WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 14, 877-888. Research Article ISSN 2277–7105

"FORMULATION AND EVALUATION OF HERBAL TOOTH POWDER"

Dhananjay Kailas Dubile[*1], Waghmare S. U.[2], Abhishek Dhapse[3], Bhushan B. Wagh[4], Vishal Waghchuare[5]

[*1,3,4,5]UG Scholar of Rashtriya College of Pharmacy, Tq. Kannad Dist. Chh. Sambhajinagar, Maharashtra, India-431103.

[2]Assistant Professor of Rashtriya College of Pharmacy, Tq. Kannad Dist. Chh. Sambhajinagar, Maharashtra, India-431103.

Article Received on
22 May 2024,

Revised on 12 June 2024,
Accepted on 02 July 2024

DOI: 10.20959/wjpr202414-33160

***Corresponding Author**
Dhananjay Kailas Dubile
UG Scholar of Rashtriya College of Pharmacy, Tq. Kannad Dist. Chh. Sambhajinagar, Maharashtra, India-431103.

ABSTRACT

Aim: Formulation and Evaluation of Herbal Tooth Powder. **Objectives:** In order to maintain dental health, including breath freshness and prevention of tooth decay, tooth powder is used in conjunction with a toothbrush. The purpose of this effort was to create a tooth powder that may be used as a tool for good oral hygiene and to mitigate the negative effects of the traditional tooth powder made with artificial substances. **Material and Methods:** A variety of herbal substances with antibacterial, antiseptic, and cooling characteristics were used to produce the tooth powder. The herbal substances utilized in this study to create tooth powder include gum acacia, neem, mentha, clove, amla, tulsi, ritha, stevia, cinnamon, fennel, pudina, camphor, and backing soda. These compounds can meet all the necessary attributes to keep the mouth fresh and to prevent tooth decay.

KEYWORDS: Clove, baking soda, tooth decay, oral hygiene, and tooth powder.

INTRODUCTION

Figure 1: Teeth.

Maintaining proper oral hygiene is crucial for one's look, self-perception, and confidence. In addition to helping to prevent cavities, gingivitis, and other gum and tooth problems, tooth powder also acts as an abrasive to help remove food particles and dental plaque from teeth. The main dental problems include calculus, plaque, and gum disease.

It can be prevented and treated by using effective tooth powders and pastes. It is mostly caused by bacterial action, and mineralized deposition leads to plaque and calculus. These disorders are primarily caused by neglect in adequate dental care.[1,2] Because of its abrasive properties, tooth powder can be used as a preventive cosmetic to stop tooth decay and bad breath. When applied to the teeth, the powder and paste work to remove accumulated minerals and food debris from the teeth.[3] The abrasive nature of tooth powders is their basis; when applied to the teeth, the powder rubs against the teeth, helping to remove accumulated food debris and minerals.[6] Maintaining dental hygiene is crucial for overall wellness. Owing to variations in phyto-constituents, adulterants, and substitutes in the formulation of crude pharmaceuticals, their purity and quality are compromised.[7,8] Because of its bitterness, aroma, and antibacterial qualities, this plant is one of the most often included in the majority of herbal tooth powders that are sold today.[9]

Anatomy of Tooth[10]

