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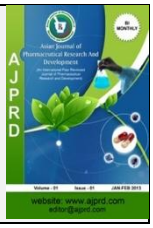

Open Access Research Article

Formulation and Evaluation of Paracetamol Effervescent Tablet

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A B S T R A C T

Oral dosage forms are the most popular way of taking medication, despite having some disadvantages compared with other methods like risk of slow absorption of the medicament, which can be overcome by administering the drug in liquid form, therefore, possibly allowing the use of a lower dosage. However, instability of many drugs in liquid dosage form limits its use. Effervescent technique can be used as alternate to develop a dosage form which can accelerate drug disintegration and dissolution, is usually applied in quick release preparations. The tablet is added into a glass of water just before administration and the drug solution or dispersion is to be drunk immediately. The tablet is quickly broken apart by internal liberation of CO2 in water due to interaction between tartaric acid and citric acid with alkali metal carbonates or bicarbonates in presence of water. Due to liberation in CO_2 gas, the dissolution of API in water as well as taste masking effect is enhanced Along with the development of new pharmaceutical technique, effervescent tablet are more and more extensively to adjust the behavior of drug release, such as in sustained and controlled release preparations, pulsatile drug delivery systems, and so on. In present work an attempt has been made to formulate an effervescent tablet containing immediate release of paracetamol using various acids and bases. In present work we are used different acids and bases in different concentration. The formulation of tablets was done by using wet granulation as well as dry granulation in that technique wet granulation which was found acceptable. Then formulated tablets were evaluated for hardness, friability, weight variation, and disintegration time . From study it was concluded that F5 shows the better result than the F1, F2, and F3 & F4.

Keywords: Paracetamol, Effervescent tablet, sustained release, wet granulation method.

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INTRODUCTION

The oral dosage forms are the most popular way of taking medication despite having some disadvantages like slow absorption and thus onset of action is prolong. This can be overcome by administrating the drug in liquid from but, many APIs have limited level of stability in liquid form. So, effervescent tablets acts as an alternative dosage form. The tablet is added into a glass of water just before administration and the drug solution or dispersion is to be drunk immediately. The tablet is quickly broken apart by internal liberation of CO2 in water due to interaction between tartaric acid and citric acid with alkali metal carbonates or bicarbonates in presence of water. Due to liberation in CO2 gas, the dissolution of API in water as well as taste masking effect is enhanced.

The advantages of effervescent tablets compared with other oral dosage forms includes an opportunity for formulator to improve taste, a more gentle action on patient's stomach and marketing aspects. To manufacture these tablets, either wet fusion or heat fusion is adopted. The tablets are compressed soft enough to produce an effervescent reaction that is adequately rapid. Water soluble lubricants are used to prevent an insoluble scum formation on water surface. To add sweetness to the formulation, saccharin is added since sucrose is hygroscopic and add too much of bulk to the tablet. The manufacturing shall be done under controlled climatic condition to avoid effervescent reaction.

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 liquified 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 paracellular 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]

The aim of this study is to develop and physicochemically evaluate the Effervescent Tablets of Paracetamol. To enhance the onset of action of Paracetamol and increase the solubility of Paracetamol.

- To produce faster onset of action
- To achieve better patient compliance.
- To Avoid the First Pass Effect.
- The Effervescent tablets should have satisfactory property.
- Tablet having the greater bioavailability than other dosage form.
- The stability of Effervescent tablets can be increased.
- The effervescent tablets require strictly humid control area. The Effervescent tablets can be made in a normal area where the humidity and temperature Condition not maintained.
- Tablet has a better patient compliance and rapid onset of action.

Benefits:

1. Pleasant Taste Compared to Regular Tablets.

Effervescent tablet can be liquefied in a liquid such as fruit juice or water, which is the main cause of their approval. Due to which their taste gets way improved than regular tablet.

