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Research Article

COMPARATIVE EVALUATION OF DISINTEGRANTS IN ORODISPERSIBLE TABLETS OF FAMOTIDINE

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ABSTRACT

The purpose of the present research was to study the effect of using variable quantity of disintegrating agents like Ac-Di-Sol, Crospovidone, Sodium Starch Glycolate on the mouth dissolving property of Famotidine tablets. Total nine formulations in triplicate having disintegrants at variable amount were prepared by direct compression method. The tablets, were assessed if suitable as oral disintegrating tablets by determination of a range of technological parameters. It was observed that the formulation containing Ac-di -Sol were have better disintegrating property compared to other. Hardness of the tablets was found to be in the range of 3.4-3.9 kg/cm2 for all formulations. The wetting time decreased with the increase in concentration of disintegrants. The tablets showed 97.52 ± 0.46 % to 100.56 ± 0.32 % of the labeled amount of drug, indicating uniformity in drug content. The in vitro dissolution time of various formulations was between 26.6 ±1.22 sec to 45.6±2.57 sec.

Keywords: Orodispersible tablets, Ac-Di-Sol, Crospovidone, Sodium starch glycolate, Famotidine, Super disintegrants.

INTRODUCTION

Famotidine used for inhibiting gastric acid secretion and healing gastric & duodenal ulcers. It is a popular and selective H2 receptor antagonist with a limited aqueous solubility of the 0.1%w/v at 20°C, it causes rise to difficulties in the development of dosage forms[1]. In the present study, an attempt was made to develop mouth dissolving tablets of Famotidine and to investigate the effect of superdisntegrants on the release profile of the drug from the tablets.

MATERIALS AND METHODS

Famotidine was received as a gift sample from Ambic pharmaceuticals, Ahmedabad, India. Ac-Di-Sol, crospovidone, sodium starch glycolate was and other materials used were of analytical grade and procured from commercial sources.

Preparation of Orodispersible tablets

Famotidine orodispersible tablets were prepared by direct compression method according to formula given in the table 1. A total number of nine formulations were prepared. All the ingredients triturated and sieved through 60-mesh sieve separately and collected. The drug and the ingredients were weighed and mixed in geometrical order and direct compressed to acquire tablets of 210 mg weight using flat face 8 mm size punch by single punch tablet compression machine[2,3].

Evaluation:

1. Weight variation[4]

Twenty tablets were selected at a random and average weight was calculated. Then individual tablets were weighed and the individual weight was compared with an average weight.

2. Hardness and Friability[5]

Tablets were evaluated for hardness and friability test using Monsanto hardness tester and Roche friabilator respectively.

3. Content uniformity test[5]

Twenty tablets from each batch were powdered and weighed accurately equivalent to 100 mg of Famotidine. The drug content was determined using the standard calibration curve. The mean percent drug content was calculated as an average of three determinations. [4]Weighed quantity of powder samples were diluted suitably and analyzed at 265nm for cumulative drug release using Elico-159 UV-Visible spectrophotometer.

4. Wetting Time and water absorption ratio[6]

Wetting time and water absorption ratio is intimately related to the hydrophilicity of the excipient and to the pore size of tablets. A piece of tissue paper folded twice was placed in a small Petri-dish (internal diameter of 5 cm) containing 6 ml of water. A tablet was placed on the paper and the time required for complete wetting was measured. The wetted tablet was then weighed. Water absorption ratio 'R' was determined using the equation,

$$R=100\{(Wa-Wa)/Wa\}$$

where Wa is weight of tablet before water absorption and Wb is weight of tablet after water absorption. The results are shown in Table 2.

5. In-vitro disintegration time[7]

One tablet each was placed in each of the six tubes of the apparatus and time in seconds taken for complete disintegration of the tablet with no palatable mass remaining in the apparatus was measured.

6. Dissolution Studies[8]

In vitro drug release studies of all the formulations were carried out using tablet dissolution test apparatus (USP TDT 06 PL, Electrolab, Mumbai) at 50rpm. Phosphate buffer pH 6.8 was used as the dissolution media with temperature maintained at 37±1ºC. Samples were withdrawn at predetermined time intervals and an equivalent amount of fresh dissolution fluid equilibrated at the same temperature was replaced. Samples were diluted suitably and analyzed at 265nm for cumulative drug release using Elico-159 UV-Visible spectrophotometer**.** The sample after each withdrawal was replaced with same volume of fresh media and the test was conducted in triplicate.

