

A Review on Formulation and Evaluation of Effervescent Tablet

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Abstract:

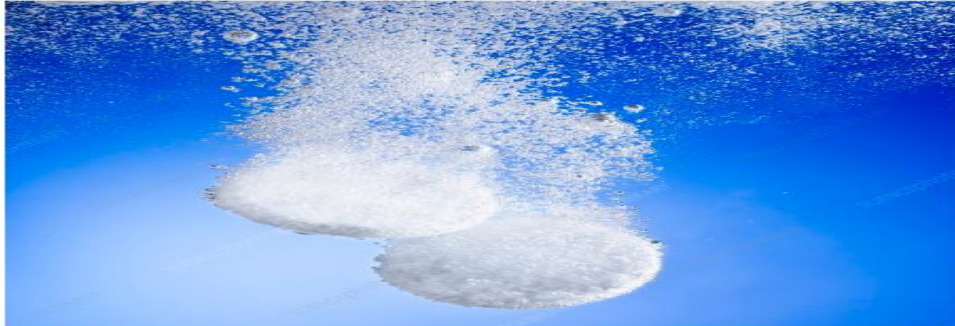
Oral dosage forms are the most popular form of medication, although there are some problems compared to others methods such as the risk of drug absorption, which can be overcome by administering the drug in a liquid form, therefore, perhaps to allow for the use of low doses. However, the instability of many drugs in the liquid dosage form reduces their use. Formulation of Effervescent tablets/granules can be used as an alternative to developing a dosage form that can accelerate the dispersion and deterioration of drugs, usually used in quick-release arrangements. The benefits of using this method of drug overdose and elimination can be accelerated. Immediate release of the preparation is an example of a product produced in this way. Pills are produced by a broadly effervescent process essential for drug delivery control, ongoing maintenance and control arrangements, drug delivery system, etc. are just a few products of this process. This review reflects the new use of the effervescent tablet.

Keywords: Effervescent Time, Hardness, Granulation, Formulation, weight variation, hardness, Friability.

INTRODUCTION

Effervescence is described as exclusion of carbon dioxide gas from a fluid due to chemical reaction. This effect starts when preparation come in contact with water which works as catalyzing agent. Effervescent tablets need to be liquefied in water before administration. The tablet is punctually broken down by releasing carbon dioxide in water. Carbon dioxide produces by effervescent reaction increases the penetration of active substance into the Para cellular pathway and consequently their absorption. The effervescent formulation does not come in direct contact with the gastrointestinal tract and thus such dosage forms are useful for this kind of patient. It decreases the onset of action, due to faster absorption of formulation in liquid dosage form, as compared to tablet formulations. ^[1,2] Effervescent tablets are becoming increasingly popular in a variety of sectors including supplements and pharmaceutical use, thanks to the convenience during which they will be consumed. Effervescent tablets are designed to break in contact with liquid like water or juice, often causing the tablet to dissolve into a solution. ^[3] Effervescence means CO₂ gas emission in reaction to acids and bicarbonates in the presence of H₂O Other common acids used in this reaction are citric, malic, tartaric, adipic, and fumaric acid and bicarbonate used in the effervescent reaction is sodium bicarbonate, potassium bicarbonate, sodium carbonate, and potassium. The most common drug reaction for pharmaceutical use is the acid-base reaction between sodium bicarbonate and citric acid. $3\text{NaHCO}_3(\text{aq}) + \text{H}_3\text{C}_6\text{H}_5\text{O}_7(\text{aq}) \rightarrow 3\text{Na}_3\text{C}_6\text{H}_5\text{O}_7(\text{aq}) + 3\text{H}_2\text{O} + 3\text{CO}_2$

This reaction occurs in presence of water, even with a small amount as a catalyzing agent, which increases the rate of reaction. As water acts as a catalyzing agent for the reaction so all the moisture-sensitive products or effervescent products are stored in a moisture-free environment. ^[3,4]



Effervescent Tablet Fig No.1

BENEFITS OF EFFERVESCENT TABLETS OVER REGULAR TABLETS

Good Taste ^[5,6]

Effervescent tablets are very popular because they can be dissolved in a liquid such as water or fruit juice, which means they often taste better than regular tablets. Regular tablets dissolve slowly which can result in reduced absorption rates, effervescent tablets, in contrast, have good speed, which means you get the full advantage of the ingredients.

