: Meliaceae

Plant part used: Leaves

Chemical constituents: Nimbin, Nimbidinin, Nimbandiol.

Uses:

- Neem is the anti-inflammatory, antiseptic and highly beneficial.
- This natural neem toothbrush combats teeth and gum diseases, prevents cavity, and significantly improves oral health.
- Neem bark is also used in a number of toothpaste and toothpowder and is helping in curing problems related to gingivitis.

2. Trikata powder

Trikatu is the Sanskrit name in which tri means three and katu mean pungent or a herb that accommodates three spices, which are - long pepper (pippali), black papper (kali mirch), dried ginger (sondh). These herbs work in collaboration to stimulate digestive burning. They are categories as demolishing fat, cleansing abdominal glands and dullness of the appetite & indigestion. In Ayurveda trikatu extract used for improving the digestive system. It has antiemetic, carminative, anti-viral, chemo-protective, anti-inflammatory properties.

A. Long pepper (Pippali)



Fig No. 2 Long pepper

Synonyms: catkins (big), pippali large.

Biological Source: This consists of dried fruiting spikes of climbing vine called as piper longum.

Family: Piperaceae

Plant part used: Fruits

Chemical constituents: Piperin, volatile oil

Uses:

- Long pepper widely used in ayurvedic and unanin medicines, specially in disease of respiratory tract.
- Roots are used for bronchitis, stomach-ache, disease of splan and tumours.

B. Black pepper (kali mirch)



Fig No. 3 Black pepper

Synonyms: Pepper, piper nigrum, maricha.

Biological Source: Pepper is the dried unripe fruit of perennial climbing vine piper nigrum Linn.

Family: Piperaceae

Plant part used: Fruits

Chemical constituents: Piperine, starch piperidine, l-phellandrene, caryophylling.

Uses:

- Aromatic, stimulant, stomachin, carminative, condiment, stimulates the taste buds with gastric juice.
- Black pepper as an ingredient in recipes to add flavour and spice to meats, fish, vegetables, salad, dressings, soups, stir-fries, pasta, and more.

- High in antioxidants.
- May improve blood sugar control

C. Dried Ginger (Sondh)



Fig No. 4 Dried Ginger

Synonyms: Zingiber, zingiberis, sunthi

Biological Source: Ginger consist of whole or cut, dried scrapped or unscrapped rhizomes of zingiber officinale.

Family: Zingiberaceae

Plant part used: Rhizomes

Chemical constituents: Volatile oil, zingiberene, curcumene, resin, gingerol, shogaals, gingediols.

Uses:

- Aromatic carminative, flavouring agent, motion-in treating sickness.
- It is an effective cure for indigestion, sore throat, cold and cough.
- Ginger therapeutic properties helps stimulate blood circulation, cleanse, thr bowels and kidney, remove toxins from the body and nourish the skin.

3. BABUL



Fig No.5 Babul

Synonyms: Babul, baboul, vachellia nilotica.

Biological Source: Vachellia nilotica, more commonly known as Acacia nilotica, and by the vernacular names of gum Arabic tree, babul, thorn mimosa.

Family: Fabaceae

Plant part used: Bark

Chemical constituents: Methionine, lysine, lupenone, lupeol, Niloticane.

Uses:

- Consuming Babool gum powder along with once a day helps in relieving joint pain due to its analgesic and anti-inflammatory properties.
- Applying a paste of Babool leaf powder and coconut oil helps manage oral problems such as plaque formation and gingivitis due to its antibacterial properties.

4. HARADA



Fig No. 6 Harada

Synonyms: Hirda, Harida, Buceral chebula, Abhaya, kayastha, katukka.

Biological Source: It's commonly known as black or chebulic myrobalan is a species of Terminalia.

Family: Combretaceae

Plant part used: Fruit

Chemical constituents: Neo-chebulic acid, 1, 6 dio-galloyl-0-glucose, Gallic acid(3,4,5-Trihydroxy-benzoic acid).

