IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
**Review Article**
June 2021 Vol.:21, Issue:3


# A Review on Formulation and Evaluation of Effervescent Tablet

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An official Publication of Human Journals
ISSN 2349-7203
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**Submitted:** 22 May 2021
**Accepted:** 29 May 2021
**Published:** 30 June 2021



**Keywords:** Effervescent Tablet, oral route, increase patient compliance

**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.

## INTRODUCTION

The oral route is the most preferred method of drug administration but may have some effect discomfort as a slow start to work or slow walking absorption. This problem can be overcome by using other dosage forms or control the drug with other routes. While we choose the rating form or the route of drug administration has certain parameters should be considered as the durability and availability of the formulations and active medicinal ingredients[1]. 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[2]. Effervescence means $CO_2$ gas emission in reaction to acids and bicarbonates in the presence of $H_2O$ 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.

$$3NaHCO3\,(aq) + H3C6H5O7(aq) \longrightarrow 3Na3C6H5O7\,(aq) + 3H_2O + 3CO_2$$

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].

Effervescent or carbon tablets are tablets that are designed to dissolve in water to release carbon dioxide [4-6]. 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 granulated before the tablets are made [7-8].

**BENEFITS OF EFFERVESCENT TABLETS OVER REGULAR TABLETS**[9]

**1.Good taste**

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.

**2.Good Distribution**

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.

**3.More Liquid Intake**

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.

**4.Alternative to regular**

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.

**5.Simple and easy measurement**

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

best. 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.

**Advantages [10-13]**

1. Tablets introduced with bubbling have a predictable and reproducible pharmacokinetic profile that is a lot more consistent than normal tablets.
2. Have a good stomach compatibility
3. Fast onset of action
4. Avoid swallowing problems.
5. Easy to transport.
6. Improved palatability
7. Good stability
8. Enhanced absorption
9. Effervescent tablet avoids the first-pass metabolism.
10. Effervescent tablets can incorporate a high amount of active ingredients.

**Disadvantages [10-15]**

1. Cost is relatively high as compared.
2. Large tablets require special packing material.
3. May require more time for full dispersion.
4. Should have a proper packing to protect it from humidity & temperature.

**FORMULATION METHODS**

Different Methods for formulation of Effervescent Tablet.

**Wet Granulation**.

The most widely used process of agglomeration is wet granulation. The wet granulation process simply involves wet massing of powder blend with a granulating liquid, wet sizing, and drying.

Important steps involved in wet granulation.

1. Mixing drug & excipients
2. Making binder solution
3. Mixing of binder solution & powder mixture to form a wet mass
4. Drying of moist granules
5. Mixing screened granules with disintegrant, glidant, and lubricant.

Advantages

1. Helps mechanical handling of the mixture without loss of quality
2. Improves the flow of powder.
3. Improves the uniformity

Disadvantages

1. It is a costly method as it involves labor, time, equipment, energy, and space.
2. More loss of material in various stages of making [16-28].

**Dry Granulation**

In a dry granulation process, the powder mixture is pressed without using heat and solvent. But is less desirable in all granulation methods. Two basic processes for building compact of material in a compress and grind compact to get granules. Two methods are used for dry granulation. The most widely used method is slugging, where the powder is present it is pressed again and the tablet or slug that appears is accessed to remove granules. Another way is to reprint the fine powder with pressure rolls using a machine such as Chilosonator [25-32].

**Roller Compaction**

Compression using a pressure roll can be done with a machine called a chilsonator. Unlike a tablet machine, a chilsonator turns out to be weight combined with continuous flow. The powder is fed between the rollers from the hopper which contains a spiral auger feeding powder compaction area. Like slugs, aggregates are screened for production into granules[32-35].

**Advancement in Granulation**

**Steam Granulation**.

It is a modification of wet granulation. Here steam is used as a binding agent instead of water. Its several benefits include high uniform distribution, high distribution rate into powders, good favorable heat balance during drying step, steam granules are rounded on top, have a large surface area so increased dissolution rate of the drug from granules, the processing time is shorter and therefore more number of tablets produced per set, compared with the use of organic solvent vapor water is nature friendly, no health risks to operators, no restrictions by ICH in the tracks left on the granules, the steam is free of any contamination/sterile therefore the total value can be kept in control, low dissolution rates can be used for the preparation of flavor granules without modification of drug availability [36-37].