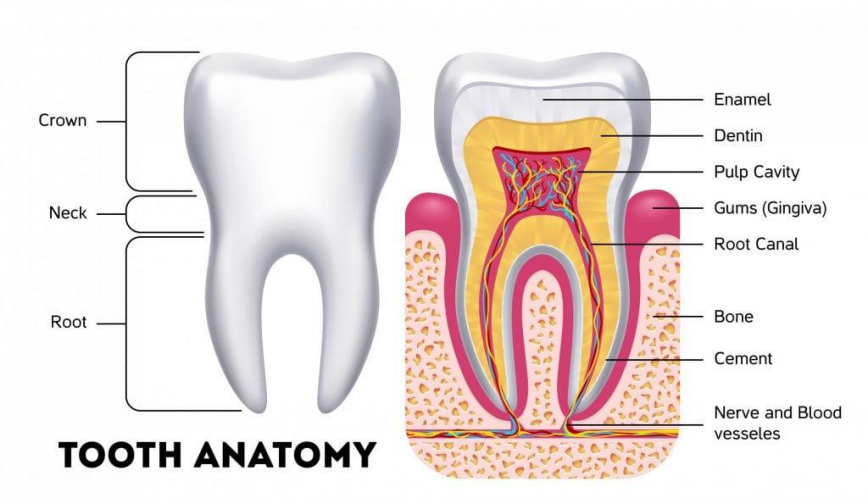

Figure 2: Tooth Anatomy.

A tooth's primary components are referred to as its anatomy

1. Crown: The portion of the tooth that is visible above the gum line

2. Neck: This is the area of the tooth that is between the root and the crown.

3. Root: The portion of the tooth that is anchored in the jawbone by its root.

4. Enamel: Mainly made of calcium phosphate, enamel is the hard outer covering of the crown.

5. Dentin: The hard tissue layer encircling the pulp beneath the enamel.

6. Pulp cavity: The tooth's soft tissue, which is home to connective tissue, blood vessels, and nerves connective tissue.

7. Gums: The gums encircle each tooth's neck region once tooth eruption is complete. Gum is linked to the cementum of each tooth as well as to the enamel of the tooth in addition to the nearby alveolar bone.

8. Root canal: The pulp chamber, which is often found inside the anatomic dental crown, and the root canal space, which is found inside the tooth's radicular section, make up the root canal system.

9. Bone: The majority of the structure of your teeth is composed of dentin, a bone-like substance that lies beneath the enamel of your teeth.

10. Cementum: A layer of connective tissue that covers the root and functions as a periodontal ligament anchor to help stabilize the tooth.

Different Types of Teeth

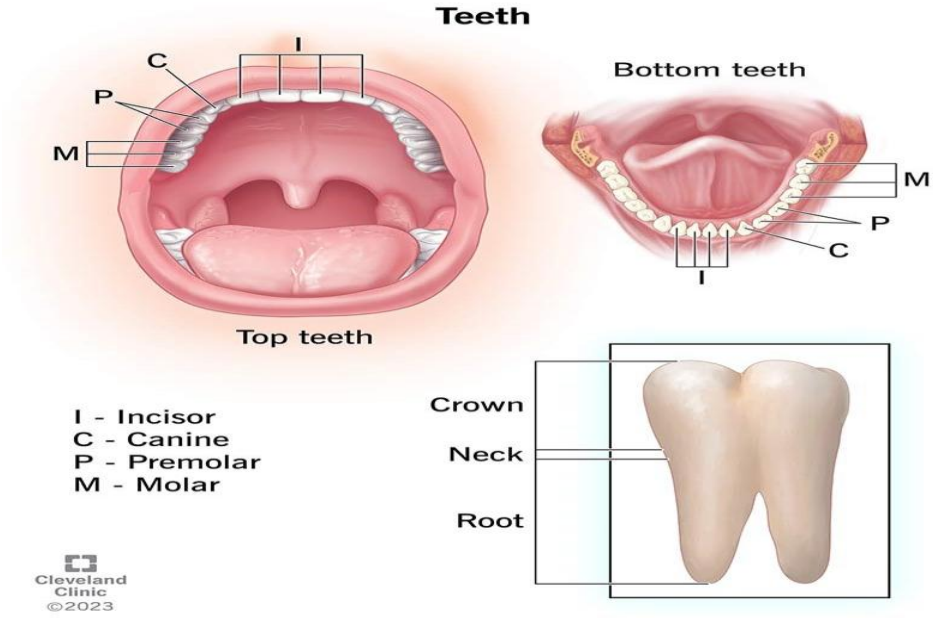

Figure 3: Anatomy of tooth.

