IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Effervescent Tablets

Das Sahil[1*], Painuly Neelam[2*]

[1]Student, B. Pharma, Dev Bhoomi Institute of Pharmacy and Research, Dehradun

[2]Associate Professor, School of Pharmacy and Research, Dev Bhoomi Uttarakhand University, Dehradun

ABSTRACT

Effervescent tablets, categorized as tablets designed for dissolution in water prior to administration, present a range of benefits in drug delivery. Comprising acids carbonates, and active components, these tablets release carbon dioxide upon water interaction, improving solubility and concealing taste. Particularly advantageous for medications sensitive to stomach pH, effervescent tablets offer reduced gastrointestinal irritation. Effervescent tablets are favored due to their quick onset of action, user-friendly nature for individuals with swallowing issues, and increased bioavailability. The formulation involves a meticulous selection of acids, carbonates, and excipients to ensure stability and desired characteristics. Effervescent tablets find application in diverse therapeutic areas, delivering faster onset, favorable gastric tolerance, and enhanced portability. Despite their advantages, challenges like unpleasant taste and production costs persist. Varied formulations and manufacturing methods, including wet granulation and direct compression, are explored for effervescent tablet optimization. Evaluation criteria encompass drug content, in-vitro drug release, hardness, disintegration time, and weight variation. Global effervescent product sales have risen by 15% in the last quarter, with heightened adoption for health and wellness. Increased consumer interest reflects a growing preference for effervescent formulations worldwide. Effervescent tablets emerge as a promising alternative in drug delivery, blending therapeutic efficacy with patient convenience.

Keywords: Effervescent tablets, medications, carbon dioxide, faster onset, gastric tolerance.

1. INTRODUCTION

"Effervescent tablets are tablets that meant to be dissolved or dispersed in water before administration" is defined by the FDA and as amended. In addition to the active ingredient, it usually contains a mixture of acids / hydrochloric acids (citric, tartaric, malic or other suitable acids or acid anhydrides), carbonates and bicarbonates (sodium, potassium or other suitable alkali metal carbonates or bicarbonates).[1,2] Carbon dioxide is released when mixed with water. Sometimes the active ingredient can acts as an acidic or primary metal compound necessary for the foaming reaction. Effervescent tablets are usually uncoated tablets containing acids, carbonates or bicarbonates that react rapidly with water release CO2. It must be dissolved or diluted in water before use. Some medications help drugs that harm the stomach or are sensitive to stomach pH

and drugs that harm are regularly prescribed in large quantities and can be taken as effervescent tablets.[3] In addition, because effervescent tablets are given in liquid form, they are easier to swallow than tablets or capsules, the consumption of which is problematic for several reasons.[4,5] One dose of the tablet, on the other hand, is often dissolved in 3-4 ounces of water. Effervescent products directly do not contact the gastrointestinal tract because they are pre-dissolved in a buffer solution. Therefore reduced gastrointestinal irritation can be well tolerated in the stomach and intestines. Immediately before administration, the tablet is dissolved in a glass of water and the resulting medicinal solution or the dispersion must be used immediately. Internal forces quickly break the tablet apart due to interaction of tartaric acid and citric acid with alkali metal carbonates or bicarbonates, in present water. CO2 gas improves API water solubility and taste masking effect liberation. Compared to other oral dosage forms, effervescent tablets have advantages taste of the formulator, mild effect on the patient and stomach, and marketing consideration.[1]

