IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Formulation And Evaluation Of Herbal Effervescent Tablets For Cleaning Denture Base

ISHAN SHARMA[1], ANJANA DEVI[1]*,

[1*]School of Pharmacy, Career Point University Hamirpur, H.P- India

Abstract

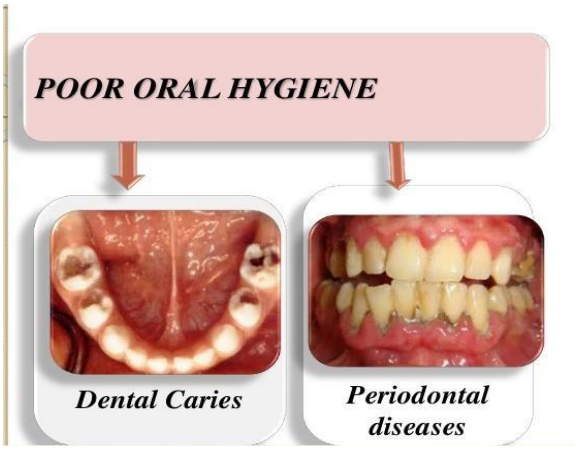
Due to the presence of microorganisms in the biofilm (dental plaque) on the surface of teeth, dental caries develops as a result of the localised disintegration of the hard tissues of teeth, which is primarily caused by acids. These "cavities" are known as dental caries. Commercially accessible liquid mouthwashes with artificial active components have drawbacks such discoloration of the teeth, a higher alcohol content, taste abnormalities, xerostomia, and stability problems. Using Azadirachta indica and Curcumin, which have antimicrobial, antibacterial, antiplaque, and anti-inflammatory activity, to create the oral hygiene solid preparation (US6428770B1) in the form of herbal effervescent mouthwash tablets (CN106619318A, US8728446B2). 33 factorial design was used to carry out the optimisation study for effervescent granules. The fusion technique was used to create a total of 27 early experimental batches with different amounts of citric acid, tartaric acid, and sodium bicarbonate. Curcumin and hydroxyl propyl -cyclodextrin were combined to create a complex, which was then further investigated using scanning electron microscopy. The pre- and post-compression parameters of the produced tablets were assessed. S. mutans was the target of an in vitro antibacterial investigation using the Agar well diffusion method. The pH, effervescent time, and CO2 concentration of each experimental batch of effervescent granules were assessed. Six additional batches were chosen to create the final tablet formulation. Excellent flow qualities and post-compression parameters were revealed by the pre-compression parameter results, which were also significant.

Keywords: Dental caries, oral hygiene, effervescent mouthwash tablet, antimicrobial study, Curcumin, Azadirachta indica.

Introduction:

By regularly brushing your teeth, you may maintain good oral hygiene and prevent diseases, bad breath, and other issues from developing in your mouth. According to WHO, dental caries affects the entire global population. Population risk has been identified, and oral health awareness campaigns have been set up. In the oral cavity, teeth are cleaned by removing dental plaque from teeth and preventing periodontal disease, gingivitis, and cavities (dental caries). Dental plaque, also known as dental biofilm, is a sticky, yellow film made of bacteria that adheres to the surface of teeth. It can be observed at the gum line. All oral appliances, including dentures, need to be maintained clean. Before going to bed at night, dentures should be taken out. The modest cleansing and antibacterial properties of saliva against candida albicans, germs, and dentures stomatitis are reduced when wearing a denture while sleeping. Older adults who wear dentures while sleeping have a high risk of pneumonia due to pain and infection in the oral mucosa that lies beneath the denture. It is advised to soak the denture in an alkaline-peroxide denture washing tablet for one day, at least

once a week, to reduce bacterial bulk and pathogenicity.



Types of bacteria:

The significant bacterial pathogen found in the oral region is Staphylococcus aureus. Gram-positive, spherical Staphylococcus aureus bacteria. Staphylococcus aureus can develop a number of ways to live in the oral cavity, including biofilm formation and extracellular enzyme extravasation. Bacteria can stay and settle in the oral cavity. This pathogen has the ability to create multicellular groups that grow inside of firmly solid teeth on their own, known as bio films.