In the typical adult human mouth, there are around 32 teeth total, 16 on each of the top and bottom jaws. There are five different types of teeth among these thirty-two, and they are distributed throughout the mouth for distinct functions.

- The mouth's eight molars. mostly flat back teeth that are ideally suited for mechanically crushing food. usually appear from the gums between the ages of 6 and 8.
- Eight incisors in the mouth. Sharp front teeth
- Four canins in the mouth.
- The mouth's eight premolars.
- Four wisdom teeth in the mouth. These problematic teeth, which are often referred to as the third molars, are situated in the very back of the mouth and are frequently surgically removed in adolescence to avoid problems from arising from their existence.

Building Blocks of Tooth Powder

➢ **Abrasive**

They are used to remove stains and shine teeth. The best results are obtained when the cleaning properties of one are combined with the abrasive action of the other. An abrasive's deterrent properties are affected by its type and quantity, the surface it comes into contact with, dilution with saliva, and brush pressure. Commonly used abrasives include silica/silicate hydrate, brushite, gibbsite, alumina hydrate, and calcium carbonate.[11]

➢ **Humectants**

During storage, they hydrate the toothpaste and prevent it from drying out. It adds to the smooth, creamy texture of the toothpaste. Humectants comprise substances such as propylene glycol, sorbitol, glycerin, and paraffin oil.[11,12]

➢ **Cleaning Agent**

They operate as surfactants, emulsify with a foaming action, and reduce surface tension to eliminate dirt. Sodium lauryl sulfate, sodium lauryl sarcoside, sodium monoglyceride sulfate, ethionates of fatty acids, sodium dodecylbenzene sulfonate, and PEG oil (polyethylene glycol oil) are a few of the detergents that are commonly added to toothpaste.[11,12]

➢ **Thickening Agent**

These hydrophilic colloids are used to stabilize dentifrice compositions because they scatter or swell in the presence of water, preventing the separation of the liquid and solid phases. One such example is xanthan gum.

➢ **Therapeutic Agents**

With toothpaste, active ingredients like as fluoride, triclosan, sanguinarine, and chlorhexidine are used to reduce tooth decay, control tartar accumulation, aid with desensitization, and provide antibacterial and anti-inflammatory qualities.[12]

➢ **Preservatives**

Preservatives prevent bacteria from forming in toothpaste, so there's no need to keep it in the fridge. Common preservatives include methylparaben, ethylparaben, and sodium benzoate.[11]

Types of Oral and Dental Disease

➢ **Cavities**

We use our jaws and teeth for a lot of different things, so it's not surprising that so many things wear down over time, particularly if you don't take excellent care of your teeth. Maintaining regular oral hygiene can help prevent the majority of dental and oral health issues. Caries, or dental decay, is another name for cavities. These are tooth regions that have accumulated damage over time and may eventually become cavities. Cavities are rather prevalent. They appear on your teeth as a result of food, acid, and bacteria combining to produce a plaque. Your teeth's enamel starts to break down due to the acid on them, exposing the dentin or connective tissue underneath. This could eventually cause permanent harm.[13,14]

➢ **Gum Disease**

Gingivitis, another name for gum disease, is another term for gum inflammation. It usually happens when plaque accumulates on your teeth as a result of improper brushing and flossing techniques. When you brush or floss when you have gingivitis, your gum bleeding may get worse. Gingivitis can develop into periodontitis, a more serious condition, if left untreated.[15]

➢ **Periodontitis**

An infection in your jaw and bones can result from your periodontitis getting worse. It could also set off an inflammatory response that spreads throughout the body.[16]

➢ **Broken or cracked teeth**

A mouth injury, chewing tough food, or grinding your teeth all night can cause a tooth to break or crack. A broken tooth could cause you a lot of discomfort. It is imperative that you see a dentist right away if you have a cracked or fractured tooth.[17]