Acids or acid salts (citric, tartaric, malic or any other suitable acid or acid anhydride) and carbonates or bicarbonates (sodium, potassium or any other suitable carbonate or bicarbonate) are included in uncoated tablets and are known as effervescent tablets. A suitable alkali metal (carbonate or bicarbonate) which reacts rapidly in the presence of water to release carbon dioxide as a result of emission of CO2 gas. API water solubility is improved, as is the taste masking effect.[6,7] One dose can contain more than 2000 milligrams of water-soluble active ingredients in standard effervescent tablet (diameter 1 inch, total weight five grams). Sachet (powder form) is a common dosing device when the required dose is greater than that. Shining in the 1930s, objects gained great importance with Alka Seltzer technology. Over the years, these compounds were moderately popular due to their attractive dosages and therapeutic effects for patients. The aim of this study is to improve the bioavailability of drugs. They should do this to avoid the first round effect has satisfactory properties, higher bioavailability of tablets is achieved better than other dosage forms patient consent. The stability of effervescent tablets and effervescent tablets can be improved needs a very humid control area. Effervescent tablets cannot be produced in the middle area where humidity and temperature are not maintained.[1]

1.1 REASON FOR CHOOSING AN EFFERVESCENT TABLET:-

- Onset of action is fast - The biggest advantage of effervescent tablets is that the drug is already in solution and absorbed; consequently, compared to the conventional tablets, absorption is simpler and more efficient. A quicker start to action is indicative of faster absorption. Drugs that are effervescent are given to the stomach at the ideal pH for absorbing substances. A lot of drugs take longer to absorb through he digestive system when combined with food or other medications.[3]

- It's not required to swallow the tablets. When effervescent medications are given or administered in liquid form rather than tablets or capsules, more people who are unable to swallow tablets or who dislike swallowing pills and capsules can take them; typically, one dose of effervescent medication can be given. in just three or four ounces of water.[3]

- Increase portability: Since effervescent tablets don't require the addition of water before use, they are simpler to transport than liquid medications.[3]

- Complete dissolution of the effervescent tablets in the buffer solution indicates good intestinal and gastric tolerance. Reducing Localized contact in the upper gastrointestinal tract reduces discomfort and improves tolerability; additionally, buffering often prevents stomach acids from causing medication interactions, which can be a significant cause of side effects. of abdominal pain.[8]

- Dependable: The pharmacokinetics of drugs utilizing effervescent technology are more consistent, repeatable, and predictable in comparison to tablets or capsules.[9]
- Improved taste - Medicines provided in an Although most liquids don't taste as good as an effervescent base, more taste coverage in mixes and suspensions can be obtained by reducing unpleasant substances. properties and additional taste and smell dosage forms. An effervescent tablet essentially contains a flavoring agent that tastes much better than a water-powder mixture that is not effervescent.
- Hydrophilic and hydrophobic ingredients. The dispersion of non-polar CO2 gas molecules into the cell wall may be the cause of the increased absorption of hydrophobic active agents, as this would improve the hydrophobic environment. active agents.[3]
- Traditional Tablets frequently experience first-pass metabolism and are linked to a delayed onset of action. Effervescent tablets prevent both the rapid and primary metabolisms from effect also begins. The oral liquid also gives a quick effect; however, required a careful handling.[10]

1.2 COMMON EFFERVESCENT REACTION:-

The reaction of citric acid with sodium bicarbonate is the most common effervescent reaction and is used in most effervescent formulations. In this reaction, 1 mol of citric acid reacts with 3 mol of sodium bicarbonate salt in the presence of water to produce 1 mol of sodium citrate and 3 mol of CO2 and 3 mol of water as an effervescent product by-product.[11]

The reaction of citric acid with sodium bicarbonate is the most common effervescent reaction and is used in most effervescent formulations. In this reaction, 1 mol of citric acid reacts with 3 mol of sodium bicarbonate salt in the presence of water to produce 1 mol of sodium citrate and 3 mol of CO2 and 3 mol of water as an effervescent product by-product.[11]