Because of its ability to adhere to oral cells and tissues and support the production of lactate, Bacillus subtilis is a pathogen that aids in the creation of plaque. It is a type of gram-positive bacteria that is typically found in the human oral cavity and plays a crucial part in tooth decay. Each of the four distinct bacterial genotypes will exhibit a different level of pathogen.

The bacteria Acinetobacter baumannii is in charge of creating the oral biofilms that are found on teeth. It is an aerobic rod-shaped gramme negative bacterium. Aerobic, gram-positive, rod-shaped Bacillus pumilus (B. pumilus) is a member of the beliaceae family.

A rod-shaped gramme negative bacteria called Pseudomonas aeruginose (P. aeruginose) causes infections in the mouth and is crucial for the development of plaque and biofilm on the teeth. The term "bio film" refers to a collection of microorganisms that reside on teeth and whose cells produce an extracellular matrix that provides protection from antimicrobial agents for the microorganisms.

The purpose of this study is to examine the antibiofilm activity and analyse how antibacterial neem leaf extract affects P. aeruginose adhesion to teeth. Neem extract demonstrated reduced microbial adherence to buccal cells, decreased biofilm, and inhibited P. aeruginosa motility.

The majority of microorganisms live in communities called "bio films," where the cells form in an extracellular matrix that serves as a home for the organisms and makes it simple for them to grow on damaged tissues.

The pharmaceutical industry does not have a herbal formulation for dentures, and only allopathic medications are successful in treating biofilm and plaque infections on dentures. Nevertheless, many researchers are still attempting to find a cure for these diseases. The literature does, however, indicate that some medicinal plants have more antibacterial activity.

Symptoms:

Symptoms of bacterial illness brought on by poor dental hygiene include:

- Under a denture, there may be slight oral mucous membrane inflammation and redness.
- On the roof of the mouth, there are little red pimples.
- Infection with swelling that may be painful.

- Gums that bleed or hurt due to plaque.

Pathophysiology:

The tooth mineral that is needed to generate plaque bacteria and, after food is swallowed, contains fermentable carbohydrates, is often lost by the teeth. the inorganic material that is typically given with saliva when meals are nearby. Regular carbohydrate diets cause low pH in the dental plaque, which in turn causes the loss of inactive minerals in the oral region. Streptococcus mutans, Staphylococcus aureus, and lactobacilus are examples of acidic organisms. S mutans, in particular, consumes polysaccharides and continues to create acid for a very long period after the meal is consumed.

Oral dosage form:

Effervescent tablets are solid oral dose forms that help maintain oral hygiene by eradicating oral germs and preventing the buildup of biofilm and plaque on dentures.

It has advantage:

- Simple to use
- appropriate for patients of any age
- uphold proper hygiene and oral health.
- Using mouthwash can help you avoid pregnancy complications.

The more favoured dosing form is effervescent pills. Solid dosage forms are the most common due to their various benefits, which include being more affordable than other dosage forms, convenient administration, accurate dose, patient compliance, and self-medication [1].The most common solid dose forms are tablets and capsules. Pharmaceutical experts developed a novel oral drug delivery dosage form called effervescent tablets, which dissolve quickly in water in a matter of seconds with the help of water. This early tablet disintegration initiates the drug's solubility and absorption, and as a result, the bioavailability and commencement of pharmacological activity are significantly improved compared to conventional dose forms. According to the European Pharmacopoeia, effervescent tablets are uncoated tablets that quickly disperse in water after being submerged for 59 seconds.

Optimal properties of effervescent tablets:

- Water must be necessary for tablets to dissolve, and they should do so quickly and readily.
- Tablets ought to include a lot of medication loading.
- Ideally, it would work well with the other excipients.
- After administration, no residue should be left in the water.
- Should be extremely insensitive to factors like temperature and humidity.

Advantages of effervescent tablets:

- patient administration is made simple.
- Compliance from patients can be increased.
- Drug administration is more convenient with effervescent tablets.
- It has advantages over liquid drugs when making solid dosages.
- Pharmacological activity on dentures begins to take effect quickly after fast absorption.

