

## Formulation and Evaluation of Herbal Toothpowder Using Indian Nettle, Coconut Spathe, Tulsi and Others

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**ABSTRACT:** Dentifrices are important in our daily life to maintain good oral health and hygiene. Gingivitis, plaque, periodontal diseases are the crucial problems related to tooth. These major issues are due to poor oral hygiene and negligence in good caring of tooth. These negligence encourages plaque formation on teeth, by causing inflammation of gum tissues which ultimately leads to gingivitis and tooth loss. Most of the synthetic preparations of dentifrices, such as toothpowder and toothpaste causes side effects such as gum irritation, canker sores, burning sensation and inflammation due to usage of chemicals.<sup>1</sup> In this study an attempt is made to dispense an alternative to the users by formulating herbal toothpowder using Indian nettle, Coconut spathe, Tulsi, Black jeera, Khair, Liquorice, Pepper, Camphor, Peppermint, Activated charcoal and Rock salt. In the present work, the herbal toothpowder was formulated and standardized by analyzing necessary evaluation parameters such as organoleptic, physical and phytochemical evaluation of herbal toothpowder.

**KEYWORDS:** Herbal toothpowder, Indian nettle, Coconut spathe, Tulsi

### I. INTRODUCTION

Herbal dentifrices helps in maintaining good oral health by preventing tooth decay, bad odor from mouth, inflammations in tissues and gums, plaque formation. As oral cavity shows good absorption due to presence of mucosal membrane, blood tissues and enzymes, an individual should use safe and efficient dentifrices. Most of the synthetic tooth products use fluorides and sodium lauryl sulfate. The fluorides are toxic to human body as they cause neurological and endocrine dysfunction.<sup>1-3</sup> Sodium lauryl sulfate is hazardous and causes irritation in mouth and neurotoxicity in body.<sup>1,2,4</sup> This can be avoided by using an efficient herbal dentifrices.

An attempt is made to formulate herbal toothpowder by using Indian nettle, burnt ash of coconut spathe, Tulsi, Black jeera, Khair, Liquorice, Pepper, Camphor, Peppermint, activated charcoal and Rock salt.

The ingredients used in herbal toothpowder has shown anti-inflammatory action<sup>5</sup> (prevents gingivitis), anti-microbial activity (avoids plaque formation and tooth decay) and tooth whitening property. They are natural and they have more beneficiary actions. The raw materials used to formulate herbal toothpowder have better effect due to the presence of various phytochemicals which helps in maintaining oral health and improves biological functions of human body.

*Acalypha indica* (Indian nettle) contains phytochemicals such as flavonoids, saponins and terpenoids. Flavonoids exhibits anti-inflammatory property and it prevents gingivitis plaque formation and periodontitis.<sup>5</sup> The other medicinal properties of Indian nettle are it is a natural diuretic, protects the liver against damage caused by toxins and heavy metals.

*Ocimum basilicum* (Tulsi) contains eugenol, linalool, oleanolic acid, rosmarinic acid. It shows potent anticariogenic property and antifungal activity against two species of candida ( i.e *C. albicans* and *C. tropicalis*). It has curative nature against oral infections, tooth ache, leukoplakia and oral submucous fibrosis, pemphigus and folic ulcerations.<sup>6</sup>

*Nigella sativa* (Black Jeera) contains phytochemicals such as terpenoids, phytosterols, alkaloids and polyphenols. Black cumin acts as antioxidant and helps in removal of bad breath from oral cavity.<sup>7</sup> It also improves digestion, relieves joint pain and lowers the inflammation.

*Senegalia catechu* (Khair) acts as astringent and contains flavanoids, epicatechin, epigallocatechin, catecutannic acid and alkaloids. It aids in curing of pain and swelling inside the mouth, gingivitis, sore throat and mouth ulcers. It

provides healthy gums and tooth by mild massaging on daily basis.

Glycyrrhiza glabra (Licorice) contains secondary metabolites like saponins, flavonoids, isoflavonoids, chalcones, coumarins, auronones, benzofurans, phenols and stilbenes. It has effective action on porphyromonas gingivalis, oral cancer, dental caries, oral candidiasis, periodontitis and it acts as sweetening agent due to presence of glycyrrhiza.<sup>8</sup>

Piper nigrum (Pepper) contains piperine, d-limonene and caryophylline. It has strong anti-inflammatory and antimicrobial activity, it has been used in the treatment of abscesses, tooth ache and avoids decaying of tooth.<sup>9</sup>

Cinnamomum camphora (Camphor) is a terpenoid which has important role in oral healthcare. It

prevents dental caries, periodontitis, dental plaque, oral ulcers and pulpitis.<sup>10</sup>

Mentha piperita (Peppermint) contains phytochemicals such as mentha, menthone and flavonoid glycosides. It exhibits strong antimicrobial activity against many gram positive and gram negative bacteria and other oral

microorganisms. Its cooling effects helps in refreshment of mouth. It assists in formation and maintenance of oral bone density and strengthens the gum. It is also used as flavouring agent.<sup>11</sup>

Coconut spathe fibres in burnt ash form acts as cleaning agent by removing all the stains and oily contents from oral cavity.<sup>12</sup>



Activated Charcoal has the capacity to remove stains, tooth whitening property and acts on acidic plaque, provides fresh odour to oral cavity.

