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A REVIEW ON EFFERVESCENT TABLET

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Abstract: Oral dosage forms are the maximum famous manner of taking medication, in spite of having a few disadvantages in comparison with different techniques like risk of slow absorption of the medicament, which may be overcome through administering the drug in liquid form, therefore, likely permitting using a decrease dosage. Oral dosage forms are the excellent medication management manner of taking medication, in spite of having a few disadvantages in comparison with different techniques like risk of gradual absorption of the medicament, which may be overcome through administering the drug in liquid form, therefore, likely allowing using a decrease dosage. However, instability of many drugs in liquid dosage form limits its use. Effervescent technique may be used as alternate to expand a dosage form that can accelerate drug disintegration and dissolution, is normally carried out in short release preparations.

Keywords **– Effervescent Tablet, Steam Granulation, Melt Granulation, Dry Granulation, Angle of Repose.**

I. INTRODUCTION

Oral drug delivery has been regarded for decades because the maximum extensively applied route of administered amongst all of the routes which have been employed for the systemic delivery of drug thru numerous pharmaceutical products of various dosage forms. The reasons that the oral route carried out such recognition can be in component attributed to its ease of administration. [1,2] Oral sustained drug delivery system is complex by confined gastric residence times (GRTs). Rapid GI transit can prevent complete drug release withinside the absorption area and reduce the efficacy of the administered dose. [3,4] Effervescent tablets are getting increasingly popular in a variety of sectors which include supplements and pharmaceutical use because of the ease in which they may be consumed. Effervescent pills are designed to break in contact with liquid including water or juice, frequently causing the tablet to dissolve into a solution. [5] These buoyant delivery systems make use of matrices organized with swellable polymers including Methocel or poly saccharides, e.g., chitosan, and effervescent components,e.g., sodium bicarbonate and citric or tartaric acid[6] or matrices containing chambers of liquid that gasify at body temperature.[7,8]

Flotation of a drug delivery device withinside the stomach may be carried out by incorporating a floating chamber filled with vacuum, air or an inert gas.[9] Gas may be added into the floating chamber by the volatilization of an natural solvent (e.g. Ether or cyclopentane) or by the CO2 produced because of an effervescent response among organic acids and carbonate–bicarbonate salts.[10] The matrices are fabricated in order that upon arrival withinside the stomach, carbon dioxide is liberated by the acidity of the gastric contents and is entrapped in the jellified hydrocolloid. This produces an upward movement of the dosage shape and continues its buoyancy. A lower in unique gravity reasons the dosage shape to float at the chyme.[11,12] Effervescent tablets are smooth to devour because of this they're getting famous over different oral dosage forms. Effervescent tablets get destroy whilst they're put in water or juice which reasons pill to dissolve and shape a solution. USFDA redefined the definition to Effervescent pill is a pill meant to be dissolved or dispersed in water earlier than administration. Effervescent pills includes acids/acid salt, carbonates and hydrogen carbonates, flavour, sweetener, etc. which launch carbon dioxide whilst it is brought to water. Following chemical response takes region in effervescent tablets.[13]

$$C6H8O7\ (aq) + 3NaHCO3\ (aq) \rightarrow Na3C6H5O7\ (aq) + 4H2O + 3CO2\ (g) \uparrow$$ Citric acid + Sodium bicarbonate → Sodium citrate + Water + Carbon dioxide

The above reaction takes place due to presence of water, due to the fact water is one of the response product which speeds up the response, main to problem in preventing the reaction. Due to this reason production and storage of effervescent product is planned by minimizing their contact with water.[12,13]

II. FUNDAMENTALS OF EFFERVESCENT

Effervescence includes a soluble natural acid and an alkali metallic carbonate salt, certainly considered one among that's regularly the API. Carbon dioxide is formed if this aggregate comes into touch with water.

Typical examples of the acids and alkalis used include:

- Citric acid
- Tartaric acid
- Malic acid
- Fumaric acid
- Adipic acid

- Sodium bicarbonate
- Sodium carbonate
- Sodium sesquicarbonate
- Potassium bicarbonate
- Potassium carbonate[14,15]

III. Advantages of Effervescent Tablets

The followings are some of the advantages of the effervescent tablets –.