Limitations of effervescent tablets:

- Due to their hygroscopic nature, effervescent tablets must be stored in a dry environment.
- On rare occasions, improperly manufactured pills may leave a grittiness behind after drug administration.
- Effervescent pills require particular packaging to maintain their stability.
- Dosage uniformity is quite challenging to achieve.

Various methods for preparation of effervescent tablets:

There are numerous ways to make effervescent tablets, but the finished products differ in terms of their mechanical strength, bioavailability, water solubility, stability, and, to some extent, flavour.

1. Molding method:

The highly porous structure of tablets made with this technique is seen in their rapid rate of breakdown and disintegration. Water soluble ingredients make up the majority of the excipients in moulded tablets. The first step in this technique is to wet a powder combination with a solvent (often ethanol or water), and after that, the moistened mixture is compressed into tablets at lower pressures than those used for traditional tablet compression. Before moulding, the powder mixture can be sieved, which will improve the dissolving. The mechanical strength of moulded tablets is minimal.

2. Compaction Method:

Effervescent tablets can also be made using conventional tablet preparation techniques such dry granulation, wet granulation, and direct compression. Effervescent tablets contain a few super disintegrants.

3. Spray-drying method:

A technique for creating fine, very porous powders is spray drying. In this process, effervescent tablets are created using sodium bicarbonate or citric acid as an alkali metal and hydrolyzed or unhydrolyzed gelatine as a supporting ingredient for the matrix. Mannitol is utilised to increase bulk. Eventually, dissolution and disintegration are aided by the use of citric acid and sodium bicarbonate. The final step is spray drying the produced mixture with the binding agent PVP-K-30. The disintegration time for tablets made using this technique is less than 59 seconds.

4. Sublimation:

'Camphor', a subliming substance, is employed in this procedure. After making the tablets, the sublimation is done in a vacuum for 30 minutes at a temperature of 80°C. The porous nature of the tablets created using this approach causes them to dissolve in 10 to 20 seconds on average.

5. Effervescent method:

This method creates an effervescent tablet by combining sodium bicarbonate, tartaric acid, and super disintegrants such pregelatinized starch, sodium starch glycolate, mannitol, etc. Sodium bicarbonate and tartaric acid were first thoroughly combined and cooked to 80°c. The mixture is then crushed into tablets to finish.

Challenges in the formulations of effervescent tablets:

- Mechanical resistance and time to disintegration
- Drug solubility in water
- dose of the medication
- Hygroscopicity
- Good packaging design for the mouth

Mechanism of tablet disintegration:

The following are the main techniques used in tablet disintegration:

- Swelling.
- Porosity and capillary action.
- Deformation.
- forces that repel particles.

Evaluation of effervescent tablets:

- **Content uniformity**

To determine if a substance is within the breaking point, the consistency of the substance test depends on testing each prescription substance individually in varied individual dose units. For tablets having less than 25 mg or 25% of one tablet, the consistency test for the content is necessary. Using the method shown in the test, the content of dynamic fixing is resolved in each of the ten randomly picked measurement units. If a single substance is between 85 and 115% of a normal material, the test is approved by the planning.

- **Hardness**

The power connected over the breadth of the tablet in an attempt to break it is how a tablet's hardness is measured. The tablet's resistance to chipping, scraping, or breaking depends on how well it is handled before use and during capacity adjustment. With the help of the Monsanto Hardness Analyzer, the hardness of each definition's tablet was determined. Since increased hardness delays the tablet's breakdown, the hardness of effervescent tablets is often kept lower than that of ordinary tablets. For uncoated tablets, a hardness of between 3 and 5 kg/cm2 is considered to be appropriate. The power is estimated in kg.

- **Uniformity of weight**

The weight variation test is carried out by weighing each of the 20 tablets individually, determining the average tablet weight, and comparing the results to the average weight.

