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Original Article

Formulation and evaluation of microsphere of antiulcer drug using *Acacia nilotica* gum

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ABSTRACT

Objective: This study was undertaken to evaluate the formulation of the microspheres for antiulcer drug using natural polymer *Acacia nilotica* gum.

Materials and Methods: All parameters evaluated *A. nilotica* gum, aqueous solution of purified gum was used for chemical characterization, organoleptic character, flow properties, pH, particle size determination, solubility, viscosity, surface tension, infrared spectroscopy, etc. The microspheres of famotidine were prepared by ionotropic gelation technique using cross-linking solution of aluminum chloride, barium chloride, and calcium chloride.

Results: Micrometric evaluation was performed of natural polymer microspheres. The micrometric parameters such as bulk density, bulkiness, compressibility index Hausner's ratio, and angle of repose better flow and good packaging properties (bulk density F5±0.02) formulation F1 showed maximum tapped density 0.06±0.04. The concentration was changed of *A. nilotica* gum so formulation F5 given maximum percentage yield of microspheres. Particle size ranges 846.31–989.04 µm. Formulation F3 shows the smallest particle size and F5 shows the largest particle size. Swelling index for all the formulations was found in an excellent range from 114.2 to 144.4. Formulation F5 showed the highest swelling property. Highest drug content was found in formulation F1 ranged from 88.98% to 98.23%. In *in vitro* drug release, F1 showed maximum release of drug, whereas F6 showed minimum release of drug.

Conclusions: Natural polymer *A. nilotica* gum was successfully used for the preparation of famotidine microparticulates. Formulation with *A. nilotica* gum was impacted to the particular size, surface morphology, swelling conduct, and *in vitro* drug release. Stability studies F1, F3, and F5 formulations showed no reduction in drug content and in percent release. In short, *A. nilotica* gum may be utilized during pharmaceutical dose frames by giving support to drug delivery system and avoiding side effects for the patients.

Keywords: *Acacia nilotica*, antiulcer drug, formulation, microspheres, natural polymer

Introduction

Peptic ulcer is a heterogeneous disease that is a major health hazard both in terms of morbidity and mortality. It occurs due to an imbalance between offensive versus defensive factors. It manifests as a break in the gastrointestinal lining bathed by acid and/or pepsin. Various classes of synthetic antiulcer drugs have been used for its treatment such as H2-blockers and M1-blockers which are associated with danger of drug interaction, adverse effects, and increased incidence of relapses during ulcer therapy.[1] Therefore, search for an ideal antiulcer drug continues and has also been extended to herbal drugs for their easy availability, better protection, low cost, and lesser toxicity.

Acacia nilotica subsp. *indica* is a tropical and subtropical tree belonging to family Leguminosae-Mimosoideae and distributed throughout the greater part of India, Ceylon, Baluchistan, Egypt, tropical Africa, and Natal.[2] *A. nilotica* is widely used in various ayurvedic formulations and its parts such as bark, leaves pods, and flowers have traditionally been proved for various ailments such as cancer, cold, congestion, cough, diarrhea, dysentery, fever, hypertension, hemorrhoid, ophthalmic, sclerosis, smallpox, tuberculosis, leprosy, bleeding piles, leucoderma, and menstrual problems.[3] Phytochemical tannins 25%–60%, mucilage 20%–30%, flavonoids, resins, saponins, and alkaloids have been isolated from different parts of *A. nilotica*. Pods and leaves of *A. nilotica* contain 8% digestible protein (12.4%

crude protein) and young seedless pods contain 18%–27% of tannins.[4-7] In this study, we investigated the formulation of the microspheres for antiulcer drug using natural polymer *A. nilotica* gum.