Good Distribution ^[5,6]

Regular tablets dissolve slowly in the stomach if imported and can sometimes be slightly dispersed which can lead to irritation in some cases. The advantage of an effervescent tablet is that they completely dissolve equally meaning the ingredients cannot accumulate. This means not only the best taste but also less chance of irritation and more performance ways to add ingredients.

More Liquid Intake ^[7]

Effervescent tablets provide not only nutritional benefits but also, increase liquid intake. This is beneficial if you are dehydrated or ill and not ingesting as much fluid. Effervescent tablets can be the best way of rehydrating as well as taking the benefits you are taking the tablets for whether this is a dietary supplement, herbal or medicinal.

Alternative to Regular ^[8]

They are thought to be a great alternative for those who may have trouble swallowing due to illness or age. Older age people sometimes have difficulty in swallowing but need to take medication or supplements regularly so, effervescent tablets can be a lot easier. In addition to this, they can be a great way to administer medication for individuals with sore throats or medical issues that make swallowing difficult and so are a good option to regular tablets.

Simple and Easy Measurement ^[9]

Effervescent tablets dissolve easily into water or a liquid of your choice and are consistent, mixed, and ready to drink. Traditional tablets or powders, however, need to be measured and stirred repeatedly to avoid a lumpy bit. Although arousing and measuring it is common to have an inconsistent drink with bumps and bumps and this is where effervescent pills work. Just install them and dispose of them fully and evenly to ensure you get all the benefits of the tablet, as well as being able to drink it properly.

Fast onset of Action ^[10]

Effervescent tablet has main advantage that the drug product is already in solution on the time it is consumed. Therefore, the absorption is earlier and further complete than with predictable tablet. Earlier absorption means faster onset of action. Effervescent drug is distributed to the stomach at a pH that is just correct for absorption. Numerous medications. Portable slowly through the stomach or have absorption that is hindered by food or another drug.

No need to Swallow Tablet [11]

Effervescent tablets are administered in liquid form so they easy to take. The number of persons who cannot gulp tablet or who dislike swallowing tablet and capsule is rising. Through an effervescent dosage form, one dose can usually transport in just 3 or 4 ounces of water.

More Portability ^[12]

Effervescent tablet is more simply delivered than liquid medication because no water is added until it is complete to use.

Improved palatability ^[12]

Drugs transported with effervescent base, taste improved than most liquids, mixture and suspensions. Greater taste masking is attained by limiting offensive characteristics and adding formulations with flavor and fragrances.

Good stomach and Intestinal Tolerance ^[12]

Effervescent tablet liquefies completely in a buffered solution. Reduced localized contact in the upper stomach leads to fewer irritation and greater acceptability. Buffering also prevent intestinal acids from interrelating with drug themselves, which can be a main cause of stomach tolerance.

3. FORMULATION METHODS ^[13]

Different Methods for formulation of Effervescent Tablet.

