



## FORMULATION AND EVALUATION OF A POLYHERBAL DENTIFRICE

**Dr. G. N. Pramodini<sup>1</sup>, C. Muralikrishna Goud<sup>2</sup>, Syed Hafeez Ahmed<sup>3</sup> and Dr. Shaik Mohd. Khasim<sup>4</sup>**

<sup>1</sup>Professor (Department of Pharmacognosy) - Shadan College of Pharmacy, Peerancheru, Hyderabad-500091, Telangana, India.

<sup>2</sup>Associate Professor (Department of Pharmaceutics) - Shadan College of Pharmacy, Peerancheru, Hyderabad-500091, Telangana, India.

<sup>3</sup>Associate Professor (Department of Pharmaceutical Analysis) - Shadan College of Pharmacy, Peerancheru, Hyderabad-500091, Telangana, India.

<sup>4</sup>Director and Professor (Department of Pharmacology) - Shadan College of Pharmacy, Peerancheru, Hyderabad-500091, Telangana, India.

**\*Corresponding Author: Dr. G. N. Pramodini**

Professor (Department of Pharmacognosy) - Shadan College of Pharmacy, Peerancheru, Hyderabad-500091, Telangana, India.

Article Received on 23/03/2022

Article Revised on 13/04/2022

Article Accepted on 03/05/2022

### ABSTRACT

Dentifrices have been used since the ancient past and one of main irreplaceable components of oral health care. During that period, squashed none, pulverized egg and clam shells were utilized as abrasives as a part of tooth cleaning. In recent years, focus has been shifted towards the release of active ingredients during the formulation development to prevent and / or treat oral illness. But some substances show unpleasant side effects such as tooth staining and altered taste. This led to increased attention of using natural ingredients in herbal dentifrices. Herbal extracts are used in dentistry for treatment of various dental disorders. The natural photochemical could offer an effective alternative to antibiotics and represent a promising approach to prevention and therapeutic strategies for various oral infections. The herbal remedies have an edge over conventional antibiotic treatment that suffer the limitation of low benefit to high risk as compared to herbal treatment that possess high benefit to low-risk ratio. The main of this experiment is to formulate and evaluate polyherbal tooth powder. The five plant samples that have been employed in this project are *Pongamia pinnata*, Clove, Betel, tulsi and ginger. They are normally used as ancient medicines. However these plants conjointly contribute a good deal to the ayurvedic medicines since history. Polyherbal tooth powder was formulated and its evaluation was performed. The evaluation results were compared with the marketed tooth powder which was taken as the standard reference (Vico Vajradanti) and the results were found to be equivalent.

**KEYWORDS:** *Pongamia pinnata*, Clove, Betel, tulsi and ginger.

### INTRODUCTION

Oral hygiene is an important key to maintain good appearance, impression of an individual and gives confidence. Tooth Powder promotes oral hygiene, serves as an abrasive agent that aids in removing the dental plaque and food from the teeth and also helps to prevent tooth and gum diseases like Gingivitis, cavities and stained teeth.<sup>[1]</sup>

The tooth consists of two parts, crown and the root. The Crown of the tooth is covered by outer surface called enamel and it is the hardest tissue in the tooth. Th major composition of the enamel is hydroxyl apatite other than that it consists of water and keratin. Dentine is the beneath part of the enamel which is a composition of hydroxyapatite. It also consistsof 70% of the collagen water.<sup>[2]</sup>

Oral dentifrice consists of tooth Powder and tooth paste which had been originated many thousands of years ago. In the ancient period people may have used some of these ingredients such as burnt, egg shells, crushed animal bone ash, myrrh and Oyster shells which were converted to Powder which was used to remove mouth odours and clean and polish the tooth. During the 19<sup>th</sup> century homemade and manufactured tooth powders came into existence that contained salt, chalk, baking soda which had reached a height of their popularity.