Materials and Methods

Isolation, purification of *A. nilotica*

Crude *A. nilotica* gum was obtained from the plant leaves and bark and was identified and authenticated by Aligarh Muslim University, Aligarh. *A. nilotica* gum was dried in hot air oven. Gum was boiled in water at temperature 60°C for 6 h after 2 h and kept aside for 2 h for release of gum into water. The material was squeezed in a muslin cloth to remove the mark from the filtrate and kept in refrigerator for 2–3 h after that equal volume of ethyl alcohol was added to filtrate to precipitate the gum these gum dried in oven at about 40°C. After complete drying, powder was passed through sieve # 20. The powder gum was stored in airtight container until further used.[8]

Physicochemical characterized of purified gum

Identification tests for carbohydrates, proteins, and gum: Aqueous arrangement of filtered gum was utilized for substance portrayal. Test for sugar, proteins, alkaloids, fats, tannins, amino acids were performing as indicated by standard technique.[9]

Organoleptic properties

Gum was described for organoleptic properties, for example, shading, scent, taste, surface, and crack.[9]

pH of gum

The gum pH was monitored as described previously.[10]

Viscosity of gum

Viscosity of gum was measured using Ostwald viscometer as described previously.[10]

Swelling property

Swelling of *A. nilotica* was determined by gauged abutter paper as described previously.[10]

Surface pressure

First, gum was gauged and after that broke up into H_2O independently to obtain a 1% w/v arrangement. Then surface pressure was measured by stalagmometer as described previously.[11]

Bulk thickness and cumbersomeness

According to the past investigation, precisely gauged amount of test was put in estimating chamber. The chamber was determined to the mass thickness gadget and the volume involved with the powder was observed. At that point, the powder was stored in a mass mechanical assembly in anticipation of consistent volume be gotten. The finishing volume was calculated using density of bulk formula.[10]

Powder flow property

Powder flow property of the gum was determined as described previously.[12,13]

Ash value

Ash value of *A. nilotica* was calculated as described previously.[10]

Infrared (IR) spectroscopy

A. nilotica powder was dried at 70–80°C for 4 h and dried content was subjected for Fourier-transform IR (FTIR) spectroscopy using FT-IR Spectrometer ALPHA (Bruker, UK).

Pre-formulation of drug

Organoleptic properties

Physical state, color, and odor of drug famotidine were observed by visual inspection.

Solubility

Solubility of famotidine was checked in different solvents (distilled water, hot water, acetic acid, glacial acetic acid, chloroform, methanol, etc.). This was done by taking a fixed amount of drug in a fixed volume of solvents as described previously.[12-19]

Melting point

Melting purpose of famotidine was determined utilizing fine strategy as described previously.[12-19]

Determination of λ max

The Lambda max (λ max) of fomatidine was determined in a ultraviolet range by spectrophotometrically using spectrophotometer (UV 1800 Shimadzu, Japan).

Microspheres formulation

The microsphere of famotidine was set up by utilizing ionotropic gelation system. Right off the bat, in this strategy required amount of sodium alginate and *A. nilotica* gum was gauged. Make an answer up to 30 ml with refined water. This arrangement blended with the assistance of attractive stirrer for 1 h and required amount of famotidine was gauged and blended into the above arrangement and mixed well ceaselessly for 3 h. Resultant arrangement was expelled dropwise with the assistance of syringe and needle into it of 50 ml of various cross-connecting arrangements of aluminum chloride, barium chloride, calcium chloride, and blended well at 50 rpm. Subsequent to mixing for 60 min, acquired microsphere was washed with refined water and desiccated at 50°C for 6 h and 18 clumps of microspheres were readied. Expanding the convergence of *A. nilotica* gum and keeping the grouping of

sodium alginate and famotidine consistent. The creation of famotidine microspheres was shown in table.

Ingredient	Formulation					
	F1	F2	F3	F4	F5	F6
Sodium alginate (mg)	1000	1000	1000	1000	1000	1000
Acacia nilotica (mg)	500	750	1000	1250	1500	1750
Drug (mg)	100	100	100	100	100	100
AlCl3, BaCl2, CaCl2 (%)	10	10	10	10	10	10
Distilled water, (ml) (q.s.)	30	30	30	30	30	30

Evaluation of microspheres

Prepared microspheres were evaluated by the following parameters:

Micrometric properties

Micrometric properties of the prepared microspheres were performed as described previously.[13-15]