➢ **Teeth Sensitive**

If you have sensitive teeth, everything hot or cold that you eat or drink could damage them. Tooth sensitivity is also known as dentin hypersensitivity. It usually happens as soon as a channel or filling opens. It could perhaps come from:

- Reclining gums
- Broken teeth;
- Gum disease;
- Damaged crowns or fillings

➢ **Oral Cancer**

Its entrance cancer of the mouth's floor, lips, cheeks, gums, and tongue. The two main causes of oral cancer are smoking and chewing tobacco.[18]

- Gums
- Lips, tongue, cheek, and floor of the mouth

Different Types of Tooth Powder

Its objectives are to lessen oral inflammation, heal gums, and enhance breath quality. Tooth powder can be used to polish and whiten someone's teeth.[19]

➢ **Natural dental powder**

Natural chalk, sea salt (which has an abrasive effect), and various essential oils (including peppermint, eucalyptus, and wintergreen) are common ingredients in tooth powder.[20]

➢ **Herbal Tooth powder**

Gums that are bleeding or painful can also benefit from using herbal tooth powder. Herbal tooth powder can have a variety of ingredients. There's baking soda, white clay, and powdered chalk everywhere. There has been herbal tooth powder since ancient times.[21] You may also make these powders at home. Homemade herbal tooth powder can be beneficial because it is less expensive, the person making it will know exactly what ingredients he is putting in his mouth, and it is safe for children.[22]

ADVANTAGE

- Preventing bad breath;
- Improving oral hygiene.
- Keeps plaque from forming.

- Treats dental pain and sensitivity;
- Reduces painful, bleeding, and spongy gums in gingivitis.

DISADVANTAGE

- No fluoride, which prevents cavities
- Leaves an unpleasant aftertaste in your mouth.
- Excessive abrasive[23]

Formulation Table For Herbal Tooth Powder

Table 1: Formulation of herbal tooth powder.

Sr. No.	Name of Ingredients powder	Quantity	Uses
1	Acacia arabica	6gm	Binding agent
2	Neem	5gm	Antiseptic
3	Mentha	6gm	Analgesic
4	Clove	4gm	Antioxidant
5	Amla	4gm	Antibacterial
6	Tulsi	4gm	Bactericidal
7	Ritha	3gm	Foaming agent
8	Stevia	6gm	Sweetner
9	Cinnamon	3gm	Germicide
10	Fennel	5gm	Mouth freshner
11	Camphor	2gm	Analgesic
12	Sodium bio-carbonate	2gm	Abrasive

Collection of Herbal Drugs:[34,35]

Acacia gum, neem, mentha, clove, amla, Tulsi, ritha, stevia, cinnamon, fennel, camphor, and backing soda are the ingredients used to make toothpowder. These ingredients are either purchased from the market or obtained from laboratories. After that, a mixer was used to dry and grind all of the herbal ingredients.

Preparation of Herbal Tooth Powder[36]

1. Next, gather all powdered ingredients, precisely weigh, and thoroughly combine.
2. Mortar and pestle until a uniform mixture is achieved.
3. After that, every powder was put through a #85 no. sieve and kept in an airtight container.

Evaluation Parameters of Herbal Tooth Powder[37,38,39,40]

A. Organoleptic Assessment

1. Color: the color of the herbal teeth power is assessed and visually verified.
2. Odor: The product's herbal tooth powder is smelled to determine its quality.

3. Taste: The powder is manually tested to determine the tooth powder's flavor.

4. Abrasiveness: Using a tooth brush, the abrasiveness of the herbal tooth powder is carefully assessed.

5. Spread-ability: Using powder to distribute, it was physically assessed

6. Texture: painstakingly assessed by human hands

7. Appearance: visual assessment is made

8. Formability

9. Stability: In accordance with ICH requirements, the stability study was carried out. To test the product's stability, it was maintained at various temperatures.

