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Formulation and Evaluation of Calcium Effervescent Tablets

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Abstract:- In the treatment there is the searching for the fast relief and the faster action and the easily administrable formulation. The tablet which produce the effervescence is the tablet which is intended to 104iquefies or spread into the water before the administration. The lots of things can be prevented by this type of administration like the less irritancy, grater tolerability, and the problems regarding the swallowing. The more stability is achieved and it also gives the fast or the quick actions of the drug formulation. Effervescent type of the formulation there is the development of the dosage form and which is accelerate the dissolution and the disintegration of the formulation. Effervescent tablets are the tablets that are adjusted the drug release.

- ***Aim and Objective:***

The main aim of calcium effervescent tablet was the study to formulate and evaluate the calcium effervescent tablets by using the different types of the solvent and by using the different types of active pharmaceutical ingredients.

- ***Result:***

The study of calcium effervescent tablets formulations shows the good and faster release profile of the drug and to give the quick relief to patient from the illness.

- ***Conclusion:***

In this effervescent tablet it was determined that this effervescent tablet gives the improved therapeutic effect, more stability, and great tolerability.

Keywords:- *Effervescent tablets, effervescence, fast release.*

I. INTRODUCTION

Oral drug transport route is the employed at the systemic delivery of drug with the help of different dosage forms. Orally constant drug transport system is the difficult by the gastric dwelling time (GRT). Fast GI transfer can stop whole drug release in absorption site and decreases effectiveness of dosage forms. Effervescent reaction can occur in between organic acid and carbonate bicarbonate salts. The reaction was due to carbon dioxide generated by neutralisation. Effervescent tablets are break when comes in interaction with fluid like water or fluid. For digesting the drug in the stomach that active pharmaceutical ingredients need the more acids for the dissolution. Effervescent preparation of calcium 104iquefies into the water is existing for body. Effervescence in which there evolution of gas foams of CO_2 because of the interaction of the acid and the bases. The need of the calcium is enhanced in the dietary supplements as increase in the ages. Dairy products and the dairy foods are the one of the biggest sources of the calcium. The milk is the most powerful source of the calcium. The calcium which is absorbed by the oral route. Calcium having very important function in the osteoporosis and used in the administration of hyperphosphatemia in kidney disaster. The bioavailability and the stability of tablet formulation is affected by the different parameters like dissolution, disintegration, hardness, and moisture content. In these preparations there is the usage of the several starches as disintegrating agent in preparation of the tablets. Less calcium consumption has been recommended as a very essential part in progress of osteoporosis. The lot of studies have shown that there is the varying Calcium stability in middle-aged women is undesirable with normal Calcium ingestion. Calcium supplements significantly reduces distal radius BMC loss. Calcium consumption in the premenopausal and postmenopausal women on self-chosen foods. Dietary calcium necessities surge from infantile to adulthood, in pregnancy and lactating mother. The preoccupation and preservation of calcium in human physique were tracked by radioactive tagging of additions. The powder elements also packed and wholesaled as effervescent powder and they are coarse and also wholesaled as effervescent pellets. Calcium having important role in the premenstrual syndrome. Lesser Calcium ingestion and captivation rather than Calcium preoccupation take a part in the osteoporosis. Calcium supplements has no consequence on bone damage in postmenopausal women are crossed-section otherwise deficiency adequate contrast with regulator cluster. The conclusion of Calcium supplements changed between premenopausal and postmenopausal topics. Nutritional calcium necessities rise after childhood to adulthood, during pregnancy and in the lactation period.

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Fig 1:- Effervescent tablet in glass of water shows the effervescence.