Compressibility index

It is also calculated through consolidation index of Carr using this formula:

$$\text{Carr's index} = \frac{\text{Tapped density - Bulk density}}{\text{Tapped density}} \times 100$$

Physical appearance

All the prepared microspheres were observed visually for color and uniformity of size.[14]

Percent yield

Percentage yield of the prepared microsphere was calculated using the following equation.

$$\% \text{ yield} = (\text{Weight of dried microspheres})/(\text{Amount of drug+Amount of polymer})$$

Swelling index

Swelling index of dried microspheres was calculated by this formula:

$$\text{Swelling Index} = \frac{\text{Initial weight - Final weight}}{\text{Initial weight}} \times 100$$

Particle size

Size of dried microspheres particle obtained through optic microscopy. Microsphere particle size was analyzed for every single batch and the mean particle size was calculated using the following equation.

$$\text{Mean particle size} = \frac{\sum(\text{mean particle size of the fraction} \times \text{weight fraction})}{\sum(\text{mean fraction})}$$

Drug content

Drug content in the dried microspheres was estimated using the following equation and the absorbance was measured at 67 nm by Shimadzu UV spectrophotometer.

$$\text{Drug content} = \frac{\text{Absorbance} \times \text{Bulk Volume} \times \text{Dilution Factor}}{1000}$$

In vitro medication discharge

In-vitro medication discharge was studied by USP Type 1 disintegration mechanical assembly as described previously.[14]

Results

The rate yield of *A. nilotica* gum was found to be 85%. Organoleptic properties of gum were observed to be worthy. The shade of powdered gum was white. The powdered gum was white, unscented and sweet in taste. The break was smooth and surface was unpredictable. The pH of *A. nilotica* gum was found to be 6.9. It was soluble in boiling water. The organoleptic properties were found to be satisfactory. *A. nilotica* gum was found to be adhesive with ethyl liquor. Phytochemical analysis showed the presence of tannins and glucose, whereas starch, proteins, polysaccharides were not found. The pH of *A. nilotica* gum was observed to be 6.9 ± 0.01. Mass thickness and tapped thickness were 0.91 ± 0.01 g/cm^3 and 0.631 ± 0.01 g/cm^3 respectively. Carr's list and Hausner's proportion were 30.51% ± 0.00% and 1.483 ± 0.00. The normal size of 150 particles determined was 101.64 µm ± 20.75. Surface pressure determined was 89.947 (dyne/cm) g×cm×sec^{-2} ± 1.77 and consistency was 0.014 (balance) N×sec×m^{-2} ± 0.02. Swelling of gum was found to be 39.49% ± 1.12 which recommends that the gum has ideal swelling property. The λ max of famotidine was found to be 267 nm. The studied evaluation parameters of *A. nilotica* gum were summarized in Table 1.

IR spectroscopy study of *A. nilotica* gum were shown in Figure 1 and the detected functional group present in *A.*

Table 1: Different evaluating parameters of *Acacia nilotica* gum

Parameter	Observations
Total ash (%)	2.50±0.10
Bulk density (g/cm^3)	0.59±0.02
pH	6.80±0.06
Tapped density (g/cm^3)	0.79±0.02
Bulkiness (cm^3/g)	1.70±0.02
Carr's index (%)	27.85±1.52
Angle of repose	3.08±0.11
Particle size (µm)	31.65±0.07
Surface tension(dyne/cm)	88.38±0.05
Viscosity(poise)	7.76 ±1.47
Swelling index (%)	14.28±0.02
Hausner's ratio	1.38±0.01

