Int. J. Chem. Sci.: 7(4), 2009, 2561-2566

FORMULATION AND EVALUATION OF NIMESULIDE *HIBISCUS ESCULENTUS* FRUIT MUCILAGE MATRIX TABLETS

HINDUSTAN ABDUL AHAD*, B. PRADEEP KUMAR, C. HARANATH and K. SOMASEKHAR REDDY

Department of Pharmaceutics, Raghavendra Institute of Pharmaceutical Education and Research, ANANTAPUR-515001 (A.P.) INDIA

ABSTRACT

The main aim of the present study was to develop matrix tablets of nimesulide with *Hibiscus esculentus* fruit mucilage and to study its functionality as a matrix forming agent for sustained release tablet formulations. Physicochemical properties of dried powdered mucilage of *Hibiscus esculentus* mucilage were studied. Various formulations of nimesulide *Hibiscus esculentus* mucilage were prepared. They were found to have better uniformity of weight and drug content with low SD values. The swelling behavior and release rate characteristics were studied. The dissolution study proved that the dried *Hibiscus esculentus* mucilage can be used as a matrix forming material for making sustained release tablets.

Key words: Nimesulide, *Hibiscus esculentus*, Matrix tablets, Sustained release.

INTRODUCTION

Hibiscus esculentus, (*Malvaceae* family) is an annual or perennial climber, growing up to 2 m tall. The fruit is a capsule up to 18 cm long[1]. Nimesulide (*N*-4'-nitro-2'-phenoxyphenyl methane sulfonamide) is a weakly acidic non steroidal anti-inflammatory drug (NSAID). The tablet formulations were evaluated for their physical and dissolution properties. Accelerated stability studies on some selected tablet formulations were also conducted to assess the formulation shelf life and determine any possible degradation[2].

The objective of present investigation is to design and evaluate sustained release tablets of nimesulide using *Hibiscus esculentus* fruit mucilage as release retardant for making sustained release matrix tablets.

*Author for correspondence

EXPERIMENTAL

Materials

Nimesulide was obtained as a gift sample from Dr. Reddy's Laboratories, Hyderabad, India. *Hibiscus esculentus* fruits were collected from plants growing in local areas of Anantapur, India. The plant was authenticated at the Botany Department of Sri Krishnadevaraya University, Anantapur, India. Micro crystalline cellulose (Avicel**)** was procured from SD Fine chemicals, Mumbai, India. All other chemicals used were analytical-reagent grade and double distilled water was used throughout the experiments.

Methods

Extraction of mucilage[3]

The fresh *Hibiscus esculentus* fruits were collected and washed. Incisions were made on the fruits and left over night. The fruits were crushed and soaked in water for 5–6 h, boiled for 30 minutes and left to stand for 1 h to allow complete release of the mucilage into the water. The mucilage was extracted using a multi layer muslin cloth bag to remove the marc from the solution. Acetone (three times the volume of filtrate) was added to precipitate the mucilage. The mucilage was separated, dried in an oven at 40°C, collected, ground, passed through a # 80 sieve and stored in desiccator at 30 °C and 45% relative humidity till use. This mucilage was tested for flow properties (Table 1). All values were found to be satisfactory.

Table 1: Flow properties of dried *Hibiscus esculentus* fruit mucilage

Parameter	Value
Bulk density (g/mL)	0.58
Tapped density (g/mL)	0.79
Carr's index (%)	26.58
Hausner's ratio	1.25
Angle of repose (^{0})	27.83
Number of experiments (n = 3)	

Preparation of sustained release matrix tablets[4]

Sustained release matrix tablets of nimesulide with *Hibiscus esculentus* fruit mucilage were prepared by using different drug : mucilage ratios viz. 1 : 0.25, 1 : 0.5, 1 : 0.75, 1 : 1 and 1 : 1.25. *Hibiscus esculentus* mucilage was used as matrix forming material while microcrystalline cellulose as a diluent and magnesium stearate as a lubricant. All ingredients used were passed through a # 100 sieve, weighed and blended. The granules were prepared by wet granulation technique and compressed by using 8 mm flat faced punches. The compositions of formulations were showed in Table 2. These matrix tablets were evaluated for their physical properties [11] as per I.P [10, 13] methods (Table 3).