3.1 Method A

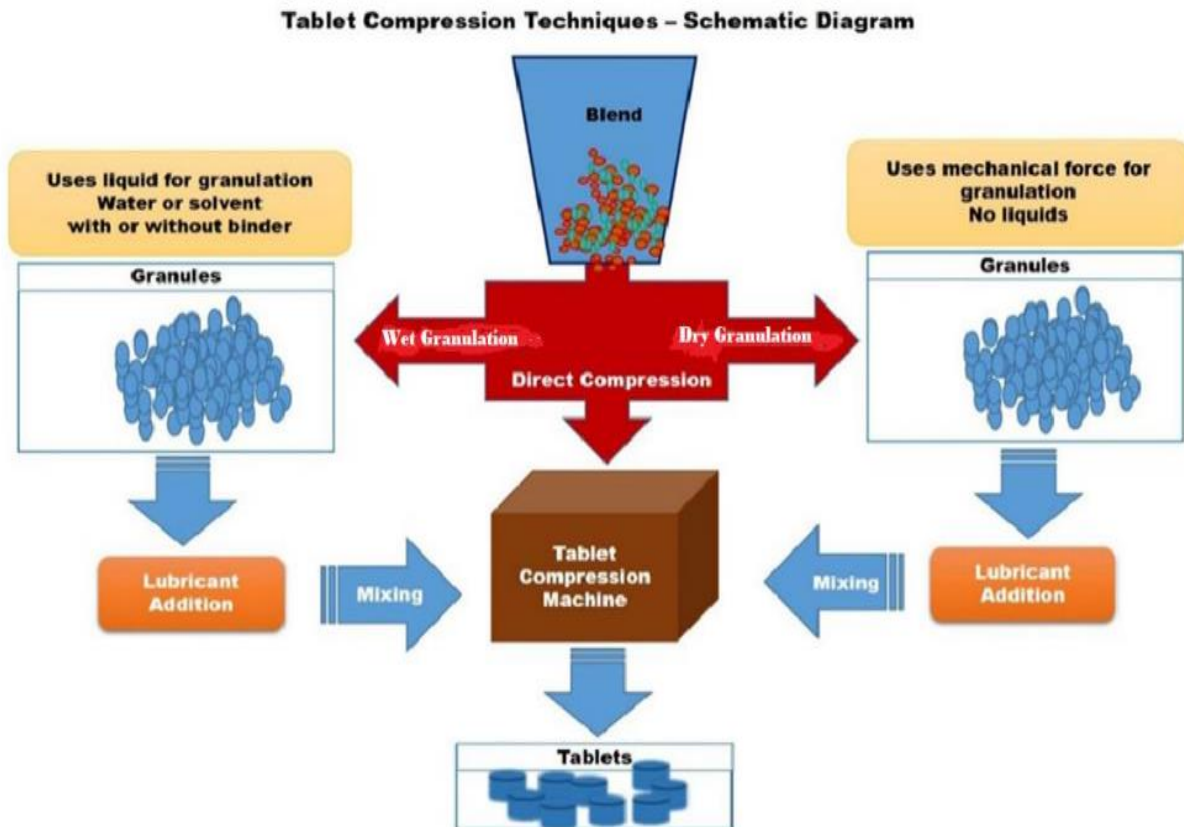
A) Wet Granulation

- Shear granulation
- Fluidized-bed granulation

3.2 Method B

B) Dry Granulation

- Sluggers
- Roller compaction



Tablet Compression Technique Fig No.2

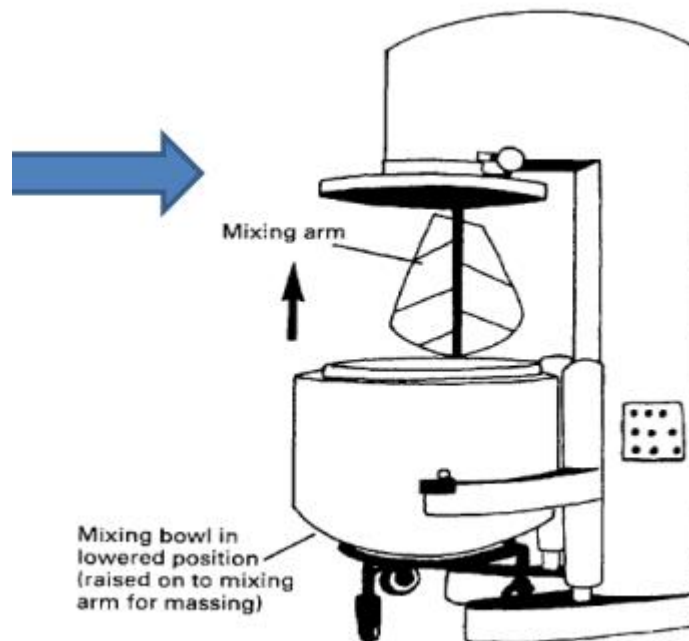
3.1 Method A

A) Wet Granulation

Wet granulation remains the foremost preferred method for effervescent granulation. This method gives homogeneous granules for compression, and is in a position to produce uniform tablets either in terms of weight or active ingredient content. Wet granulation method further may be divided in two types looking on the amount of process steps- Important steps involved within the wet granulation. Drying of moist granules. Mixing of binder solution with powder mixture to make wet mass. Preparation of binder solution. Mixing of the drug(s) and excipients. Mixing of screened granules with disintegrate, gliding, and lubricant. [14]

