Research Article

Pharmaceutical Characterization of Ocimum *tenuiflorum* Linn. Seed Mucilage as Superdisintegrant

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ABSTRACT

The aim of the present work was to evaluate the superdisintegrant property of *Ocimum Tenuiflorum Linn.* seed mucilage in the formulation of mouth dissolving tablets. The *Ocimum Tenuiflorum Linn.* seed mucilage was isolated by defatting with petroleum ether and then soaked in distilled water. *Ocimum Tenuiflorum Linn.* seed mucilage alone, crosspovidone alone and different combination of *Ocimum Tenuiflorum Linn.* seed mucilage with crospovidone and sodium starch glycolate were evaluated for disintegrant property. Glimepiride, an anti-diabetic drug was selected as a model drug in present study. Nineteen formulations of mouth dissolving tablets were prepared and evaluated for various pre-compression, post compression properties and in-vitro drug release. The formulation F10 was found to be optimum with in-vitro disintegration time 32 sec. and 91.89% drug release in 45 min. *Ocimum Tenuiflorum Linn.* seed mucilage alone did not show superdisintegrant property however it gives good results when combined with crospovidone. It shows potential of superdisintegrant activity in combination with other commercially available superdisintegrant agents. The partial replacement of the semi synthetic and synthetic superdisintegrants by the eco-friendly natural polymers will lead to development of economic formulations.

Keywords: Ocimum mucilage, Superdisintegrant, Mouth dissolving tablet, Crospovidone.

INTRODUCTION

The natural gums and polymers are widely used in the pharmaceutical industries in recent years. The mucilages are used as superdisintegrant, binder, sustaining agent, thickening agent, suspending agent, gelling agent etc. Natural gums and polymers are preferred over semi-synthetic and synthetic materials due to their low cost, free availability, non-toxic, emollient and nonirritating nature. Also they are economical, environment friendly, devoid of side effects, more patient compliance [1,2].

Mouth dissolving tablets dissolves in oral cavity within one minute. There is no need of water to take it, also no need to swallow it. Easy to carry and easy to take doses even during travelling so there are less chances to miss the doses, so patient compliance increases.[3,4].

The mucilage is extracted from the seeds of the plant *Ocimum Tenuiflorum Linn.* The seeds were collected from the local market. The flowering top of the plant with the seeds were send for the authentication to Botanical Survey of India. The plant was authenticated as *Ocimum Tenuiflorum Linn.* The aim of the study was to evaluate the superdisintegrant property of the ocimum seed mucilage. The other superdisintegrants used in combination with the ocimum mucilage were crospovidone and sodium starch glycolate. The model drug used was Glimepiride. The mouth dissolving tablets were formulated and evaluated.

MATERIALS AND METHODS

Materials

Glimepiride was obtained as a gift sample from the Zim laboratories, Nagpur. Ocimum seeds were purchased from local market. Lactose & Manitol were obtained from Qualigens, Mumbai. Crospovidone was obtained as a gift sample from Cipla Ltd, Mumbai. Sodium starch glycolate was donated by Maple Biotech, Bhosari, Pune.

METHODS

Isolation of the mucilage from *Ocimum Tenuiflorum Linn.* seeds

The *Ocimum Tenuiflorum Linn.* seeds were blended and defatted in Soxhlet apparatus using petroleum ether as defatting agent. After defatting the material was soaked in distilled water for 12 h. The swollen mass was spread on a tray and dried in an oven at 60^0C. The dried mass then passed through sieve no. 30. The mucilage was winnowed and again passed through mesh no. 60. The mucilage obtained was stored in desicator until use[5].

Drug mucilage compatibility testing

The compatibility between glimepiride and mucilage was studied by Differential Scanning Calorimetry (Mettler). The mixture of drug and mucilage in 1:1 ratio was subjected to temperature range of 30°C to 280°C in presence of reference material[6].

Preparation of mouth dissolving tablets

The mouth dissolving tablets of glimepiride were prepared by using different concentrations of mucilage, crospovidone and sodium starch glycolate. Table 1 & 2 show composition of mouth dissolving tablets of glimepiride. Nineteen formulations were prepared by wet granulation method. In preparation of tablets, ethanol (60% v/v) was used as moistening agent to form damp coherent mass of thoroughly mixed ingredients and then passed through sieve to form granules. The granules obtained were dried in oven at 60°C. The weighed quantity of granules were mixed with required quantities of talc and magnesium stearate which is then placed in 6mm die cavity and compressed on 8 station rotary tabletting machine (CIP, D8 Lab press, Ahmadabad).