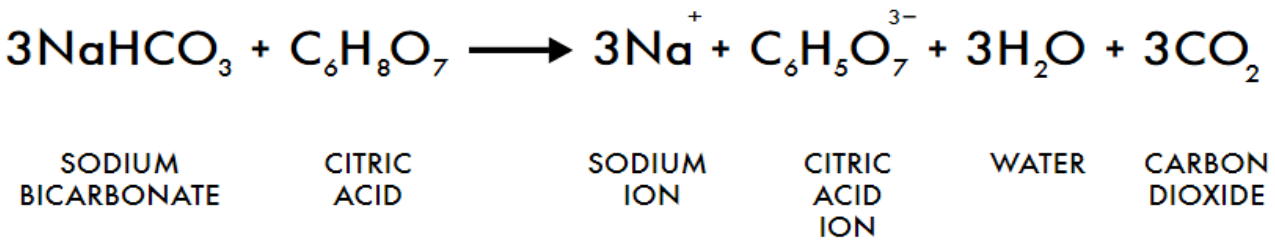

Figure 1: Citric acid reaction with Sod. Bicarbonate

Numerous effervescent compositions also contain tartaric acid, which dissolves more readily in water than citric acid. One mol of tartaric acid and two mol of sodium bicarbonate react in the presence of water in this reaction to yield one mol of sodium tartarate, two mol of CO2 effervescent, and two mol of water as byproducts.[11]

$$H_2C_4H_4O_6 + 2NaHCO_3 \rightarrow Na_2C_4H_4O_6 + 2H_2O + 2CO_2$$

Tartaric Acid	Sodium Bicarbonate	Sodium Tartarate	Water	Carbon Dioxide

Figure 2: Tartaric acid reaction with Sod. Bicarbonate

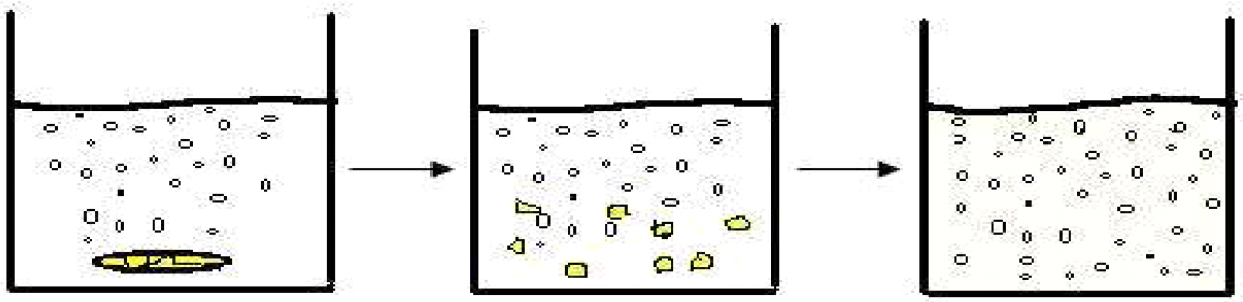

Figure 3: Mechanism of Effervescence

1.3 Benefits of Effervescent Tablets:-

- Faster onset of action.
- Good gastric and intestinal tolerance.
- The tablet does not need to be swallowed.
- Increase portability.
- Improve in taste.
- Excellent stability.
- A more dependable reaction.
- Contains a large amount of active ingredients.
- Dosing accuracy.
- Better treatment effect.
- Effervescent tablets could be a viable option in remote areas, particularly when parenteral forms are unavailable due to unreasonably high prices or a lack of qualified medical professionals.

1.4 Drawbacks of Effervescent Tablets:-

- Some active ingredients have an unpleasant taste.
- Larger tablets require particular materials for packagings.
- It is advised to administer a clear solution; however, Nowadays, a fine dispersion is widely and consistently accepted.
- Because more expensive or less costly excipients and facilities for specialized manufacturing are being used, the product is relatively expensive to produce.
- These methods are not suitable for GIT drug solubility and stability problems.
- Products that cause inflammation of the gastric mucosa are not suitable for GRDDS product.

1.5 FORMULATION:-

Apart from the active component, it typically contains a blend of acids, carbonate, hydrogen carbonate, and acid salts that react with water.

