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AN OVERVIEW ON HERBAL TOOTH POWDER

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ABSTRACT

Powders are pharmaceutical solid dosage form encountered in almost every aspect of pharmacy both in industry and in practice. A pharmaceutical powder is a mixture of finely divided drugs and chemicals in dry form, which are meant for internal and external use. The present work is aimed to explain the relevancy of toothpowder in the current scenario. The overall study concludes about the characteristics, types, properties, preparation and evaluation of toothpowder. 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 toothpowders are safe, effective, and less toxic. This study is thus aimed to provide an alternative to the consumer and formulate herbal tooth powder using Clove, Neem, Peppermint, Cinnamon, Myrobalan, Amla. The oral cavity infections are the most common types of infections. Dental caries is an infectious disease, causes damage and infection of enamel and dentine. If it is not treated, the infection continues and will lead to tooth loss. The mouth contains normal flora of opportunistic bacteria that are normally non-pathogenic. The imbalance of this situation causes infection and tooth decay. Streptococcus mutants are considered as the main species involved in the development of dental caries. S. mutants, acid-producing bacteria, causes fermentation of carbohydrates which results in tooth decay. Therefore, in the present work, the following aspects of Herbal tooth powders were planned for the formulation, standardization of herbal tooth powder, and anti-bacterial screening of the extracts of herbal tooth powder.

KEYWORDS: Tooth Powders, Dental Caries, Fermentation, Bacteria, Flora, Herbal Tooth Powder.

INTRODUCTION

Powders are pharmaceutical solid dosage form encountered in almost every aspect of pharmacy, both in industry and in practice. A pharmaceutical powder is a mixture of finely divided drugs and chemicals in dry form, which are meant for internal and external use. Drugs and other ingredients, when they occur in the solid state in the course of being processed into a dosage form, usually are in a finely divided condition. A powder whose state of subdivision is critical in determining its behavior both during processing and in the finished dosage form. Although the use of powders as a dosage form has declined, the properties and behavior of finely divided solid materials are of considerable importance in pharmacy. They are available in crystalline or amorphous forms. They are considered as the oldest and simplest dosage form.[1]

WHO estimates that 80% of the world's population, particularly these living in developing nations, rely on plant derived medications for their healthcare, and there is growing interest in traditional medicine worldwide.[2]

Natural products are secure, affordable, and work as strong substitutes for the chemotherapeutics now in use, which have negative side effects and increased bacterial resistance. India, a country renowned for its ancient medical practises, has long been intrigued by the search for alternative therapeutic modalities including natural items.[3]

To prevent and manage bad breath and tooth decay, dentifrice can be used as a preventative cosmetic treatment for teeth. Dentifrice can be made using both natural and artificial substances. When opposed to formulations using synthetic ingredients, herbal formulations are now highly demanded and necessary due to their effectiveness in preventing adverse effects. Based on their abrasive qualities, tooth powders and pastes are applied to the teeth and rab against them, helping to remove the minerals and food particles that have been deposited there.[4,5]

Currently, 66 percent of Indian families use toothpaste, 24 percent use toothpowder, and 18 percent don't use any toothpaste, according to IRS data (those who use neither toothpastes nor toothpowders). "These figures

aren't all that stunning in and of themselves as a result of bat typically cleaner and tooth powder unit of measurement utilized in Republic of Asian nation. Even but, some folks use each tooth powder and dentifrice as a result of they suppose that rabbing their gums with tooth powder is that the best thanks to maintain smart dental hygiene. Today, toothpowders square measure fashionable among customers everywhere the planet. Today, there are numerous instances of international corporations introducing toothpowder in their home markets. However, toothpowder demand is far smaller than toothpaste demand. However, certain consumers, particularly senior individuals, are devoted to Toothpowders.[6,7]

TYPES OF TOOTH POWDRES

WHITENING TOOTH POWDER

- It is used to freshen breath; help heal gums and reduce the amount of inflammation in the mouth.
- It can also polish and whiten teeth.
- The application method using cotton swab dipping into tooth powder and cleaning inner and outer surface slightly every day.[8]