- **Shear Granulation**

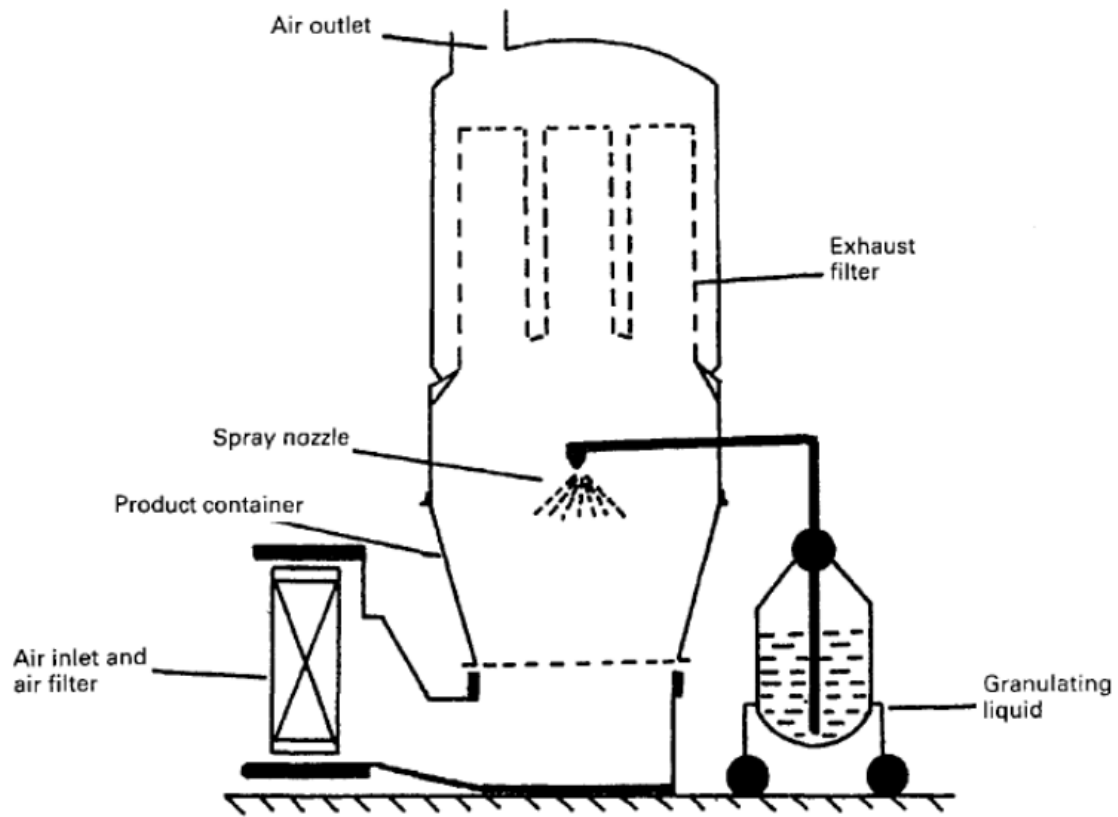
Shear granulators have been successfully used by the pharmaceutical industry for decades as a shaping method for granulation. With high-shear granulation, a binding fluid is added to the powdery particles in a closed tank that has an agitator blade and chopper. The agitator blade with its high-shear and compaction guarantees effective granulation. Dense granules are formed. The chopper prevents excessive granule growth and distributes the granulation fluid throughout the product. e.g. Hobart, Collette, Beken. [15,16]



Shear Granulator Fig No.3

- **Fluidized-Bed Granulation**

The fluid bed granulation process (also known as agglomeration) involves suspending particles in an air stream and spraying a liquid from the top of the system down onto the fluidized bed (top-down spray). Particles in the path of the spray get slightly wet and become sticky. The sticky particles collide with other particles in the bed of material and adhere to them to form granules. [17,18]