Rock salt helps in remineralization of enamel and avoids halitosis, gum diseases, cancer sore and tooth decay.




Ideal properties of herbal tooth powder.<sup>13</sup>

- Non-irritant and non-toxic
- Impart no stains on tooth
- Good abrasive effect
- Keeps the mouth fresh and clean
- Economical and easily available
- Prolonged refreshing effect

Herbal toothpowder Ingredients used in formulation, Botanical name and its uses along with images are tabulated in the Table number -1

SL. NO	INGREDIENTS	BOTANICAL NAME	PHOTO OF SAMPLE USED	USES
1.	Indian nettle	Acalypha indica		Anti-inflammatory
2.	Coconut spathe	Cocos nucifera		Cleansing agent

3.	Tulsi	Ocimum basilicum		Bactericidal
4.	Black jeera	Nigella sativa		Antioxidant
5.	Khair	Senegalia catechu		Astringent
6.	Liquorice	Glycyrrhiza glabra		Sweetening and foaming agent
7.	Pepper	Piper nigrum		Prevention of tooth decay
8.	Camphor	Cinnamomum camphor		Refreshing agent

9.	Peppermint	Mentha piperita		Antimicrobial agent
10.	Activated Charcoal	-		Whitening agent
11.	Rock salt	-		Cleaning agent

## II. MATERIALS AND METHODS

The herbal toothpowder was prepared by using Indian nettle powder, Burnt ash of coconut spathe, Tulsi, Black jeera, Khair, Liquorice, Pepper, Camphor, Peppermint, Activated Charcoal, Rock salt. Coconut spathe was incinerated into ash using muffle furnace. All the

herbal ingredients were weighed according to ascending order of its weight. Weighed ingredients were triturated using mortar and pestle. The powdered herbal materials were sieved through the mesh size 85 and stored in air tight container. The composition of developed formulation is summarized in the table 2.

Table 2 – Formulation of herbal toothpowder

SL.NO	INGREDIENTS	QUANTITY (100gm)
01.	Indian nettle	30gm
02.	Coconut spathe	4gm
03.	Tulsi	15gm
04.	Black jeera	10gm
05.	Khair	1gm
06.	Liquorice	15gm
07.	Pepper	8gm
08.	Camphor	1gm
09.	Peppermint	10gm
10.	Charcoal	10gm
11.	Rock salt	6gm

### III. EVALUATION

#### Organoleptic characters

The sample was evaluated for organoleptic characters like color, odor, taste, appearance and solubility, flow.

#### Determination of loss on drying<sup>13</sup>

2 gm of sample was taken in the oven at 105°C, then cooled. The loss of weight is recorded as percentage loss on drying and calculated by the given formula.

#### %Loss on drying

$$= \frac{\text{weight of sample after drying}}{\text{sample weight}} * 100$$

#### Determination of pH<sup>13</sup>

About 1gm of sample was taken in 25ml beaker. To this 5ml of freshly boiled and cooled water (at 27°C) was added. Stirred well to make a thorough suspension. pH of suspension was determined using pH meter.<sup>13</sup>

#### Determination of Bulk density

About 10gm of sample was weighed and placed it in dried graduated measuring cylinder and note volume as V1 mL. Cylinder containing sample was placed in bulk density apparatus and operated for 50 tapping. The volume occupied by the powder was recorded as V2 ml and calculated by given formula.

$$\text{Bulk density} = \frac{\text{Untapped density} - \text{Tapped density}}{\text{Volume}}$$

#### Determination of flow property [Angle of repose]

Clean and dry funnel with round stem of 30 mm diameter with flat tip was taken and attached to the burette stand. Graph paper sheet was placed below the funnel and distance between lower tip of the funnel and sheet was adjusted to height of 2cm. Sample was poured in funnel from top till a heap of powder formed and touched the lower tip of the funnel. Circle was drawn around the heap covering the total sample powder. The average diameter and radius of the circle followed by height was recorded and calculated by using given formula

$$\theta = \tan^{-1} h/r$$

#### Determination of foaming power<sup>13</sup>

About 5gm of sample was taken in measuring cylinder with sufficient amount of water. Initial volume was noted and then shaken for 10 mins.

