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EFFERVESCENT TABLET: A REVIEW

***Mr. Gaikwad Gorakshanath B*[*1]*., Prof. Khandre R.A*[*2]**

[1]Department of Pharmaceutics Pratibhatai Pawar College Of Pharmacy, Shrirampur, Maharashtra, India, 413739
[2]Department of Quality Assurance, Pratibhatai Pawar College Of Pharmacy, Shrirampur, Maharashtra, India, 413739
E- mail:- ggorakgaikwad1234@gmail.com

ABSTRACT

Medicines are not only science; it is also an art. It does not consist of compounding pills and plasters ; it deals with very processes of life must be understood before they may be guided. Pharmaceutical oral solid dosage form have been used widely for decades mainly due to their convenience of administration and their suitability for delivery of drug for systemic effect. The tablet can be made directly from powder or from granules pellets, or from film- coated multiple units .Tablet are now the most popular dosage form, accounting for some 70% of all ethical pharmaceutical preparation produced .Tablet may be define as solid pharmaceutical dosage form containing with or without suitable diluents prepare by either compression or modeling method.

Hence tablet can be broadly classifies as compress tablet .Compressed tablet can be further classified as directly compressible tablet, chewable tablet and tablet triturates etc.

Keywords: *Binder, coated tablets, compression, granulation, Ingredients.*

1. INTRODUCTION

Solid medicaments may be administered orally as powders, pills ,cachets, capsules for tablets .These dosage forms contain a quantity of drug which is given as a single unit and they are known collectively as solid unit dosage forms ,even in the case of sustained action preparation which ,technically ,contain the equivalent of several normal doses of drug .The stringent formulation requirements of modern medicaments ,the many advantages of tabletand capsule medication ,coupled with expanding health services and commitment need for large –scale economic manufacture have led to a steady decline in the prescribing of powder and pills.

Tablets and capsules ,on the other hand currently account for well over two third of the total number and cost of medicines produced all over the world .Tablets are solid dosage form which is the conventional as well as have many advantages over other dosage forms .Tablets are the most popular dosage form ;about 70% of the total medicines are dispensed in the form of tablet .Tablets had different shapes, sizes ,as well as weight depending on medicinal substances and the intended mode of administration .In this paper the some advantages as well as some disadvantages of tablets ,the basic ingredients that are commonly found in tablet , methods of tablet preparation and the various type of tablet, tablet design are briefly reviewed .

2. AIM AND OBJECTIVES

Overall aim is to develop level of understanding of the basic knowledge about tablet (solid dosage form) ,their types and Effervescent tablet, their formulation , uses , advantages , disadvantages and evaluation:

- To formulate tablets that is chemically and physically stable over a long period oftime.
- Effervescent tablet are designed to release carbon dioxide upon contact with paper,promoting their disintegration.

3. DEFINITION OF TABLET

According to the Indian pharmacopoeia pharmaceutical tablets are solid ,flat or biconvex dishes ,unit dosage form ,prepare by compressing a drug or a mixture of drugs ,with or without diluents .Tablet is defined as a compressed solid dosage form containing with or without excipients .They vary in shape and differ greately in size and weight depending onamount of medicinal substances and the intended mode of administration .

PROPERTIES:

- Should be elegant product having its own identity while being free of defects such aschips, cracks, discoloration and contamination.
- Should have the physical stability to maintain its physical attributes over time.
- Must have a suitable chemical over time so as not allow alteration of the medicinalagent.

ADVANTAGES:

- Tablets are unit dosage form and offer the greatest capabilities of all oral dosage form for the greatest dose precision and the least content variability.
- They are easiest and cheapest to package and ship.
- Easy to handling.
- Suitable for large scale production.
- Having greatest chemical and microbial stability over all oral dosage forms

DISADVANTAGES:

- Problem with compression to crystalline drug.
- Hygroscopic drugs are not suitable for compressed tablet .
- Swallowing is difficult especially for children and ill (unconscious) patients.
- Cost of production may be increase because of coating and encapsulation to removebitter and unpleasant taste.