Fluidized-Bed Granulator Fig No.4

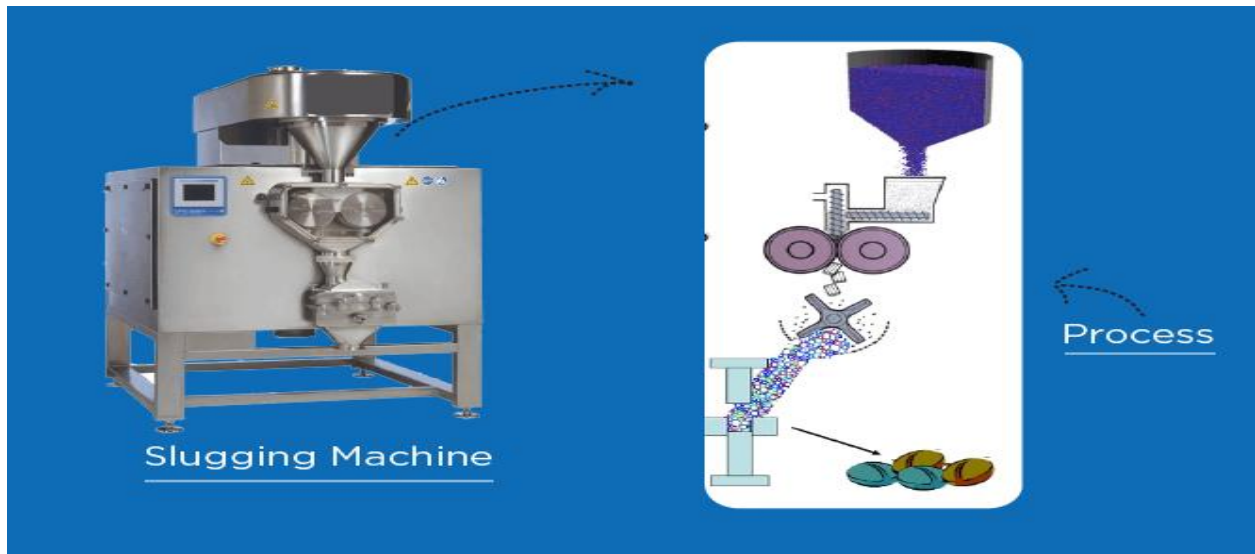
B) Method B

3.2 Dry Granulation

The Dry granulation process is used to form granules without using a liquid solution because the product to be granulated may be sensitive to moisture and heat. Forming granules without moisture requires compacting and densifying the powders. Dry granulation can be conducted on a tablet press using slugging tooling or on a roller compactor commonly referred to as a when a tablet press is used for dry granulation, the powders may not possess enough natural flow to feed the product uniformly into the die cavity. The dry granulation process is used to form granules without using a liquid solution because the product to be granulated may be sensitive to moisture and heat. Forming granules without moisture requires compacting and densifying the powders. ^[19,20]