NATURAL TOOTH POWDER

- Ingredients like sea salts, which acts as an abrasive, natural chalk, and certain essential oils like pepper mint, eucalyptus, and wintergreen are common ingredients in natural tooth powders.
- Sore or bleeding gums also can benefit from herbal tooth powder. Herbal tooth powder can have a variety of ingredients, powdered chalk and white clay are common.
- It has been around for centuries, and many believe it to be an essential part of any teeth cleaning regimen.
- To be applied on the surface of the teeth with the help of toothbrush.[9]

HOMEMADE TOOTH POWDER

- These powders can be made at home.
- Homemade herbal tooth powders can be beneficial because they may cost less, and ingredients are free from chemicals produces good effect.
- It involves chewing sticks made out of young woody stem or root pieces.[10]

ADVANTAGES

1. Powders are used both internally and externally.
2. They are more stable than liquid dosage form.
3. Powders are convenient to handle, store and carry than liquid dosage forms.
4. Some products are administered by mixing with food.
5. Bulky and large dose drug can be convenient to administered conveniently.
6. A tablet/ capsule meant for adults can be improvised in the form of powders by dose dividing.
7. They are more chemically stable to solid state than liquid state.
8. They are less susceptible to microbial growth than liquid dosage forms.
9. Provide means of dispensing of incompatible drugs in divided form.[11]

DISADVANTAGES

• Not suitable for oral administration of bitter drugs.
• Dispensing of powder is a time-consuming process.
• In powders for external use, it requires finest state of sub- division in powders. Hence, become costly.
• Powders are inconvenient to handle and administer as compared to tablets and capsules.
• Less dose accuracy than that can be achieved with tablets or capsules.
• Coarse powders are friable or undergo size reduction to further fines.

Materials

1. Neem

The neem tree grows quickly. Although it is evergreen, in extreme droughts the majority of its leaves may fall off. Because it is a rich source of antioxidants and is used as an antibacterial agent and to freshen the breath, it's fruit and seeds are the source of neem oil, which is credited with having a healthpromoting impact.[12]

Fig No 1: Neem.

Synonyms: Holy tree, Margosa

Biological Source: It is obtained from fully matured seeds of Azadirachta indica Linn**.**

Family: Meliaceae.

Chemical Constituents: It contains glycerides of saturated and unsaturated fatty acids. The main fatty acids are oleic (50 per cent) and stearic (20 per cent) acids. It contains nimbidin, nimbin, nimbinin and nimbidol. The unsaponifiable part contains nimbosterol (0.03 per cent).

Uses: Nimbin, nimbidin and related compounds possess anti-viral activity.

As non-edible oil, it is used for soap making and for manufacture of oleic and stearic acids.

It is indicated in rheumatism and also as a pesticide and in medicated soaps for skin diseases.

GEOGRAPHICAL REGIONS - The exact place of origin is unknown, while some people assert that neem is a native of the entire Indian subcontinent, while others attribute it to dry woods in Sri Lanka, Malaysia, and Indonesia. India is the country that uses the tree the most.

How to prepare neem powder

1. Neem leaves were taken from local sources and dried for two to three days. The dried leaf was then crushed into fine particles using a tool for grinding.
2. At a temperature of roughly 400°C, the powder is activated. Following that, the powder was sieved using a 90 micron IS standard sieve size. Using filter paper, sieved particles are filtered before being rinsed with double distilled water.
3. The dried, cleaned powder is then prepared for use as a bio coagulant. To protect it from moisture, the fine powder was gathered and placed in an airtight container.[13]

2. Clove

Clove tress are evergreens that grow to some 40feet tall Their bark is smooth and gray and their long.5-inch leaves look like bay leaves.[14]

Fig No. 2: Clove.

Synonyms: Caryophyllum, Clove flower, Clove buds.

Biological Source: Colve consists of dried flower buds Of Eugenia caryophyllus. It should contain not less than 7.0 per cent (w/w) Of eugenol calculated on dried basis.

Family: Myrtaceae.

Chemical Constituents: Clove contains about 15 to 20 percent of volatile Oil, 10 percent to 13 percent of tannin (gallotannic acid), resin, chromone and eugenin. The volatile oil of the drug contains eugenol (about 70 to 90 percent).

