Available Online through
www.ijpbs.com

IJPBS |Volume 2| Issue 1 |JAN-MARCH |2012|54-59

Extended Drug Release Retarding Effect of Aloe vera Gel IN THE DESIGN OF TABLET DOSAGE FORM

Bharath Kumar. N, S. Bharath*, R. Deveswaran, B.V. Basavaraj, V. Madhavan
Department of Pharmaceutics, M. S. Ramaiah College of Pharmacy, M.S.R.Nagar, M.S.R.I.T. Post, Bangalore-54, India.
***Corresponding Author Email:** bharath1970in@yahoo.com

PHARMACEUTICAL SCIENCES Research Article
RECEIVED ON 10-01-2012 ACCEPTED ON 30-01-2012

ABSTRACT
The main aim of the present study was to evaluate ALOEVERA gel powder as an extended drug releasing agent. Aloe veragel powder was obtained by the collection and treatment of inner parenchymatous tissue of Aloe barbadensis millerleaves.Nifedipine was used as a model drug and various tablet formulations of Nifedipine using different ratios of Aloe veragel powder were prepared. The compressed tablets were of uniform weight and drug content. The tablets possessed good hardness in the range of 4.0 -5.6 kg/cm^2 and friability values < 0.5%. The in-vitro dissolution study showed a drug release retarding efficiency with the linear increase polymer concentration in the formulation.

KEYWORDS:
Aloe verabarbadensis miller leaves, Nifedipine, In-vitro drug dissolution, Aloe vera gel powder, Sustained release.

1. INTRODUCTION

In recent years, considerable attention has been focused on the development of sustained release drug delivery systems. These dosage forms cover a wide range of prolonged action preparations that provide continuous release of their active ingredients for a specific period of time. Natural gums and polysaccharides and their derivatives represent a group of polymers widely used in pharmaceutical dosage form due to their non-toxicity, low cost and free availability. The genus Aloe belongs to the family, Liliaceae and includes the species *Aloevera barbadensis miller*, commercially known as *Aloe vera*. *Aloe Vera* has been used therapeutically for many centuries and is of particular interest due to its lengthy historic reputation as a curative agent and its wide spread use in supplementary therapies. The *Aloe Vera* gel, beginning in the 50's, has gained recognition as a base for nutritional drinks and foods, as a moisturizer and a healing agent in cosmetics and OTC drugs[1]. Nifedipine is a dihydropyridine calcium channel antagonist, which is widely used as a coronary dilator in hypertension and angina pectoris. It is a poorly soluble drug with a short biological half-life of 4 hr and its absorption from gastrointestinal tract (GIT) is rate limited[2].

The objective of the present research work is to evaluate the *aloe vera* gel powder as a potential drug release retardant for the formulation of tablet dosage form by using Nifedipine as the model drug.

2. MATERIALS AND METHODS

Nifedipine was procured from Yarrow Chem. Products, Mumbai. Aloe vera was procured from local garden. All other ingredients used were of analytical grades.

2.1 Seperation of *Aloe* Gel Powder from Fresh Leaves of*Aloe Vera:*

Freshly cut *Aloevera barbadensis miller* leaves were washed thoroughly with water to remove the debris of soil and then cut open to collect the inner parenchymatous tissue (gel) of the leaf. The gel was then washed with distilled water and air dried under ambient condition for 12hr and then at 80^{o}C in a tray dryer for 4 hr to get a solid dry mass. The dried solid mass was then converted into fine powder by mechanical grinding and passed through sieve #85. The mucilage powder

obtained was stored in an air tight container until further usage[3].

2.2 Formulation of Nifedipine Tablets Using *Aloe Vera* Gel Powder:

The tablets were prepared by wet granulation method. All the ingredients including drug, aloe gel powder and excipients were weighed and granulated using water and alcohol (1:1) as a binding solvent and the wet mass was passed through sieve #16 and the obtained granules were dried at 40°C in the tray dryer. After drying, the granules was passed through sieve # 20 to obtain the fine granules and blended with magnesium stearate and purified talc. The granules were evaluated for pre-compression parameters. The granules were punched using multistation single rotary tablet compression machine to get desired tablets.