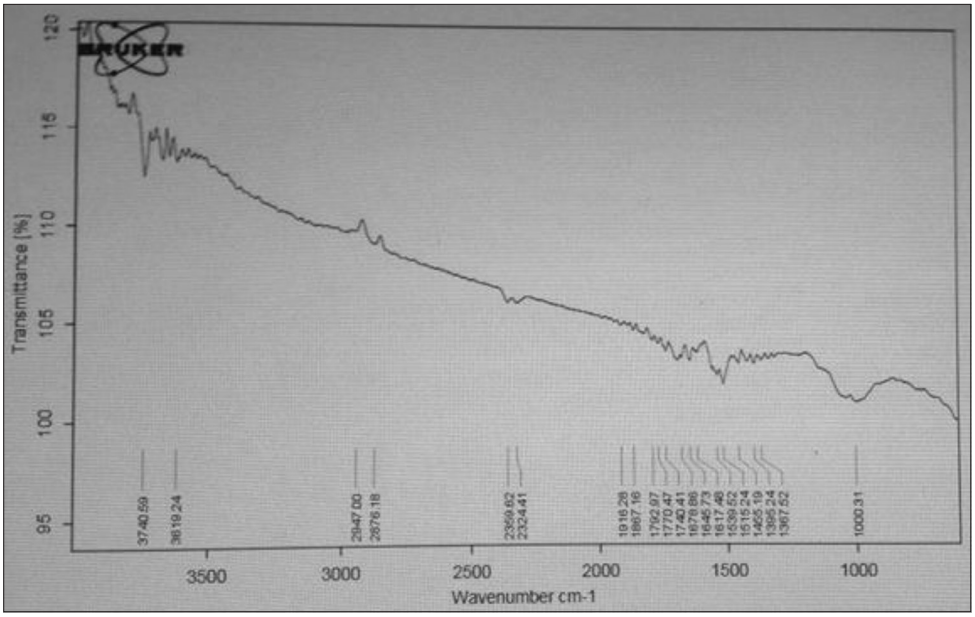

Figure 1: Infrared spectra of *Acacia nilotica* gum

Table 2: Infrared study of *Acacia nilotica* gum showed the following functional groups

Wave number (cm^{-1})	Functional group
1679–1740	COOH (Carboxy)
1916	C=C
2876	CHO
2947	O-H str
3525	O-H

Table 3: Infrared study for the drug-polymer mixture

Functional group	Famotidine	Famotidine+*Acacia nilotica* gum+NaAlg
-O-H Phenol (stretch)	_	3665.14
-C-H- Alkynyl (stretch)	_	3397.85
-C-H- Aromatic (stretch)	_	3101.59
-C=O- Aldehyde (stretch)	1678.99	1675.59
-C=C- Alkenyl (stretch)	1635.29	1637.59
-C=CH- Aromatic (bending)	1529.97	1598.55
-C-H- Alkanes (bending)	1425.64	1426.54
-C-N- Alkanes (bending)	1248.86	1247.29
-C-O- Tertiary alcohols (stretch)	1141.85	1140.42
-C-H- Aromatic (bending)	657.43	689.09

nilotica gum powder was summarized in Table 2. Famotidine and polymers *A. nilotica* gum powder IR were taken separately and then they were mixed in the same ratio and a spectrum was observed. The data obtained from the FT-IR spectra of *A. nilotica* gum, famotidine, and drug + polymer were summarized in Table 3. The IR study of drug and polymer mixture shows no signs of interaction between them. This concludes that no incompatibility between the polymer and drug. Microspheres forming capacity was determined using different concentration of *A. nilotica* gum as a microspheres formed. The natural polymer microspheres were geared up by inotropic gelation procedure. Ingredients were used natural polymer of *A. nilotica* gum and sodium alginate obtained by a natural source and drug famotidine. Micrometric evaluation was performed of natural polymer microspheres. Evaluation that is bulkiness, Carr's index, tapped density, bulk density, and Hausner's ratio were studied. The micrometrics parameters such as bulkiness, bulk density, tapped density, compressibility index, Hausner's ratio, and repose angle showed excellent packaging properties. Micrometric study concluded that good acceptable (bulk density F5 0.57 ± 0.02) flow properties. A comparative study has shown formulation F1 and F5 higher bulk density 0.57 ± 0.02. Formulation F1 has shown maximum tapped density 0.60 ± 0.04. Hence, the final concluded that F5 formulation has excellent flow properties than other formulations. Percentage yield of dried natural polymer microspheres showed fluctuated yield but the formulation F5 was given maximum percentage yields of microspheres, whereas particle size from this study found to be 846.31–989.04 µm. Formulation F3 showed the smallest particle size and F5 shows the largest particle size. Formulation F3 smallest particle size may be due to high mixing speed. The characterization parameters of *A. nilotica* microspheres cross-linked with aluminum chloride, barium chloride, and calcium chloride were summarized in Tables 4-6, respectively.