Table No. 1.1. Weight variation table

Monograph	Average weight	Deviation [%]
IP/BP	<80 mg	10
	Between 80 and 250 mg	7.5
	>250 mg	5
USP	<130 mg	10
	Between 130 and 325 mg	7.5
	>325 mg	5

- **Friability test**

Friability is the loss of tablet weight in the holder as a result of surface expulsion of tiny particles. To determine the tablet's ability to survive a scraped surface during packing, handling, and transportation, a friability test is conducted. The friability of the tablets is determined using the Roche friabilator. The friabilator consists of a plastic chamber that rotates at 25 revolutions per minute while lowering the tablets at a height of 6 creeps after each upset. A sample of pre-measured tablets was placed in the friabilator and rotated 100 times. Then, the tablets were reweighed after being de-tidied with a delicate muslin cloth. The measure of friability is the weight loss of the pill, which is transmitted in rate as it follows.

$$\%Friability = \frac{Lossinweight}{Initialweight} \times 100$$

- **Thickness**

Using a Micrometre screw gauze, the tablets' diameter and thickness were measured. There were five tablets from each type of detailing used, and average characteristics were calculated. It is expressed in millimeters. According to WHO, dental caries affects the entire global population. Population risk has been identified, and oral health awareness campaigns have been set up. In the oral cavity, teeth are cleaned by removing dental plaque from teeth and preventing periodontal disease, gingivitis, and cavities (dental caries).

- **Water absorption ratio**

Someone took a piece of tissue paper and folded it twice. It was then put in a tiny Petri plate with 6 ml of water in it. A pre-weighed tablet was placed on the paper, and the amount of time needed to completely moisten the entire tablet was counted. The tablet was weighed once more after being moist. The following equation was used to obtain the water absorption ratio [R],

$$R=10\times WaWb$$

Where, Wb is weight of tablet before water absorption and Wa is weight of tablet after water absorption.

Future Perspective:

The presence of microorganisms in the biofilm (dental plaque) on the surface of teeth, dental caries develops as a result of the localised disintegration of the hard tissues of teeth, which is primarily caused by acids. The most common solid dose forms are tablets and capsules. Pharmaceutical experts developed a novel oral drug delivery dosage form called effervescent tablets, which dissolve quickly in water in a matter of seconds with the help of water. This early tablet disintegration initiates the drug's solubility and absorption, and as a result, the bioavailability and commencement of pharmacological activity are significantly improved compared to conventional dose forms. According to the European Pharmacopoeia, effervescent tablets are uncoated tablets that quickly disperse in water after being submerged for 59 seconds.

Discussion:

Staphylococcus aureus can develop a number of ways to live in the oral cavity, including biofilm formation and extracellular enzyme extravasation. Bacteria can stay and settle in the oral cavity. This pathogen has the ability to create multicellular groups that grow inside of firmly solid teeth on their own, known as bio films. Because of its ability to adhere to oral cells and tissues and support the production of lactate, Bacillus subtilis is a pathogen that aids in the creation of plaque. The tablet's resistance to chipping, scraping, or breaking depends on how well it is handled before use and during capacity adjustment. It is a type of gram-positive bacteria that is typically found in the human oral cavity and plays a crucial part in tooth decay. Each of the four distinct bacterial genotypes will exhibit a different level of pathogen.

Conclusion:

Based on the aforementioned findings, neem effervescent pills are given to people who wear dentures so that the neem, which has antibacterial properties, will destroy the bacteria on the dentures and stop it from forming biofilm and plaque. Effervescent pills' formulation produces the best outcomes when compared to amoxicillin antibiotic tablets. Neem herbal effervescent pills were created. Neem was chosen as the medication candidate after conducting a review of the literature. Manitol, sodium bicarbonate, citric acid, and pvp were chosen as the excipients for making effervescent tablets. There were pre- and post-formulation experiments carried out. Based on its physicochemical characteristics, formulation F3 dissolved in water in 33 seconds. As a result, F3 was determined to be the most effective formulation. Formulation F2 showed 28 sec, while Formulation F1 displayed 1 minute, and neither formulation could completely dissolve in water. F4 displayed 38 seconds, F5 displayed 34 seconds, and F6 displayed 37 seconds while being fully dissolved in water. Mannitol was used 0.6% as a lubricant in Formulation F3. Consequently, F3 displayed superior performance than the formulas. Additionally, it has to have its flavour masking capacity evaluated by a human taste panel, and more work needs to be done to address the mottling problem in the tablets.