Uses:

- Harada is good for preventing cough and cold naturally.
- Harada helps to remove toxins from the body and keeps digestive system on track due to its Deepan (appetizer) and pachan (digestive) properties.

5. TURMERIC



Fig No. 7 Turmeric

Synonyms: Haldi, turmeric, curcuma, curcuma domestica.

Biological Source: It consists of dried powder of the plant curcuma longa.

Family: Zingiberaceae.

Plant part used: Rhizomes

Chemical constituents: Curcumin, curcuminoids, cymene, tumeron, isdemethoxy curcumin, demethoxy curcumin, dialy, heptanoids.

Uses:

- Teeth whitening and reduced risk of gum pain and inflammation.
- It delays the signs of aging like wrinkles and also possesses other

properties like antibacterial, antiseptic, and anti-inflammatory.

- It is the best source of blood purifier. It is effective in treatment of acne due to its antiseptics and antibacterial properties that fight pimples and breakouts to provide your skin.
- It reduced risk of gum disease.

6. TULSI



Fig No. 8 Tulsi

Synonyms: Tulsi, holy basil, padina pavonica.

Biological Source: It consists of dried powder of the leaves of the plant *Ocimum sanctum* Linn.

Family: Lamiaceae

Plant part used: Leaves

Chemical constituents: Eugenol, tannin, vitamin C, tartaric acid, volatile oil, carvacrol, fixed oil, alkaloids.

Uses:

- It natural anti-inflammatory and anti-bacteria properties help curb the growth of bacteria in the mouth, further preventing infection.
- It can also be used by itself to help with mouth ulcers.
- Tulsi helps to reduce inflammation and may be useful in easing stress and lowering blood pressure.

7. CAMPHOR



Fig No. 9 Camphor

Synonyms: Turpentine, Rose oil, camphor, resin, menthol.

Biological Source: Camphor is a solid keton, obtained from the volatile oil of *Cinnamomum camphora*.

Family: Lauraceae

Plant part used: Wood

Chemical constituents: D-camphor(51.3%), 1,8-cineole, linalool, terpineol.

Uses:

- It is used in many rub-on products to reduce pain related to cold sores, insect stings and bites, minor burns, and haemorrhoids.
- Camphor has a wide variety of topical uses due to its antibacterial, antifungal, and anti-inflammatory properties.
- It can be used to treat skin condition, improve respiratory function, and relieve pain.

8. CLOVE OIL



Fig No. 10 Clove oil

Synonyms: Clove tree, spice tree, syzygium, genus syzygium.

Biological Source: Clove oil is obtained from the dried flower bud of *Eugenia caryophyllus*.

Family: Myrtaceae

Plant part used: Flower buds

Chemical constituents: Eugenol (76.8%), caryophyllene, Acetyeugenol, Methyl eugenol, eugenyl acetate (12%).

Uses:

- Clove oil contains the active ingredient eugenol, which is a natural anesthetic.
- Clove oil has been used for easing digestive upset, relieving pain, and helping with respiratory condition.
- It helps numb and reduce pain to ease a toothache. Eugenol also has natural anti-inflammatory properties. It may reduce swelling and irritation in the affected area.

9. SENDHA NAMAK



Fig No. 11 Sendha Namak

Synonyms: Halite, saindhava lavana, rock salt

Biological Source: Sendha namak, a type of salt, is formed when salt water from a sea or lake evaporates and leaves behind colourful crystals of sodium chloride.

Chemical constituents: Sodium chloride, zinc, iron, potassium, magnesium, calcium.

Uses:

- Rock salt improves digestion and is a natural way to relieve stomach pain. It also used to cure stomach infection and aids in deforming as well.
- It helps stabilise blood pressure by maintaining a balance of high and low blood pressure.
- Rock salt provides the entire essential and greatly improves the body immune system.

10. SACCHARIN SODIUM



Fig No. 12 Saccharin sodium

Synonyms: Calcium cyclamate, cyclamates, sodium cyclamate, sucralose.