Tooth Powder containing active pharmaceutical ingredients, abrasives, humectants, detergents, binders, sweeteners, preservatives and antioxidants and flavors are the most commonly used ingredients of tooth powders.<sup>[3,4]</sup>

**Ideal properties of toothpaste<sup>[5]</sup>**

- Good abrasive effect
- Non irritant and non toxic
- Impart no stain in tooth
- Keep the mouth fresh and clean
- Prolonged effect
- Cheap and easily available

Hence, nowadays there is a need for a safe, effective and well formulated dentifrice. To achieve this present work deals with the formulation and evaluation of a Polyherbal dentifrice containing *Pongamia pinnata*, clove, tulsi, ginger, betel was formulated and evaluated and which are effective in the treatment of tooth problems like gum, dental cavities and gingivitis.

**POLYHERBAL FORMULATIONS**

Polyherbal formulations refer to formulations in which two or more than two herbs are involved to develop a product to reduce adverse events by enhancing the therapeutic action and reducing the single herbs concentrations. Sometimes, these herbs are combined with mineral preparations. The concept of polyherbal formulation is well-established and documented in the literature of ancient history. Today, a challengeable task is subjected to concern on the development of a stable polyherbal formulation because of the wide diversity of chemical compounds in different medicinal plants. They

are compilation of therapeutic entities that are formulated and prepared on the basis of the healing properties of individual ingredients with respect to the condition of sickness. Such herbal constituents with diverse pharmacological activities principally work together in a dynamic way to produce maximum therapeutic benefits with minimum side effects. Different polyherbal formulations are available in today’s market.<sup>[6,7,8]</sup>

**MATERIALS AND METHODS**

The Polyherbal dentifrice contains *Pongamia pinnata*<sup>[9]</sup>, clove, ginger, tulsi and piper betel. The main active ingredient is *Pongamia pinnata* belonging to the family leguminaceae. It is a tree which grows wild in the coastal forests throughout India and besides the streams and rivers. During the course of our literature work we found that the plant *Pongamia pinnata* is traditionally used to treat tooth problems and apart from this it is having many other medicinal uses like anti-ulcer, anti diarrhoeal, anti-oxidant, anti plasmodial anti-bacterial and anti-viral activities. So from the literature review we came to the conclusion that the plant *Pongamia pinnata* is only traditionally used in tooth problems and no work related to this has been done till now. Hence we tried to explore *Pongamia pinnata*’s traditional claim i.e., we have taken up to expedite to formulate and evaluate this Polyherbal dentifrice containing *Pongamia pinnata* as a main drug.



**FIG 1: PONGAMIA PINNAT.**

**3 MATERIALS AND METHODS FORMULATION**

**Formula setup (Test sample)**

**Table 1: Formula of the formulation.**

S.NO	INGREDIENT	QUANTITY
1	Pongamia pinnata	10 gm
2	Piper beetle	10 gm
3	Tulsi	10 gm
4	Clove	10 gm
5	Ginger	10 gm

**Table 2: Polyherbal dentifrice parts used in the formulation.**

S.NO	COMMON NAME	BOTANICAL NAME	PARTS USED	CATEGORY	QUANTITY (gm)
1	<i>Pongamia pinnata</i> 	<i>Millettiapinnata</i>	Roots	Antibacterial	10

2	 <p>Clove</p>	<i>Eugeniacyo phyllata</i>	Fruits	Antibacterial	10
3	 <p>Ginger</p>	<i>Zingiberoffici nale</i>	Root	Antiseptic	10
4	 <p>Tulsi</p>	<i>Ocimumsanct um</i>	Leaves	Prevents bad breath	10
5	 <p>Betel</p>	<i>Piperbetle</i>	Leaves	Antibacterial	10

### Method of preparation

**SHADAN COLLEGE OF PHARMACY**

**HERBAL TOOTH POWDER**

**INGREDIENTS**

P.PINNATA-10 gm

P.BETLE -10 gm

CLOVE - 10 gm

TULSI -10 gm

GINGER -10gm



BEST BEFORE 12 MONTHS FROM THE DATE OF MANUFACTURING

FOR APPLICATION ON GUMS AND TEETH

TO BE STORED AT ROOM TEMPERATURE ON

Dried leaves of the Plants Tulsi, Piper betle and Pongamia pinnata<sup>[9,10]</sup>, Clove buds, ginger, mortar pestle, weighing balance.

