



## DEVELOPMENT AND CHARACTERIZATION OF HERBAL TOOTHPASTE CONTAINING *NEEM EXTRACT*; COMPARED WITH MARKETED PRODUCT

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### ABSTRACT

Since many centuries, Ayurveda regarded neem as a cure for many ailments, predominantly due to its superb antimicrobial activity. It possesses anti-bacterial, anti-cariogenic, anti-hermitic, anti-diabetic, anti-oxidant, astringent, anti-viral, cytotoxic, and anti-inflammatory activity. Nimbidin, Azadirachtin and nimbinin are active compounds present in Neem which are responsible for antibacterial activity. Neem bark has anti-bacterial properties; it is quite useful in dentistry for curing gingival problems and maintaining oral health in a natural way. Neem twigs are used as oral deodorant, toothache reliever and for cleaning of teeth. It has been a practice since time immemorial to use tender twigs of neem as dentifrice. In addition to the antimicrobial activity it was thought that the small fibers in the powder may act as

abrasive thereby potentiating the activity of the dentifrice. The scope of the present work is limited to testing the antibacterial activity of neem extract and neem powder in a tooth paste form. The formulated herbal toothpaste compared with marketed preparation. Physical examination: smooth in nature, Odour- Characteristic, pH-8.5, homogeneity-good, Taste- Characteristic, spreadability-good and stable the formulation. The antimicrobial evaluation *Streptococcus viridans* reveals that formulated growth of microorganism was inhibited.

**KEYWORDS:** Tender twigs of neem, Antimicrobial activity, Azadirachta indica.

## INTRODUCTION

Since antiquity neem has been renowned for healing. The earliest Sanskrit medical writings refer to the benefits of its fruits, seeds, oil, leaves, roots, and bark. Each of these has been used in the Indian Ayurveda and Unani systems of medicine. The neem has been antibacterial activity is has evaluated from the ancient times. It has been used for the various activities like as astringent, antiseptic, insecticidal, anti ulcer and for cleaning the teeth in pyorrhea and other dental disease. The extract of neem showed superior antiviral and anti-hyperglycemic activity in vitro and in vivo on animals. It showed good in vitro broad range antibacterial activity.<sup>[1]</sup>

The primary acid tolerant bacteria associated with dental plaque including *Streptococcus mutans*, *Streptococcus oralis*, *Streptococcus sobrinus*, *Lactobacillus acidophilus*, *Streptococcus salivarius*, *Streptococcus mitis*, *Streptococcus sanguis*, *Streptococcus intermedius*, and *Streptococcus anginosus* that surround orthodontic appliances are a common problem in many patients undergoing orthodontic treatment. It has also been reported that presence of fixed orthodontic appliance greatly inhibits oral hygiene and creates new retentive areas for plaque and debris.<sup>[1]</sup>

The chemical constituents consist of various biologically active compounds that can be derived from the neem tree, including steroids, triterpenoids, alkaloids, carotenoids, ketones, flavonoids, and phenolic compounds biologically more active compound is azadirachtin, which is actually a mixture of seven isomeric compounds named as azadirachtin A-G and azadirachtin E is the most effective one.<sup>[2]</sup> Other compounds that have a biological activity are salannin, volatile oils, meliantriol and nimbin.<sup>[3]</sup>

The aim of study was to formulate herbal base product was compare the efficacy and conventionally marketed formulated toothpaste and evaluated the various parameter like color, spreadability, foamability, extrudability and anti-bacterial activity.<sup>[4]</sup>

## MATERIALS AND METHODS

Tender stem of *Azadirachta indica* were collected from Solapur district. The stems were dried at room temperature to get coarse powder and fine preparation of paste by using domestic mixer. Fine neem powder was obtained by sifting through muslin cloth. The other ingredients used i. e. Calcium carbonate, SLS, Glycerin, Methyl cellulose; methyl paraben, propyl paraben, methanol, etc were of analytical grade.

### Preparation of extracts

Continuous hot extraction (Soxhlet extractor) with absolute alcohol at 50-70°C designated as Soxhlet Neem Extract. These extracts were dried by evaporation in vacuum oven. After evaporation, the dried extracts were evaluated for antimicrobial activity.

### Formulation of neem toothpaste

The standard toothpaste base was formulated as given in Table 1. Extracts of neem twigs Soxhlet Neem Extract were incorporated in the base. Formulation was filled in regular metal tube used for toothpastes. The storage in tube was done to avoid the problem of crusting and drying of toothpaste during evaluation and stability studies.<sup>[5]</sup>

### Evaluation of neem extract and neem powder

Evaluation of the extracts and the powders were carried out for antimicrobial activity. Antimicrobial activity was determined by Cup plate method. The plates were prepared by using sterile nutrient agar medium and were inoculated with the bacterial cultures obtained from oral swabs by using lawn culture technique. Microorganisms present in oral swab were *Streptococcus viridans* and *Streptococcus mutans*. Sterile discs were used to inoculate the formulation on the plates. The plates were incubated at 37°C for 24 hours and the observations were recorded for three consecutive days. The statistical mean of three readings of zone of inhibition was determined.

### Evaluation Studies

#### Ph<sup>[6]</sup>

pH of formulated herbal toothpaste was determined by using pH meter. 10g of toothpaste placed in 150ml of beaker. Allow to boil and then cool, stir vigorously to make a suspension.

