Formulation And Implementation of Furosemide Gastro-Retentive Tablet Using Natural Polymers of Maize And Jowar Plant

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Abstract- *Nowadays, the use of natural polymers as stomach-holding polymers is increasing. Materials such as natural materials are biocompatible and biodegradable, have little or no visible side effects, and are affordable. The main objective of this research work was to design gastric retaining tablets of furosemide using Maize Root Extract (MSP) and Jowar Root Extract (JSP) powders as novel micropolymers and provide sustained release of the drug for up to 12 hours. Our current goal is , research aimed at preparing stomach-holding tablets, evaluating swimming behavior and achieving a release effect of at least 12 hours. The innovation of this research work is that MSP powder and JSP powder have low density. Thus, stomach retention tablets with a low (floating) shape can be prepared at a much lower cost than normally sold tablets.furesomide gastro-retaining tablets were produced using MSP and JSP powders. With the help of design-expert® version 13, designs are designed using 32-dimensional design. The gastro-retaining tablets showed good floating behavior and good dissolution properties, maintaining drug release for 12 hours. Development research using contour plot and surface response showed that formula R9 is best in class in every respect. The present study () showed that as the size of MSP powder and JSP powder increased, there was an increase in the floating time and a corresponding decrease in the dissolution rate of the tablets. The R9 formulation consists of HPMC (K-100M) with 12% and 8% MSP powder and 8% JSP powder, respectively, and showed good swimming behavior and drug release mechanism. Therefore, MSP powder and JSP powder can be used as suitable polymer materials for the low-cost design of furosemide gastric retention tablets*

Keywords- Captopril; Maize Stem Pith; Jowar Stem Pith; Floating Behavior and Sustained Release

I. INTRODUCTION

Oral delivery (CR) devices have been used for a short time to reduce drug administration.(1,2) However, the release of the drug in the distant part of the gastrointestinal tract and the poor bioavailability due to the short residence time of the drug in the stomach can overcome many obstacles and lead to accelerated gastric emptying time Suitable.(3,4) Additionally, the method used for this dosage significantly reduces the absorption of the drug and increases its local absorption in the stomach Due to the intestinal instability of furosemide and its absorption mainly in the upper gastrointestinal tract, many researchers have developed stomach-retaining floating tablets to increase their bioavailability(5). Digestion forms fall into the following categories: bioreactive (cultivation) materials, intumescent materials, expandable systems, floating systems, and flame retardant systems(6). Time. Furosemide is an ACE inhibitor used in the treatment of various heart d(10,11)The electronic molecule furesomideis stable in an acidic environment. Moreover, it is absorbed from the stomach at a rate of %. On the other hand, if the pH increases due to the alkaline environment of the intestine, furosemide becomes unstable and therefore cannot be absorbed in the intestine(12,13). Natural polymers are becoming increasingly popular due to their innovative designs and unique designs. Plant-based materials generally appear to be effective, harmless, biocompatible, biodegradable, reusable, environmentally friendly, and patient-friendly.(14) There are Polymers that can be classified as low-density polymers. In this study, corn marrow meal and jowar stalk marrow meal were used as layer polymers. Corn (Zea mays L.), a member of the Poaceae family, is a global grain crop in Central America.(7,8) Corn is known as the “queen of grains” in the world because it is widely grown and has high yields for the global market.(9) Corn crops can be grown at any time of year in . As a result, corn kernels can be used as a low density substitute. Jowar is known worldwide as the ‘new quinoa’ as it is gluten-free and super healthy. In English it is called sorghum. The botanical name of Jowar is Sorghum bicolor, which belongs to the Poaceae family. Planting and harvesting of jowar is done in the same way as maize(15). In this study, the wet granulation method was used to make Tablets; Stomach-retaining furosemide tablets are made with natural

polymer of corn stalk extract powder and Jowar stalk extract powder in different concentrations. Lessons are organized using professional software. The study aimed to improve the gastric arrestant release of extended-release furosemide using corn stalk marrow powder and Jowar root marrow powder, which show a profile similar to BRUTORIL 50.