#### Method

- Fresh leaves of the Plants tulsi, piper betle and Pongamia pinnata are collected and dried in sunlight.
- On the other side, few clove buds and rhizome of the ginger are taken and are left in sunlight for drying.
- Collect the dried leaves of the mentioned plants.
- All the dried ingredients were crushed and grounded
- Collect the powdered form of the leaves and weigh 10 grams of each separately.
- Mix the powdered form of each herb and the resultant 50 grams of powder is the required Polyherbal tooth powder

## Standard reference sample: VICO VAJRADANTI TOOTH POWDER



Fig 1: Vico Vajradanti Powder.

Table 3: Formula of standard reference sample.

S.NO	INGREDIENT	QUANTITY IN GRAMS	S.NO	INGREDIENT	QUANTITY IN GRAMS
1	Babhul	0.06g	11	Bakul	0.22g
2	Jambhul	0.05g	12	Jeshthamadh	0.016g
3	Lavang	0.005g	13	Kavab-Chini	0.06g
4	Manjishtha	0.06g	14	Anantmul	0.01g
5	Dalchini	0.002g	15	Maifal	0.01g
6	Bor	0.02g	16	Trifala	0.04g
7	Vajradanti	0.04g	17	Ajwan	0.005g
8	Acrod	0.003g	18	Akkalkadha	0.01g
9	Khair	0.02g	19	Alum	0.038g
10	Patang	0.02g	---	---	---

## EVALUATION OF TOOTHPOWDER

## Test Samples and standards

The extracts of Vico vajradanti tooth powder was the standard samples.

## Evaluation parameters

**Volatile matters and moisture<sup>[11]</sup>:** A specific amount of the product required to be taken in a dish and drying was done till constant weight. Loss of weight will indicate percentage of moisture and volatile matters.

**Foaming character:** This test was specially required for foam forming tooth powders. Specific amount of product can be mixed with specific amount of water to be shaken. The foam thus formed was studied for its nature, stability, washability.

**Flow property:** Flow property is determined by Angle of repose in Funnel method. ( $\theta = \tan^{-1} h/r$ )

**Bulk density:** Bulk density was determined by Tapped and untapped volume of the powder

## • EVALUATION TEST RESULTS

Table 4: Moisture content of the test sample and standard sample.

TYPE	MOISTURE CONTENT
Test sample	12.67 ± 0.441% w/w
Standard sample	10.06 ± 1.766% w/w

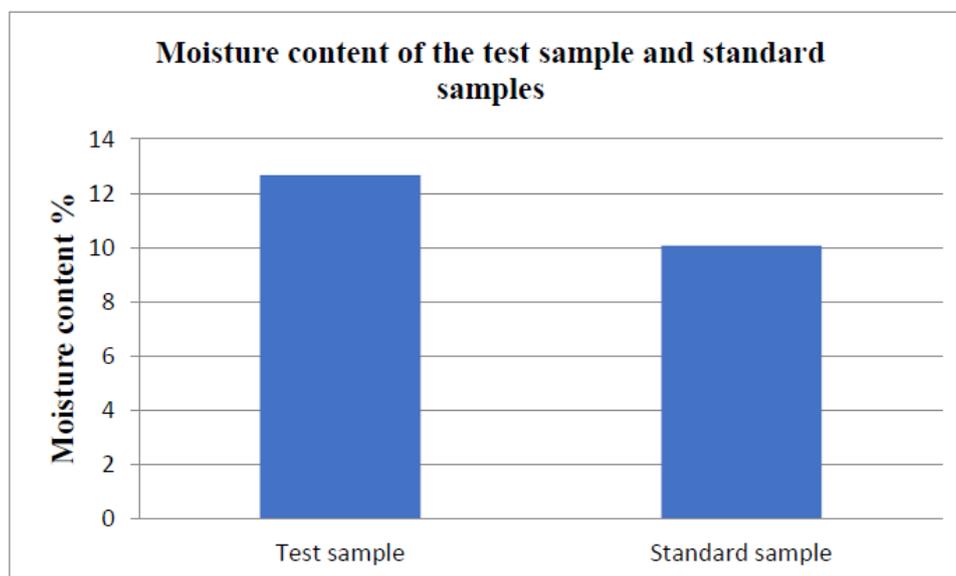


FIG 2: Moisture content of the test sample and standard samples.

Table 5: Foaming characters of the test sample and standard sample.