2. Distributed More Evenly

The dissolution of predictable tablet is gradually in sometime and can sometime be gateway causing there to the motive of irritation in some cases, in difference the dissolution of effervescent tablet is comprehensive and even through the stomach which stops the accumulation of component in local area. This makes effervescent tablet taste better and fewer irrigative and on effervescent method of ingestion of ingredient. Apart from providing nutritional benefit intended effervescent tablet also rise liquid consumption.

3. Increased Liquid Intake

Increased Liquid Consumption is more helpful during period of desiccation ill time and in less liquid ingestion.

4. Easy Alternative to Regular Tablets

Effervescent tablet can use in residence of regular tablet. Which cause trouble in swallowing either due to sickness or age, old age people who administer medicine or supplement on daily basis reports problem associated to swallowing of tablet to overcome these difficulties effervescent tablets are of great significance and can be on relaxed way to swallow a tablet.

5. To Sum Up

Effervescent tablets are receiving progressively popular and it's easy to work out why. They supply a way more effective way of taking supplements or medicine since being spread consistently and far faster than regular medicines. [2]

Reason for selection of effervescent tablets of Paracetamol:

Fast onset of action

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 - effervescent tablets are administered in liquid form so they easy to take as International Journal of Pharmaceutical Research & Development ISSN: 0974 – 9446 Existing online on www.ijprd.com 78 associated to tablets or capsule. 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.

Good stomach and intestinal tolerance - effervescent tablet liquefy 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.

More portability - effervescent tablet is more simply delivered than liquid medication because no water is added until it is complete to use.

Improved palatability - 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.

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Conventional tablets are often associate with slower onset of action and also undergoes first pass metabolism. Effervescent tablet avoid the first pass metabolism and also produce rapid onset of action. Oral liquid also provide rapid onset of action but required carefully handling. Slower onset of action and also undergoes first pass metabolism. Effervescent tablet avoid the first pass metabolism and also produce rapid onset of action. Oral liquid also provide rapid onset of action but required carefully handling.

Aim & Objectives:

The aim of this study was to formulate effervescent tablet with sufficient mechanical integrity and to achieve faster disintegration in the water.

Objectives:

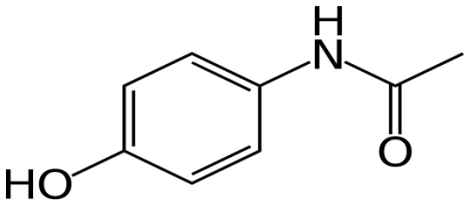
- To optimize formulation for effervescent tablet.
- To prepare effervescent tablet
- To evaluate various parameter for effervescent tablet.
- To generate information useful to the formulation in developing desired, stable and bioavailable dosage form.
- Fast onset of action.
- Rapid and enhanced absorption.

MATERIAL AND METHOD:

Ingredients: paracetamol, citric acid, Sodium Bicarbonate, starch, talk, lactose.

Paracetamol: Paracetamol / acetaminophen is one of the greatest prevalent and most usually used analgesic.

Structure:



- Name: Paracetamol
- IUPAC name: N-(4- hydroxyphenyl) ethanamide
- Molecular formula: C8H9NO2
- Molecular mass: 151.163 gm/mol
- Density: 1.263 g/cm3
- Melting point: 169o c
- Boiling point: 420 c
- Solubility in water: 7.21g/kg (0c).

Table 1: Excipients used in Formulations

Sr.No.	Category	Use	Example
1.	Diluents	Used to make up volume of tablet.	Lactose, Microcrystalline cellulose.
2.	Glidant	Helps in free flowing of granules from hopper to die cavity.	Colloidal silicon dioxide, starch, Talc.
3.	Binder	Used as binding agent in tablets.	Glucose, Lactose, Gelatin.
4.	Lubricant	Used to reduce the friction between die wall and tablet.	Stearic acid, Magnesium stearate, Talc, SLS.
5.	Disintegrant	Generally, not used in Effervescent tablet.	Sodium starch, glycollate, Starch.
6.	Antiadherent	Prevents sticking of tablets	talc

Table 2: Formula for preparation of effervescent tablet.