4. TYPES AND CLASSES OF TABLETS

Tablets are classified by their route of administration or function, by the type of drug delivery system they represent within that route and by their form and method of manufacture. The classifications of tablet are as follows:

Oral tablets for ingestion:

- Compressed tablet or standard compressed tablet (CT)
- Multiple compressed tablet (MCT)
    1. Layered tablets
    2. Compressed –coated tablet
- Chewable tablets
- Sugar and chocolate-coated tablets
- Film coated tablets
- Repeat-action tablets
- Delayed-action and enteric coated tablets
- Controlled release tablets

Tablets use in the oral cavity:

- Buccal and sublingual tablets
- Troches and lozenges
- Dental cones

Tablets administered by other route:

- Implantation tablets

- Vaginal tablets

Tablets used to prepare solutions:

- Effervescent tablets
- Dispensing tablets (DT)
- Hypodermic tablets(HT)
- Tablet triturates (TT)

ORAL TABLET FOR INGESTION:

Well over 90% of the tablets manufactured today are ingested orally. These tablets aredesigned to be swallowed intact, with the exception of chewable tablets.

1) Standard compressed tablet or compressed tablets:

This category refers to standard uncoated tablets made by compression using wet granulation, direct compression or double compression. They are usually provide rapid integration and drug release. Typically include water insoluble drug such as antacids and adsorbents .Other drug having systemic effect have some aqueous solubility, dissolve from tablet and disintegrate tablet fragments in GI contents and are then distributed in the body.

2) Multiple compressed tablet:

There are two classes of multiple compressed tablets:

1) Layered tablets
2) Compression –coated tablets

Tablets in this category are usually prepared for one of two reasons: to separate physicallyor chemically incompatible ingredients, or to produce repeat-action or prolonged –action products.

3) Chewable Tablets:

Chewable tablets which are required to be broken and chewed between the teeth before ingestion. The most common chewable tablet on the market is the chewable aspirin tabletintended for use in children. Many antacid tablet products are of the chewable type.

4) Sugar- and chocolate- coated tablets:

Chocolate –coated tablets are nearly a things of past their primary historical role was toproduce an elegant, glossy, easy to swallow tablet dosage form.

5) Film coated tablets:

It is the type of coated tablets in which the drug is not required to coating. In case to provide more strength to the table , film coating is used as alternative to sugar coating. The polymer such as HPC (Hydroxypropyl Cellulose),HPMC(Hydroxypropylmehyl Cellulose), and Ethyl Cellulose are used for this technique.

6) Repeat action tablet:

In addition to multiple compressed tablet being used for this effect, sugar coated tablets may also be employed. The core tablet is usually coated with shellac or an enteric polymerso that it will not release its drug load in the stomach.

7) Delayed- action and Enteric coated tablets:

The enteric coated tablets are coated with the material resistant to acidic medium (stomach environment) and hence are not able to release drug in stomach. Whereas, it easily releasesdrug in intestine (alkaline) media .Hence drugs have to pass through stomach and the time of release of drug is delayed and hence called delayed action tablet.

Two types of enteric coated tablet are as follows:

- Layered tablets
- Inlay tablets

8) Controlled release tablets:

Currently, the vast majority of such products are coated pellets placed in capsule. The Orosproduct of the Alza Corporation is another new zero-order sustained release tablet product;it is based on osmotic pressure as the rate controlling process.

TABLETS USED IN THE ORAL CAVITY:

1) Buccal and sublingual tablets:

These tablets are usualy small and somewhat flat, and are intended to be held between the cheek and teeth or in the cheek pouch(buccal tablet), or beneath the tongue (sublingual tablets).Drug administratered by this route are intented to produce systemic drug effects, and consequently they must have good absorption properties through the oral mucosa.

Buccal and sublingual tablets should be formulated with bland excipients,which do not stimulate salivation.

2) Troches and Lozenges:

Lozenges are flavored medicated dosage forms intended to be sucked and held in mouth or pharynx. Two lozenge forms include hard candy (or boiled) candy lozenges and compressed tablet lozenges (TROUCHES). Lozenges were originally termed pastilles, but are more commonly called cough drops.

3) Dental cones :

These tablets are designed to be loosely packed in the empty socket remaining following a tooth extraction .Main purpose behind the use of this tablet is either to prevent multiplication of bacteria in the socket by employing a slow releasing antibacterial compound or to reduce bleeding by an astringent or coagulant containing tablet.