1) Fast onset of action.
2) No want to swallow tablet.
3) Good belly and intestinal tolerance.
4) More portability.
5) Improved palatability.
6) Superior stability.
7) More constant response.
8) Incorporation of huge quantities of energetic ingredients.
9) Accurate Dosing.
10) Improved Therapeutic Effect.
11) In remote areas, specifically in which parenteral forms aren't to be had because of prohibitive cost, lack of certified medical staff, effervescent capsules ought to turn out to be an alternative.

IV. Disadvantages of Effervescent Tablets

1) Unpleasant flavor of a few active ingredients.
2) Larger tablets requiring unique packaging materials.
3) Relatively expensive to provide because of large quantity of extra or less highly-priced excipients and special production facilities.
4) Clear solution is preferred for administration, although a fine dispersion is now universally acceptable.[16,17]

V. Limitations of Effervescent Tablets

- Excipients are costly.
- Special production facilities is required.
- High sodium or potassium makes it inappropriate for patients with heart failure or cardiac insufficiency.
- Difficult to formulate drugs with unpleasant taste sufficiently palatable as an effervescent product.[18-21]

VI. Excipients used in Effervescent Tablets

- Excipients used in effervescent formulation is mentioned below[22]: Acids
- Citric acid
- Tartaric acid
- Adipic acid
- Fumaric acid
- Malic acid

VII. Advancement Wet Granulation Techniques

- **Steam Granulation**

Steam granulation system do now no longer require water, it makes use of steam in place of liquid water as a granulating agent. Steam offers higher diffusion rate into powder because of which it forms a warm thin movie of water at the powder particles, requires small quantity of heat to make it evaporate and for that reason dry granules are obtained.[23-26]

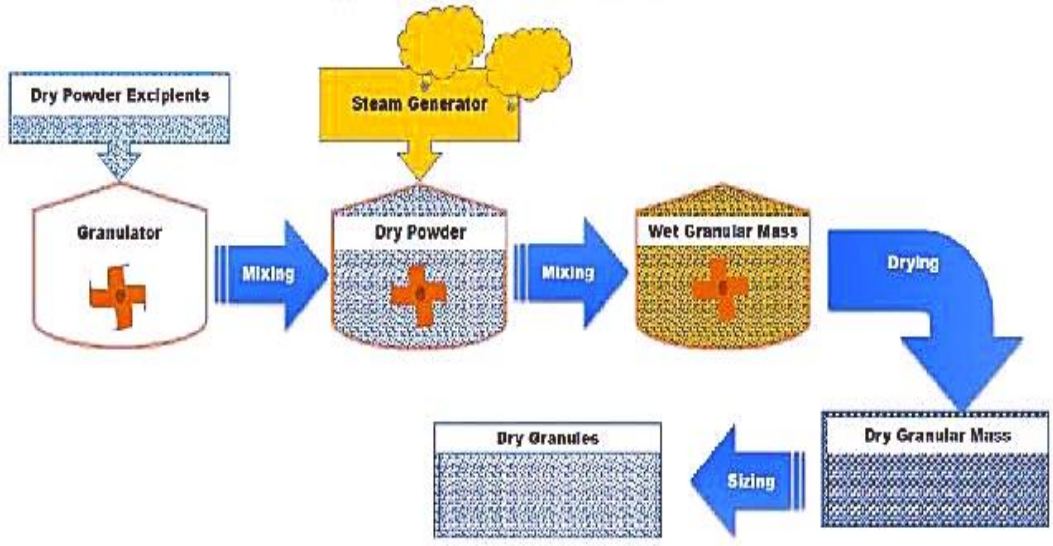

Figure 1 – *Steam granulation process for Effervescent Tablets*

- **TOPO Granulation**

TOPO vacuum granulation is a patented technology for the moisture sensitive element like effervescent dosage forms. In this technology, a small quantity of water is brought throughout manner. Due to the chain response initiated by response among acid and base, extra water is generated which must be removed by applying vacuum repeatedly for a while throughout the manner. Due to vacuum, material is permitted to dry at low temperature; additionally much less drying time is required. This makes the manner greater useful for the additives or API which are warmth sensitive so it's far a fee effective manufacturing manner.