1.5.1 Medications designed to be taken as effervescent tablets:-

- Drugs that cause stomach distress or are difficult to digest.
- After taking Because the stomach acid is lowered, calcium carbonate effervescent granules and calcium dissolved in water are easily absorbed by the body and do not increase the possibility of constipation or excessive gas formation content.
- Drugs sensitive in pH, such as amino acid and antibodies. By increasing the pH of the stomach and buffering the water-active solutions, the effervescent granulation helps keep the active ingredients from deactivating or being destroyed that result from a lower stomach pH.
- Medicines that call for a high dosage. If a larger dose is required, a sachet is typically used for administration. A standard effervescent tablet (diameter 1 inch, total weight 5 grams) can have over two grams of the active ingredient that is soluble in water as components in a single dosage. (powder form).

1.6 EXCIPIENTS:-

Ingredients in effervescent formulation are-

- **Lubricants:** The ideal It has been demonstrated that a non-toxic, The tasteless, water-soluble mixture of 0.1% sodium stearyl fumarate and 4% polyethylene glycol (PEG) 6000 works well as an excipient (or lubricant) for effervescent products. for direct compression vitamin C tablets on a small scale. Even For effervescent tablets, water-soluble lubricants like salt, sodium acetate, and D,L-leucine have been proposed. hardly any metal state concentration. Lubricants are also produced by surfactants like magnesium and sodium lauryl sulfate.

- **Adherents:** Utilizing discs made of polyurethane or polytetrafluoroethylene, blade adhesion is avoided.
- **Binders:** As binders, they inhibit the effervescent tablet's rapid dissolution, which isn't typically needed. Nonetheless, bubbly granules are also used to create links. Since the liquid was effervescent, denatured alcohol was used to perform the Anhydrous acid and NaHCO3 granulation. During the massage, some of the acid dissolved and served as a binder. 4. Maltitol was an effective binder for vitamin C effervescent tablets. The binding mechanism was assumed to be the formation of maltitol crystal bridges.
- **Disintegrates or dissolution aids:** The disintegrating ingredients are chosen as specificallyafter putting the tablet in a cold water glass, a clear solution needs to be obtained in a matter of minutes.
- **Surfactants:** Want to increase moisture rate (wetting) and the way medications dissolve.
- **Antifoaming agents:** Reduces the drug's propensity to stay on the glass wall above the water line as a result of the foam's formation. One antifoam agent that is used is polydimethylsiloxane.
- **Sweeteners:** Sweeteners have been used, including saccharin, sucrose, and other natural sweeteners.
- **Flavor:** Flavoring agents are use to give an additional effect to sweeteners to inquire about the off flavor.
- **Colors:** Also, water-soluble color is added to provide a visually appealing appearance.

1.7 GENERAL PROCEDURE FOR MANUFACTURING EFFERVESCENT PRODUCTS RAW MATERIALS:-

Three main ingredients make up the effervescent preparation.-

- Active ingredient.
- Acid source.
- An alkaline substance made up of bicarbonate or carbonate.

Acid Sources	Alkali Sources
Citrate salts of acid: ascorbic acid, malic acid and fumaric acid	Sodium carbonate, sodium glycine carbonate, potassium and calcium carbonate, sodium bicarbonate
Lubricants	**Other Agents**
Sodium Acetate, Fumaric Acid, Alanine, Glycine, Sodium Benzoate, and Polyethylene Glycols (PEG) Greater Than 4000	Binders, Glidants, Disintegrates or dissolution aids, Antiadherents, Surfactants, Colors, Sweeteners, Flavors

Table 1: Lists of Sources and other agents

1.8 MANUFACTURING OF EFFERVESCENT TABLETS:-

Manufacturing of procedure for producing effervescent tablets is the same as for conventional tablets, but regulated ambient conditions are required. In order to keep the raw material from absorbing moisture and starting the effervescent reaction, temperature and humidity levels need to be closely monitored. To stop products from degrading and from sticking to equipment, a cool, moderate temperature of 25°C and a low relative humidity of 25 percent or less.