3. EVALUATION STUDIES

3.1 Phyto-chemical Studies:

The separated *aloe vera* gel powder was subjected to preliminary tests to confirm the nature of the obtained powder. The tests performed were to determine the presence of alkaloids, amino acids, minerals, proteins and polysaccharides[4].

3.2 Flow properties of a*loe vera*gel powder:

The *Aloe vera gel* powder was evaluated for flow properties like Bulk density (BD), Tapped density (TD), Carr's index, Hausner's ratio and Angle of repose.

3.3 Drug polymer compatibility studies:

The compatibility studies of drug, polymer and the physical mixture (1:1) of both drug and polymer were carried out using Fourier Transform Infrared Spectrophotometer (Shimadzu FT-IR 8400-S) in the range of 400-4000cm^{-1} by KBr disc method.

3.4 Pre-compression and Post-compression studies:

The powdered blend was evaluated for micromeritic flow properties like Bulk density (BD), Tapped density (TD), Carr'sindex, Hausner's ratio, Angle of repose and the formulated tablets were evaluated for various parameters like weight variation, hardness and friability studies [5].

3.4.1 Drug content of formulated tablets:

Ten tablets from each formulation were randomly chosen, pulverized and powder weight equivalent to 20mg of drug was extracted with 100ml of methanol. Aliquot from subsequent filtered solution was further diluted in phosphate buffer (pH 6.8) and were analysed spectrophotometrically at 237.5 nm using UV – Visible spectrophotometer.

3.4.2 *In vitro* dissolution studies:

The dissolution studies were performed in triplicate for all the batches in a USP XXIII dissolution rate test apparatus (Type II). The release studies were performed at 50 rpm in 900 ml of 1.2 pH buffer at 37± 0.2°C for first 2 hours and replaced with phosphate buffer of pH 6.8 for further studies. Aliquots were withdrawn at predefined intervals, and the volume of the dissolution medium was maintained by adding the same volume of fresh pre-warmed dissolution medium. The absorbance of the withdrawn samples was measured spectrophotometrically at 237.5 nm and the drug release calculated.

4. RESULTS AND DISCUSSION

Aloe vera gel powder was isolated from fresh *Vera barbadensis miller* leaves. The gel powder obtained was a light brown in color. The gel powder obtained was subjected to phytochemical tests and it showed the presence on alkaloids, proteins and polysaccharides. The results of the micromeritic flow properties are shown in **Table 3**, which indicated good flow properties. Drug – excipient compatibility studies were done to evaluate interactions between the drug and polymer. The characteristic peaks (**Figure.1**) at 3452.34 cm^{-1}indicating N-H stretching, 2952.48cm^{-1} indicating C-H aliphatic stretching, 3100.97cm^{-1} indicating C-H stretching aromatic are the major peaks of the nifedipine. The IR spectrum of *aloe vera* gel powder (**Figure.2**) showed peaks at

3031.89 cm^{-1} indicating C-H aromatic stretching, 1830.32 cm^{-1} indicating C=O stretching, 2974.03 cm^{-1} indicating C=H stretching. The (**Figure. 3**) of drug: polymer mixture also showed the characteristic peaks of pure drug indicating that there were no interaction between the drug and the polymer.