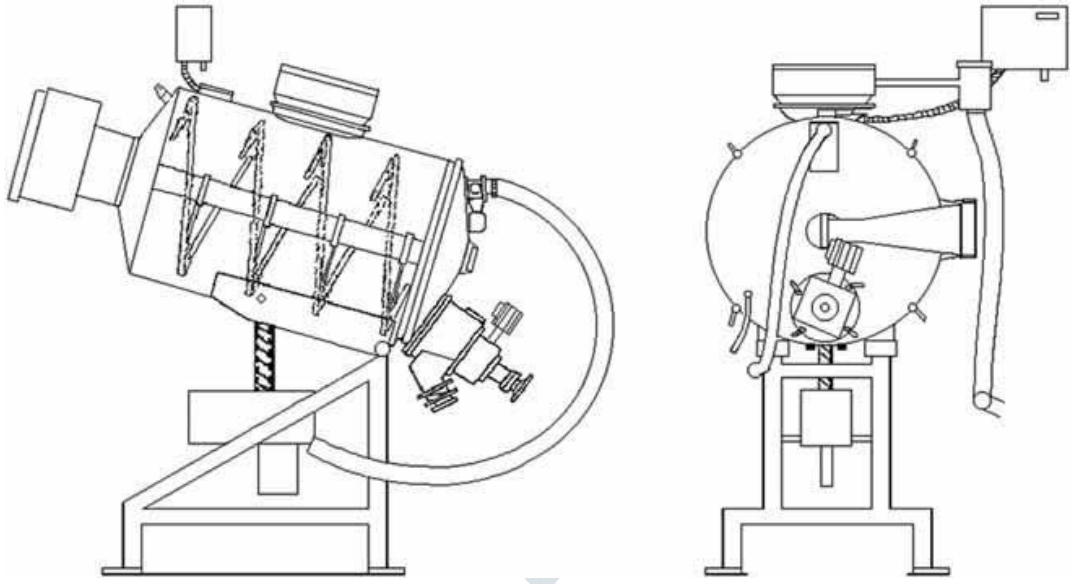

Figure 2 – *TOPO Granulators*

- **Continuous Flow**

Continuous flow era is an advanced step of TOPO granulation that is designed for the continuous production of effervescent products. With the assist of this era manufacturers can produce up to 10 tons of granules each day. In this method powder is fed from one end and granules are accumulated from the other quit and the complete method is carried out in an inclined drum. This era is greater beneficial while large quantity of product is needed to manufacture, mainly touchy substances or API like calcium or nutrition D3.[27]

- **Dry Granulation**

In dry granulation technique the powder combination is compressed with out heating as there may be no need of solvent. It is the least suitable technique amongst numerous granulation technique. The simple methods are to shape a compact of cloth by compression after which to mill the compacted cloth to acquire a granules. Two techniques are typically used for dry granulation. The extra extensively used technique is slugging, in which the powder is recompressed and the ensuing tablet or slug are milled to get the granules. Another technique is to recompress the powder with stress rolls using a system including Chilsonator.