Physical appearance of prepared microspheres was found to color which is dark brownish and mostly uniform in size, but F3 and F5 were fully uniform in size and spherical in shape. The

Table 4: Characterization parameters of *Acacia nilotica* microspheres cross-linked with aluminum chloride

Formulations	Bulk density (g/ml)	Tapped density (g/ml)	Bulkiness ($cm^{3/g}$)	Carr's index (%)	Hausner's ratio	Angle of repose (°)	Percent yield (%)	Particle size (µm)
F1	0.57±0.02	0.56±0.04	1.75±0.20	1.78±0.08	0.98±0.01	19.64±0.01	85.00±0.02	982.42±0.02
F2	0.56±0.01	0.54±0.00	1.78±0.22	3.70±0.14	0.96±0.02	18.98±0.02	75.67±0.01	934.56±0.01
F3	0.54±0.04	0.53±0.02	1.82±0.30	1.88±0.00	0.98±0.02	20.55±0.02	80.5±0.05	863.31±0.02
F4	0.56±0.01	0.55±0.10	1.78±0.24	1.81±0.22	0.98±0.01	24.56±0.02	73.19±0.02	928.04±0.03
F5	0.57±0.02	0.58±0.04	1.75±0.26	1.72±0.16	1.01±0.02	26.29±0.01	83.46±0.01	994.04±0.04
F6	0.55±0.01	0.56±0.02	1.70±0.32	1.78±0.08	1.01±0.06	26.24±0.02	78.24±0.12	967.98±0.02

Table 5: Characterization parameters of *Acacia nilotica* microspheres cross-linked with barium chloride

Formulations	Bulk density (g/ml)	Tapped density (g/ml)	Bulkiness (cm3/g)	Carr's index (%)	Hausner's ratio	Angle of repose (°)	Percent yield (%)	Particle size (µm)
F1	0.57±0.04	0.55±0.03	1.75±0.20	3.63±0.08	0.97±0.01	19.65±0.02	85.44±0.02	968.54±0.02
F2	0.58±0.01	0.57±0.02	1.73±0.12	1.75±0.10	0.98±0.03	18.99±0.04	77.69±0.01	943.58±0.01
F3	0.55±0.04	0.54±0.02	1.70±0.10	1.85±0.01	0.98±0.02	20.57±0.01	80.5±0.05	847.33±0.02
F4	0.60±0.02	0.57±0.10	1.67±0.24	5.26±0.22	0.95±0.01	24.52±0.02	73.19±0.02	981.04±0.03
F5	0.59±0.02	0.58±0.04	1.70±0.02	1.72±0.16	0.98±0.04	27.39±0.04	83.48±0.01	989.04±0.04
F6	0.56±0.04	0.55±0.02	1.78±0.32	1.82±0.08	0.98±0.06	26.28±0.04	79.34±0.12	924.97±0.02

Table 6: Characterization parameters of *Acacia nilotica* microspheres cross-linked with calcium chloride

Formulations	Bulk density (g/ml)	Tapped density (g/ml)	Bulkiness (cm^3/g)	Carr's index (%)	Hausner's ratio	Angle of repose (°)	Percent yield (%)	Particle size (µm)
F1	0.59±0.04	0.58±0.03	1.69±0.20	1.72±0.08	0.98±0.01	19.65±0.02	85.44±0.02	968.54±0.02
F2	0.60±0.01	0.58±0.02	1.67±0.12	3.45±0.10	0.96±0.03	18.99±0.01	77.69±0.01	943.58±0.01
F3	0.55±0.04	0.54±0.02	1.82±0.10	1.85±0.02	0.98±0.02	20.57±0.04	80.5±0.05	847.33±0.02
F4	0.58±0.02	0.56± 0.10	1.72±0.24	3.57±0.12	0.96±0.01	24.52±0.03	73.19±0.02	981.04±0.03
F5	0.57±0.03	0.56±0.04	1.75±0.02	1.78±0.04	0.98±0.04	27.39±0.04	83.48±0.01	989.04±0.04
F6	0.56±0.04	0.55±0.02	1.78±0.32	1.81±0.08	0.98±0.06	26.28±0.02	79.34±0.12	924.97±0.02