The final volume of foam was noted and calculated by using given formula.

$$\text{Foaming power} = \frac{V1 - V2}{V2}$$

V1 = Volume in ml of foam with water

V2 = Initial volume with water

#### Chemical Evaluation

##### Detection of alkaloids

- Dragendroff's test:** Sample was dissolved in dilute hydrochloric acid and treated with dragendroff's reagent (Potassium bismuth iodide solution). Presence of alkaloids is indicated by formation of red precipitate.
- Mayer's test:** Sample was dissolved in dilute hydrochloric acid and with mayer's reagent (potassium mercuric iodide solution). The presence of alkaloids is indicated by a yellow cream precipitate.

##### Detection of flavonoids

- Lead acetate test:** Sample was treated with lead acetate solution. The presence of flavonoids is shown by the formation of a yellow-colored precipitate.
- Alkaline reagent test:** Sample was treated with sodium hydroxide solution. The presence of flavonoids is shown by the development of a bright yellow colour that fades to colorlessness when dilute Acid is added.

##### Detection of carbohydrates

- Fehling's Test:** Sample was dissolved in 5ml of distilled water and dissolved Sample was hydrolyzed with dilute HCl and neutralized with alkali finally heated with fehling's A and B solution. Development of red precipitate indicates the presence of carbohydrates.
- Molisch's Test:** Sample was dissolved in 5ml of distilled water in test tube. Dissolved sample was treated with few drops of alcoholic  $\alpha$ -naphthol solution and 2ml of Concentrated sulphuric acid was added deliberately along the sides of the test tube. The presence of carbohydrates is indicated by the development of a violet ring at the junction.

### IV. RESULTS AND DISCUSSION

The prepared herbal toothpowder was subjected to under mentioned evaluation. All results are average of three replicas.

- Organoleptic Evaluation:** Distinct parameters were studied such as: Color, Odor, Taste, Appearance, Solubility and Flow and tabulated in table 3.

Table 3 – Organoleptic evaluation.

SL.NO	PARAMETERS	OBSERVATION
01.	Color	Greenish black
02.	Odor	Aromatic
03.	Taste	Aromatic
04.	Appearance	Acceptable
05.	Solubility	Soluble in water
06.	Flow	Good flow

The formulated herbal toothpowder was greenish black in color. Odor, Taste and appearance was aromatic and acceptable. Herbal toothpowder was soluble in water and has good flow property.

**1. Physical Evaluation:** The physical evaluation such as Loss on drying(%), pH value, Bulk Untapped density, Tapped density, Angle of repose and Foaming power was carried out as per standard method and tabulated in table 4.

Table 4 – Physical evaluation.

SL.NO	PARAMETERS	OBSERVATION
01.	Loss on drying(%)	8%
02.	pH (1% W/W)	7
03.	Bulk untapped density (gm/ml)	32.5
04.	Tapped density (gm/ml)	27.5
05.	Angle of repose	30.62
06.	Foaming power	0.7ml

The formulated herbal toothpowder has 8% of loss on drying and have good stability. pH value of herbal dentrifice has 7, which is neutral and does not show any irritation in oral cavity.

Bulk untapped density and tapped density is 32.5 and 27.5 respectively and the difference between these two values is 5 which shows good porosity value.

Angle of repose value is 30.62 which shows excellent flow property of herbal toothpowder.

Foaming power of herbal toothpowder is 0.7ml. At present times consumers are preferring foamless toothpowders therefore the formulated herbal dentrifice in present work is more suitable for consumers use.

**2. Chemical Evaluation:** The formulated herbal toothpowder were subjected to chemical analysis and results are tabulated in table 5.

Table 5 – Chemical evaluation

SL.NO	TEST	RESULT
01.	Dragendroff's test	Present (+)
02.	Mayer's test	Present (+)
03.	Lead acetate test	Present (+)
04.	Alkaline reagent test	Present (+)
05.	Fehling's test	Absent (-)
06.	Molisch's test	Absent (-)

After conducting the above chemical analysis, the formulated herbal toothpowder shows the presence

of alkaloids and flavonoids which is responsible for anti-inflammatory property and there is absence of carbohydrates.

### CONCLUSION

The good quality and purity of the herbal toothpowder has met with almost all the parameters and comes under the specified limits. This toothpowder reduces inflammation, bad odor and plaque formation. Usage of herbal toothpowder twice a day is safe and effective. Oral hygiene can be maintained in a reliable, safe and inexpensive way by using herbal tooth powder.

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