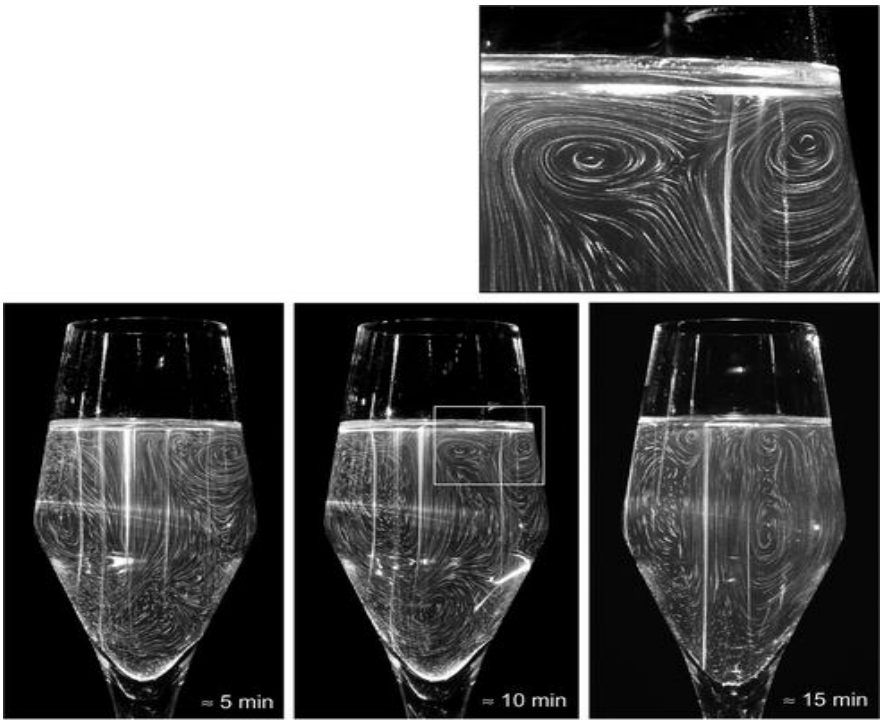

Fig 2:- Mechanism of effervescence

➢ *Advantages of effervescent tablets:*

- Easy way of administration of the medicine
- Rapid onset of action
- Better intestinal tolerance
- Higher stability
- Increase therapeutic effect
- Reliable response
- They are so crucial in pregnancy and lactating mother
- Higher portability
- Higher palatability
- Exact dosing
- More continuous response

➢ *Disadvantages of effervescent tablets:*

- Need of the clear solution for administration
- Obnoxious taste of active ingredients
- Larger size of tablets having obligatory particular type of packaging
- Reaction occurs because of moisture
- Need unique type of packing
- To maintain temperature and moistness is problematic

➢ *Side effects:*

- Nausea
- Abdominal pain
- Allergic reaction
- Difficulty in breathing
- Diarrhoea
- Constipation
- Rashes and itching on skin
- Hypercalcaemia / hypercalciuria
- Hypersensitivity
- Hypervitaminosis

➢ *Different types of excipients used in effervescent tablets:*

Sr. no.	Excipients	Characteristics/ Use
1	Lubricant	Lubricating agent
2	Antiadherents	Adherence of granules is prevented
3	Binders	For the binding of two solids
4	Disintegrants	Breakdown of tablets
5	Surfactants	Increase moistening and termination of drugs
6	Antifoaming agent	Less development of drugs
7	Sweeteners	To give the sweetness to tablets
8	Flavours	To mask the unpleasant smell
9	Colours	To get the pleasant appearance

Table 1

➢ *Marketed products of effervescent tablets:*

Name of product	Active ingredient	Manufacturer
Prolyte fizz	Glucose + Pottasium chloride + Sodium bicarbonate + Sodium chloride +Anhydrous citric acid	Cipla
Solpado	Paracetamol, Codeine phosphate	Sanofi-aventis
Hangoverz	Aspirin, Caffeine	Pious pharma. Ltd.
Ca-c 1000	Ascorbic acid, Calcium	ICN Hungary
Calcium Sandoz	Calcium	ICN Hungary
Vitalmag	Vitamin B6, Magnesium Citrate, Folic acid	ICN Hungary
Zantac	Ranitidine	Glaxo Smithkline
Histac	Ranitidine Hydrochloride	Ranbaxy
Pepfiz-O&L	Simeticone, Papain, Fungal disease	Ranbaxy
Effcal	Vitamin D3, Caco3	Ranbaxy
Tagamet	Cimetidine	Glaxo Smithkline

Table 2

II. FORMULATION METHODOLOGIES

➢ *Wet granulation:*

This is the broadly used process of agglomeration in therapeutic development. In which there is the damp massing of powder mixture by using granulating fluid.
Some are the steps which are involved in the wet granulation

- Mingling the drug product or excipient.
- Formation and development of binder solutes.
- Mingling of binding solutes through powder combination which forms the compact mass.
- Complete drying of the granules
- Mixing of all ingredients like disintegerant, lubricant and the glidant with the granules.