TABLET ADMINISTERED BY OTHER ROUTES:

1) Implantation tablet:

These tablets are implanted in the body cavities for a prolonged effect from several month to year. These tablets are usually small, cylindric, or rosette –shaped forms and are typically not more than 8mm in length.

2) Vaginal tablets:

Designed for vaginal administration in treatment of local vaginal infections, for systemic absorption and absorption into vaginal tissue can be inserted with aid of an applicator .In the treatment of localized vaginal infections such as ,Candida albicans , yeast and Haemophilus vaginalis.

TABLETS USED TO PREPARE SOLUTIONS:

1) Effervescent tablets:

Effervescent tablets are designed to break in contact with liquid such as water or juice, often causing the tablet to dissolve into a solution the benefit of effervescent tablets is thatthey dissolve completely and evenly meaning that localized concentration of the ingredientscannot occur.

2) Hypodermic tablet:

These are one type of sterile preparations. In these , tablets are dissolved in the WFI or sterile water to inject before the actual injection in the hypodermic cavity. They are intended to be added in WFI of sterile water to form a clear solution which is to be injectedparentally.

3) Tablet triturates:

Tablet triturates are small, usually cylindrical ,Molded or compressed tablets. The drugemployed in such products was usually quite potent and were mixed with lactose and possibly a bonder, such as powder acacia. Tablet triturates are usually soft and friable.

5. EFFERVESCENT TABLETS

INTRODUCTION

Effervescent tablets are becoming increasingly popular in a variety of sectors includingsupplements and pharmaceutical use due to the ease in which they can be consumed.Effervescent tablet are used to break in contact with liquid such as water or juice, often causing the tablet to dissolve into a solution.

The buoyant delivery system utilize matrices prepared with swellable polymers such as methocel or poly saccharides , e.g., chitosan , and effervescent components , e.g., sodium bicarbonate and citric or tartaric acid or matrices containing chambers of liquid that gasify at body temperature.

Flotation of a drug delivery system in the stomach can be achieved by in corporating a floating chamber filled with vacuum , air or an inert gas. Gas can be introduced into the floating chamber by volatization of an organic solvent (e.g. Ether or cyclopentane) or by the CO_2 produced as a result of an effervescent reaction between organic acids and carbonate – Bicarbonate salts . The matrices are fabricated so that upon arrival inthe stomach, carbon dioxide is liberated by the acidity of the gastric contents and is entrapped in the jellified hydrocolloid.

Effervescent or carbon tablets are tablets which are designed to dissolve in water, and release carbon dioxide. They are products of compression of component ingredients in the form of powders into a dense mass, which packaged in blister pack, or with a hermitically sealed package with incorporated desiccants in the cap .

Figure 1: An effervescent tablet in a glass of water

HERE WE LOOK AT 5 BENEFITS OF EFFERVESCENT TABLETS OVER REGULAR TABLETS.

Pleasant Taste Compared to Regular Tablets:

Effervescent tablets are also so popular due to the fact they can be dissolved in a liquid such as water or fruit juice , meaning that they often taste better than regular tablets. Conventional tablets dissolve slowly which can result in reduced absorption rates , effervescent tablets , in contrast , dissolve quikly and completely , meaning youget the full benefit from the ingredients.

Distributed More Evenly:

Conventional tablets dissolve gradually in the stomach once ingested and can sometimes only partially dissolve which can lead to irritation in some cases. The benefit of effervescent tablets is that they dissolve completely and evenly meaning that localized concentration of the ingredients cannot occur.

Increased Liquid Intake:

Effervescent tablets provide the nutritional benefits intended , but in addition to this they also increase liquid intake. This can be especially beneficial if you are dehydratedor ill and not ingesting as much fluid as usual.

Easy Alternative to Regular Tablets:

They can be a great alternative for those who may have trouble swallowing either dueto illness or age . Older individual may have difficulty swallowing but need to take medication or supplements on a regular basis and this respect , effervescent tablets can be a lot easier than having to swallow a tablet.

Simple and Easy to Measure:

Effervescent tablets are easily dissolved into water or a liquid of your choice and thenafter a while are consistent , well mixed and ready to drink . Traditional tablets or powders, however , need to be measured and stirred in repeatedly to avoid an inconsistent drink with lumpy bits.

To Sum Up:

Effervescent tablets are becoming increasingly popular and it is easy to see why. Theyprovide a much more efficient way of taking supplements or medication due to beingdistributed evenly and much more quickly than regular tablets.