Table 7: pH of prepared microspheres

Formulation	$AlCl_3$ cross-linked microspheres	pH $BaCl_2$ cross-linked microspheres	$CaCl_2$ cross-linked microspheres
F1	6.8±0.01	6.9±01	7.0±0.02
F2	7.0±0	7.1±0.01	6.8±0.01
F3	7.0±0.02	7.2±0.02	7.2±0.03
F4	7.1±0.02	7.0±0.01	7.1±0.02
F5	6.8±0.01	7.0±0.02	6.9±0.02
F6	6.9±0.02	7.0±0.02	7.2±0.04

pH of prepared microspheres has been summarized in Table 7. It tested that the pH was compatible with mucosal membrane and hence no irritation was observed. The percentage of swelling index entire batches was found to be excellent in range from 114.16% to 144.37%. Batch F5 having the highest swelling property. Swelling (%) of aluminum chloride, barium chloride, and calcium chloride cross-linked microspheres has been summarized in Table 8. The present study was also determined the drug content and was found highest drug content % F1 formulation of all batches the comparative other

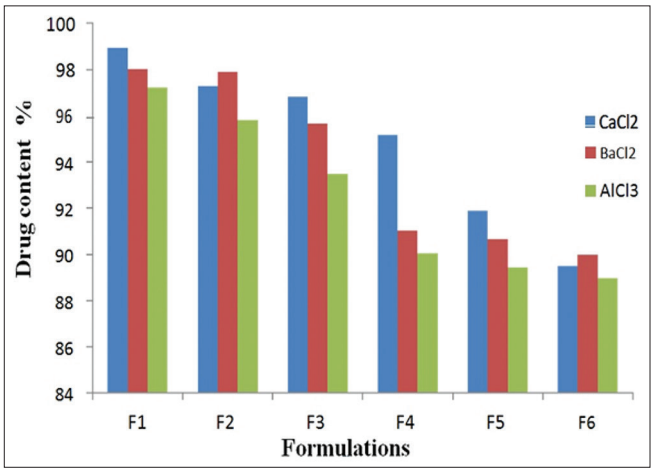

Figure 2: Percent drug content in the prepared formulations

formulations and drug content range 88.98–98.23%. The drug contents in the percentage of microspheres were shown in Figure 2. Percentage of *in vitro* medicine discharge study entire batches was done. F1 batch demonstrates maximum % discharge of drug and F6 batch shows minimum % release

Table 8: Swelling (%) of $AlCl_3$, $BaCl_2$, and $CaCl_2$ cross-linked microspheres

Formulations	Swelling study (%) of prepared microspheres		
	$AlCl_3$ cross-linked microspheres	$BaCl_2$ cross-linked microspheres	$CaCl_2$ cross-linked microspheres
F1	115.23±1%	114.16±2%	115.67±2%
F2	122.99±4%	125.22±4%	123.67±1%
F3	127.23±4%	129.59±1%	126.14±2%
F4	132.56±6%	130.12±2%	131.45±5%
F5	143.06±2%	144.21±3%	144.37±1%
F6	109.94±2%	111.20±2%	108.34±3%

Table 9: Stability studies of aluminum chloride (A), barium chloride (B), and calcium chloride (C) cross-linked microspheres