Granulation is the technique most often used to create tablets with the desired characteristics. There are numerous granulation techniques accessible, spanning from two-step granulation to one-step granulation with water or organic solvents. with distinct acid granulation and alkaline phases.[11]

1.8.1 Wet granulation:-

Despite serious drawbacks, wet granulation remains the most widely used technique for effervescent granulation. This procedure yields homogeneous compressible granules and tablets with consistent quality, measured in either weight or amount of active ingredient.[18]

- **2-step granulation techniques** Before adding the tablet lubricant, the acidic and basic components are first ground into a dry mixture using common tools such as a single pan, fluidized bed spray granulator, or high shear granulator. Another option is to grate in one source of effervescence and incorporate the powdered form of the other during the last stages of mixing with other chemicals like lubricants and flavors. By skipping the entire granulation stage, this technique increases output and lowers expenses.

- **1-step granulation techniques** With the one-step granulation technique, a tiny quantity of alcohol or isopropanol as a binder combined with water or organic solvents, are used to granulate the basic and acidic components. By regulating the effervescent's reaction and causing granule formation, this method generates dry effervescent granules instantly. The insoluble nature of the effervescent and other constituents in the employed organic solvent is imperative.[11]

- **Fluidised bed granulation**The fluid bed granulation-drying method is used to granulate the ingredients for effervescent mixing in a single step. Using a heated air stream and a dry mixture of acid and carbonate sources, this method produces a fluid bed. The most popular granule fluid, water, reacts momentarily before vanishing when injected in tiny amounts. When the last bit of water is injected and Hot, dry air is used to finish the drying process, and the reaction is complete.[19]

  An alternative approach to effervescent granules pellets is a rotor fluidized bed spray granulator. This technology reduces interaction between the effervescent system's two parts. Making effervescent pellets requires a continuous two- or three-step process. Granulating the alkaline ingredients in a revolving fluidized bed is the first step. The acid powder is sprayed onto the basic spheres using the granulation solution in the following step. Consequently, the spheres develop an outer acid layer that is isolated removed by a neutral layer from the binder. Following agglomeration, drying takes place.[20]

1.8.2 Dry granulation:-

A wet granulation process that breaks down the substance is what causes the effervescent reaction. Consequently, alternative solutions were created. Using a roller or other direct compression methods, dry granulation slugging is one of these methods for compressing big tablets or slugs. These work best as substitutes for the wet granulation method.

- **Slugging:** For the production of slugs or big tablets, mixed powders are frequently compressed at higher pressure between two counter-rotating rolls using a roller or chilsonator. The final fragments, also known as slugs, are then chopped down to a size that allows the tablets to be ground up. Lubrication might be necessary while the slug is being manufactured. This process works well for making effervescent tablets by granulating dry ingredients with both basic and acidic ingredients. However, this is only appropriate for small-scale tablet production because it requires the use of costly excipients. The technology is easy to use, affordable, boosts output, and needs less space and users—but it also needs less ventilation.[11]

- **Direct compression:** In the production of Direct compression has been successfully used as an alternative to dry granulation for effervescent tablets containing acetylsalicylic acid. In this procedure, it is helpful to solve operational stability and process efficiency issues. This technology's practical applications are limited because it can only be utilized in the best production environments. This is because complex combinations of raw materials that are compressible, free-flowing, and non-dissolving are required.[11]

- **Granulation by heating:** Hot melt granulation and other dry granulation techniques can be applied in place of wet granulation.. Melting hydrated citric acid releases the water of hydration, which acts as a granulation fluid, agglomerating the powder mixer and its particles in hot melt granulation. The granules are subsequently cooled to the required level of mechanical stability and hardness. PEGs and other In fluid bed spray, low melting point polymers can be utilized as binders granulators, or high shear granulator dryers can be used for hot melt granulation. Another unusual method is hot extrusion, which calls for an extruder with temperature-controlled heating zones, an extrusion die, and a hot extrusion binder.[21,22]

1.9 EVALUATION TEST OF EFFERVESCENT TABLETS:-

- **Weight variations**

Twenty effervescent tablets are chosen at random and weighed one at a time. We compute the average weight and standard deviation for each of the twenty effervescent tablets.[23]