EVALUATION

Pre-compression characteristics

The granules prepared were evaluated for Bulk density, Tapped density, Carr's compressibility and Hausners ratio[7,8].

Post compression characteristics

The tablets were evaluated for Thickness[9], Hardness[9], Weight variation[10], Friability[11], Drug content[9], Wetting time[13], In-vitro disintegration time[13], In-vitro drug release[14].

Drug Content

Five tablets of each formulation were weighed accurately and powdered. An amount of powder equivalent to 8 mg of glimepiride was weighed accurately and transferred to 100 ml volumetric flask. Using phosphate buffer pH 7.4 was added to it and mixed well and sonicated for 3 min. The solution was filtered, diluted suitably and analyzed by determining absorbance on UV spectrophotometer (Jasco V530) at 227nm using phosphate buffer pH 7.4 as blank [12].

In-vitro disintegration time

The disintegration time was measured using a modified disintegration method. For this purpose, a petri-dish (10-cm diameter) was filled with 10 mL of water. The tablet was carefully put in the center of the Petri dish and the time for the tablet to disintegrate completely into fine particles was noted[13].

Wetting time

5 circular tissue papers of 10 cm diameter were placed in petri dish with a 10-cm diameter. Ten milliliters of water containing methylene blue, a water-soluble dye, was added to the petri dish. A tablet was carefully placed on the surface of the tissue paper. The time required for water to reach the upper surface of the tablets was noted as the wetting time[13].

In-vitro drug release

The formulation showing in vitro disintegration time less than 40 sec. were subjected to in-vitro drug release study. The in-vitro drug release of the selected formulation was carried out using USP dissolution apparatus Type II (Electrolab, India). The dissolution medium used was 900 mL of phosphate buffer pH 7.4, the paddles were rotated at speed of 50 rpm and temperature was maintained at 37°C ± 0.5°C. Five milliliters of sample were withdrawn at specific time intervals and

replaced with equal quantity of fresh dissolution medium maintained at same temperature [14].

RESULTS AND DISCUSSION

The drug and mucilage were found to be compatible with each other Fig.1 shows DSC spectra of pure glimepiride, plain mucilage and mixture of glimepiride and mucilage. As revealed in results of DSC there is no significant change in the spectra of DSC of drug and drug-mucilage mixture.

As given in table 1 & 2 formulation F17 contains only mucilage and F18 contains only crospovidone as superdisintegrants. In other formulations a combinations of mucilage with crospovidone and sodium starch glycolate is used in different concentrations. The purpose of using mucilage alone was to determine the ability of *Ocimum Tenuiflorum Linn.* seed mucilage to act as superdisintegrant for mouth dissolving tablets.

All nineteen formulations were evaluated for pre-compression parameters and the results are given in tables 3 & 4. The tablet formulations were evaluated for thickness, hardness, friability, weight variation, drug content and in-vitro disintegration time and the results are shown in table 5 & 6. The aim of present study was to develop a formulation having in-vitro disintegration time less than 40 sec. Formulations F10, F12, F15 and F17 showed in-vitro disintegration time less than 40 sec. and were further subjected to in-vitro drug release studies. All formulations except F1, F3, F15 and F19 have hardness above 2.5 Kg/cm^2 showing sufficient to mechanical shock during handling and transportation. The friability of all the formulations except F16, F18 and F19 was found to be within acceptable range. The drug content uniformity of all the formulations was found to be within acceptable range.

Formulation F18 which contained *Ocimum Tenuiflorum Linn.* seed mucilage alone as superdisintegrant failed to show desirable disintegration properties. Also the friability of F18 was found to be more than desirable range. Formulation F19 contained crospovidone alone as superdisintegrant showed disintegration time of 80 sec. and also failed to give proper hardness and friability characteristics. The results suggest that a combination of these two (*Ocimum Tenuiflorum Linn.* seed mucilage and crospovidone) gives best results.

The results of in-vitro drug release of F10, F12, F15 and F17 are shown in table 7 and fig.2. From the pre-compression, post compression and in-vitro drug release studies, it is indicated that F10 is the optimum formulation with hardness 3 Kg/cm^2, friability 0.60%, In-vitro disintegration time 32 sec. and 91.89 % drug release in 45 min.

CONCLUSION

Ocimum Tenuiflorum Linn. seed mucilage alone did not show superdisintegrant property however a combination of it with other commercially available superdisintegrant has shown good results. *Ocimum Tenuiflorum Linn.* seed mucilage shows potential of partly replacing the commercial superdisintegrant in mouth dissolving dosage forms leading to development of economic formulations.