- **Sluggers**

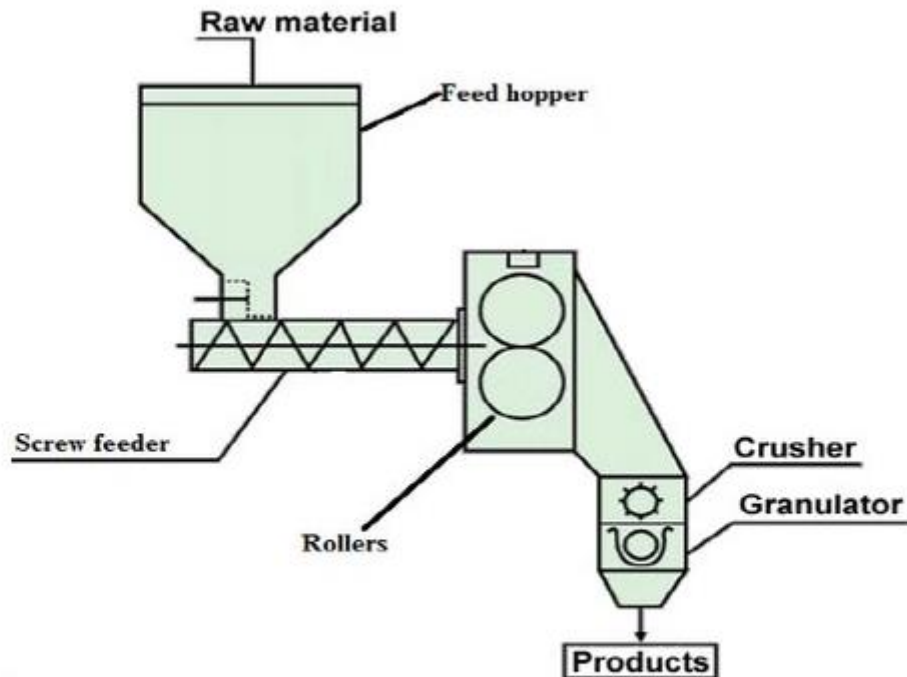
The dry powders can be compressed using a conventional tablet machine or, more usually, a large heavy duty rotary press can be used. This process is often known as 'slugging', the compact made in the process (typically 25 mm diameter by about 10-15 mm thick) being termed a 'slug'. A hammer mill is suitable for breaking the compacts. ^[19,21]



Sluggers Fig No.5

- **Roller compaction**

Roller compaction is an alternative gentler method; the powder mix being squeezed between two rollers to form a compressed sheet. The sheet normally is weak and brittle and breaks immediately into flakes. These flakes need gentler treatment to break them into granules. This can further be milled into desired particle size. Roller compaction is a method of powder compaction of dry powders into a solid mass known as the ribbon. This process is achieved by feeding powder through a set of directly opposed, counter-rotating rollers. The process avoids the use of liquids and high temperatures. The ribbon is broken down into a specific granule size via a milling system, such as an oscillating mill. The purpose of dry granulation is to increase the bulk density of powders and particle size to ensure a better flow of distributed material; an important factor in the manufacturing of tablets and capsules using production equipment. [19,22]



Main parts of roller compactor

Roller Compactor Fig No.6

Excipients Used In Effervescent Tablet

Effervescent tablet formulations generally include an agent that is capable of releasing CO₂ (sodium carbonate and sodium bicarbonate) and an agent that induces releases of CO₂ (adipic acid, malic acid, tartaric acid, ascorbic acid, fumaric acid, maleic acid, succinic acid, or citric acid). The generation of carbon dioxide is a result of the chemical reaction that occurs between a carbonate or bicarbonate salt (e.g., sodium bicarbonate) and a weak organic acid (e.g., citric or tartaric acid) in the presence of water. ^[23,24]

S no	Excipient	category
1	Citric acid	acidifying agent
2	Sodium citrate	buffering agent
3	Tartaric acid	acidifying agent
4	Sodium bicarbonate (anhydrous)	alkalizing agent
5	Sodium carbonate	alkalizing agent
6	Ascorbic acid	antioxidant
7	Polyethylene Glycol-6000	binding agent.
8	Polyvinylpyrrolidone-30	binding agent.
9	Fumaric acid	acidulant
10	Sodium Benzoate	lubricant
11	Sodium lauryl sulphate	lubricant
12	Mannitol	binding agent
13	Acesulfum potassium	sweetener

Excipients Table No.1

EVALUATION OF EFFERVESCENT TABLETS

1. Weight Variation

The weight variation test would be a satisfactory method for determining drug content uniformity of drug distribution. Weight variation test is applicable when the table containing 50 mg or more of drug substance. the drug substance represents 50% or more (by weight) of the dosage form unit. Weight 20 tablet selected at random, each one individually. Determine the average weight.

$$X = (X_1 + X_2 + X_3 + \dots + X_n) / 20. \text{ [23,25]}$$

2. Thickness

The thickness of the Effervescent Tablet is measured by using a sliding caliper scale, twenty Effervescent Tablets are selected randomly in a holding tray and total crown thickness is measured. [26]

3. Hardness [27]

The Hardness of the Tablet is also called as Tablet Crushing strength. Harness test is used to check the Hardness of the prepared tablet. In this test we can Measured the force which is required for the breaking of The tablet.⁵



Hardness Tester Fig No.7

4. **Friability** ^[28]

Twenty Effervescent Tablets are weighed and placed in the Roche friabilator. It is revolved at 25 rpm, dropping the Effervescent Tablet at a distance of six inches with each revolution. The Effervescent Tablets are then dusted and reweighed.