In addition to this, they taste better as can be added to water or a liquid drink ofyour choice as well as being easier to take for people who may find it difficult to swallow.

Effervescent tablets are uncoated tablets that generally contain acid or acid salts (Citric , tartaric , Malic acid or any other suitable acid or acid anhydride) and carbonates or bicarbonates (Sodium , potassium or any other suitable alkali metal carbonate) , which react rapidly in the presence of water by releasing carbon dioxide.Due to liberation in Co_2 gas , the dissolution of API in water as well as taste masking effect is enhanced .

The reaction between Citric acid and sodium bicarbonate & Tartaric acid andsodium bicarbonate , which results in liberation of carbon dioxide shown as follows: $C_8H_8O_7.H_2O+3NaHCO_3$ (aq)→ $Na_3C_6H_5O_7+ 4H_2O +3CO_2$ (g)

Citric	+Sodium	Sodium	+Water +Carbon
acid	Bicarbonate	citrate	dioxide

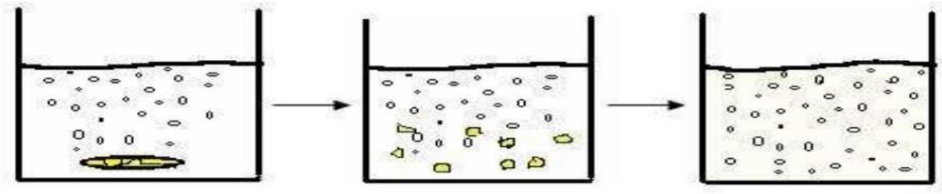

Figure 2: Mechanism of effervescence

$C_4H_6O_6$ + 2 $NaHCO_3$→ $Na_2C_4H_4O_6$ + $2H_2O$ + $2CO_2$ (g) ↑ Tartaric acid + Sodiumbicarbonate → Sodium tartrate + Water + Carbon dioxide

6. FUNDAMENTALS OF EFFERVESCENTS

Effervescence consists of a soluble organic acid and an alkali metal carbonate salt, oneof which is often the API. Carbon dioxide is formed if this mixture comes into contactwith 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

ADVANTAGES OF EFFERVESCENT TABLETS:

- Fast onset of action.
- No need to swallow tablet.
- Good stomach and intestinal tolerance.
- More portability.
- Improved palatability.
- Superior stability.
- More consistent response
- Incorporation of large amounts of active ingredients.
- Accurate Dosing.
- Improved Therapeutic Effect.
- In remote areas, especially where parenteral forms are not available due to prohibitive cost, lack of qualified medical staff, effervescent tablets could become an alternative.

DISADVANTAGES OF EFFERVESCENT TABLETS:

- Unpleasant taste of some active ingredients.
- Larger tablets requiring special packaging materials.
- Relatively expensive to produce due to large amount of more or less expensive excipients and special production facilities.
- Clear solution is preferred for administration, although a fine dispersion is now universally acceptable.

7. ACTIVE INGREDIENT

There are several categories of active ingredients:

Those that are difficult to digest or disruptive to the stomach. A classic example is calcium carbonate, the most widely used form of calcium. In a normal tablet or powder, the calcium carbonate dissolves in the stomach acidand is carried into the digestive system for absorption.

However, calcium carbonate releases carbon dioxide when it dissolves in the GI, which usually produces gas in the stomach. On the other hand, as people age, they have less acid in the stomach, and thus a calcium carbonate tablet may pass through the stomach without dissolving. That, in turn, may lead to constipation. However, if the calcium carbonate is taken in an effervescent formulation, the calcium dissolves in water, is readily available for the body to absorb, and there is no risk of excessive gas in the stomach or of constipation.

Those that are pH-sensitive, such as amino acids and antibiotics. The low pH in the stomach can cause active ingredients to become denatured, lose activity, or cause them to remain inactive. Effervescent ingredients, however, can buffer the water-active solution so that the stomach pH increases (becomes less acidic) and thus prevent the degradation or inactivation of the active ingredient. This buffering effect (via carbonation) induces the stomachto empty quickly—usually within 20 minutes— into the small intestine. The result is maximum absorption of the active ingredient .