TYPE	% OF SOLUTION	VOLUME OF FOAM
Test sample	1 %	$0.5 \pm 0.05774$
	2 %	$0.3333 \pm 0.08819$
Standard sample	1 %	$4.6667 \pm 0.3333$
	2 %	$9 \pm 1.528$

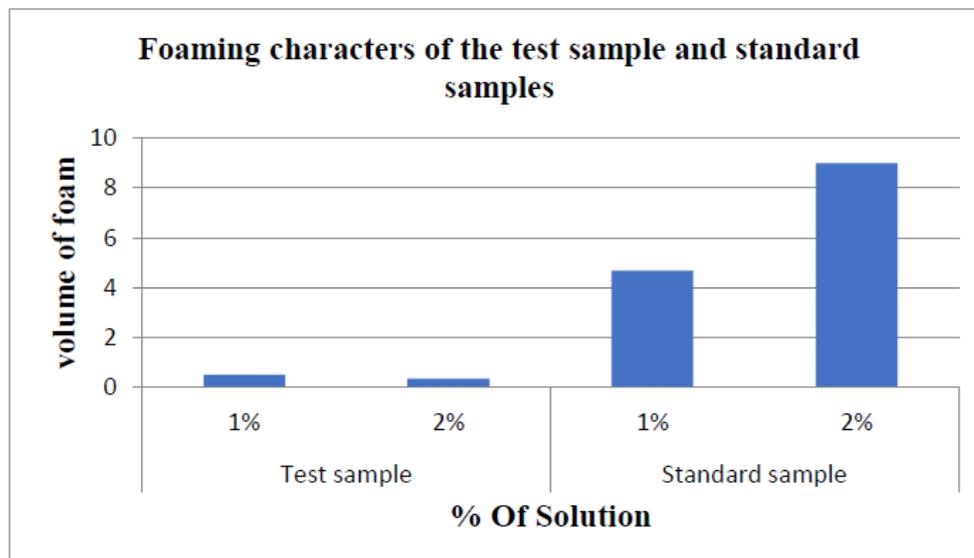


FIG 3: Foaming characters of the test sample and standard samples.

Table 6: Bulk density of the test sample and standard sample.

SAMPLE	TYPE	BULK DENSITY
Test sample	Untapped density	$0.528 \pm 0.017$
	Tapped density	$0.391 \pm 0.011$
Standard sample	Untapped density	$0.478 \pm 0.022$
	Tapped density	$0.613 \pm 0.033$

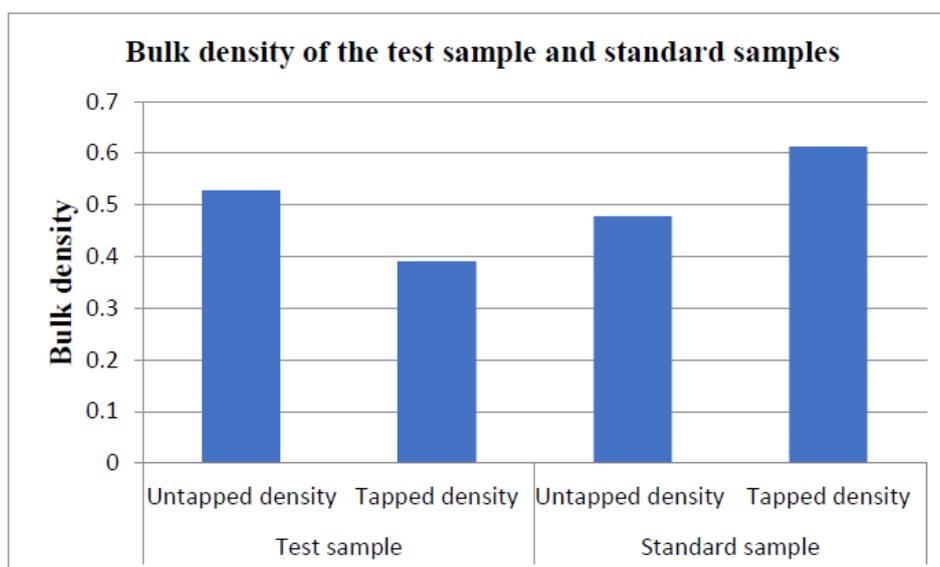


FIG 4: Bulk density of the test sample and standard samples.