#### Determination of moisture content<sup>[7]</sup>

5 g of formulation placed in a porcelain dish containing 6-8 cm in diameter and 2-4 cm depth in it. Dry the sample in an oven at 105°C. Moisture content was determined by following formula

% by mass =  $100 \frac{M_1 - M_2}{M_1}$  MI-Loss of mass (g) on drying

M- Mass (g) of the material taken for the test

### Spreadability

In this method slip and drag characteristic of paste involve. Formulated paste (2g) placed on the ground slide under study. The formulated placed like a sandwich in between this two glass Slide for 5 min to expel air and to provide a uniform film of the paste between slides. Excess of the paste was scrapped off from the edges. The top plate was then subjected to pull of 80g with the help of string attached to the hook and time (sec) required by the top slide to cover a distance of 7.5cm was noted. A short interval indicated better spreadability.

### Formula was used to calculate spreadability

$$S=M \times L / T$$

Where,

S= Spreadability

M= Weight in the pan (tied to the upper slide)

L= Length moved by the glass slide

T=Time (sec) taken to separate the upper slide from the ground slide.

### Foamability

The foamability of formulated toothpaste evaluated by taking small amount of formulation with water in measuring cylinder initial volume was noted and then shaken for 10 times. Final volume of foam was noted.

### Stability study

The stability study was performed as per ICH guideline. The formulated paste was filled in collapsible tube and stored at different temperature and humidity conditions, 25°C ± 2°C / 60% ± 5%, RH, 30° C ± 2°C / 65% ± 5% RH, 40°C ± 2°C / 75% ± 5% RH for the period of three months and studied for appearance, pH and spreadability.

### Heavy metals quantification<sup>[7]</sup>

Determination of heavy metals was done by atomic absorption spectrophotometer.

### Comparison

The formulated herbal toothpaste was compared with marketed preparation follows Anti-malarial activity, spreadability, foamability, pH determination, % moisture content.

## RESULTS AND DISCUSSION

The herbal tooth paste formulation was prepared from Neem extract and synthetic ingredient. At the trial phase of formulation three batches were performed due to the problem like homogeneity, spreadability, and foamability the two batch discarded permanently and only single batch was selected for next steps. The formulated toothpaste is light brown in color and showed the good homogeneity with absence of lumps and good antimicrobial activity. The aim of current research is to formulate toothpaste utilizing extract of *Neem*. In multiple clinical studies and antimicrobial studies used in dentistry for gingivitis, plaque control and curing oral mucosal lesions. The results of the evaluating parameters shows the promising results as compare to marketed formulations. Hence the lab made herbal toothpaste was found to be of good quality. The FTIR spectrum of *NEEM extract*(*Azadirachta indica*) is shown in fig.1.

**Table. 1: Formulation of toothpaste base selected for study.**

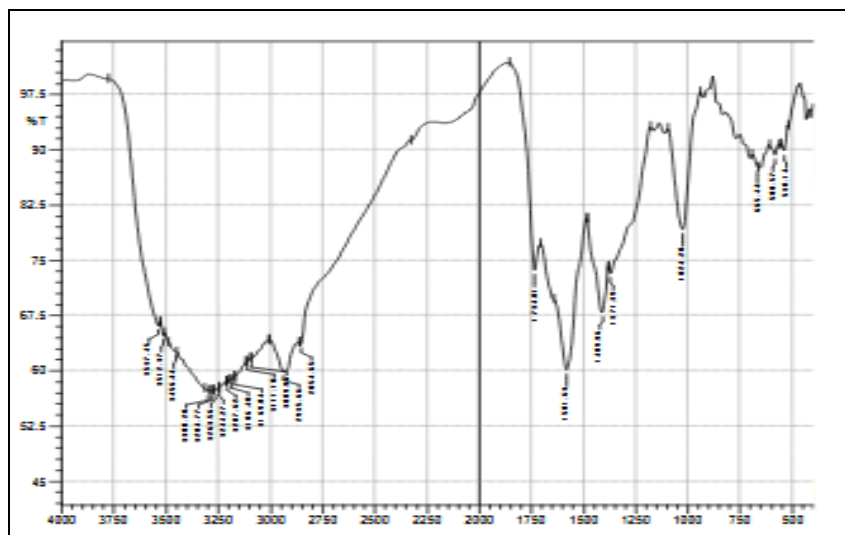
Sr. No.	Ingredients	Qty used (%)
1	Neem extract/powder	0.50
2	Calcium carbonate	35.00
3	Sodium lauryl sulphate	01.50
4	Glycerin	30.00
5	Methyl cellulose	01.00
6	Sodium saccharine	00.30
7	Methyl paraben	00.10
8	Propyl paraben	00.02
9	Titanium dioxide	00.50
10	Menthol	01.50
11	Purified water	q.s.

**Table. 2: Physical examination of tooth paste.**

Sr. No	Parameters	Observations
1	Color	Greenish Brown
2	Odour	Characteristic
3	Taste	Characteristic
4	Smoothness	Smooth

**Table. 3: Evaluation results of tooth paste.**

Sr. No.	Parameters	Results of Lab Product	Results of Marketed Product
1.	pH	8.3	8.55
2.	Foamability	9.5(Good)	11.2
3.	Moisture Content	11.30%	22.50%
4.	Homogenesity	Good	Good
5.	Stability	Stable	Stable
6.	Spreadability	3.8 Cm/Sec	4 Cm/Sec



**Figure No.1: FT-IR spectrum of Neem extract.**

## CONCLUSION

The research concluded that Herbal toothpaste is more acceptable in dental research and they are safer with minimum side effect than synthetic preparation. The formulated tooth paste is capable to the tooth and oral hygiene and show the anti-microbial activity against pathogen. The formulation compared with marketed preparation, therefore it shows the equal patronizing and engrossing passion over the marketed formulations. Oral hygiene can be maintained in a reliable, safe and inexpensive way by using herbal tooth pastes.

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