- **Thickness:**

Twenty effervescent tablets are chosen at random from a tray, the thickness of the effervescent tablet is measured using a sliding scale, and the total thickness of the crown is measured.[23]

- **Hardness:**

Hardness testers are used to determine how hard an effervescent tablet is.[23]

- **Friability:**

Weighing twenty effervescent tablets, they are put inside a Roche fribilator. With each revolution, the effervescent tablet descends six inches as it spins at 25 rpm. The effervescent pills are reweighed after being dusted.[23]

- **Disintegration time:**

  When the effervescent When a tablet is added to 200 ml of water in a beaker that is heated to 150–250°C, many gas bubbles start to form. when there is no longer any particle agglomeration and the effervescent tablet in the water stops producing gas. The examination is redone. using five more effervescent tablets.[24]

- **Solution pH:**

The pH utilizing a digital pH meter in a solution with a constant temperature and water volume. The effervescent tablet needs to be dissolved in 200 ml of hot water heated to a certain temperature between 150°C and 250°C. Following the receipt of the effervescent tablet, the pH is determined as completely dissolved.[25]

- **Drug content determination:**

The concentration of the drug is ascertained by breaking down the tablet in 200 milliliters of water. To find out how much medication is in the tablet, use a UV spectrophotometer to measure the drug's absorbance in this solution.[26]

- **In-vitro study of drug release:**

Numerous tools and the proper dissolving medium were used in in vitro release investigations. The dissolution medium's temperature was kept constant at 37 ± 0.5 °C. Three and a half hours are needed for the emission tests. The dissolving medium is taken in an aliquot and filtered at predefined intervals. The calculation of absorbance follows.[26]

- **Measurement of CO2 content:**

Following dissolution, One 1 N sulfuric acid solution is dissolved in 100 milliliters of effervescent tablet, and the mass change is calculated. The ensuing weight differential displays the amount of C02 (mg) in each tablet. We use the means of the three conclusions.[27,28]

- **Evaluation of the water content:**

Ten of the preparation's tablets are dehydrated for four hours using activated silica gel in a desiccator. A percentage of water of no more than 0.5% is a reasonable threshold.[27,28]

- **Effervescence Time:**

A stopwatch was used to measure the amount of effervescence that occurred following the addition of three tablets to three water-filled beakers. The period of bubble time was set at when a clear solution was obtained.

- **Uniformity of Content:**

There are ten randomly selected tables. Each tablet should be put dissolved and diluted to a volume of 50 ml using phosphate buffer (pH 6.8) in a 50 ml volumetric flask. Phosphate buffer is used to dilute one milliliter of this solution. 6.8 pH to make one hundred milliliters. Each tablet's drug content is determined by UV spectroscopy at a wavelength of 246 nm.[29] The typical content uniformity limit is

- IP: Inactive less than 10% or 10 milligrams

- BP: Active less than 2% or 2 milligrams
- USP: Less than 25 mg or 25% active

1.10 ADVANCEMENTS AND DEVELOPMENT IN EFFERVESCENT TECHNOLOGY:-

Traditionally, an acidic source reacts with basic (or alkaline) carbonates to produce carbon dioxide in effervescent tablets. However, more recent developments in this method have resulted in the effervescence-produced generation of oxygen and hydrogen gas. By fusing mechanical and physiological qualities, this created opportunities for local drug delivery. Due to the development of Additionally promising for oral hygiene and antimicrobial activity are effervescent tablets., as have oral tablets and prostheses. These tablets work well for dosing not just oral drugs but also dietary supplements and herbal remedies. In preparations for manicures, pedicures, and bath bombs, effervescent tablets have also been developed. The use of bladder technology to deliver medication to the lungs has great potential.[11]