B. Patch test: The skin is exposed to the powder twice a day for two days, and irritation, swelling, and redness are manually assessed.

C. Analyzing physio-chemically

1. PH: A prepared herbal powder was tested by adding 5 grams of dental powder to a 100 milliliter beaker. Permit the 10ml of water to boil before cooling down. quickly whisk to create a suspension and take a Ph reading.

2. Moisture content: 4 grams of specially prepared tooth powder are added to a porcelain dish that is 6 to 8 cm in diameter and 2-4 cm deep. Next, dry the sample for five minutes at 100 degrees Celsius in a hot air oven. Calculation percentage by mass: 100 M1/m M1= mass loss M=mass of the substance consumed for flavor

D. Rheological evaluation

1. Flow property: A funnel was placed in the sand and clamped down. The graph paper was then placed beneath the funnel, and a measurement was taken at the height between the graph paper and the funnel's bottom. After weighing and adding 50g of powder to a funnel, the flow property was measured and plotted on a graph.

Evaluation Table[41]

A. Organoleptic evaluation

Table 2: Organoleptic Evaluation.

Sr. No.	Test	Observation
1	Color	Brown
2	Odor	Pungent
3	Taste	Sweet

4	Abrasiveness	Good
5	Spread-ability	Good
6	Texture	Smooth, Fine
7	Appearance	Powder
8	Formability	Good
9	Stability	Stable

B. Patch Evaluation

Table 3: Patch Evaluation.

Sr. No.	Test	Observation
1	Swelling	No
2	Redness	No
3	Irritation	No

C. Physio-Chemical Evaluation

Table 4: Physio-chemical Evaluation.

Sr. No.	Test	Observation
1	PH	5.9
2	Moisture content	2%

D. Rheological Evaluation

Table 5: Rheolohical Evaluation.

Sr. No.	Test	Observation
1	Flow Property	Less than 1cm

RESULT AND DISCUSSION

This study focuses on the creation and evaluation of teeth powder made from herbs. The brown color, sweet taste, and odor were indicative of the organoleptic features. Its bulk density is 0.48 grams per milliliter. In order to determine the flow property, the angle of repose was found, and the results indicate good flow property. The powder has a PH of 5.9. Additionally, a patch test is performed to check for swelling, redness, and irritation. Tooth powder has a pleasant flavor and is a very light abrasive that polishes and gently cleanses our teeth. Any herbal tooth powder that is deemed safe for repeated usage can be kept in a trustworthy manner. Using herbal tooth powder is a cost-effective and safe method.

CONCLUSION

It was found in this study that tooth powder has antibacterial and antiseptic properties and helps to maintain dental hygiene. Herbal tooth powder can be used twice a day to maintain oral hygiene in a dependable, affordable, and safe manner.