GEOGRAPHICAL REGIONS

Clove is also grown in Malaysia, SriLanka, India, Indonesia, France, USA.[15]

How to prepare clove powder

1. Bring a cast iron or other non-coated pan to medium high heat.
2. Place whole cloves into pan and toss for 2 minutes or until fragrant immediately remove from heat and let cool.
3. Move cloves to a spice mill, coffee grinder, or mortar and pestle. Grind until cloves are a fine power.[16]

Uses: Clove is used as a dental analgesic, carminative, stimulant, flavouring agent, an aromatic and antiseptic.

3. Peppermint

The hybrid species of mint known as peppermint is a cross between spearmint and water mint.[17]

Fig No. 3: Peppermint.

Synonym- Mentha piperita
Family- Lamiaceae
Chemical Constituents: Menthol, Menthone

GEOGRAPHICAL REGIONS - The plant, which is originally from Europe and the Middle East, is now widely farmed throughout the world. It occasionally coexists with its parent species in the wild.

How to prepare peppermint oil

1. Put fresh peppermint leaves in a glass jar with a tight lid and crush or muddle them.
2. Apply grapeseed or olive oil to the leaves. Lock the jar lid and shake.
3. Keep for three days. Put the leaves in a basin after straining.
4. Pack the jar with fresh leaves, pour the oil back in the jar and cover with fresh oil.

4. Cinnamon: Cinnamon verum trees grow to a height of 10–15 metres (30–50 feet). The leaves are 7–18 cm long and ovate–oblong in form. The blooms, which grow in panicles, are greenish in colour and smell strongly. The fruit is a singleseeded purple lem druple.

Fig No. 4: Cinnamon.

Synonyms: amber, bay, beige, bister, brick, bronze, buff, chestn.

Chemical Composition: cinnamaldehyde, cinnamate, cinnamic acid, and numerous essential oils.

Biological source: Cinnamon is the dried inner bark of the coppiced shoots of Cinnamomum zeylanicum Nees., belonging to **family:** Lauraceae.

GEOGRAPHICAL REGIONS - Cinnamon verum trees are 10-15metres (30- 50feet) tall. The leaves are ovate -oblong in shape and 7-18cm long. The flowers which are arranged in panicles have a greenish colour and a distinct odour.

How to prepare cinnamon powder

1. Cinnamon sticks should be broken into smaller sticks (This helps the sticks to get powdered without much difficulty
2. Using a food processor or blender, now finely powder it. Sieve the powdered cinnamon.
3. Finally, add the sugar and sieved powder to the blender and blend. However, doing so is optional.

USES: It can lower blood sugar levels, reduce heart disease risk factors and has a plethora of other impressive health benefits. Just make sure to get Ceylon cinnamon or stick to small doses if you're using the Cassia variety.

5. Myrobalan

The Myrobalan could be a moderate sized deciduous tree attaining a height of 25-30 metres. For haemorrhage and painful gums, discard seeds and use a fine powder of the edible fruit as tooth powder. For mouth ulcers, build a swish paste of the pulverised fruit cowl, combine with thin milk and use as a gargle many times on a daily basis.[18]

Synonym-Prunus Cerasifera
Family-Combretaceae
Common name-Haritaki
Chemical Constituents: triterpene acid, galloyl glucose, anthraquinonoid

Fig No. 5: Myrobalan.

GEOGRAPHICAL REGIONS Myrobalan is found throughout South and geographical region together with in Republic of India, Sri Lanka, Bhutan, Nepal, Bangladesh, Myanmar, Cambodia, Laos, and Asian country. In India, They are found within the Sub range region from Ravi eastward to West Bengal and Assam.[19]

How to prepare myrobalan powder

1. Myrobalan Powder is created from the nuts of Terminalia chebula.
2. Nuts were collected from nearby supply and dried.
3. Then the dried nuts were small-grained by using mortar and pestle.
4. The fine powder was hold on in well closed container.[20]

Uses

Improves Digestion, Circulation
It is good for the skin & reduces pimples.
Expectorant

6. Amla

Amla is frequently referred to as an Indian gooseberry. The berries of the trees are often used in pharmaceutical formulations due to their therapeutic properties. In classical Ayurveda, the Amla is described to by a number of titles, including sour, nurse, immortality, and mother.[21]

Fig No. 6: Amla.