Table 7: Flow properties of the test sample and standard sample.

TYPE	RADIUS(cm)	HEIGHT(cm)	h/r	$\theta = \tan^{-1} h/r$
Test sample	$3.24 \pm 0.0251$	$3.46 \pm 0.0333$	$1.077 \pm 0.0064$	$47.2 \pm 0.2292$
Standard sample	$3.5 \pm 0.0288$	$3.76 \pm 0.0666$	$1.07 \pm 0.0286$	$47.09 \pm 0.716$

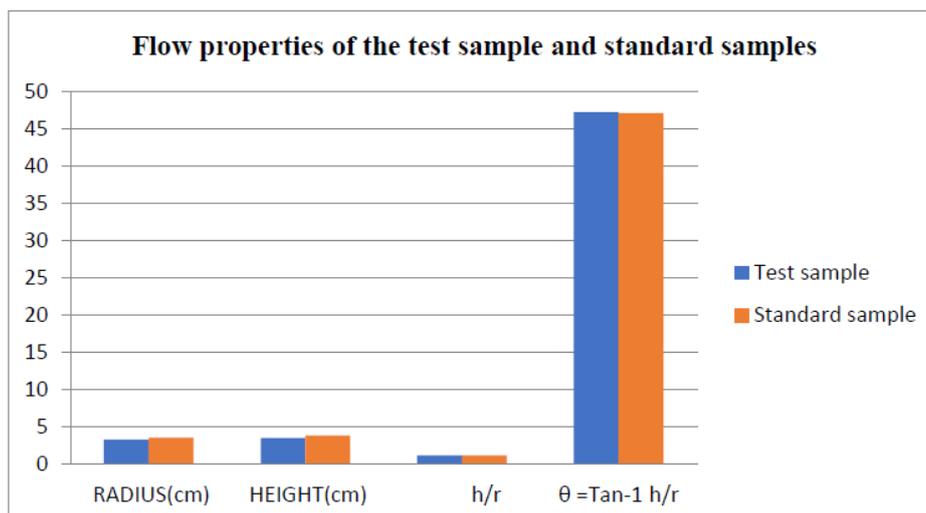


FIG 5: Flow properties of the test sample and standard samples.

## DISCUSSION

The herbal extracts have been used since ancient times which contain the active ingredients that help to prevent/treat illness and promote health and healing.

They are used in dentistry for treatment of various dental disorders and offer an effective alternative to antibiotics and herbal treatment possess high benefit to low risk ratio.

The main aim of this work was to formulate and evaluate the poly herbal tooth powder, here are the five plant samples that have been employed in this project are:

- 1- *Pongamia pinnata*.<sup>[9,10]</sup> It is a member of the leguminosae family. Its extracts have hypotensive effects, also used in bronchitis, chronic fever, whooping cough and chronic skin diseases; also it has anti-inflammatory, antiviral and antispasmodic effects.
- 2- Clove: It contains Eugenol as an active ingredient which mainly possesses pharmacological properties of the drug; it is used in the food, beverages and toothpaste because of its analgesic and antiseptic activity. It possesses anti-diabetic, antifungal, antioxidant activities etc. It has gained wide acceptance in Dentistry.
- 3- Tulsi: It is a highly revered culinary and medicinal aromatic herb from the family Lamiaceae. Its extracts are used in the treatment of bronchitis, rheumatism and pyrexia, headache, wounds, inflammation etc.
- 4- Ginger: It belongs to the family zingiberaceae and commonly called as wild ginger. It is used as stomachic, stimulant and carminative and it is used more as a spice and also as a flavouring agent.
- 5- Piper betel: also called Paan leaves used for foul smell in mouth and strengthen teeth. It is widely used as mouth freshener and acts as a gentle stimulant and also possesses other activities like anthelmintic, antibacterial laxative, stimulant etc.

The leaves of tulsi, piper betel and *Pongamia pinnata* are collected and dried. Whereas the clove buds are sun dried.

After collection they are converted into powdered form and are taken in sufficient quantities for evaluation.