Biological Source: Saccharin is a non-nutritive or artificial sweetener. It's made in a laboratory by oxidizing the chemicals o-toluene sulphonamide or phthalic anhydride.

Chemical constituents: Sodium chloride.

Uses:

- Saccharin is often featured in various vitamin supplements and medicines and it can be used for the baking as a substitute for sugar.
- Saccharin has been used to sweeten foods and beverages without calories.
- Saccharin provides products with increased stability, improved taste, lower production costs and more choices for the consumer.

MATERIALS AND METHOD

All drugs were collected from the local market. For the preparation of herbal tooth powder, we have selected ten important ingredients such as Neem, Trikutu, Babul, Harada, tulsi, Clove oils, Sendha, Camphor, Saccharin sodium. The powdered herbal materials were sieved through a mesh size 75. Then all the ingredients mix uniformly to prepare a homogenous formulation.

Table No.1 Composition of Herbal Tooth Powder

Sr. No	Ingredients	Quantity(gm)
1.	Neem	10gm
2.	Trikutu	10gm

3.	Babul	10gm
4.	Harada	5gm
5.	Turmeric	3gm
6.	Tulsi	5gm
7.	Camphor	1gm
8.	Clove oil	q.s
9.	Sendha Namak	20gm
10.	Saccharin Sodium	3gm

EVALUATION OF HERBAL TOOTH POWDER^{1, 2, 3}

The prepared herbal tooth powder was evaluated for its various parameters such as organoleptic, physic-chemical, rheological evaluation and anti-microbial activity.

1. Organoleptic Evaluation

Organoleptic characteristics for various sensory characters like colour, odour, taste was carefully noted down as illustrated. The raw drugs and powder were separately studied by organoleptic and morphological characters like colour, odour, texture, and appearance.

- **Colour:** The prepared tooth powder was evaluated for its colour. The colour was checked visually under normal lamp.
- **Odour:** Odour was checked by smelling the product.
- **Taste:** Taste was manually checked by tasting the product.

2. Physic-chemical Evaluation

The physical and chemical feature of the herbal tooth powder was evaluated to determine the pH, its moisture content, and ash value and the amount of inorganic matter present in it.

PH

PH of formulated herbal tooth powder was observed by using pH meter. 5gm of tooth powder placed in 100ml of beaker. Allow the 10ml of boiled and then cool water. Stir vigorously to make a suspension and measured the pH.

Moisture Content

Tooth powder (10gm) weighed and dried it in the oven at 105o C then it was cooled. The loss of weight is recorded as percentage moisture content and calculated by the given formula

% Moisture content = $\frac{\text{Original sample weight} - \text{Dry sample weight}}{\text{Original sample weight}} \times 100$

Original sample weight X 100

Ash value

Weight accurately about 3gm of the powdered drug in silica crucible, Incinerate the powdered drug by increasing the heat gradually until the sample was free from carbon and cool it keep it in a desiccators. Weigh the ash and calculate the percentage of total ash in contrast to the air dried sample.

3. Rheological Evaluation

Physical parameters like bulk density, foaming test, angle of repose were observed and calculates for the formulation.

□ Bulk Density

The bulk density of the powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume. It is expressed in gram/ml.

Bulk density = Untapped density – tapped density

□ Foam test

The foamability of the product was evaluated by taking 2gms of tooth powder with water in a measuring cylinder initial volume was noted as v1 and then shaken for ten times. Final volume of foam was noted v2.

□ Flow Property

A funnel was taken and fixed with a clamp to the sand. A graph paper was kept below the funnel and the height between graph paper and bottom of the funnel was measured. Then 50gm of powder was weighed and poured into funnel by blocking the orifice of the funnel by thumb, the thumb was removed. The powder started flowing down onto the graph paper and formed a cone shaped pile until the peak of pile become touched to the bottom of the funnel stem. Then, the angle of repose was calculated by following formula.