Table 2: Formulae of nimesulide matrix tablets

Ingredients (mg)	Formulations				
	F1	**F2**	**F3**	**F4**	**F5**
Nimesulide	100	100	100	100	100
Hibiscus esculentus dried mucilage	25	50	75	100	125
Micro crystalline cellulose (Avicel)	120	95	70	45	20
Magnesium stearate	5	5	5	5	5
Total weight of tablet	250	250	250	250	250

Table 3: Physical properties of formulated matrix tablets

S. No.	Formulation code	Thickness (mm)	Hardness (kg/cm^2)	Friability (%)	Drug content (%)
1	F1	5.9	7.70 ± 1.25	0.80	101.2 ± 0.08
2	F2	6.2	8.10 ± 1.40	0.75	100.6 ± 0.30
3	F3	5.8	6.90 ± 1.35	0.46	99.8 ± 0.80
4	F4	6.0	6.80 ± 1.45	0.62	99.6 ± 0.50
5	F5	6.1	7.20 ± 1.30	0.72	100.8 ± 0.45

n = 5

Swelling behavior of sustained release matrix tablets[5]

The extent of swelling was measured in terms of % weight gain by the tablet. The swelling behavior of formulation F1, F2, F3, F4 and F5 were studied. One tablet from each formulation was kept in a petri dish containing pH 7.4 phosphate buffer. At the end of 2 h, the tablet was withdrawn, kept on tissue paper and weighed then for every 2 h, till the end of 12 h.. % weight gain by the tablet was calculated by formula -

$$S.I. = \{(M_t - M_0) / M_0\} \times 100$$

Where, S. I. = Swelling Index, M_t = Weight of tablet at time't' and M_o = weight of tablet at time 0.

Swelling behavior of Sustained release matrix tablets are represented in Fig. 1.

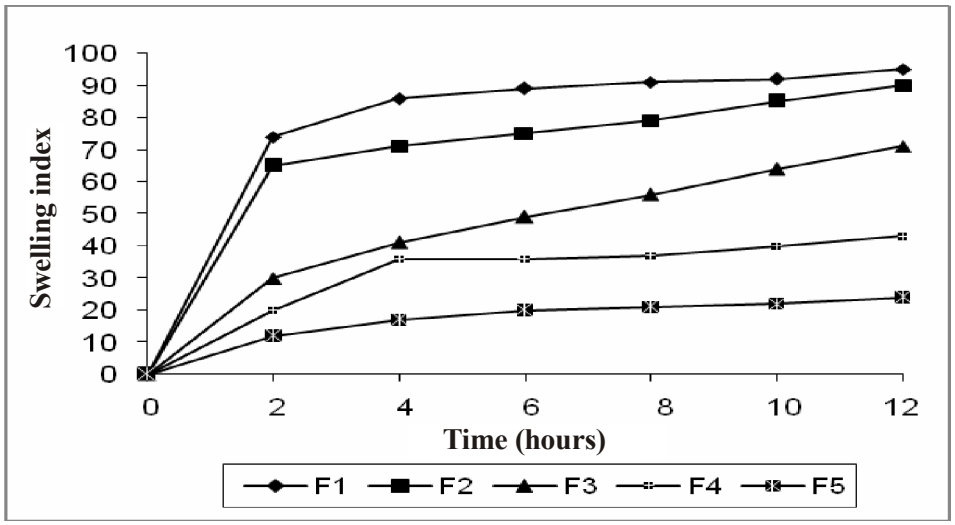

Fig. 1: Swelling index of formulated matrix tablets

Estimation of nimesulide

An ultraviolet spectrophotometric method based on measurement of absorbance at 397 nm in alkaline borate buffer of pH 8.4 was used. The method obeyed Beer-Lambert's law in the concentration range of 1-20 µg/mL. When a standard drug solution was assayed for 6 times, the accuracy and precision were found to be 0.8% and 1.0%, respectively. No interference was observed from the excipients used.

In vitro drug release studies[6]

Nimesulide *in vitro* dissolution studies of tablet formulations were performed in 900 mL of dissolution medium, pH 8.4 alkaline borate buffer Indian Pharmacopeia (IP) using a United States Pharmacopoeia (USP) 8-station Dissolution Rate Test Apparatus (Model Electro Lab, TDT- 06T, Mumbai, India) with a rotating paddle stirrer at 50 rpm and 37° ± 0.5°C .Tablets contained 100 mg of nimesulide were used in each test. A 5 mL aliquot was withdrawn at different time intervals and filtered using a 0.45 µm nylon disc filter. Each sample was replaced with 5 mL of fresh dissolution medium. The filtered samples were suitably diluted, if necessary and assayed by measuring the absorbance at 397 nm using a UV/ visible single-beam spectrophotometer-117 (Systronics Corporation, Mumbai, India). The drug release experiments were conducted in triplicate (n = 3). The *in vitro* release rates are shown in Fig. 2.