II. MATERIALS AND METHODS

Materials

The fresh stems of the maize plant and jowar plant were collected from the home farm of Jamthi, Tal. Bodwad, Dist. Jalgaon (Maharashtra) in December. The maize plant and Jowar plant were authenticated before the research study. The Department of Botany, Arts, Commerce and Science College Bodwad identified these plants. The voucher specimen of Maize plant and Jowar plant has been deposited In the herbarium of the Department of Botany, Arts, Commerce and Science College Bodwad. Furesomidewas purchased from Balaji drugs Surat, (Gujarat). Vishal Agencies, Jalgaon, Maharashtra, provided HPMC (K100M), PVP (K90), Microcrystalline cellulose, Talc, Magnesium stearate, Isopropyl alcohol (99.90 %) AR grade and Hydrochloric acid (37 %) AR grade. During entire research, distilled water was utilized. BRUTORIL 50, a marketed tablet procured from Shriram Medico, Jamner, District Jalgaon (Maharashtra) was used in this study.

Methods :

- Direct compression technique: This involves removing particles from the powder without changing the shape of the material. Dicalciumtrihydrate phosphate, tricalcium phosphate etc. It is very effective.
- Effervescence technique: The reaction of fatty acid (citric acid) and bicarbonate salt will fill the floating compartment of the drug delivery system with inert gas (CO2).
- Fine packaging techniques: These include wet pressing, milling or drying. Wet mills create granules by combining the powder with a binder rather than binding it.
- Ionotropic gelation technique: Gelation of the anionic polysaccharide sodium alginate, a base polymer of natural origin, is carried out with another calcium ion (anti-ion) to form small particles.
- Solvent evaporation technique: The capacity of the continuous phase is not sufficient to remove all the dispersed water. The drug is inhaled from the surface to recover solid microspheres.
- spray drying technique:It involves dispersing the basic ingredients into the liquid combustion equipment and injecting the chemical mixture into the environment so that the cap is reinforced and air is rapidly absorbed.
- Melting technique: This method simulates a molten mass in the liquid phase, which is then frozen to solidify. Lipids, waxes, polyethylene glycol, etc. are the carriers used in this technique.
- Melt Granulation Technique: It is a method in which pharmaceutical powder is produced using a melting machine and no water or harmful chemicals are used.(16-20)

Advantages of drug delivery system:

- FDDS can remain in the stomach for several hours, which prolongs the time it takes for the stomach to be fed with various drugs.
- Advantages of drugs intended to act locally in the stomach E.g. Antacids.
- Preparation of FDDS is useful in taking the drug into the stomach for better response in the gastrointestinal tract.
- Reducing the frequency of FDDS increases patient compliance. Treatment of gastrointestinal disorders such as gastroesophageal reflux.
- Although early bioavailability effects of drug plasma are avoided.
- The HBS/FDDS formula may be useful when administering aspirin and other similar medications because these medications are acidic and irritate the stomach lining.
- It is good for gastrointestinal drugs. For example. Iron salts, antacids.
- Medicine delivery on private property. (20)

Disadvantages of Floating Drug Delivery Systems:

- Drug properties that are unstable in the stomach acid environment are not suitable candidates for inclusion in the system.
- This way there is a source of food to be added for free.
- It is not a safe drug or suitable as a problem for self-resolution of GIT.
- Drugs with an initial effect and drugs that are widely absorbed in the gastrointestinal tract are the only desirable candidates.
- The tendency to float depends on the hydration status of the dose.
- Water management may sometimes be necessary to keep these sheets above water.(20)

Preparation of MSP and JSP flour

Maize crop is sown between the last week of May and the 2nd week of June (Kharif season) and harvested in late September or October. After harvesting corn from plant , the remaining part of the plant is allowed to dry completely.

Later the dried sap was used for cooking. First, the outer covering Is removed from the plate and the inner spongy medulla Is partially separated. The resulting marrow fraction is then separated from other contaminants. The marrow is then fractionated using a mill to obtain MSP powder In such a process, JSP powder is prepared.