$\tan \theta = H/R$

H = Height of powder, R = Radius of graph paper

4. Anti-Bacterial Activity

Anti-bacterial activity was determine by agar well diffusion method-

➤ Preparation of Agar media:

Suspended 7gm Nutrient agar in a 250ml conical flask and 250ml distilled water was added. Then, it was heated on a hot plate with frequent agitation until it completely dissolved. Then, the media was sterilized in an autoclave at 121°C for 1 hour.

➤ Agar well diffusion method:

Approximately 25ml of Nutrient agar was poured into a sterile petridish and allowed to solidify. 50µl of bacterial inoculums was spread on the solidify nutrient agar media by using the sterile spreader. In these plates, four wells (5mm diameter) were punched into the agar by using a sterile cork borer. Then, the working concentration of 100mg, 200mg, 300mg, and 400mg dilution were prepared and was separately added into wells and allowed to diffuse at room temperature. standard antibiotic (Erythromycin) was used as a positive control. The plates were incubated for 24hours at 37°C for one day and another day I seen the zone of

inhibition.

RESULTS AND DISCUSSION

In the present study formulated and evaluated Herbal tooth powder. The organoleptic property showed a yellowish green colour characteristics odour with a sweet taste. The moisture content of the powder shows 1.64%. The powder has 4gm/ml of bulk density. The angle of repose was determined to find out the flow property and it shows good flow property. The pH of the formulation was found to be 5. Anti-microbial activity of tooth powder of E.coli was shown in table no.6 and fig no.13.

Dental caries are the most common oral infections disease among children and old age. The prevention strategy against dental caries includes the elimination of carcinogenic microorganisms from the oral cavity, inhibition of their plaque formation, and the enhancement of tooth resistance to demineralization. In the former strategies, phytochemicals have been widely studied for their antimicrobial activity.

1. Organoleptic Evaluation:

Table No. 2 Organoleptic evaluation of herbal tooth powder

Sr.no	Parameters	Result
1.	Colour	Yellowish green
2.	Odour	Characteristics
3.	Taste	Sweet
4.	Texture	Fine
5.	Appearance	Powder

2. Physic-chemical Evaluation:

Table No.3 Physic-chemical evaluation of herbal tooth powder

Sr.no	Parameters	Result
1.	PH	5
2.	Ash value	0.58

JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 07, ISSUE 18, 2020

3.	Moisture content	1.64
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3. Rheological Evaluation:

Table No.4 Rheological evaluation of herbal tooth powder

Sr.no	Parameters	Result
1.	Bulk density	4gm/ml
2.	Foam	Present
3.	Angle of repose	48.74

4. Patch test:

Table No.5 Patch test of herbal tooth powder

Sr.no	Parameter	Result
1.	Swelling	Negative
2.	Redness	Negative
3.	Irritation	Negative

5. Anti-microbial activity:

Table No.6 Anti-microbial activity of E.coli

Culture	Minimum inhibition concentration	Result
Escherichia coli	0.1mg/ml	Sensitive



Fig No.13 Anti-microbial activity of E.coli

CONCLUSION

The research concluded that herbal tooth powder an emphasizing and more acceptable in dental research and they are safer with minimum 2side effect than synthetic preparation. The formulated tooth powder capable to the tooth and oral hygiene and show the anti-microbial activity against pathogens. The formulated herbal tooth powder has been good scope in future in nature remedies research and dental health of public.

Natural plant products are an important source to control bacterial pathogens. Therefore, in the present study, a herbal tooth powder was developed and evaluated for antimicrobial activity which has shown excellent results. The ingredients are used in the present work, was screened and selected to possess anti-microbial effect and to maintain oral hygiene as it claimed by its results as effective tooth

Powder. It does not cause any harmful effects, instead, it imparts good freshness and away from bad Odour. Oral hygiene can be maintained in a reliable, safe, and inexpensive way by using herbal tooth powder.

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