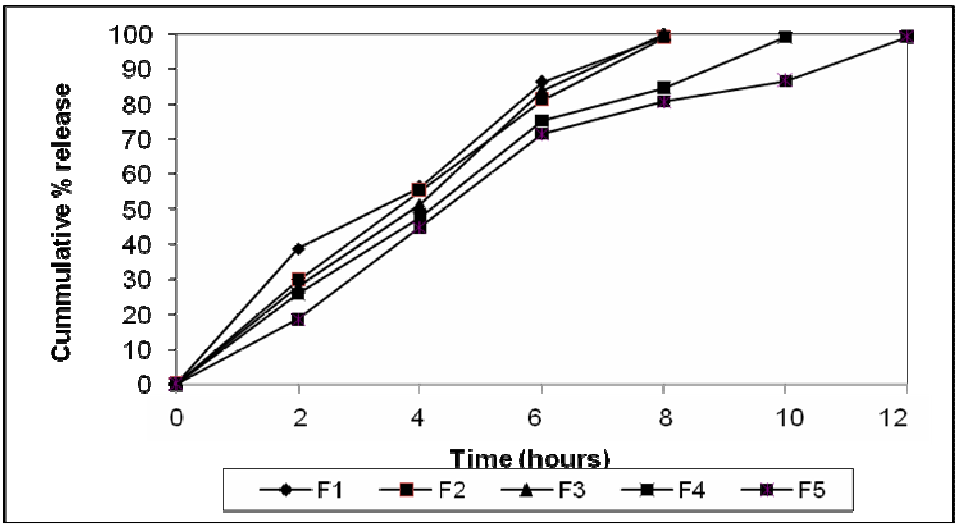

Fig. 2: *In vitro* drug release profile of nimesulide from formulated matrix tablets

RESULTS AND DISCUSSION

Matrix tablets, each containing 100 mg of nimesulide, were prepared using dried fruit mucilage of *Hibiscus esculentus* in various drug : mucilage ratios (1 : 0.25, 1 : 0.5, 1 : 0.75, 1 : 10 and 1 : 1.25.). The rate of release was faster in F1 and slower in F5. This result shown that as the proportion of mucilage was increased, the overall time of release of the drug from the matrix tablet was also increased. Drug releases from matrix tablets were by drug dissolution, drug diffusion or a combination of both.

CONCLUSIONS

The present study revealed that *Hibiscus esculentus* fruit mucilage appears to be suitable for use as a release retardant in the manufacture of sustained release matrix tablets because of its good swelling, good flow and suitability for matrix formulations. From the dissolution study, it was concluded that dried *Hibiscus esculentus* mucilage can be used as an excipient for making sustained release matrix tablets.

ACKNOWLEDGEMENT

The authors are thankful to Dr. Reddy's Laboratories, Hyderabad, India for providing the pure drug sample.

REFERENCES

1. C. Evans, Trease and Evans—Pharmacognosy Elsevier Ltd., New York 15th Ed., (2002) pp. 240-244.
2. Council of Europe 28, The British Pharmacopoeia, **20**, (2001) pp. 28-21.
3. Felter, Harvey Wickes and Lloyd, John Uri. Hibiscus, Esculentus-Okra., King's American Dispensatory, 1898, Retrieved March, 23 (2007).
4. L. Lachman, H. A. Lieberman and J. L. Kanig, The Theory and Practice of Industrial Pharmacy Philadelphia, PA, Lea and Febiger, (1987) pp. 317-318.
5. S. G. Killedar, D. A. Bhagwat, R. S. Adnaik, H. N. More and J. I. D'Souza Optimization of Method for Determination of Swelling Factor of Abelmoschus Esculentus Mucilageseeds, Indian Drugs, **45(4)**, 310-313 (2008).
6. R. K. Verma and S. Garg, Development and Evaluation of Osmotically Sustained Oral Drug Delivery System of Nimesulide, Eur. J. Pharm. Biopharm. **57** (2004) 513-525, DOI, 10.1016/j.ejpb., 02.003 (2004).

Accepted : 19.08.2009