➢ *Dry granulation:*

In dry type of granulation there is blend of powder is compressing deprived of usage of the warmth and any type of solvent or fluid. They form the compacted material by the compacting of the drug molecules or the granules. By using this technique there is to obtain the granules. The two types of the procedures is commonly applied for this dry type of granulation technique, one is slugging, in which there is the dust is recompressing and subsequent tablets pulverized to form the granules. The second process is recompressing the powered material by the pressure rolls using machine like the chilsonator.

➢ *Evaluation of effervescent tablets:*

- *Precompression parameters:*

✓ *Angle of repose(θ):*

The extreme slant should be among the superficial level of heap of powder and parallel surface. Friction force of granule is also calculated by use of slant of repose. This is intended by using the formula as

$\tan\theta = H/R$

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

Where, θ is the angle of repose
H is height of pile
R is radius of surface of pile

Determined amount of powder was taken for the further calculation of the powder or granules. The angle of repose intended by computing the radius and tallness of powder.

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

Table 3:- Angle of repose shows the suggestion flow of powder charactristics

✓ *Rate of Flow:*

In the rate of flow there is the rate at which the particular amount of the powder is going to flow through the fixed diameter of the funnel. In the flow rate there is the particular amount of the drug or granules are weighed and then passed from the orifice of the funnel. We can determine the flow rate of the granules or the particles by using the next formula:

Rate of Flow = Weight of granules/ Time in seconds

✓ *Bulk density:*

The bulk density is manipulated by taking the ratio of weight of powder to bulk volume of powder or granules. Before that the sample was passed through the sieve no.20 consciously poured in the 100 ml of proceeded tube. The tube in which the powder is poured in it and without any shaking or tapping the volume is calculated. The bulk density is intended by using next formula as,

Bulk density = Mass of powder/ Bulk volume

✓ *Tapped density:*

Tapped density was manipulated by taking ratio of weight of powder to tapped volume of powder or granules. Before that the sample was passed through the sieve no.20 was consciously poured in the 100 ml of progressed cylinder. The cylinder is tapped each 2 second recesses. The cylinder is tapped as each specified intervals of the height of the 1 inch from the surface up to 100 times. Tapped density is intended by using the following formula as,

Tapped density = Weight of powder/ Tapped bulk

✓ *Hausner ratio:*

The hausner ratio is determineded by ratio of the tapped density to the bulk density. The hausner ratio is the quantity that is interrelated with the flowability of a powder or the granulated material. The hausner ratio determined by using the following formula as,

Hausners ratio = Tapped density/ Bulk density

Hausner Ratio	Type of flow
1.00-1.11	Excellent flow
1.12-1.18	Good flow/ free flow
1.19-1.25	Fair flow
1.26-1.34	Passable flow
1.35-1.45	Less flow
1.46-1.59	Very less flow
>1.60	Very less flow

Table 4:- Hausners ratio like the indication of flow of powder and its properties

✓ *Carr's Index:*

The carr's index is determined by taking ratio of bulk density is subtracted from the tapped density to the bulk density and ratio is multiplied by 100. The carr's index is also called the percentage (%) compressibility. The % compressibility of a powder there is the quantity the probable powder, stability and the bridge strong point. The % compressibility is determined by using the next formula as,

% compressibility = Bulk density – Tapped density/ Bulk density *100

Carr's index (%)	Type of flow
5-15	Excellent
12-16	Good
18-21	Fair to passable
23-35	Poor
33-38	Very poor
>40	Extremely poor

Table 5:- Carr's index as the indication of powder flow

➢ *Evaluation parameters of effervescent tablets:*

✓ *Weight variation:*

Variation in weight test is carried out to determine the uniformity of different batches of tablets. In this weight variation there is the determine typical weight of tablets and then tablets weight is compared to the weight of the single tablet. This test of the variation is protecting the dose and the dosing frequency of the tablets, this will also reduce the overdosing of the tablets or any side effects. Weight dissimilarity of the tablets as per Indian pharmacopoeia (IP) as shown in the table as

IP/BP	Limit	USP
80 mg or a smaller amount	10%	130 mg or less
More than 80 mg or Smaller than 250 mg	7.5%	130 mg to 324 mg
250 mg or additional	5%	More than 324 mg

Table 6

✓ *Thickness of Tablet and diameter:*

Very essential or the very important role of the thickness and the diameter of the tablets for the obtaining the uniformity of the tablets and the specified sizes of the different types of the tablets. This width and the diameter of tablets were calculated by using instrument like the Vernier callipers.