Those requiring a large dose. A typical effervescent tablet (1 inch in diameterweighing 5 grams in total weight) can include more than 2,000 milligrams of water soluble active ingredients in a single dose. If the required dose is largerthan that, the sachet (powder form) is a common means of delivery.

Those that are susceptible to light, oxygen, or moisture. Many vitamins fall into this category. Typical effervescent formulations have less than 0.5 percent of free moisture. To maintain that level and prevent other damage from the ambient environment, the formulation's package should be 0.001-inch-thick aluminum that completely blocks light, oxygen, and moisture.

8. FORMULATION

Effervescence is the reaction (in water) of acids and bases producing carbon dioxide. Typical acids used in this reaction are citric, malic, tartaric, adipic, and fumaric. Citric acid is the most commonly used, and it imparts a citrus-like taste to the product. Malic acid can be used in effervescent formulas for a smoother aftertaste, but the price of malic acid is higher than that of citric acid. Tartaric, adipic, and fumaric acids are used sparingly because of their low water solubilities.

Typical bases used in the effervescent reaction are sodium bicarbonate, potassium bicarbonate, sodium carbonate, and potassium carbonate. Sodium bicarbonate is very common in effervescent formulas and produces a clear solution after tablet disintegration. When sodium levels are a concern, potassium bicarbonate is used. Both types of carbonates are used mainly as desiccants.

Binders are normally necessary in effervescent tablets to bring the tablet hardness to a point where handling is possible. These binders should be water-soluble and include dextrose, sorbitol, xyitol, and lactose. A binder should be used very cautiously because binders can carry free moisture into the tablet, which is undesirable and can increase disintegration times when used in large quantities. The ideal amount of binder is one that makes the tablet hard enough to handle, but soft enough to disintegrate (the harder thetablet, the slower the disintegration) and dry enough to be stable.

Lubrication of effervescent tablets has historically been the main stumbling block to an acceptable, marketable product. Typical lubricants such as magnesium stearate are not useful due to their insolubility in water. Most formulators have to use water-soluble lubricants such as sodium benzoate, polyethylene glycol, and adipic acid. These are minimally effective, and depend heavily on the type of granulation they are used in. There are tablet presses that use lubrication spray on the punches so that the formula does not require lubrication.

Depending on the product, formulators can use color (artificial or natural), sweeteners (acesulfame potassium, sodium saccharin, aspartame, and surcalose), and flavors (artificial or natural) to enhance a product or to mask off-notes derived from the active ingredients.

9. FORMULATION METHODOLOGIES

WET GRANULATION:

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

Important steps involved in the wet granulation

- Mixing of the drug(s) and excipients.
- Preparation of binder solution.
- Mixing of binder solution with powder mixture to form wet mass.
- Mixing of screened granules with disintegrant, glidant, and lubricant.
- Drying of moist granules.

Advantages:

- Permits mechanical handling of powders without loss of mix quality.
- Improves the flow of powders by increasing particle size and sphericity.
- Increases and improves the uniformity of powder density. Limitation of wet granulation .

Limitation of wet granulation:

- The greatest disadvantage of wet granulation is its cost. It is an expensive process because of labor, time, equipment, energy and space requirements
- Loss of material during various stages of processing.

Dry Granulation:

In dry granulation process the powder mixture is compressed without the use of heatand solvent. It is the least desirable of all methods of granulation. The two basic procedures are to form a compact of material by compression and then to mill the compact to obtain a granules. Two methods are used for dry granulation. The more widely used method is slugging, where the powder is recompressed and the resultingtablet or slug are milled to yield the granules. The other method is to recompress thepowder with pressure rolls using a machine such as Chilosonator.

Rollar Compaction:

The compaction of powder by means of pressure roll can also be accomplished by a machine called chilsonator. Unlike tablet machine, the chilsonator turns out a compacted mass in a steady continuous flow. The powder is fed down between the rollers from the hopper which contains a spiral auger to feed the powder into the compaction zone. Like slugs, the aggregates are screened or milled for production intogranules.

Use: Use in the production of directly compressible excipients, the compaction ofdrugs and drug formulations, the granulation of inorganic materials, the granulation of dry herbal material and the production of immediate/sustained release formulations.