Formulation	Drug release (%)	Drug content (%)	pH
(A) Stability studies $AlCl_3$ cross-linked microspheres			
F1	95.98	97.23±0.08	6.8±0.01
F3	98.02	93.46±0.27	7±0.02
F5	97.84	89.44±0.26	6.8±0.01
(B) Stability studies $BaCl_2$ cross-linked microspheres			
F1	97.93	98.02±0.02	6.9±0.01
F3	98.48	95.65±0.01	7.2±0.02
F5	96.4	90.67±0.18	7±0.02
(C) Stability studies $CaCl_2$ cross-linked microspheres			
F1	96.39	98.94±0.02	7±0.02
F3	96.73	96.82±0.14	7.2±0.3
F5	98.82	91.88±0.06	6.9±0.04

of drug. In 480 min, more than 98% drug is released. Drug released with aluminum chloride, barium chloride, or calcium chloride cross-linked microspheres was summarized in Figure 3.

The stability of cross-linked microspheres with aluminum chloride, barium chloride, and calcium chloride has been summarized in Table 9.

Discussion

Microspheres are made up of polymeric materials and are circular in shape.[16] This polymeric material has unique defensive layer that not only provides the structural support, but also controls the framework for the drug delivery.[16] Normal polymers possess very much utilized in ongoing energy for the arrangement of novel medication conveyance framework. Ordinary polymers are generally gotten from plant and set everything being equal. They are high subatomic weight; water dissolvable

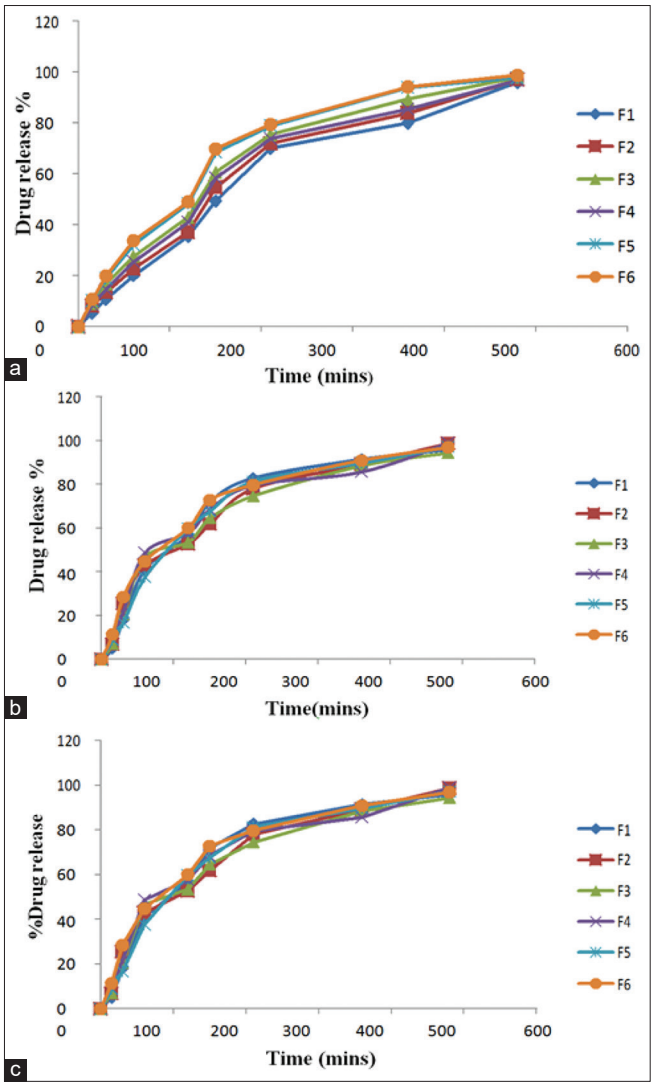

Figure 3: Percent drug release with aluminum chloride (a), barium chloride (b), and calcium chloride (c) cross-linked microspores