Friabilator Fig No.8

5. **Disintegration time** ^[29]

Place an Effervescent Tablet in a beaker containing 200 ml of water at 1500 C to 2500 C; numerous bubbles of gas are evolved. When the evolution of gas around the Effervescent Tablet stops in the water and no agglomerate of particles remains. The test is repeated for five other Effervescent Tablets.

6. **Solution pH**^[29]

Solution of pH is measured with a digital pH meter in standardized water volume and temperature. Place an Effervescent Tablet in a beaker containing 200 ml of water at 1500C to 2500C. The pH is measured after complete disintegration of the Effervescent Tablet is done.

7. **Drug content** ^[30]

Determination Drug content is determined by dissolving the Effervescent Tablet in 200 ml of water. Determine Drug content absorbance of this solution, using UV Spectrophotometer to know how much drug is present in the tablet.

8. **In-vitro drug release study** ^[31]

In-vitro release studies were carried out using various apparatus with appropriate dissolution medium. The temperature of the dissolution medium was maintained at $37 \pm 0.5^{\circ}\text{C}$. The release study is carried out for 3.30 hrs. The aliquot of the dissolution medium is withdrawn at a specific time interval and is filtered. Then absorbance is measured.

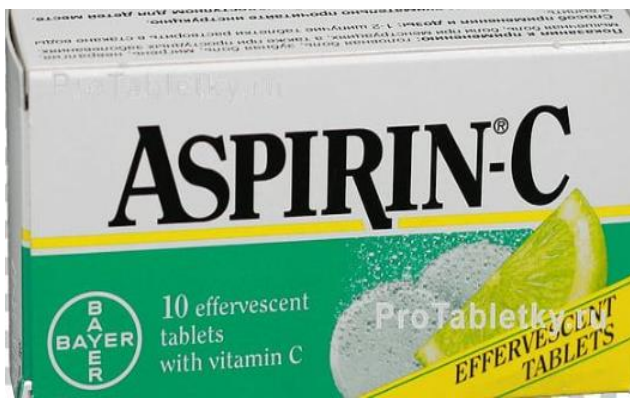
9. Measurement of CO₂ content [32]

One effervescent tablet is dissolved in 100 ml of 1N sulphuric acid solution and weight changes are determined after dissolution ends. The obtained weight difference shows the amount (mg) of CO₂ per tablet. Averages of determinations are taken.

10. Evaluation of the water content [32]

10 tablets of the formulation are dried in a desiccator containing activated silica gel for 4 hours. The water content of 0.5 % or less is an acceptable parameter.

Marketed Brands



Aspirin C Fig.9



Glopar C Fig.10



Savoeffer Fig.11

CONCLUSION

Effervescent tablets are prepared by Dry method, Wet method and Compression, in which Wet method is the most widely used for formulation of Effervescent Granules. These formulations were evaluated for hardness, friability, weight variation, Disintegration time. Effervescent tablets not only increase ease of administration but also mask the taste of some ingredients so flavoring agents are not needed to be used. The use of effervescent tablets may decrease problems with regular tablets such as stomach compatibility. As effervescent tablets have a fast onset of action, the person administered will feel better. Effervescent or carbon tablets are tablets that are designed to dissolve in water to release carbon dioxide. It is a product of compression ingredients in powder form that become thick mass, covered with a blister pack, or with a packet packed with gasoline with desiccant embedded in the cap. To use them, mix them into the water to make a solution. Powder ingredients are also packaged and marketed as effervescent powders or can be granulated and sold as effervescent granules. Often the powdered ingredients start granulating before the tablets are made.

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