Synonym- phyllanthusemblica L.
Family- Euphorbiacea
Common name- Amla
Chemical Constituents
Ellagic acid, chebulinic acid, gallic acid, gallic acid, chebulagic acid, apeigenin, quercetin, corilagin, leutolin, etc.
GEOGRAPHICAL REGIONS – Throughout India.[22]

How to prepare amla powder

1. Amla's should be chopped into small pieces and dried in the sun for a few days. The dried-up amla fragments will be visible after a few days in the sun
2. Transfer the dried amla pieces into a blender and blend them completely.
3. The Amla powder is ready. The amla powder can be stored in an airtight container.[23]

Uses

Amla can be used for the management of dementia, Alzheimer's disease and Parkinson's disease due to its anti-cholinesterase activity. Amla also has antioxidant

and anti-inflammatory property. It fights against free radicals and inhibits the inflammatory mediators to reduce brain damage and improve cognitive function.

EVALUATION METHODS

❖ Determination of pH

A 1%w/v dispersion of tooth powder is prepared in distilled water and shaken gently for 30 minutes for homogenous dispersion. The dispersion is filtered through Whatman filter paper at room temperature and the pH of the filtrate is measured by digital pH meter. The measurement of sample is performed in triplicate and the results is expressed as the mean of measured observations. The acceptable pH between 3.76-8.03.

❖ Foaming Index

It is determined by taking 10ml of 1%w/v dispersion of tooth powder in 100ml measuring cylinder. The dispersion is stirred mechanically for 30 minutes for creating the foams. When the maximum foams are produced, the volume occupied by the foams is recorded and the mean of the three respective observations is recorded. Result calculated by measuring the height of foam developed in the measuring cylinder.

❖ Density of powder

The density of powders is determined by liquid displacement method in pycnometer by using following formula:

$$DP = \frac{w}{[(a+w)-b]X\ SG}$$

where 'W' being the wt. of powder,' SG' is the specific gravity of the solvent used, 'a' is weight of bottle and solvent, and 'b' is the weight of bottle+solvent+powder. The result shows the ratio of untapped powder sample and its volume including contribution interparticulate void volume.

Fig No. 6: Pycnometer.

❖ Bulk Density

The tooth powder is poured freely in 100ml measuring cylinder up to the mark with their natural flow. The upper surface of powder is made regular with the help of spatula. The volume occupied by the powder is noted down and represented as bulk volume and the weight as bulk mass. The bulk density is determined by using following expression

$$\text{Bulk Density} = \frac{Mass\ of\ powder}{Bulk\ volume\ occupied\ by\ powder}$$

As the bulk volume of the powder increases the bulk density increases.

❖ Tapped Density

It is determined by using tapped density test apparatus. The powder taken in measuring cylinder (50ml) of the apparatus is tapped in up and down position up to the specified distance until it is compressed to the constant volume. The open end of the measuring cylinder is covered with aluminum foil to prevent the loss of lines due to dusting at the time of tapping. The tapped density is determined by following Formula-

$$\text{Tapped Density} = \frac{Tapped\ mass\ of\ tooth\ powder}{Tapped\ volume\ of\ tooth\ powder}$$

As the tapped volume increases density decreases.

❖ Porosity

It is the void space that is occupied by the mass of the powder along with the entrapped air. It was determined as follows-

$$\text{Percentage porosity} = 1-\frac{Tapped\ volume}{Bulk\ volume} \text{ X } 100$$

Result shows that as the density of the powder increases porosity decreases.[24]

❖ Carr's Index (compressibility index) and Hausner's ratio

The usefulness of this simple ratio (Carr's index)' based on the decrementing powder volume during tapping, is to predict flow ability of powders. The lower the number, the more is the free-flowing powder. An increase in the value is proportional to adhesion and friction properties of a powder. Both the Carr's index (compressibility index) and Hausner's ratio is determined by using following formula-

$$\text{Carr's Index} = \frac{100\ X\ (vo-v)}{vo}$$

$$\text{Hausner's ratio} = \frac{vo}{vf}$$

Where 'Vo' initial volume of the powder taken in the measuring cylinder and 'Vf' is the final volume of powder after tapping.

The result indicated by Hausner's ratio a good flow is greater than 1.25 and a poor flow may have a value of 1.5.