polymers.[17] These are comprised monosaccharide unit and joined by a glycosidic bond. Normal polymers have been utilized in different pharmaceutical items. The notable characteristic polymers are sodium alginate, gum karaya, neem gum, babool gum, agar gum, guar gum, gelatin, and so forth. These characteristic polymers are pertinent in various pharmaceutical control discharge measurement structures such as microspheres, nanospheres, resealed erythrocyte, nanoparticles, microparticles, framework controlled framework, and so forth.[17] The particular use of characteristic polysaccharide in pharmaceutical readiness is to assist in the handling of medication conveyance framework during its assembling, security, upgrade of solidness, bioavailability, and patient worthiness.[17] Famotidine is an oral medication which hinders the creation of corrosive by corrosive delivering cells inside the stomach. It has a place with a set of medication called histamine-2 (H2) blockers that additionally incorporate ranitidine and cimetidine and so forth.[1] Histamine is normally happening concoction

that animates cells in the stomach (parietal cells) to created corrosive. H2 blocker represses the activity of histamine over the cells, consequently diminish the creation of acids.[1]

In the present study, all parameters assessed *A. nilotica* gum, fluid arrangement of sanitized gum was utilized for compound portrayal, organoleptic characters, stream properties, pH, molecule measure assurance, solvency, thickness, surface strain, IR, and so forth were finished. The microspheres of famotidine were set up by ionotropic gelation system. Right off the bat, in this strategy sodium alginate and *A. nilotica* gum were said something a required amount. Make an answer up to 30 ml with refined water. With the assistance of attractive stirrer, this arrangement blended for 60 min. At that point, required amount of famotidine was gauged and blended in above arrangement, mixed well persistently for 3 h. Resultant arrangement was expelled dropwise with the assistance of syringe and needle into 50 ml of various cross-connecting arrangements of aluminum chloride, barium chloride, calcium chloride, and mixed well at 100 rpm for 1 h. Gotten microsphere was cleaned with refined water and desiccated at 50°C for 6 h in a stove. Eighteen groups of microspheres were readied. Expanding the concentration of *A. nilotica* gum and keeping the convergence of Sodium alginate and famotidine consistent. Micrometric assessments were done of regular polymer microspheres. The micrometrics parameters like mass thickness, tapped thickness, cumbersomeness, compressibility file Hausner proportion, showed excellent results (mass thickness F5 0.57 ± 0.02); formulation F1 has appeared tapped thickness 0.60 ± 0.04. Rate yield dried regular polymer microspheres have discovered the vacillated yield and fixation is change of *A. nilotica* gum polymer so plan F5 given greatest rate yield of microspheres. Molecule estimate from this investigation discovered to be molecule size reaches 846.31–989.04 µm. F3 indicates littlest molecule size and F5 demonstrates biggest molecule measure. Swelling of clusters was found in range from 114.16% to 144.37%. Group F5 showed highest swelling property. Formulation F1 showed the drug content in a range 88.98–98.23%. These findings were fully supported by the previous reports.[18,19]

In vitro drug delivery investigation of all formulations, formulation F1 demonstrated maximum yield whereas F6 demonstrated lowest drug yield. Natural polymer *A. nilotica* with sodium alginate was effectively utilized for fomotidine microparticulates. Cross-linked microsporic factors were utilized such as aluminium chloride, calcium chloride and barium chloride to study the surface morphology, swelling conduct and also *in-vitro* drug release. Findings showed that formulation with *A. nilotica* gum was impacted to the particulare size, surface morphology, swelling and also in-vitro drug release. Studied formulations F1, F3 and F5 with *A. nilotica* gum showed no reduction in the drug content and also no reduction in the perecent release of the studied drug.

Conclusions

Natural polymer *A. nilotica* gum was successfully used for the preparation of famotidine microparticulates. Formulation with *A. nilotica* gum was impacted to the particular size, surface morphology, swelling conduct, and *in vitro* drug release. Stability studies F1, F3, and F5 formulations showed no reduction in drug content and in percent release. *A. nilotica* gum may be utilized during pharmaceutical dose frames by giving support to drug delivery system and avoiding side effects for the patients. In conclusions, formulation with *A. nilotica* gum may be utilized during pharmaceutical dose frames by giving support to drug delivery system and avoiding side effects for the patients.

Competing Interests

The authors declare competing interests.

Authors' Contributions

All authors participated in study design, coordination, data collection, and manuscript drafting.

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