1.11 UTILIZATIONS OF EFFERVESCENT TABLET:-

- Better stability and easy to transport.
- This is useful in a pulsatile system; the quick release core was made so that the drug was released quickly after the polymer coating was broken.
- In floating drug delivery systems, the floating (or swimming) time is contingent upon the concentration of effervescent agents..
- An alternative to parenteral forms when parenteral administration is difficult.
- Cosmetic effervescent tablets were also available.
- Pre-determined (or programmed) drug delivery is achieved.
- Enhancement through effervescence is thought to cause tight junctions to open and the hydrophobicity of the membrane spanning the intestines of rats and rabbits to increase.
- Carbon dioxide (C02) bubbles can also promote intestinal absorption by opening extracellular transport.
- Zero release is achieved by adding to a low effervescence mixture within the tablet matrix.

2. CONCLUSION:-

Because effervescent tablets are simple to dose or administer, they make an excellent substitute for conventional tablets. Effervescent tablets are easy for the elderly or those who have swallowing issues to take because they dissolve they float in water and don't have to be ingested.

Effervescent tablets exhibit a favorable therapeutic effect due to their high bioavailability. Because effervescent supplements are more easily ingested and improve patient compliance, more of them are produced today. In addition to being simpler to administer, Additionally, some ingredients' tastes are disguised by effervescent tablets, which eliminates the need for flavorings. The stomach compatibility and other issues that come with regular tablets are less common with effervescent tablets. Due to their quick onset of action, effervescent tablets will make a person feel better very quickly.. The medication tastes better when taken in effervescent tablets, which also work faster, are more compatible, have a better therapeutic effect, and, most importantly, improve patient compliance.

Nevertheless, there are a few drawbacks to effervescent tablets, among them are their bulkier dimensions, complex manufacturing method, brittle packaging, and protracted disintegration period. Despite these disadvantages, effervescent tablets are a practical and helpful dosage form for a variety of therapeutic uses. An increasing number of pulsatile drug delivery systems and formulations with controlled and sustained release are using effervescent tablets, and other related applications to control drug release behaviors as a result of advancements in pharmaceutical techniques.

REFERENCES:-

- Patel HK, Chauhan P, Patel KN, Patel BA, Patel PA. Formulation and evaluation of effervescent tablet of Paracetamol and Ibuprofen. Int. J. Pharm. Res. Scholars. 2012; 1(2):509-20
- Kabir AK, Huda NH, Jhanker YM, Shamin K. Formulation development of verapamil hydrochloride tablet by effervescent method. Stamford J. Pharm. Sci. 2010; 3(1):34-7
- Dr. Yogesh Vaishnav , Arpan Kumar Tripathi , Ms. Isha sonker , Mr. Vinay Sagar Verma , Mr. Ashish Kumar Pandey, Dr. Shekhar Verma. Electrolytes effervescent tablets - A review. Journal of Cardiovascular Disease Research ISSN: 0975-3583, 0976-2833 VOL 12, ISSUE 03, 2021
- Palanisamy P, Abhishekh R, Yoganand Kumar D. Formulation and evaluation of effervescent tablets of aceclofenac. Int Res J Pharm. 2011; 2(12):185-90
- Krishna KB, Prabhakar CH. A Review on Effervescent Tablets. Int. J. Pharm. Technol. 2011; 3(1): p. 704-712
- Lindberg NO. effervescent pharmaceuticals, Encycl. Pharm. Technol. 2002; p. 1037-1040
- Shirsand SB, Para MS., Rampure M. V., et al. Formulation Design and Optimization of Fast Dissolving Effervescent Tablets of Clonazepam. Indian J. Pharm. Sci. 2011; 1(3): p.202-208
- Palanisamy P, Abhishekh R, Kumar DY. Int. Res. J. Pharm. 2011;185-190
- Foldvari M. Nanopharmaceutics Innovations in Gene Therapy: Moving Towards Non-Viral and NonInvasive Delivery Methods. J. Nanomed. Biother. Discovery. 2014; 4(2):129