The result indicated by Carr's index is greater than 25 is considered to be an indication of poor flowability and below 15 provide good flowability.[25]

❖ Abrasiveness

It is the measurement of the powder fineness that by rubbing on the teeth surface scrubs out the adhered particles of consumed food articles and maintains the shiny smooth surface of teeth. It is measured by rubbing the known amount of powder on glass slide for 15 minutes with the help of fingertip in the similar manner of brushing the teeth. The surface of the slide is observed

microscopically and the scratches on slide generated by rubbing the powder is noted down. The results are expressed arbitrarily in positive and negative signs indicating the scratches on glass slide. More positive signs indicated the more abrasiveness.[26]

❖ **Angle Of Repose**

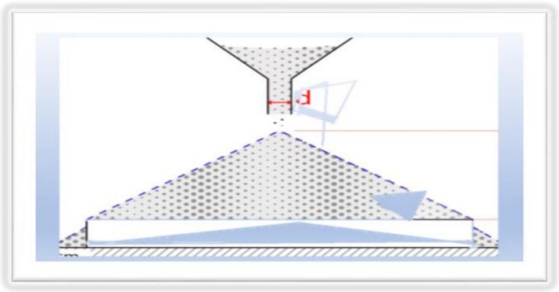

Figure 7: Angle of repose.

It is determined by heap method. Briefly the powder is poured through a glass funnel from a definite distance to the smooth horizontal surface until a heap of maximum height is formed in a conical fform. The diameter and the height of the heap is determined and the tangent of the angle is determined by following expression

Angle of repose(θ) = $\tan(\frac{h}{r})$

Where, 'h' is the height of heap and 'r' is the radius heap made by powder.

The table shows,
The powder having angle of repose 25 exert an excellent powder flow.
The powder having angle of repose between 25-30 exert good powder flow.
The powder having angle of repose between 30-40 exert passable powder flow.
The powder having angle of repose greater than 40 exert very poor powder flow.

❖ **Determination of ethanol-soluble extractive**

A 5.0g of air-dried tooth powder is macerated with 100ml of ethanol of the 95%v/v strength in a closed flask for 24 hours and shaken frequently during the first 6 hours and then allowed to stand for 18 hours. Thereafter, it is filtered rapidly taking precautions against loss of ethanol and then 25ml of the filtrate is evaporated to dryness in a tare flat-bottomed shallow dish, dried at 105 C and weighed. The percentage of ethanol-soluble extractive with reference to air dried tooth powder is calculated. Ethanol-soluble extractive value should be 10.16% w/w.[27]

Table No: 1 Angle of Repose.

Angle of Repose	Types of Flow
25	Excellent
25-30	Good
30-40	Passable
>40	Very Poor

COMMERCIAL TOOTHPOWDERS AVAILABLE IN MARKET

Table 2: Marketed Preparation of herbal toothpowder.

BRAND NAME	INGREDIENTS	USES	FIGURE
Farooky Tooth Powder	• Ajwain • Salt • Clove	Reducing plaque and whitening teeth Fights Tooth Decay Stops Bleeding Gums Stops Bad Breath	
Dabur Lal Dant Manjan	• Clove Oil • Pudina • Satva & Karpura • Pippai • Tomar Beej	Effective Against Bacteria And Beneficial For Gingivitis. Helps Prevent Foul Breath and Toothaches.	

Colgate ToothPowder	• Calcium Carbonate • Flavour • Sodium Saccharin • Sodium Lauryl Sulphate • Sodium	Cavity Preventation Enamel Protection Fresh Breath Plaque Preventation Sensitivity Relief Tartar Control	
Vicco Vajradanti Powder	• Ajwain • Dalchini • Khair • Patang • Harada • Amala • Behada • Maifal • Babhul • Jambhul • Acrod	Treats Pyrorrhoea, Swollen Gums, Bleeding Gums And Gum Irritation While Preventing Tooth Decay. Used To Treat Toothaches. Cure Wounds. Harden Gums And Teeth	
Hamdard manjan	• Ilaichi kalan • amla dry • post halela zard • zanjabeel Khoolanjan • roghan peppermint	Cleans and sparkles the teeth like pearls. It also tightens the loose teeth and stops bleeding	

CONCLUSION

Powders are pharmaceutical solid dosage form which is applied to provide cleanliness and polishness in teeth to prevent dental caries. Tooth powders are common oral care product used to control plaque and other deposits from tooth surface thereby reducing gingivitis.