✓ *Tablet hardness:*

Hardness of tablets having very essential role in the manufacturing of tablets. The hardness of tablet of each formulation calculated / measured by the Monsanto Hardness apparatus. The hardness is calculated in the units kg/cm^2. Hardness of the tablets means the force which is required to break or crush the tablet by the particular amount of the compression force. The hardness of the tablets up to 3-5 kg/cm^2 measured as the pleasing for the uncoated type of tablets. Breaking condition, stability, storage condition and the transportation of the tablets all this important parameter are depends on the hardness of the tablets.

✓ *Friability:*

Friability of the is also plays the essential role in the tablet dosing, stability and the weight of the tablets. In the friability test there is the tablets were placed in the instrument of the pan which is made from the plastic and then this plastic chamber is going to revolved at 25 rpm and dropping the tablets at a height from the 6 inches in each revolution. The friability of the tablets is calculated by using the Roche Friabilator. In this Roche friabilator there is the abrasion of the tablets in the friabilator chamber. The weighing of the tablets before placed in the fraibilator and then placed into the plastic chamber of the friabilator to the 100 revolutions. Then there are the tablets were dusted by using a soft muslin cloth and the again reweighing the weight of the tablets. As per the USP limit is up to 0.5 to 1%. The friability is calculated by using the formula as,

Friability of tablet = Initial weight of tablet– Final weight of tablet/ Initial weight of tablet*100

✓ *Measurement of effervescence time:*

The effervescence time of the tablets is calculated by using the to take the single tablet which is placed in the beaker which contains the 200ml of the purified water at 20℃ ± 1℃. The time at which we get the clear solution without any particles in the solution at this time the effervescence time has finished. We took the mean of the three formulations and to take the final result of the average result.

✓ *Determination of effervescent solution pH:*

pH of solution is determined by using the one tablet in 200 ml of the purified water at 20℃ ± 1℃ by using the pH meter after completing the the dissolution time. Repeat the experiment 3 times for each formulation and to take the mean of the all the results.

✓ *Measurement of CO_2 content:*

The single effervescent tablet solved in the 100 ml of 1N sulphuric acid solution and weight changes are determined after the complete dissolution process. The obtained weight difference is shown the amount of the CO_2

✓ *Evaluation of water content:*

To take the 10 tablets of each formulation are dried in a desiccator which contains the activated silica gel for 4 hours. The water content is of the 0.5% or less is acceptable.

✓ *In-vitro disintegration time:*

In process of breaking of the tablet into the smaller particles is also known as the disintegration. This time is calculated by using the disintegration apparatus as per the Indian pharmacopoeia specification. The phosphate buffer adjusted at pH 6.8 maintained at 37℃ ±2℃ as of immersion liquid. The standard limit for the disintegration is within 3 minutes in water at 25℃ ±1℃ as per Indian pharmacopoeia.

✓ *Dissolution studies:*

The release rate of the tablets is determined by using the USP dissolution testing apparatus 2. The dissolution medium is used was about 900 ml of phosphate buffer at pH 6.8which was maintained at 37℃ ±0.5℃. 5ml of sample was withdrawn from the sample to maintain the sink condition at after every 5 minutes interval.

➢ *Applications: -*

- Good stability and effortlessness of transferring.
- Alternative form for the parentrals.
- Planned drug delivery may achieve.
- It is very useful in the pulsatile drug delivery system.
- Effervescent agent concentration distresses time of floating in floating drug delivery system.
- The release of zero order can be proficient for combination low stages of blends of effervescent in the matrix form.

III. RESULT AND DISCUSSION

The calcium effervescent tablet formulations show the good and faster release profile of the drug and to give the quick relief to patient from the illness. In the effervescent tablet formulation, the effervescence is evolution bubbles of gas of CO2 because of the interreaction of the base and acid. Punctual acids used in the intereaction of the effervescent tablets.

IV. CONCLUSION

From this effervescent tablet it was determined this tablet gives the improved therapeutic effect, more stability, and greater tolerability, improves the palatability and increases the onset of action of the drug release.

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