REFERENCE

1. Jensena JL, Barkvoll p. Clinical implications of the dry mouth; Oral Mucosal Diseases. Annals of the New York Academy of Sciences, 1998; 842(1): 156-162. https://doi.org/10.1111/j.1749-6632.1998.tb09623.x
2. W Scherer, The ability of an herbal mouth rinse to reduce gingival bleeding, Journal of Clinical Dentistry, 1998; 9(4): 97-100. https://doi.org/10.4103/0970-4388.191409
3. NC Mohire, AV Yadav, Chitosan-based polyherbal toothpaste: as novel oral hygiene product, Indian Journal of Dental Research, 2010; 21(3): 380-384. https://doi.org/10.4103/0970-9290.70808.
4. AI Kholani, comparison between the efficacy of herbal and conventional dentifrices on established gingivitis, dental research journal (Isfahan) springer. 2011; 8(2): 57-63. https://doi.org/10.21088/ijde.0974.6099.10117.1
5. Dave KK et al. Journal of Research in Ayurveda & Siddha, 1996; 17(3-4): https://doi.org/10.22271/int.book.290
6. Evans WC, Trease. Pharmacognosy. Harcourt publisher Ltd: 15th ed, 2002; 353-54. https://doi.org/10.1016/s0367-326x(02)00228-9
7. Ersoy, M; Tanalp, J; Ozel, E; Cengizlier, R; Soyman, M; The allergy of toothpaste: a casereport. AllergoletImmunopathol, 2008; 36(6): 368-70. https://doi.org/10.1016-/s0301-0546(08)75871-3
8. https://www.carsondds.com/dental-services/tooth-anatomy/
9. Barnes, J., Anderson, L.A. and Phillipson, J.D. (2007). Herbal medicine. Pharmaceutical Press, London, 2010; (2): 29-40. https://doi.org/10.2165/00002018-200730100-00052
10. http://www.ayurvedjournal.com/JAHM_201954_02.Pdf.
11. Deswal H, Singh Y, Grover HS. Bhardwaj A. Verma S. Neem: A Boon in Medical and Dental Therapies: A Review. UJOAS, 2016; 4(2): 12. https://doi.org/10.1201/9781003301066-4
12. https://www.cdc.gov/oralhealth/conditions/index.htMl
13. George J, Hegde S, Rajesh K S, Kumar A. The efficacy of a herbal-based toothpaste in the control of plaque and gingivitis: A clinico-biochemical study. Indian J Dent Res., 2009; 11: 234-243. https://doi.org/10.4103/0970-9290.59460
14. Bharathi M, Rajalingam D, Vinothkumar S, Artheeswari R, Kanimozhi R, & Kousalya V. Formulation and evaluation of herbal tooth powder for oral care. International Journal of Pharmaceutical Research and Life Sciences, 2020; 8(1): 1-5. https://doi.org/10.26452/ijprls.v8i1.1145

15. Jardim J., Alves L., Maltz M. The history and global market of oral homecare products. Braz Oral Res., 2009; 22-55. https://doi.org/10.1590/s1806-83242009000500004
16. Palombo EA, Traditional Medicinal plant extracts, Journals and natural products with activity against oral bacteria: Potential application in the prevention and treatment of oral diseases. Evid Based Compliment Alternat Med., 2011; 680354: 66. https://doi.org/10.1093/ecam/nep067.
17. Willerhausen B, Gruber I, Hamm G, The influence of herbal ingredients on the plaque index and bleeding tendency of the gingival, J Clin Dent, 2008; II: 320. https://doi.org/10.1038/sj.ebd.6400595
18. https://www.slideshare.net/Shahvijesh1/tooth-powder.
19. https://www.taaseer.com/herbal-tooth-powder/.
20. Nikita RN, Manojkumar NN & Magdum CS, Formulation and Evaluation of Herbal Toothpaste: In Vitro Study. J Drug Design Discov, Res., 1992; (III): 197. https://doi.org/10.21275/mr23919002121
21. Nc Mohire, Av yadav chitosan-based polyherbal tooth paste: as novel oral hygiene products Indian journal of dental research, 2010; 21(3): 380-384.
22. Kister, KF (1994). Kister's Best Encyclopedias: A Comparative Guide to General and Specialized Encyclopedias (2nd ed.). Phoenix, Arizona: Oryx Press. ISBN 978-0-89774-744-8. https://doi.org/10.5860/choice.32-2480.
23. The History of Toothpaste and Toothbrushes. Bbc.co.uk. Retrieved on[7] 5PP Sharma, Cosmetics: formulation, manufacture, quality control, 7th edn., Pardana publication Pvt ltd, April 4, 2013; 507-19.
24. Bipul Biswas, Kimberly Rogers, Fredrick Mc Laughlin, Dwayne Daniels and Anand Yadav, Antimicrobial Activities of Leaf Extracts of Guava (Psidiumguajava L.) of Two Gram-Negative and Gram-Positive Bacteria, International Journal of Microbiology, 2013; 1: 1-7. https://doi.org/10.1155/2013/746165
25. Reviews by the Editorial Board of Reference Books Bulletin; revised introduction by Sandy Whiteley. Purchasing an Encyclopedia: 12 Points to Consider (5th ed.). Booklist Publications, American Library Association, 1996. ISBN 978-0-8389-7823-8.
26. Srivasuki KP, Nutritional and health care benefits of Amla, Journal of Pharmacognosy, 2012; 3(2): 141-51. https://doi.org/10.33545/27072827.2023.v4.I 2a.92
27. https://www.webmd.com/vitamins/ai/ingredientmono-1470/sodiumbicarbonate.
28. Paton LJ, Beauchemin KA, Veira DM, von Keyserlingk MA (2006). "Use of sodium bicarbonate, offered free choice or blended into the ration, to reduce the risk of ruminal