Table 1: The formulation of mouth dissolving tablet (F1 to F10)

S. no.	Ingredients	F1 (mg)	F2 (mg)	F3 (mg)	F4 (mg)	F5 (mg)	F6 (mg)	F7 (mg)	F8 (mg)	F9 (mg)	F10 (mg)
1	Glimepiride	2	2	2	2	2	2	2	2	2	2
2	Mucilage	30	30	50	50	50	30	30	30	30	30
3	Lactose	35	35	35	35	35	35	35	35	35	35
4	Manitol	30	30	30	30	30	30	30	30	30	30
5	SSG	0	0	0	0	15	20	0	0	0	0
6	Crospovidone	50	50	50	50	50	50	50	20	15	40
7	Talc	2	2	2	2	2	2	2	2	2	2
8	Mg. St.	2	2	2	2	2	2	2	2	2	2
Total		151	151	171	171	186	171	151	121	116	141

Table 2: The formulation of mouth dissolving tablet (F11 to F19)

S. no.	Ingredients	F11 (mg)	F12 (mg)	F13 (mg)	F14 (mg)	F15 (mg)	F16 (mg)	F17 (mg)	F18 (mg)	F19 (mg)
1	Glimepiride	2	2	2	2	2	2	2	2	2
2	Mucilage	40	20	20	30	10	10	10	10	0
3	Lactose	35	35	30	30	30	30	30	30	35
4	Mannitol	30	30	30	30	30	30	30	30	35
5	SSG	0	0	0	0	0	0	0	0	0
6	Crospovidone	10	10	20	10	10	20	5	0	5
7	Talc	2	2	5	5	5	5	5	5	5
8	Mg. St.	2	2	5	5	5	5	5	5	5
Total		121	101	112	112	92	102	87	82	87

Table 3: Evaluation of granules (F1 to F9)

Parameters	F1	F2	F3	F4	F5	F6	F7	F8	F9
Bulk density (g/ml)	0.46	0.45	0.45	0.43	0.45	0.47	0.42	0.43	0.43
Tapped density (g/ml)	0.52	0.51	0.53	0.52	0.54	0.53	0.53	0.52	0.51
Compressibility index (%)	11.5	11.7	15.0	17.3	16.6	11.3	20.7	17.3	15.6
Hausner's ratio	1.1	1.13	1.17	1.2	1.2	1.12	1.2	1.2	1.18

Table 4: Evaluation of granules (F10 to F19)

Parameters	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
Bulk density (g/ml)	0.46	0.46	0.45	0.43	0.45	0.44	0.45	0.43	0.46	0.46
Tapped density (g/ml)	0.51	0.53	0.51	0.54	0.55	0.54	0.53	0.54	0.52	0.51
Compressibility index (%)	9.8	13.2	11.7	20.3	18.1	18.5	15.0	20.3	11.5	9.8
Hausner's ratio	1.1	1.15	1.13	1.25	1.22	1.22	1.17	1.25	1.13	1.1

Table 5: Evaluation of tablet (F1 to F9)

