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Fabrication and evaluation of oro-gel containing ferrous fumarate

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ABSTRACT

The present study aimed to develop Ferrous Fumarate oral jellies for the treatment of iron deficiency anemia. These jellies were prepared by using Carbapol 940 or tragacanth with different concentrations as a gelling agent. The benefits of these prepared jellies are increased bioavailability by-passing first pass metabolism. Difficulty in swallowing (dysphagia) is common among all groups, especially in elderly and pediatrics. The persons suffering from dysphagia may get choked when they consume liquid formulations, thus to alleviate such problem liquid formulations of high viscosity were prepared. Various parameters like appearance, viscosity, pH, spreadibility, syneresis and drug content were performed and all were shown satisfactory results. The in-vitro dissolution test was performed in 1% SLS using USP apparatus type II (paddle), at 75 rpm. The formulations with Tragacanth10% (F8) and Carbapol 940 (10%) (F10) were selected for further stability studies because these formulations shows better results in all the parameters.

1. INTRODUCTION

Ferrous fumarate is used in preventing and treating iron-deficiency anemia. Iron deficiency anemia is the commonest cause of anemia, especially in developing countries where a large percentage of population is anemic. The RBC are microcytic and hypochromic due to deficient HB synthesis. Other metabolic manifestations are seen when iron deficiency severe. Apart from nutritional deficiency, chronic bleeding from Gastro intestinal track (ulcer, inflammatory bowel disease, and hook worm infestation) is a common cause. Iron deficiency also accompanies repeated attacks of malaria and chronic inflammatory disease. The cause of iron deficiency should be identified and treated. Therapy should be Continue till normal HB levels attained.

The conventional dosage forms (ferrous fumarate tablet) have the disadvantages such as bright red blood in stools or black or dark-colored stools or urine. Pain in chest, heartburn, stomach pain and upset stomach were experienced when swallowing a ferrous fumarate tablet. Recent advances in novel drug delivery systems aims to enhance safety and efficacy of drug molecules by formulating a newer dosage form for administration and to achieve patient compliance and convenience. One such approach lead to development of medicated oral jelly.

Medicated jelly is solid, single dose preparations that have to be chewed and not Swallowed jelly contains one or more active ingredient that is released by chewing. A medicated jelly is intended to be chewed for a certain period of time, require to deliver the dose, after which the remaining mass is discarded. During the chewing process the drug contained in the gum product is released from the mass into saliva and could be absorbed through the oral mucosa or swallowed reaching stomach for gastro-intestinal absorption. The aim of the study is to design, optimize, formulate and evaluate the stable, Quality improved formulation of ferrous fumarate oral medicated jelly for achieving patient compliance and convenience.

2. MATERIALS AND METHODS

Ferrous fumarate was received as a gift sample from Lobe Chemie Pvt. Ltd., Mumbai. Carbapol 940 was obtained from Lobe Chemie Pvt. Ltd. Sucrose was brought from Merck Specialities Pvt Ltd, Mumbai. Citric acid was received from Merck Specialities Pvt Ltd, Mumbai. All other chemicals and solvents used are of analytical grade and used as procured.

Preparation of medicated jellies: All the formulations were prepared using freshly boiled and cooled distilled water as per the composition listed in Table 1. Ferrous fumarate jellies were prepared by heating and congealing method. Syrupy base was prepared in a

copper vessel dissolving the required amounts of sugar in water on heating and stirring at 80°C for about 90 minutes. Accurately weighed polymer powder was dispersed in 10 mL of purified water maintained at 90°C throughout preparation. The dispersion was stirred using a magnetic stirrer for 20 minutes to facilitate hydration of gelling agent. Ferrous fumarate was taken in another beaker and solubilized using alcohol. Then simple syrup was added to it under continuous stirring. Then citric acid and preservatives were added under continuous stirring. Color and flavor was added to this under continuous stirring at 60°C. The final weight was adjusted with purified water, mixed, transferred to polyethylene moulds, sealed and allowed to cool at room temperature (25°C ± 5°C) to form a jelly like texture. After the jelly is set it is wrapped in to the gelatin paper and store in dry place.

Table.1.Working formulae to prepare ferrous fumarate jelly

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Ferrous fumarate (mg)	10	10	10	10	10	10	10	10	10	10
Carbapol (940) (g)	10	12.5	15	-	-	-	10	10	-	-
Tragacanth (g)	-	-	-	10	12.5	15	-	-	10	10
SSG (g)	5	5	5	5	5	5	-	-	-	-
CCS (g)	-	-	-	-	-	-	5	-	5	-
CP (g)	-	-	-	-	-	-	-	5	-	5
Sucrose (g)	50	50	50	50	50	50	50	50	50	50
citric acid (g)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Methyl parabean (g)	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Propyl parabean (g)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PEG 400 (g)	10	10	10	10	10	10	10	10	10	10
Water (up to)(ml)	100	100	100	100	100	100	100	100	100	100

Characterization of prepared ferrous fumarate jellies:

Physical observation: The prepared jellies were observed visually for clarity, odour, texture and presence of any gritty particles. The texture was evaluated in terms of stickiness and grittiness by mild rubbing the jelly between two fingers.