RESULTS AND DISCUSSION

In this study total ten Famotidine orodispersible tablets were formulated direct compression technique using Ac-Di-Sol, Crospovidone and Sodium starch glycolate as superdisntegrants (Table 1). The post-compression parameters such as hardness, friability, weight variation, amount of drug content; in-vitro wetting time and in-vitro disintegration time were evaluated which are shown in table 2.

1. Weight variation: The weight variation of all the tablets tested was within the pharmacopoeial limits. The weights of tablets of various batches were between 98.57%-100.47%.

2. Hardness and Friability: It is well known that the hardness of the tablet can markedly affect the release rate of drug[10]. The hardness was found to be in the range of 3.59±0.78 to 3.86±0.45 kg/cm^2. It indicates good mechanical strength with a capability to resist physical and perfunctory stress conditions during handling[11]. The friability values of all the formulations are less than 1% and they meet the pharmacopoeial standards.

Table 1: Formulation design

Ingredient	F1 (mg)	F2 (mg)	F3 (mg)	F4 (mg)	F5 (mg)	F6 (mg)	F7 (mg)	F8 (mg)	F9 (mg)	F0 (mg)
Famotidine	20	20	20	20	20	20	20	20	20	20
Ac-Di-Sol	09	12	15	-	-	-	-	-	-	
Crospovidone	-	-	-	09	12	15	-	-	-	
Sodium starch glycolate	-	-	-	-	-	-	09	12	15	
Avicel 102	25	25	25	25	25	25	25	25	25	25
Saccharin	2	2	2	2	2	2	2	2	2	2
Talc	4	4	4	4	4	4	4	4	4	4
Mg. stearate	2	2	2	2	2	2	2	2	2	2
Mannitol	148	145	142	148	145	142	148	145	142	156
Total	210	210	210	210	210	210	210	210	210	210

Table 2: Evaluation of tablets

Formulation code	Weight* variation ± SD	Hardness* (kg/cm2)	Friability* (%)	Wetting* Time (sec)	Water absorption ratio	In-vitro* disintegration Time (sec)	Drug Content (%)
F1	207±0.002	3.86±0.45	0.88±0.01	42.03 ±1.08	54.82± 0.89	45. 84 ±1.36	97.54 ±1.47
F2	208±0.003	3.79±0.82	0.86±0.14	31.35 ±0.85	79.13±0.62	34.24 ±0.96	98.05 ± 0.6
F3	211±0.001	3.84±0.79	0.99±0.11	23.43 ±1.27	89.45± 0.68	26.63 ±1.66	100.56 ±0.32
F4	208±0.002	3.57±0.49	0.76±0.02	41.85 ±0.64	56.34± 0.45	49.84 ±2.26	98.84 ±0.62
F5	207±0.002	3.55±0.66	0.82±0.07	36.53 ±1.45	67.52± 0.96	37.86 ±2.37	99.04 ±0.67
F6	209±0.001	3.42±0.45	0.85±0.09	29.42 ±1.58	81.25± 0.24	32.65 ±1.32	98.83 ±0.73
F7	209±0.001	3.48±0.46	0.59±0.10	48.94 ±0.58	50.68± 0.22	52.73 ±2.67	97.52 ±0.46
F8	208±0.002	3.62±0.86	0.68±0.04	33.47 ±0.92	76.95± 0.48	35.45 ±0.62	100.09 ±0.18
F9	207±0.003	3.59±0.78	0.72±0.08	29.13 ±0.87	82.43± 0.69	32.41 ±0.52	100.47 ±0.17
F0	209±0.001	4.06±0.62	0.89±0.19	40.37 ±1.53	58.51± 0.84	63.05 ±0.59	99.45± 0.75