Sr No	Ingredient	F1 (mg)	F2 (mg)	F3 (mg)	F4(mg)	F5(mg)
1.	Paracetamol	300	300	300	300	300
2.	Sodium bicarbonate	92	110	128	128	130
3.	Citric Acid	112	120	128	122	121
4.	Lactose	92	92	92	92	92
5.	Gelatin	18	18	18	18	18
6.	Starch	12	12	12	12	12
7.	Talc	22	22	22	22	22

METHOD OF PREPARATION OF EFFERVESCENT TABLET:

- Drug (Paracetamol), sodium bicarbonate were sieve through sieve No: 40#.
- Granules prepared with ethanol to form damp mass and it was passed through sieve no.40#. Citric acids, sodium bicarbonate, spray dried lactose, starch, gelatin was blended & passes through sieve no: 40#.
- Granules prepared by using binding agent (ethanol) & dry at 60˚c for 30 minutes.
- Both granules mix & dry at 60˚c for 15 minutes.
- Granules were compressed into tablet by using single rotary tablet punching Machine.

EVALUATION OF PRECOMPRESSED BLEND:

1. Angle of Repose (θ)

The dry mixture powders were permitted to flow through the funnel immovable to a stand at certain height (h). The angle of repose was then considered by measure the height and radius of the heap of powders formed.

$\tan \Theta = h / r.$

$\Theta = \tan^{-1} (h / r).$

Where θ called as angle of repose, h and r were height and radius of the powder heap pleasingly. According to the conditions the angle of repose value less than 250 shows excellent flow whereas angle greater than 400 indicates poor flow. [4]

2. Bulk Density

Apparent bulk density was resolute by pouring presieved drug excipient mixture into a graduated cylinder and measures the volume and weight "as it is". It is expressed in g/ml and is specified by

Db = M / V0

Where, M is mass of powder and V0 is the Bulk volume of powder. [5]

3. Tapped density

It is weight of granules divided by its tapped volume.

Dt = M / Vt

Where, M is mass of powder and Vt is the tapped volume of the powder. [6]

4. Compressibility index

The % compressibility is determined by Carr's compressibility index.

The % Carr's index is calculated by means of the following formula:

$$\% \text{ Carr's Index} = \frac{\text{Tapped density} - \text{Bulked density}}{\text{Tapped density}} \times 100$$

Where, TD is tapped density and BD is bulk density.[7]

5. Hauser's Ratio

It was calculated by following formula:

Hauser's ratio = Tapped density / Bulk density

Hausner's ratio from 1.25 to 1.6 show moderate flowing properties. If ratio is more than 1.6 will show more cohesive powders. [8]

EVALUATION OF TABLET:

Average thickness

The thickness of the tablets was determined using vernier Calliper. According to report tablet thickness would be precise within a ± 5% variation of average value.

Hardness and friability

For each formulation, the hardness and friability of 20 tablets were determined using the Monsanto Hardness Tester and Roche Friabilator resp. Percentage friability of tablets was measured by using following formula,[9]

Percentage friability: Initial weight – Final weight/ Initial weight x 100

Disintegration time

This test performed on 6 tablets. For disintegration time, one tablet was positioned in the centre of the Petri dish (internal diameter 10 cm) comprising 10 ml of water and the time taken by the tablet to disintegrate totally was noted.[10]

Weight Variation

Twenty tablets were selected casually. Tablets were weighed individually and mean weight was calculated. Then deviation of each tablet from average weight was calculated and percent deviation was calculated.