Then they are evaluated with the extracts of Vicco vajradanti tooth powder as a standard sample. After evaluation the test were performed to identify the foaming character, bulk density and flow properties followed by its phytochemical screening which includes tests for flavonoids saponins, carbohydrates, tannins, protein, alkaloids, starch, fats, terpenoids and phenols. Moisture content of the formulation was determined and upon comparison with standard reference sample the results were found to be within limits.

## CONCLUSION

The use of plants and herbs for dental care is a very common indigenous system of medicine and it must be included in everyday life. The active principles of plants should be incorporated into modern oral health-care practices and dentists should be encouraged to use natural remedies in various oral health treatments. Herbs are used to reduce inflammation, and calm and soothe irritation. Herbs may be used internally as pills, syrups, and infusions, or externally as poultices, plasters, and liniments. This will make dentistry much safer, affordable and more accessible for the lower socio-economic groups in society. In future, studies on efficacy of ayurvedic herbs should be carried out in developing countries like India to establish their therapeutic benefits either alone or in combination with conventional therapies.

The medicinal plant *Pongamia pinnata* and beetle leaf is famous for its dental analgesic potential in the herbal world is concerned. Apart from this, the ginger, tulsi and clove were used and the formulation of herbal tooth powder was carried out. The evaluation of herbal tooth

powder was done and compared it with standard sample (Vicco vajradanti) and the results were found to be within the limits. This proves that the Prepared herbal tooth powder can be useful to treat the dental caries and dental plaque with the scientific documentation. However in future more research on this study has to be carried out.

## REFERENCES

1. Oral health. [www.who.int. https://www.who.int/news-room/fact-sheets/detail/oral-health](https://www.who.int/news-room/fact-sheets/detail/oral-health).
2. Lacruz RS, Habelitz S, Wright JT, Paine ML. DENTAL ENAMEL FORMATION AND IMPLICATIONS FOR ORAL HEALTH AND DISEASE. *Physiol Rev.*, 2017; 97(3): 939-993.
3. Martin MR and David G: pharmaceutical dosage forms: Disperse system. Marcel Dekker In., New York, 1996; 2: 423-447.
4. Mehata RM; A text book of pharmaceuticals; vallabh prakashan, 5<sup>th</sup> edition- 2015; 215-218.
5. Jagtap AM, Kaulage SR, Kanse SS, Shelke VD, Gavade AS, Vambhurkar GB, Todkar RR, Dange VN. Preparation and Evaluation of Toothpaste. *Asian J. Pharma Ana.*, 2018; 8(4): 191-194.
6. Phalke PL, Rukari TG and Jadhav AS: Formulation and evaluation of toothpaste containing combination of aloe and sodium chloride. *Int J Pharm Sci & Res.*, 2019; 10(3): 1462-67.
7. Parveen A, Ahmad QZ, Rashid M, Rahman A, and Rehman S, Study of antimicrobial activity of Unani poly herbal toothpaste “*Sunoon Zard*”. *HELIYON*, 2021; 7(2): 565- 569.
8. Pentapati KC, Kukkamalla MA, Siddiq H and Sabnis N, Effectiveness of novel herbal dentifrice in control of plaque, gingivitis, and halitosis – Randomized controlled trial. *Journal of Traditional and Complementary Medicine*, 2020; 10(6): 565-569.
9. Badole SL and Patil KY. Chapter 45 - Polyphenols from *Pongamia pinnata* (Linn.) Pierre in Metabolic Disorder. *Polyphenols in human health and disease*, 2014; 1: 607-610.
10. Mbaveng AT, Zhao Q and Kuete V. 20 - Harmful and Protective Effects of Phenolic Compounds from African Medicinal Plants. *Toxicological Survey of African Medicinal Plants*, 2014; 577-609.
11. Mude G, Pise S and Thombare G. Formulation and evaluation of polyherbal toothpaste and comparative study with marketed formulations. *International Journal of Creative Research Thoughts*, 2020; 8(5): 3796-806.
12. Sharma S, Agarwal S.S, Prakash J, Pandey M and Singh A. Formulation development and quality evaluation of polyherbal toothpaste “Oral S” *Int. J. of Pharm. Res. & All. Sci.*, 2014; 3(2): 30-39.