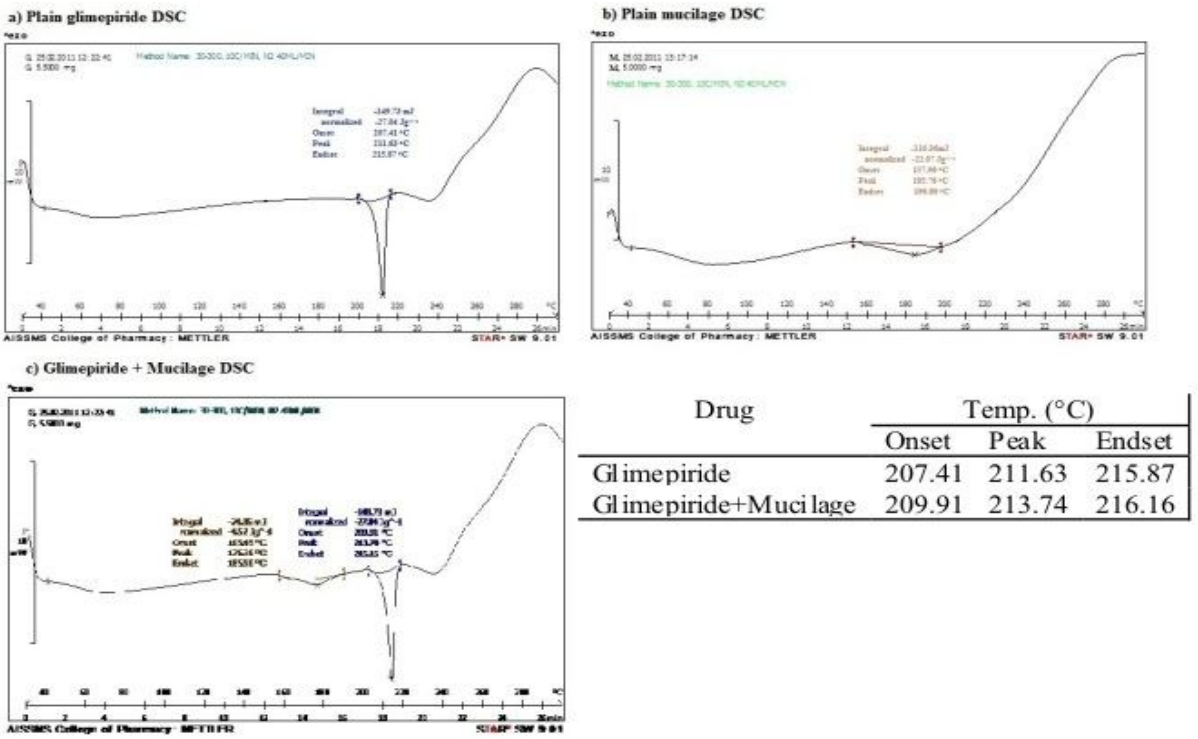
Parameters	Formulations								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
Hardness (kg/cm^2)	2	2.5	2	2.5	3.5	2.5	2.5	3	3
Weight Variation (mg)	Within acceptable range								
Thickness (mm)	3	3	4	4	3	3	3	2.5	2.5
Friability (%)	0.21	0.72	0.43	0.56	0.20	0.76	0.72	0.23	0.26
Disintegration time (sec.)	76	120	170	170	230	170	170	180	180
Drug Content (%)	97.99	98.87	99.01	98.54	98.78	98.45	98.67	98.34	99.13

Table 6: Evaluation of tablet (F10 to F19)

Parameters	Formulations									
	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19
Hardness (kg/cm^2)	3	3	2.5	3.5	2.5	2	2.5	3	2.5	1
Weight Variation (mg)	Within acceptable range									
Thickness (mm)	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3
Friability (%)	0.60	0.24	0.65	0.54	0.64	0.75	2.1	0.62	1.73	4.60
Disintegration time(sec.)	32	>180	37	135	137	35	40	18	>300	80
Drug Content (%)	99.44	98.56	99.15	98.65	98.45	99.03	97.43	99.21	98.56	99.44

Table 7: Cumulative % release of formulations F10, 12, F15, F17

Time (min)	Cumulative % release of formulations			
	F10	F12	F15	F17
5	76.40	73.24	74.42	82.81
10	90.12	88.17	89.29	91.52
15	96.22	96.45	96.27	97.42
20	98.95	98.76	98.98	98.91
25	96.51	97.21	97.38	96.97
30	94.71	96.59	96.67	94.33
45	91.89	94.39	92.12	90.65



Drug	Temp. (°C)		
	Onset	Peak	Endset
Glimepiride	207.41	211.63	215.87
Glimepiride+Mucilage	209.91	213.74	216.16

Fig.1: DSC of glimepiride, mucilage and glimepiride + mucilage

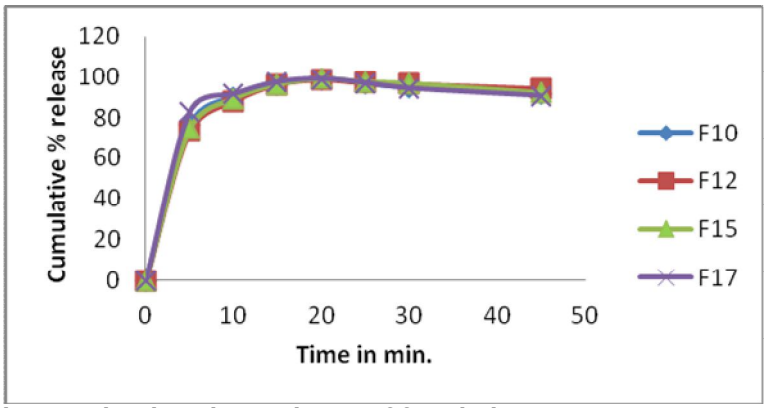


Fig. 2: % in-vitro drug release of formlations F10, F12, F15, F17

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