**Melt Granulation**

In this process, granulation is achieved by using a mouldable binder. The binder is in a solid state at room temperature but melts in the temperature range of 50 – 80˚C. This Melted binder then acts as a binding liquid. In this process, there is no need for a drying phase since dried granules are obtained by cooling them to room temperature [38-40].

**EVALUATION OF EFFERVESCENT GRANULES**

1. **Angle of repose** [41]

The angle of repose is determined by using the funnel method. Effervescent Granules are poured from the funnel, that can be raised vertically until a maximum cone height, h, diameter of the heap, D, is measured. The repose angle θ is calculated by the formula:

$$\tan \theta = 2h / D$$

2. **Bulk density**

Bulk density is determined by placing Effervescent Granules into a graduated cylinder and measuring the volume and weight [42].

3. **Tapped density**

Tapped density is determined by placing a graduated cylinder, containing a known mass of Effervescent Granules on mechanical tapping apparatus, which is operated for a fixed number

of taps until the Effervescent Granules bed volume is reached a minimum. Using the weight of Effervescent Granules bed in a cylinder and this minimum volume, the tapped density is calculated [42].

**4. Compressibility index and Hausner ratio**

It is measured for the property of Effervescent Granules to be compressed. As such they are measured for the relative importance of inter particulate interactions. The compressibility index is calculated by the following equation:

$$\{(Dt - Db)\} \times 100$$

Where Dt = Tapped Density. Db = Bulk Density

Hausner ratio was calculated by the following equation

$$Dt / D0$$

Where Dt = Tapped Density. D0 = Bulk Density.[43]

**EVALUATION OF EFFERVESCENT TABLETS**

**1. Weight variation**

Twenty Effervescent tablets are selected randomly and weighed individually. The average weight and standard deviation of all twenty Effervescent tablets are calculated [44].

**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 [44].

**3. Hardness**

The hardness of the Effervescent Tablet is measured using hardness testers [44].

**4. Friability**

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 [44].

**5. Disintegration time**

Place an Effervescent Tablet in a beaker containing 200 ml of water at $150^0$ C to $250^0$ 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 Tablet [45].

**6. Solution pH**

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 $150^0$C to $250^0$C. The pH is measured after complete disintegration of the Effervescent Tablet is done [46].

**7. Drug content 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 [47].

**8. *In-vitro* drug release study**

*In-vitro* release studies were carried out using various apparatus with appropriate dissolution medium. The temperature of the dissolution medium was maintained at 37 ± 0.5°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 [47].

**9. Measurement of $CO_2$ content**

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 $CO_2$ per tablet. Averages of 3determinations are taken [48-49].

**10. Evaluation of the water content**

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 [48-49].

**11. Uniformity of Content:**

10 tablets are selected randomly. Each tablet is transferred into a 50 mL volumetric flask, dissolved, and diluted to 50 mL with phosphate buffer pH 6.8. 1 ml of this solution is diluted to 100 ml with phosphate buffer pH 6.8. The amount of drug present in each tablet is determined by UV spectroscopy at 246 nm. The standard limit for uniformity of content is

IP: - Active less than 10 mg or 10 %,

BP:- Active less than 2 mg or 2 %,

USP:- Active less than 25 mg or 25 %.

**12. Determination of the equilibrium moisture content**

Three desiccators are prepared to contain saturated salt solutions of potassium nitrate (for creation 90 % RH, at 18 °C), sodium chloride (for creation 71 % RH, at 18 °C), and sodium nitrite (for creation 60 % RH, at 18 °C). Three tablets of each formulation are placed in desiccators. Then, the equilibrium moisture content is determined by the Karl Fischer method and the auto titrator device on the first day and after the 7$^{th}$ day [48-49].

**CONCLUSION AND FUTURE PROSPECTUS**

Effervescent tablets are a good alternative to regular tablets as they are easy to administer. Elderly people or people who have swallowing problems can easily have effervescent tablets as they need to be taken after dissolving in water and need not be swallowed. The effervescent tablets have a good therapeutic effect as bioavailability is good. Nowadays supplements are manufactured more in effervescent form as can be taken easily and increase patient compatibility. 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 fill better soon.

Effervescent tablets are best to mask the taste of the drug, have a quicker onset of action, good compatibility, good therapeutic effect and the best is it increases patient compliance.

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