ADVANCEMENT IN GRANULATIONS:

Steam Granulation:

It is modification of wet granulation. Here steam is used as a binder instead of water.Its several benefits includes higher distribution uniformity, higher diffusion rate into powders, more favorable thermal balance] during drying step, steam granules are more spherical, havelarge surface area hence increased dissolution rate of the drug from granules, processing timeis shorter therefore more number of tablets are produced per batch, compared to the use of organic solvent water vapour is environmentally friendly, no health hazards to operators, norestriction by ICH on traces left in the granules, freshly distilled steam is sterile and therefothe total count can be kept under control, lowers dissolution rate so can be used forpreparation of taste masked granules without modifying availability of the drug.

Melt Granulation / Thermoplastic Granulation:

Here granulation is achieved by the addition of moldable binder. That is binder is in solid stateat room temperature but melts in the temperature range of 50 – 80˚C. Melted binder then acts like a binding liquid. There is no need of drying phase since dried granules are obtained by cooling it to room temperature.

10. PRODUCTION

Effervescent tablets and powders are produced in much the same manner as conventional tablets and powders, but production must occur in very low humidity areas. Effervescent granulations can be mixed in conventional blending equipment, such as ribbon, twin-cone, and V-type blenders. All equipment should be well grounded and should allow you to make it completely and absolutely dry after wash-down. Any traces of moisture in the equipment will give erratic granulation results and most likely result in lost batches of product. Figure 1 shows a tablet press making an effervescent dosage.

Figure 2: Tablet press making an effervescent tablet.

Wet granulation of the effervescent base can be performed by carefully adding 0.1 to 1.0 percent water (weight-to-weight basis) to the chosen blending equipment. The granulation steps must be precisely timed and the ingredients mixed thoroughly to distribute the solventor binder solution evenly in the blend. The mix is then quickly discharged to drying ovens. Youmust constantly monitor the operational parameters of all equipment, especially drying equipment, as variations in drying times and temperatures can affect the finished product.

While stable granulations will ultimately be made, vast differences in tablet hardness and disintegration times can result from over- or under-reacting the granulation. After drying, thegranulation is sized, and a final mix is performed.

Fluid-bed dryers have been used for many years to make effervescent granulations. Basically, the water or binder solution is sprayed onto the effervescent mixture while it is suspended in a stream of hot, dry air. The humidity and temperature of the air serve to stop the effervescent reaction quickly and uniformly. To ensure that you produce a free-flowing granulation, chose the particle sizes carefully and monitor all systems closely.

Vacuum granulators have also been used to make effervescent granulations. This equipment gives you a very controlled granulation of the product and allows a dustfree environment. The equipment also generally requires less power and less operating space thanother types of granulators. In operation, the water or binder solution is sprayed onto the effervescent mixture during blending. Drying occurs by placing the granulation under vacuumand heating it via a thermal jacket.

Effervescent products normally require tablet presses that can deliver high compression forces. If the tablets are to be wrapped in foil or placed into a tube, give carefulattention to the tablet parameters during compression. Monitor the tablet thickness to ensure the wrapping or packaging equipment can handle the tablets.

Strict control of temperature and humidity in all areas is a must (65 to 75ºF, relativehumidity of 10 percent), or the formulation will begin a chemical reaction after it's packaged.In essence, the tablet will self-destruct because the byproducts of an effervescent reaction are water and carbon dioxide.

The best way to stabilize an effervescent product is to produce it in an environmentwhere humidity is under strict control and to package it in a suitable moisture barrier. All ingredients in the formulation must be anhydrous. Your contractor should test for free moisture before packaging.

11. EVALUATION OF EFFERVESCENT TABLET

PRE-COMPRESSION PARAMETERS:

1) Angle of repose (θ):

Angle of repose is defined as the maximum angle possible between the surface of a pileof the powder and horizontal plane. The frictional force in a loose powder or granules can bemeasured by angle of repose. It is an indicative of the flow properties of the powder.

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

Where, θ is the angle of repose

H is height of pile

R is radius of the base of pile

The powder mixture was allowed to flow through the funnel fixed to a stand at definite height (H). The angle of repose was then calculated by measuring the height & radius of the heap of powder formed. Care was taken to see that the powder particles slip & roll over each other through the sides of the funne . Relationship between angle of repose and powder flow property.