acidosis in cattle". Canadian Journal of Animal Science, 2004; (IX): 429-437. https://doi.org/10.4141/a06-014.

29. Gupta N, Patel AR, Ravindra RP. Design of Akkalkara (Spilanthesacmella) formulations forantimicrobial and topical anti-inflammatory activities. International Journal of Pharma and Bio Sciences, 2012; 3(4): 161– 170. Copyright: Jensena JL, Barkvoll P. Clinical Implications of the Dry Mouth: Oral https://doi.org/10.22376/ijpbs.2020.11.1.p13-27.
30. Rahman S. Begum H, Rahman Z, et al. Effect of cinnamon (Cinnamomum cassia) as a lipid lowering agent on hypercholesterolemic rats. J Enam Medical College, 2013; 3(2): 94-8. https://doi.org/10.3329/jemc.v3i2.16132.
31. https://www.pharmacy180.com/article/camphor-236/.
32. Rajendran S, Santhi N, Jenifer A, Karthigeyan A, Raj SD. Preparation and evaluation of herbal dentifrice. Asian Journal of Pharmaceutical Analysis and Medicinal Chemistry, 2020; 8(1): 16-23.
33. Mamatha A, Swathi Vijaya P, Vinutha L, Hemalatha S. Formulation and evaluation of herbal toothpowder using Indian nettle, coconut spathe, tulsi and others. International Journal of Pharmaceutical Research and Applications, 2022; 7(1): 416-422.
34. B.M. Mithal, R.N. Saha. A hand book of cosmetics 1st edition, Vallabh Prakashan, 2000; 199- 215
35. Nidhi Sharma, Neeru and Dr.Sushil Kumar Dubey; To evaluate marketed herbal tooth powders with antimicrobial and antioxidant activity. WJPPS; ISSN 2278-4357, 5(7): 1473-1491.
36. Rajasekaran Aiyalu, Arul Kumaran Govindarjan, Arivukkarasu Ramasamy; Formulation and evaluation of topical herbal gel for the treatment of arthritis in animal model; BJPS, Jul./Sep., 2016; 52(3).
37. Roshan Telrandhe, Pawan Deshmukh, Mahendra Gunde; Formulation and evaluation of herbal toothpaste: compared with marketed preparation. IJPDA, 2017; 5(10): 406-410.
38. S. S. Rajendran*, N. Santhi, A. Jenifer, Akshaya karthigeyan, S. Dharan raj, Rajendran S S. et al. / Asian Journal of Pharmaceutical Analysis and Medicinal Chemistry, 2020; 8(1): 16-23.
39. Sachin B. Dudhe, Chagan R. Doijad, Journal Of Critical Reviews, Issn- 2394-5125, 2020; 07(18).
40. Dr. Mamatha A, Swathi Vijaya P, Vinutha L, Hemalatha S. International Journal of Pharmaceutical Research and Applications, Jan-Feb 20227; 1: 416-422 www.ijprajournal.com ISSN: 2249-7781.