- Chowdary Cherukuri P, Palanisamy P. Formulation and evaluation of effervescent tablets of paracetamol. Formulation and evaluation of effervescent tablets of paracetamol. Int J Pharm Res Dev. 2011; 3(3):76-104
- Kajal Gopinath Vanhere, Deelip Vishram Derle, Sandeep Bhausaheb Khatale, Satish Laxman Nangude. A Comprehensive Review on Effervescent Tablets. Journal of Drug Delivery & Therapeutics. 2023; 13(7):141-150
- Pharmaceutics,2010; 4(4) 184-189
- Dhakar RC Maurya SD, Aggarwal S, Kumar G. Tilak VK. Design and evaluation of SRM microspheres of Metformhydrochlonde
- PharmacieGlobale(LICP), 2010: 1(07) 1-6
- Dhakar RC, Maurya SD. Sagar BPS, Prajapati SK, Jam CP. Variables influencing the drug entmpment efficiency of microspheres a pharmaceuticalreview Der Pharmacia Lettre 2010 (5) 102-116
- Sastry SV, Nyshdham JR. Fix JA. Recent technological advances in oral drug delivery A review Pharmaceutical Science and Technology Today. 2000; 1(3) 38-45
- Radha Rani, KomalMasoan, sherry, “A recent updated Review on effervescent tablet” International Journal of creative Research Thoughts,2020, Vol – 8, ISSN 2320- 2882
- Simone V De, Caccavo D, Dalmoro A, Lamberti G, d'Amore M, Barba AA. Inside the Phenomenological Aspects of Wet Granulation: Role of Process Parameters. In: Granularity in Materials Science. InTech; 2018. p. 63-84
- Zheng X, Wu F, Hong Y, Shen L, Lin X, Feng Y. Improvements in sticking, hygroscopicity, and compactibility of effervescent systems by fluid-bed coating. RSC Adv. 2019; 9(54):31594-608.
- Jean Bru. Process for manufacturing effervescent granules and tablets. Vol. 614. France: United states Patent; 4614648, 1983. p. 01-7
- Murray RB. New Approach to the Fusion Method for Preparing Granular Effervescent Products. Industrial Pharmaceutical technology. 1968; 57(10):1776-9.
- Yanze FM, Duru C, Jacob M. A Process to Produce Effervescent Tablets: Fluidized Bed Dryer Melt Granulation. Drug Dev Ind Pharm [Internet]. 2000; 26(11):1167-76
- Banker.G.S., Anderson. N.R., In Lachman, Leon, Liberman H A. Knig J.L., Eds., The theory and Practice of industrial pharmacy, 3rd Edn, Varghese Publishing House, Mumbai, 297-300(1987)
- British pharmacopoeia, by the stationary office on behalf of the department of health and social services f or Northern Ireland, Crown Copy-right, Vol 11:1452(1998).
- Roymond M., In Lachman, Leon, Liberman H A., Joseph B. Schwartz., pharmaceutical Dosage Forms: Tablets Vol 1, 2nd Edn, by Marcel Dekker Inc., New York. 294, 295, 322, 304 (1989)
- The United States Pharmacopoeia 27 / National formulary 22, Asian Edn, United States Pharmacopeial convention, Inc., Rockville, MD, 1313(2004)

- Thoke SB, Sharma Y., Rawa t S, Nangude, SFormulation development & evaluation of effervescent tablet of Alendronate sodium with vitamin D3, Journal of Drug Delivery & Therapeutics; 20 13; 3(5):65-74
- Abolfazl A, Formulation, Characterization and Physicochemical Evaluation of Ranitidine Effervescent Tablets, Advanced Pharmaceutical Bulletin, 2013; 3(2): 315- 322
- Sangram Biranje*, Akshata More, Trusha P. Shangrapawar, Ashok Bhosale. A Review onFormulation andEvaluation of Effervescent Tablet, International journal of Pharmacy and Pharmaceutical research, June 2021 Vol.:21, Issue:3
- Elhassan M, Shayoub A. Design, Formulation, and Evaluation of Senna Effervescent Tablets. Journal of forest products and industries [Internet]. 2012; 1(2):21-5