Table 1: Angle of repose as an indication of powder flow properties

Angle of repose (degrees)	Type of flow
< 20	Excellent
20-30	Good
30-34	Passable
> 40	Very poor

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 time required for thecomplete granule mass to emerge out of the orifice was recorded using a stopwatch.The flow rate was calculated from following equation:

$$\text{Flow Rate} = \frac{\text{Weight of granules}}{\text{Time in second}}$$

3) Bulk Density:

The bulk density was obtained by dividing the mass of a powder by the bulk volumein cm3. The bulk density of each formulation was then obtained by dividing the weightof sample in grams by the final volume in cm3 of the sample contained in the cylinder.It was calculated by using equation below:

$$\mathbf{Df = M/Vp}$$

Df = bulk density

M = weight of samples in grams

Vp = final volumes of granules in cm3

4) Tapped density:

The tapped density was obtained by dividing the mass of a powder by the tapped volume in cm3. 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. It was calculated by using equation given below:

Do= M/Vp

Do= bulk density

M = weight of samples in grams

Vp = final volumes of granules in cm3

5) Carr's Index:

Carr's index of each formulation was calculated according to equation given below:

$$\% \text{ compressibility} = \frac{Df - Do}{Df} \times 100$$

Df = Fluff or Poured bulk or bulk density. Do= Tapped or Consolidated bulk density.

EVALUATION OF EFFERVESCENT TABLETS:

Weight variation: Weight variation was determined to know whether different batches of tablets have uniformity. Weighed 20 tablets individually, calculated the average weight and compared the individual tablet weights to the average.

Tablet Thickness and Diameter: Thickness and diameter of tablets were importantfor uniformity of tablet size. Thickness and diameter were measured using Vernier Calipers.

Tablet Hardness: The hardness of tablet of each formulation was measured by Monsanto Hardness Tester. The hardness was measured in items of kg/cm2. Hardnessor tablet crushing strength is the force required to break a tablet in a diametric compression.

Friability (F): Friability of the tablet determined using Roche friabilator. This device subjects the tablet to the combined effect of abrasion and shock in a plastic chamber revolving at 25 rpm and dropping a tablet at a height of 6 inches in each revolution. USP limit is 0.5 to 1%. The friability (F) is given by the formula:

$$F = \frac{\text{Initial wt} - \text{Final wt} \times 100}{\text{Initial wt}}$$

Measurement of effervescence time: A single tablet is placed in a beaker containing 200 ml of purified water at 20 °C ± 1 °C.

Determination of effervescent solution pH:

pH of solution is determined with one tablet in 200 ml of purified water at 20 ± 1

°C by using pH meter, immediately after completing the dissolution time.

Measurement of CO2 content:

One effervescent tablet solved in 100 ml of 1N sulphuric acid solution andweight changes were determined after dissolution end.

Evaluation of the water content:

10 tablets of each formulation are dried in a desiccators containing of activated silicagel for 4 hours. Water content of 0.5% or less is acceptable.

Uniformity of Content:

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

IP: - Active less than 10mg or 10%, **BP**:- Active less than 2 mg or 2%, **USP:-** Active less than 25mg or 25%.

Determination of the equilibrium moisture content:

Three desiccators are prepared containing 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).

In-vitro disintegration time:

The process of breakdown of a tablet into smaller particles is called as disintegration.The in-vitro disintegration time of a tablet was determined using disintegration test apparatus as per I.P. specifications.

Dissolution Studies:

The release rate of Atorvastatin from mouth dissolving tablets was determined using USP Dissolution Testing Apparatus II (Paddle type). The dissolution medium used was 900 ml of phosphate buffer pH 6.8 which was maintained at 37±0.50C. The paddle speed was kept at 50 rpm throughout the study. Five ml of samples was withdrawn at every 5 minutes interval and diluted to 10ml then 5ml of fresh dissolution media maintained at the same temperature was replaniced. The samples were analysed spectrophotometrically at 246nm using phosphate buffer pH 6.8 as blank

12. CONCLUSION

As a solid dosage form, tablets are popular among patients and practitioners alike as they provide a means of self- administration .To understand each dosage form , tablets here are classified by their route of administration and by the type of drug delivery system they represent within that route.

Effervescent technology provides a novel dosage form for nutritional supplementsand pharmaceuticals. The ability to incorporate large dosages of a wide variety of active ingredients in an easy-to-swallow liquid, plus increased absorption of the active ingredient, offers advantages over conventional tablets.

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