Weight variation: The average weight of ten jellies was taken to determine weight variation. The jellies were taken out of the moulds in a beaker and weighed individually, pooled and mixed.

Determination of p^H: The pH of the formulation influences the taste and stability of oral jellies. The pH of prepared jellies was measured using a digital pH meter (LI 120, Elico Ltd., and Hyderabad, India) at room temperature (25°C ± 5°C). For this purpose, 0.5 g of jelly was dispersed in 50 ml of distilled water to make a 1% solution, and the pH was noted.

Syneresis: Syneresis or de-swelling is usually seen in gels due to the release of liquid, resulting in shrinkage of gels and reduce quality. Syneresis is the contraction of the gel upon storage and separation of water from the gel. It is more pronounced in the gels, where lower concentration of gelling agent is employed. All the jellies were observed for signs of syneresis at room temp (25°C ± 5°C). The formulations showing signs of syneresis were rejected and not considered for further studies.

Drug-Excipient Compatibility Studies: The drug and excipients were mixed together in 1:1 ratio and placed in borosilicate colored glass vials. These vials were sealed and placed in an oven maintained at 40°C and 75% RH. The samples were observed after 15, 30 and 45 days for any color change or lump formation. Fourier transforms infrared (FTIR) spectra of the pure drug and its mixtures of gelling agents were measured by preparing dispersion in dry KBr using attenuated total reflectance FTIR spectrophotometer. The absorption maxima in the spectra obtained were compared, and the presence of additional peaks corresponding to the functional groups was noted.

Stability Studies: A physically stable medicated oral jelly should retain its viscosity, color, clarity, taste, and odour throughout its shelf-life. The stability studies were performed at two temperatures i.e., 37°C and 45°C over a period of six months. Sufficient number of samples (10) were packed in amber colored screw capped bottles and kept in incubator maintained at 37°C. Samples were taken at intervals of 15 days for the drug content estimation.

In- vitro dissolution studies for jelly formulations: In-vitro dissolution was studied in USP 29 dissolution apparatus 2 employing a paddle stirrer. 900 ml of 0.1M HCl in 0.5% SLS solution was used as dissolution medium. The stirrer was adjusted rotate at 75rpm. The temperature of dissolution media was previously warmed to 37±0.5°C and was maintained throughout the experiment. 5ml of sample of dissolution medium were withdrawn by means of syringe fitted with pre-filter at known intervals of time and analyzed for drug release by measuring the absorbance at 248.3 nm after

suitable dilution with 0.1M HCl in 0.5% SLS solution. The volume withdrawn at each time interval was replaced with fresh quantity of dissolution medium. Percentage amount of ferrous fumarate released was calculated and plotted against time.

3. RESULTS AND DISCUSSION

Physical observation of jellies is important to justify the patient acceptance and compliance of the products. It was observed that parameters like appearance, texture, colour, taste and odour are acceptable for all formulations.

Table.2.Results of various evaluation parameters of prepared jelly formulations (F1–F10)

Formulation code	%Drug content (n=3)	pH of the jelly (n=3)	Viscosity(cps) (n=3)	Spread Time in sec
F1	89.06±0.3	6.51±0.02	599947	23
F2	84.92±0.66	6.83±0.04	733452	27
F3	77.33 ±0.38	6.52±0.03	807839	29
F4	90.52±0.66	6.73±0.05	558944	31
F5	86.57±0.20	6.61±0.08	699754	33
F6	83.38±0.41	6.80±0.05	777841	34
F7	93.34±0.12	6.83±0.04	599948	18
F8	96.69±0.75	6.47±0.03	567839	19
F9	96.42 ±0.36	6.49±0.04	473433	22
F10	99.40±0.79	6.45±0.05	443728	24

In-vitro dissolution studies: The in-vitro dissolution study was carried out as per the procedure and testing parameter is mentioned in methodology section, and the average cumulative% of drug release was tabulated as below.