Content Uniformity

Used to ensure that every tablet contains the amount of drug substances certainly with little variation between tablets with in batch.[11]

In vitro drug release studies

In vitro drug release studies were started using USP apparatus I (basket method). The dissolution media was 1000 mL of 0.1 N HCl at 37 ˚C for 30 minutes to signify the gastric medium where the tablets will disintegrate. In all experiments, 5 mL of sample was withdrawn at 5 min interval and replaced by means of fresh medium to keep sink condition. Samples were filtered and examined spectrophotometrically at 230 nm.[12]

STANDARD CALIBRATION CURVE FOR PARACETAMOL (PH-1.2)

Accurately weighed 100 mg of paracetamol was dissolved in 100.0 ml of 0.1N HCL. 10.0 ml of this stock solution was further diluted to 100.0 ml with 0.1N HCl from this dilution 10.0 ml was further diluted up to 100.0 ml with 0.1 n HCl the aliquots of 1.0 ml., 2.0 ml, 3.0 ml, 4.0 ml, 5.0 ml, 6.0 ml, 7.0 ml, 8.0 ml, 9.0 ml and 10 ml were pipette out and were made up to 10 ml volume with 0.1 N HCL individually. The absorbance of all these solutions were measured at 249 nm using U.V.spectrometer.

Slope=0.0229

r2=0.996

Table 3:

Concentration	mcg/ml
1	0.022
2	0.044
3	0.064
4	0.088
5	0.114
6	0.132
7	0.154
8	0.182
9	0.208
10	0.244

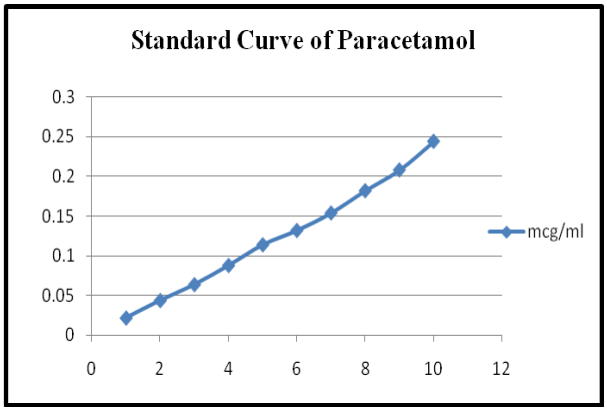


Figure 1: Standard Curve of Paracetamol:

RESULT AND DISCUSSION:

Table 3: Evaluation of Granules:

Property	F1	F2	F3	F4	F5
Bulk density gm/cm 3	0.75	0.73	0.75	0.74	0.75
Tapped density gm/cm 3	0.87	0.85	0.84	0.86	0.88
Angle of repose (Degree c)	25.12	24.25	27.18	25.24	28.17
% Compressibility	13.79	14.11	10.71	13.95	14.77
Hausner's Ratio	1.02	1.16	1.12	1.16	1.17

Table 4: Evaluation of Tablets:

Property	F1	F2	F3	F4	F5
Thickness (mm)	7.4	7.9	7.7	7.7	8.0
Disintegration Time (Second)	11-13	12-15	15-18	10-13	10-13
Hardness (kg/cm3)	2.2	2.4	2.1	2.2	1.9
Friability Test (%)	Pass	Pass	Pass	Pass	Pass
Weight variation	Pass	Pass	Pass	Pass	Pass

From the evaluated data it has been observed that the F5 shows the better result than F1, F2 F3 & F4.

SUMMARY AND CONCLUSION

The study was under taken with an aim to formulate effervescent tablets of analgesic and antipyretic drug (paracetamol). The literature review showed that paracetamol having similar mechanism of action to aspirin because similarity in structure. Paracetamol act by reducing production of prostaglandin which involved in pain and fever process, by inhabiting the cyclo-oxygenase enzyme.

In present work an attempt has been made to formulate an effervescent tablet containing immediate release paracetamol using various acids and base. the effervescent tablets were prepared by wet granulation technique. Lactose as a binder and talc as lubricant were used. There are three formulations that content the citric acid and sodium bicarbonate were formulated.

These five formulations were evaluated for hardness, friability, weight variation, Disintegration time .From above study it was concluded that F5 shows the better result than the F1, F2 F3 & F4.

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