*All values are expressed as mean ± SD, n=3

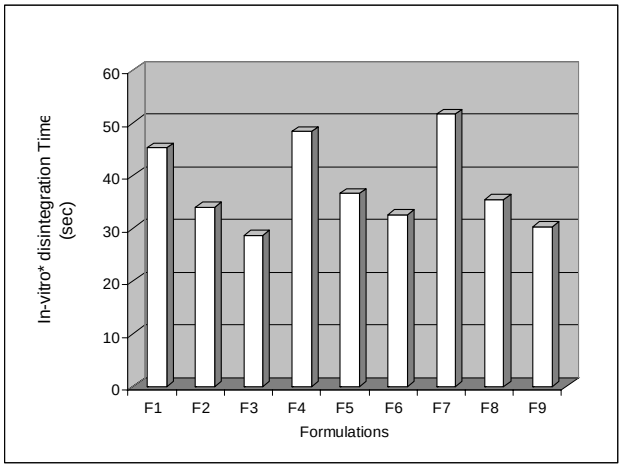

Fig. 1: In vitro disintegration profile of various formulations

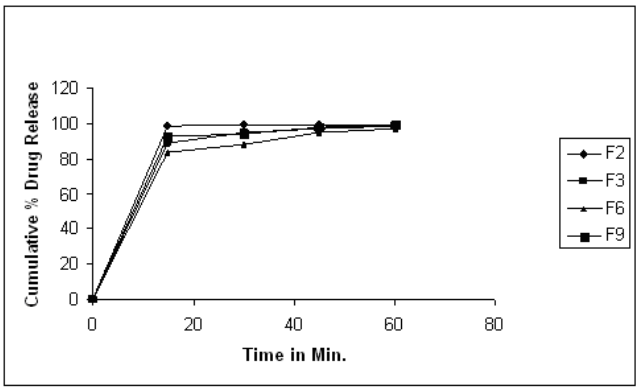

Fig. 2: In vitro release profile of optimized formulations

3. Content uniformity test:. The percentages drug contents of all the tablets were found to be between 97.52 ± 0.46 % to 100.56 ± 0.32 % of Famotidine, which was within the acceptable limits as mentioned for normal Famotidine tablets mentioned in USP[9].

4. Wetting Time and water absorption ratio[6]: The results of in-vitro wetting time and water absorption ratio were found to be within the prescribe limits and satisfy the criteria of orodispersible tablets. The in-vitro wetting time was found to be in the range of 23.43 ±1.27 to 48.94 ±0.58 seconds. The in-vitro disintegration time was founds in the range of 26.63 ±1.66to 52.73 ±2.67seconds respectively. The formulation containing Ac-Di-Sol as disintegrant, disintegrates rapidly minimum time due to fast swelling capability. SSG and Ac-Di-Sol is capable of swelling more extensively than the others, during water uptake study in optimum volumes of pores inside the tablets (89.45± 0.68).

5. In-vitro disintegration time: The formulation showed ideal characteristic of an dispersible type tablet. [3]The rate ofdisintegration of formulations increased with variation in concentration of various disintegrants.[7] Batch F3, containing a higher amount of Ac-Di-Sol, disintegrates rapidly than other batches and showed increased wetting time.

6. Dissolution Studies [8] The *in-vitro* dissolution profile indicated a faster and maximum of 96.56 ±0.32% drug release within 5.46min from formulation F3 proving the disintegrating property of Ac-Di-Sol. It was observed that when preparation containing Ac-Di-Sol comes in contact with water, it gets exaggerated immediately causing a quick rupture there by releasing the entire drug within the small time lap[9]. The utmost raise in the dissolution rate with various superdisintegrants was found to be Ac-Di-Sol> Crospovidone >SSG.

CONCLUSION

In the present study the disintegrating properties of the Ac-Di-Sol, Crospovidone and Sodium starch glycolate had been studied. All the disintegrants showed a rapidly disintegration, which is required for faster drug dissolution and improved bioavailability[12,13]. Ac-Di-Sol has the lead over others, thus proving its future prospects as a superdisntegrants in orodispersible tablets for rapid absorption, effective therapy and patient compliance. The batch F3 containing Ac-Di-Sol 15mg was found to be the best as compare to other formulations as this formulation has optimum hardness (3.84±0.79 kg/cm2), friability(0.99±0.11%), wetting time (23.43 ±1.27sec.) and disintegration time of (26.63 ±1.66sec). By an appropriate combination of excipients it was thus possible to obtain orally disintegrating tablets of famotidine using simple and conventional techniques.

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