Preparation of Gastro-Fast Tablet

The ingredients listed in the formula have been tested correctly . The measured PVP-K90 was then slowly added to the isopropyl alcohol And stirred until dissolved. The clear solution Is used as a basis for the wet granulation method For the preparation of tablets. Then, Captopril, MSP powder, JSP Powder, HPMC (K100M), sodium bicarbonate, and microcrystalline cells Were mixed together using aMixer, and a pre-prepared Binder was added dropwise to the mixed solution for 30 min. In , measures were taken to prevent clot formation. The starch gave a uniform mass of; this was then passed through a 20# sieve to prepare granules. Granules were processed in an oven where Was maintained at 40°C. After drying, Grains were measured through a 16# sieve. Finally, the produced Granules are mixed with talc and magnesium stearate and Is obtained after passing through a 30# sieve. Finally, a ablet press machine was used to cut 300 mg of Granules into tablets.20

Sr.no	Ingredients	R1	R2
1	Furosemide	50	50
2	MSP powder	36	36
3	JSP Powder	24	18
4	HPMC(K100M)	36	36
5	Sodium bicarbonate	30	30
6	PVP K -90	10	10
7	Microcrystalline cellulose	106.5	112.5
8	Talc	4.5	4.5
9	Magnesium stearate	3	3
10	Isopropyl alcohol	q.s	q.s

Table:- Formulation for gastro retentive tablets

Evaluation of granules Density:

Granules are poured into the
Measuring cylinder with a capacity of 100 ml and pressed 4-5 times on the
To determine the density. Bulk density
Was calculated as the weight of the grains and the volume of the volume.
It is usually given as (g/cm3).2

Tap density: Starch is poured into the Measuring cylinder with a capacity of 100ml and tapped
Times and 100 times to determine the tap density. The density of the press was , calculated as the weight of the grains and the volume of the volume. It is And is usually expressed as (g/cm3).23

Discharge angle: Discharge angle determines the flow characteristics of the granules. The plate is placed on a horizontal plane and the tube Is held firmly on top of it. 10 g of granules are added to the Oven. The powder is immediately released from the top of the Furnace to form a crisp, uniform and complete stack of On the plate. According to the scale, the height of the pile was . The following formula was used to calculate the Angle. 23
Ø = tan-1 (h/h)

Angle of repose.	Powder flow
<25.	Excellent
25-30.	Good
30-40.	Passable
>40	Very poor

Consistency index: Consistency index also Describes the fluidity of the granules. It is Calculated using the formula below. 23
Density Ratio = 100 * (Click Intensity – Maximum Density) / Density.
Where, Ø- angle of repose, h- pile height andpile radius

Evaluation of Gastro-retaining Tablets

Dimensions

Physical Dimensions:

Tablet dimensions and diameters Measured using a caliper.23
Hardness: Hardness indicates the dimensions of the tablets
To withstand mechanical stress during use and transportation
. Determined using Monsanto
. Scale

Weight difference test:

20 standard plates are selected among Pieces and weighed separately and the average of Pieces is determined. After weighted averages, the percentage deviation of each variable was calculated. % Deviation Checked according to the parameters of the IP test tablet. 23

Friability : Frites were tested using Roche friabilator . The above apparatus Rotating at a speed of 25 rpm was packed into twenty Plates after weighing appropriately. After 4 minutes, tablets were analyzed to determine weight percentage.

Drug contents : Usually twenty tablets are selected and then processed to obtain powder. Powder Containing the chemical equivalent of 25 mg of measured Is placed in a volumetric flask (capacity 100.ml) containing 0.1 N HCl. Shaking is used to properly dissolve chemicals. The sound was made using 0.1 N HCl. The same procedure was used on another To prepare a 10 µg/ml solution of Furosemide. The resulting solution was filtered and the Filtrate was analyzed by UV-visible Spectrophotometry at 222 nm to determine absorbance. The introduction of narcotics took place. 24

Floating lag time: When tablets are placed by the Dissolution method, the time it takes for the tablet to reach the top of the Is called floating time. A Beaker with a capacity of 250 ml containing 0.1 N HCl was used for the test. 2

Floating time: This is the time it takes for the tablet to float on the surface of the Solution. Float time was measured using a USP- Type II dissolution test kit containing 900 mL of 0.1 N HCl held at 37 ± 0.5°. C.25

Swelling Rate: Swelling rate is the ability of Files to absorb water and swell. Was prepared using a USP Type I (basket) dissolution test apparatus containing With 900 mL of 0.1 N HCl maintaining At 37 ± 0.5 °C. Sometimes Tablets were removed and excess water was removed using Tissues. The swelling ratio was And was determined using the following formula.27