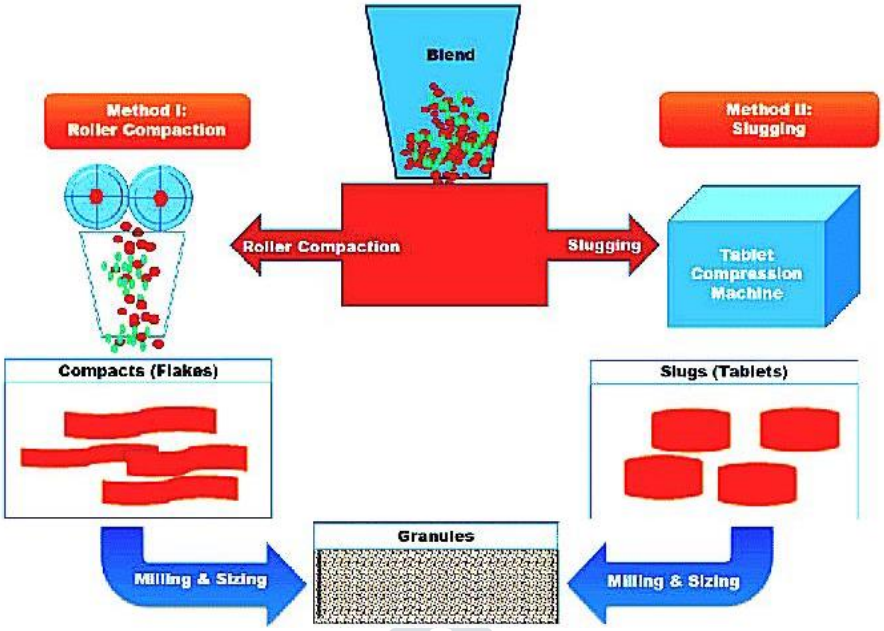

Figure 2 – *Dry granulation process for Effervescent Tablets*

- **Dry Granulation using roller compaction**

Materials are fed from the hopper which then is going to pressure rolls, this strain rolls will compact the material into flakes which is milled or reduce to obtain the granules. Similarly in slugging process materials are compressed in tablet device to capsules after which milled to achieve the granules.[28-34]

- **Melt Granulation/Thermoplastic Granulation**

Melt granulation is much like moist granulation most effective the distinction is of use in binder (moldable). In soften granulation, binder that is in stable country is allowed to melt at temperature variety of 50-80℃. This melted binder will now be used as a granulating liquid. As there may be no want of drying section due to the fact as we cool it at room temperature dried granules are obtained.[35]

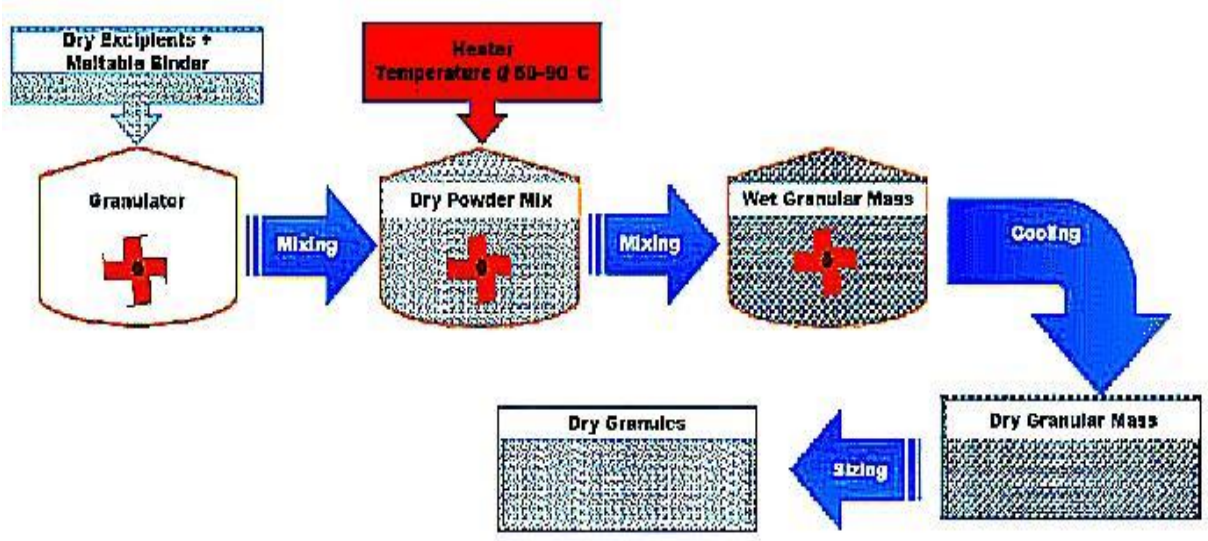

Figure 3 – *Melt Granulation process for Effervescent Tablets*

VIII. Evaluation of Effervescent Tablet

➢ **A Pre-compression Parameter:**

1. **Angle of repose (θ):**

Angle of repose is defined because the maximum angle possible among the floor of a pile of the powder and horizontal plane. The frictional pressure in a free powder or granules may be measured by attitude of repose. It is an indicative of the glide properties of the powder.[36,37]