From the current study, it may be concluded that toothpowder has been shown to be Statistically superior to toothpastes in controlling dental plaque and gingivitis. The impact of toothpowder in the healthcare system can't be excluded.

REFERENCES

1. Robert E O Connor and Joseph B Schwartz. Powders: Introduction. Remington The Science and Practice of Pharmacy, 2000; 10: 681.
2. Evans WC Trees and Evans Pharmacology London WB, Saunders Company Ltd Fox R. Pharmaceuticals From plants: Great Potential, few funds. Lancet, 1997; (XIV)343: 1513-1515.
3. 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.
4. D. Mamatha IOSR Journal of pharmacy and biological Sciences (Nov. Dec. 2017;) VII: 15.
5. Rantamen 1, et al. Effects of a betaine containing toothpaste on subjective symptoms of dry mouth: A randomized clinical trial. The J. of Cont. Dent. Practice, 2003; 4(2): 1-10.
6. Moran J., "Comparison of a phenolic and a 0.2% chlerhexidine mouthwash on the development of plaque and gingivitis", Clin, Prev. Dent, 1991; (VII): 19-24.
7. http://www.ayurvedjournal.com/JAHM_201954_02.pdf
8. 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.
9. https://www.slideshare.net/Shahvijesh1/tooth-powder
10. Nikita RN, Manojkumar NN & Magdum CS, Formulation and Evaluation of Herbal Toothpaste: In Vitro Study. J Drug Design Discov, Res., 1992; (III): 197.
11. Michael Bayba. Powders: Advantages and disadvantages. Asian Journal of Aesthetic Dentistry, 2022; 9: 629-632.
12. Bharathi, D. Rajalingam, Kausalya. Formulation and Evaluation of herbal toothpowder for Oral care. Journal Of clinical Dentistry, 2020; 22: 456-467.
13. Khan M.K, Ayyaz AK, Tasleem H. Comparison of the plaque removing efficacy of toothpowder. Journal of The International Academy of periodontology, 2009; 92: 147-150.

14. Jain SK. Medicianl Plants, National Book Trust, New Delhi, 1968; 123-142.
15. Shan B, Cai YZ, Sun M, Corke H. Antioxidant capacity of 26 spice extracts and characterization of their phenolic constituents. J Agric Food Chem 223.
16. https://mountainroseherbs.com/clove-powder
17. Pathak. A., Sardar, A. Kadam, V., Rekadwad, B., & Karuppayil, S. N. (2012). Efficacy of some medicinal plants against human dental pathogens. Indian Journal of Natural Products and Resources, 2012; 3(1): 123-127.
18. Kirtikar KR, Basu BD. Indian Medicinal Plants, International Book Distributors, Dehradun, 1987; L: 536-541.
19. https://en.m.wikipedia.org/wiki/Myrobalan
20. Dash bhagawan, the drug terminalia chebula in ayurveda and Tibetian literature. [Last cited on 2012 Jan 21].
21. Srivasuki KP, Nutritional and health care benefits of Amla, Journal of Pharmacognosy, 2012; 3(2): 141-51.
22. Raymond CR., Paul JS., Marine EQ. "Handbook of Pharmaceutical excipients." Sixth Edition, 2009; 780.
23. Singh E. Sharma S, Pareek A. Dwivedi J. Yadav S and Sharma S. Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (Phyllanthus emblica): the sustainer. J. App. Pharma. Sci., 2011; 2(1): 176-183.
24. Bharathi, D. Rajalingam, Kausalya. Formulation and Evaluation of herbal toothpowder for Oral care. Journal of clinical Dentistry, 2020; 22: 456-467.
25. Khan M.K, Ayyaz AK, Tasleem H. Comparison of the plaque removing efficacy of toothpowder. Journal of the International Academy of periodontology, 2009; 92: 147-150.
26. Ivan SP. Dental Caries and periodontal diseases. Journal of clinical Dentistry, 1999; 11: 29-36.
27. RM Mehta. Solid dosage forms. Dispensing Pharmacy, 2008; 4: 110-118.