Table.3.In-vitro dissolution data of Ferrous fumarate oral jellys

Time (Minutes)	Cumulative percent drug release									
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0	0	0	0	0	0	0	0	0	0	0
3	35.46	34.11	33.21	43.65	43.20	42.75	35.91	37.98	44.64	46.10
6	49.34	48.70	47.79	61.53	59.82	55.59	50.78	52.76	60.01	62.54
9	65.70	60.66	56.96	74.32	68.64	63.40	76.60	78.50	76.47	83.66
12	74.52	73.68	68.62	85.91	79.67	73.25	84.21	87.01	86.82	89.09
15	89.00	84.90	77.30	90.50	86.50	83.30	93.30	96.60	96.40	99.40

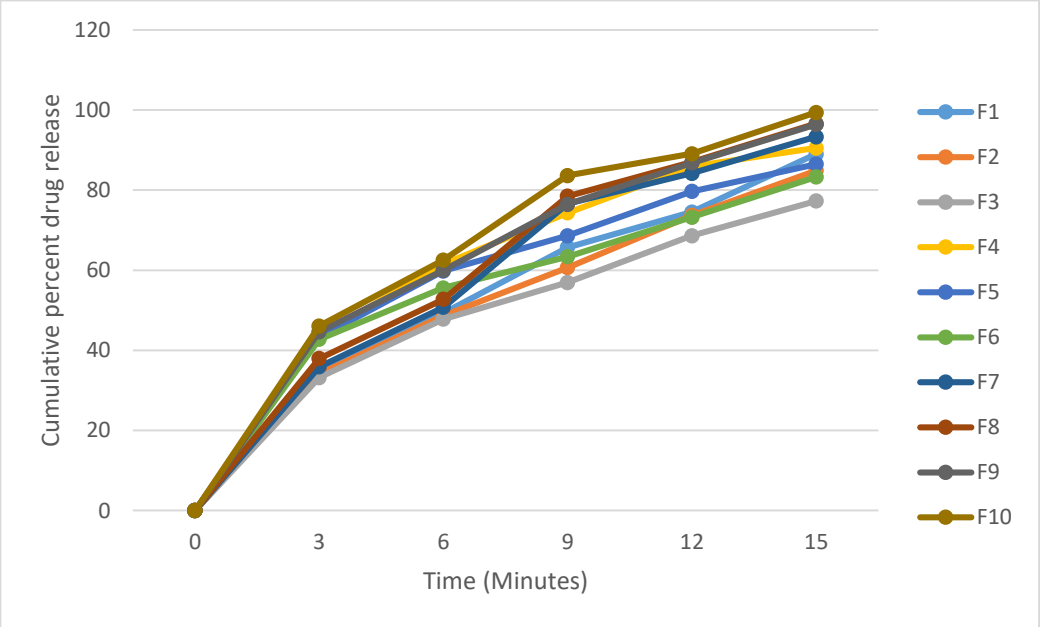

Figure.1.Cumulative percent drug release of all the formulations

4. CONCLUSION

Tragacanth and Carbapol 940 in the concentration of 10% resulted in the formulations of jellies with desired consistency. PH of the all formulations are acceptable range. Drug content was found to be satisfactory. All formulations of jellies shown the plastic flow of viscosity. The dissolution kinetics followed first order kinetics. The formulations found to be stable for a period of 3 months. The formulation prepared with 10% of Carbapol 940 was offered relatively rapid release of ferrous fumarate when compared with other concentrations employed in this investigation. Statistically significant difference between dissolution efficiency (DE9) of ferrous fumarate jellies formulated with different super disintegrates was observed. The formulation prepared with cros povidone was offered relatively rapid releases of ferrous fumarate when compared with other super disintegrates used in this investigation.

REFERENCES

1. Kanika Nayak, Manoj kumar Mishra, Garima Verma, Formulation and evaluation of oral soft jelly containing Glibenclamide, Indo American journal of pharmaceutical sciences, 3(10), 2016, 1276-1282

2. Natarajan R, Prabhu C and Rajendran NN, Formulation, development and evaluation of tadalafil oral jelly comparative with market product, International journal of research in pharmacy and chemistry, 2014, 4(2), 479-483.

3. Yie W. Chien, A Text book of Novel drug delivery systems. Revised and Expanded, 2(3), 2013, 139-141.

4. Vibhakara HS, Bawa AS, Manufacturing Jams and Jellies. Handbook of fruits and fruit processing (Chapter 11), 189-204

5. Javalgikar Akshay, Shinde Vinay, Formulation of clortrimazole ororetentive jelly, Journal of Drug Delivery & Therapeutics, 6(2), 2016, 21-25.

6. Doaa A Helal, Dalia Abd El-Rhman, Sally A Abdel-Halim, Mohamed A, El-Nabarawi, Formulation and Evaluation of Fluconazole Topical Gel International Journal of Pharmacy and Pharmaceutical Sciences, 4(5), 2012, 675-679.

7. Mahendrakumar Dubey, Zankhana Sheth, Design and development of oral medicated jelly of Palonosetron hydrochloride, Indian journal of research, 4(6), 2015, 253-255.

8. Anand Ambedkar, Ajay karthik, Vinay B Shinde, Pratima S, Purushotham Rao K, Preclinical study of ketoconazole ororetentive medicated jellies, British journal of research, 2(4), 2015, 122-131.

9. Kanika Nayak, Manoj Kumar Mishra, Garima Verma, Formulation and Evaluation of Oral Soft Jelly Containing Glibenclamide: Indo American Journal of Pharmaceutical Sciences, 3(10), 2016, 1276-1282.