In Vitro Dissolution Study: An in vitro Study was performed for 12 hours using a USP-II Test kit containing 900 mL of 0.1 N -HCl maintained at 37 ± 0.5°C with a paddle rotation speed. Sometimes a 7 ml sample is taken from the Filter and 5 ml of it is injected into the 10 ml. The resulting samples were analyzed using a Visible UV spectrophotometer to measure the absorbance of At 222 nm28 . In the solution study, the Parameter was compared with T75 of %CDR29, f1, and f230 as a drug kinetics comparison. Publication Studies 31 and mean dissolution time (MDT)

Use of floating drug delivery systems:

Bioavailability: The bioavailability of riboflavin CR-GRDF increased significantly compared to the application of the GRDF CR polymer formulation.

Sustained drug release: Oral CR formulations experienced problems in the GIT, such as residence time in the stomach. The HBS system, which can stay in the stomach for a long time, have a density less than 1 and float on the surface of the stomach contents, can overcome these problems.

Site-specific drug delivery: Controlled and slow administration of drugs into the stomach ensures an appropriate therapeutic dose and minimizes drug toxicity. Dosing frequency can be reduced by increasing the gastric absorption of the drug delivery system. For example, Furosemide and riboflavin.

Gutezimber absorption:Drugs with low bioavailability due to site-specific absorption in the upper gastrointestinal tract are candidates for development as floating drug delivery systems, possibly with increased efficacy.

Reducing negative effects on the colon: In RLS, keeping medications in the stomach reduces the amount of medication entering the intestine. Unnecessary drug effects in the colon area can be prevented.

Decreased drug metabolism: Continued administration of the drug after administration of CR-GRDF Results in lower levels of accumulation in blood plasma depending on the type of dose released.(21)

Pharmacological aspects

The following factors should be considered in the design of FDDS:

i) Gastric retention according to clinical requirements;
ii) maintenance
iii) The ability to package and market many drugs with different physical and chemical properties in a controlled manner;
iv) Complete balance of the matrix in the form of SR in the stomach, to make an expensive industry, efficiency between floating time and release rate (floating time increases by increasing the drug: polymer rate but release by increasing polymer level), old time so the time taken by the floating file is shorter should be (Wong P S Reka al.2000). Most floating systems mentioned in the literature are single

systems; these methods are unreliable and irreversible in terms of long gastric residence time when administered orally, due to their mode of elimination ("all or none"). On the other hand, the multidimensional form seems to be the best choice because it reduces the variability of the material in the intake and reduces the possibility of drug waste.(22)

III. FUTURE CHALLENGES IN DRUG DELIVERY

- Applying oral pharmacology to replace parenteral administration will improve medical care.
- FDDS is expected to increase this capability.
- Moreover, it is expected that the FDDS method can be used in many practical applications with small access windows, the development of which has been hampered by the lack of pharmaceutical FDDS technology.
- Treatment of H.Pylori infection in FDDS needs to be improved.
- Further research could focus on the following issues: Determination of the minimum dose distributed during long-term retention of DF in the human stomach.
- This allows specific control during pregnancy. FDDS design, each with a narrow GRT to be used according to clinical need, for example . the rate and nature of the disease.
- This can be achieved by combining polymeric parameters with different biodegradation properties.
- To examine the effect of different geometric shapes, large sizes and hardness, which are more extreme than previous studies, on straw retention.
- Design of polymers according to clinical and pharmaceutical needs.(22)

IV. CONCLUSION

According to the results and discussions in this study, the formulation of gastric retention furosemide tablet containing MSP powder and JSP powder at 12% and 8% concentration showed buoyancy (flotation) up to 12 hours. On the other hand, it showed an expected release profile after 12 hours with HPMC (K100M). The results showed that furosemide stomach retention tablets showed a better release profile than BRUTORIL 50. One study showed that formulation containing MSP powder and JSP powder had a significant effect on buoyancy and swelling values during use. In combination, balanced. Based on the experimental results, it is clear that MSP powder and JSP powder can be used as effective excipients of natural polymer with floating and swelling properties in the preparation of furosemide stomach-holding tablets.

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