Reference:

1) World Health Organization, Media Centre (2012, Apr). Fact sheet N° 318, available at: http://www.who.int/mediacentre/factsheets/fs318/en/ Wu X, Hou J, Chen X, Chen X, Zhao W (2016). Identification and functional analysis of the L-ascorbate-specific enzyme II complex of the phosphotransferase system in Streptococcus mutans. BMC Microbiol, 16(1), 51.

2) Bastos RS, Carvalho ÉS, Xavier A, Caldana ML, Bastos JRM, Lauris JRP (2012). Dental caries related to quality of life in two Brazilian adolescent groups: A cross-sectional randomised study. Int Dent J, 62(3), 137–143.

3) Loesche WJ (1986). Role of Streptococcus mutans in human dental decay. Microbiol Rev, 50(4), 353–380.

4) Bratthal D (1996). Reasons for the caries decline what do the experts believe. Eur J Oral Sci, 104, 416–422.

5) Benjamin RM. Oral health: The silent epidemic. Public Health Rep 2010;125:158-9.

6) Christersson LA, Wikesjo UM, Albini B, Zambon JJ, Genco RJ. Tissue localization of Actinobacillus actinomycetemcomitans in human periodontitis: II. Correlation between immunofluorescence and culture techniques. J Periodontol. 1987;58:540–5.

7) Foster TJ, Hook M.(1998) Surface protein adhesins of Staphylococcus aureus. Trends Microbiol ;6:484e8.

8) Pellizzaro D, Polyzois G, Machado AL, Giampaolo ET, Sanitá PV, Vergani CE Braz Dent J. (2012). Effectiveness of mechanical brushing with different denture cleansing agents in reducing in vitro Candida albicans biofilm viability;23(5):547–554.

9) Mohammad Abhary , Abdul-AzizAl-Hazmi (July 2016) Antibacterial activity of Miswak (Salvadora persica L.) extracts on oral hygiene, Pages 513-520.

10) Abderrahmen Meghrnia, *, Mouna Ben Nejma a , Hajer Hentati b , Aouni Mahjoub a , Maha Mastouri a,c Adhesive properties and extracellular enzymatic activity of Staphylococcus aureus strains isolated from oral cavity May 2014.

11) Abderrahmen Merghni , Dorra Kammoun, Hajer Hentati, Sebastien Janel, Michka Popoff, Frank Lafont, Mahjoub Aouni, Maha ´ Mastouri, (2016) Quantification of Staphylococcus aureus adhesion forces on various dental restorative materials using atomic force microscopy.04.072.

12) Karen Tereza Altieri, Ana Lucia Machado, Eunice TeresinhaGiampaolo (March 2012) Effectiveness of two disinfectant solutions and microwave irradiation in disinfecting complete dentures contaminated with methicillin-resistant Staphylococcus aureus, Pages 270-277.

13) Ju Ying The, Rabiah Rawi, Siti Suraiya MdNoor,Haslina Taib (May 2015) In-vitro antimicrobial effectiveness of herbal-based mouthrinses against oral microorganisms, Pages 370-374.

14) Hyun-Jun Yoo , Su-Kyung Jwa (2018), Inhibitory effects of β-caryophyllene on Streptococcus mutans biofilm pages 42-46.

15) Sara Abdelkhalek Hassan, Nadia EzzEldin Metwalli, Gehan Gaber Ibrahim, Moustafa Abdelnasser Aly Comparison of the efficacy of mouth rinses camellia sinensis extract, guava leaves extract and sodium fluoride solution, on Streptococcus mutans and Lactobacillus in children (an in vivo study).

16) Cardoso Julia Gabiroboertz (2016), Iorio Natalia Lopes Pontes s.Influence of a Brazilian wild green propolis on the enamel mineral loss and Streptococcus mutans count in dental biofilm..02.001.