$$\tan \theta = H / R \quad \theta = \tan\text{-}1 (H/R)$$

Where,
θ is the angle of repose

H is height of pile
R is radius of the base of pile

2. **Flow Rate**
Flow rate of a powder has been defined as the rate at which the particular mass emerges through the office of funnel of a suitable diameter. The flow rate for granules of each formulation was determined by pouring accurately weighed quantities of granules in funnel with an orifice of 8 mm diameter. The time required for the complete granule mass to emerge out of the orifice was recorded using a stopwatch.[36]

3. **Bulk Density**
The bulk density was obtained by dividing the mass of a powder by the bulk volume in cm3. The sample of about 50 cm3 of powder, previously been passed through a standard sieve no. 20, was carefully introduced into a 100 ml graduated cylinder. The cylinder was dropped at 2-second intervals onto a hard wood surface three times from a height of 1 inch. The bulk density of each formulation was then obtained by dividing the weight of sample in grams by the final volume in cm3 of the sample contained in the cylinder.[36]

4. **Tapped density**
The tapped density was obtained by dividing the mass of a powder by the tapped volume in cm3. The sample of about 50 cm3 of powder previously been passed through a standard sieve no. 20, is carefully introduced into a 100 ml graduated cylinder. The cylinder was dropped at 2-second intervals onto a hard wood surface 100 times from a height of 1 inch. The tapped density of each formulation was then obtained by dividing the weight of sample in grams by the final tapped volume in cm3 of the sample contained in the cylinder.

➢ **An evaluation of Effervescent Tablets**

- **Weight variation**
Twenty tablets from each batch is randomly decided on to test their uniformity. These pills are weighed for my part and their avg. weight is calculated. From this common weight, percentage deviation every tablet is obtained.
Tablet thickness and diameter
Thickness and diameter of tablets are vital for uniformity of tablet size. It is measured the use of Vernier Callipers.

- **Tablet hardness**
Resistance of tablets is usually rely upon the hardness of tablets that is an vital thing as tablet might also additionally get break throughout transportation, storage and dealing with if it does not have right hardness. Monsanto hardness tester is used to measure the hardness of tablet. Hardness is measured in kg or N.

- **Friability (F)**
Friability of tablet is measured to realize the impact of shock or abrasion on tablets. To decide the friability of tablet Roche Friabilator is used. In this tool pre weighed drugs are positioned within the friabiator and are allowed to rotate at 25 rpm for 4minutes, drugs are dropped from peak of 15.6 cm in every revolution. According to USP friability restrict need to be inside 0.5-1%.

- **Measurement of Effervescence Time**
To measure the effervescence time, one tablet is located in the beaker containing 200 ml of water having temperature 20 °C ± 1 °C, whilst putting the tablet in beaker time have to be mentioned in stopwatch. Final time is mentioned while the clear solution is acquired or tablet is absolutely dispersed. About mean of 3 tablets have to be measured of every formulation.

- **L877Determination of effervescent solution pH**
PH of solution must be checked straight away after finishing the dissolution time of tablet the usage of pH meter. Mean of 3 measurements is taken into consideration.

- **of CO2 Content**
One tablet is placed in 100ml of 1N sulfuric acid and weight changes are determined. The difference obtained is in amount of carbon dioxide (mg) in one tablet. Measurement of 3 tablets is taken into consideration.

- **Moisture Content**
10 tablets are dried in desiccators which contain activated silica gel and let it remain for 4 hours. Moisture content of 0.5% or less is accepted for effervescent tablets.[37]

IX. CONCLUSION

Effervescent drugs are designed to interrupt in contact with liquid which include water or juice, frequently causing the tablet to dissolve right into a solution. This makes effervescent tablets the desired choice of many, such as folks that are taking tablets medicinally in addition to a nutritional supplement.

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