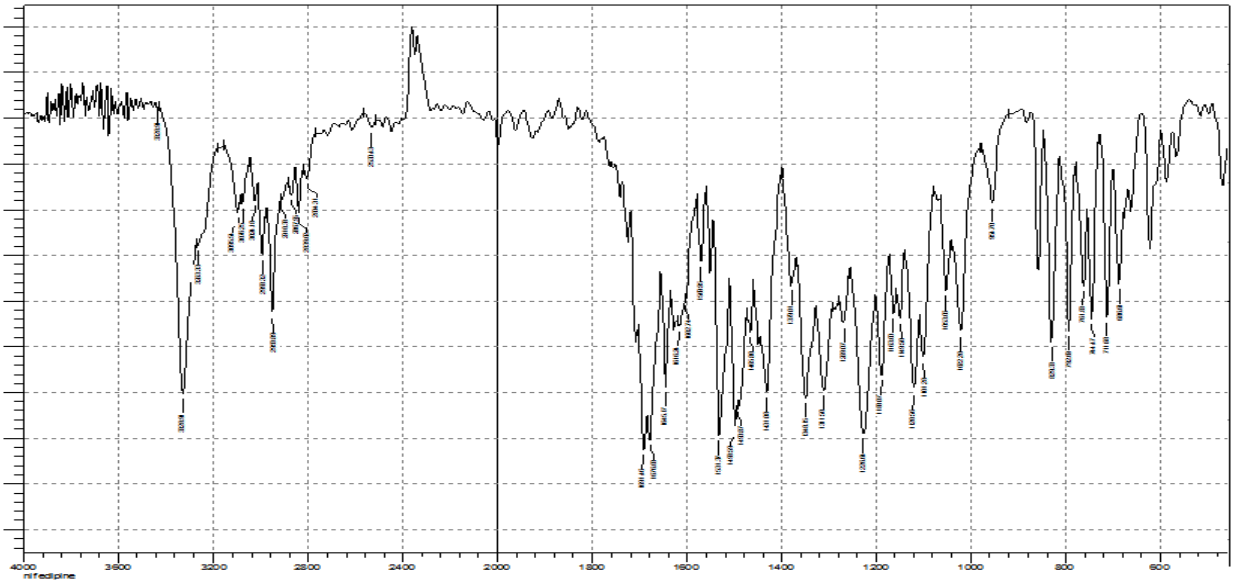

Figure 1: IR spectrum of Nifedipine

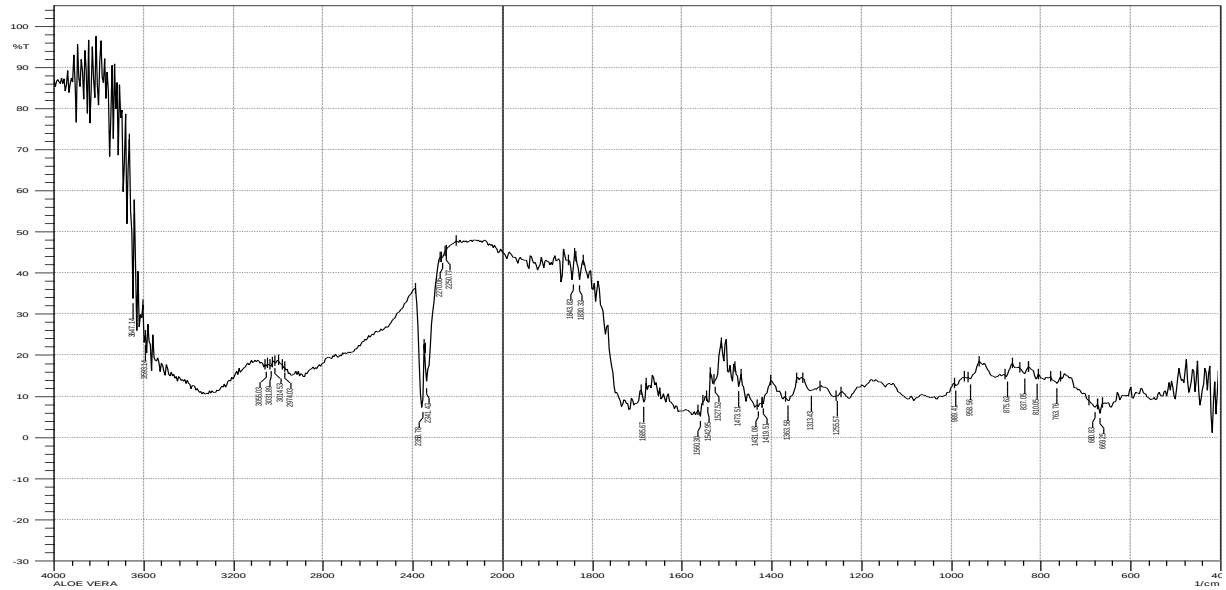

Figure 2: IR spectrum of *Aloe vera* gel powder

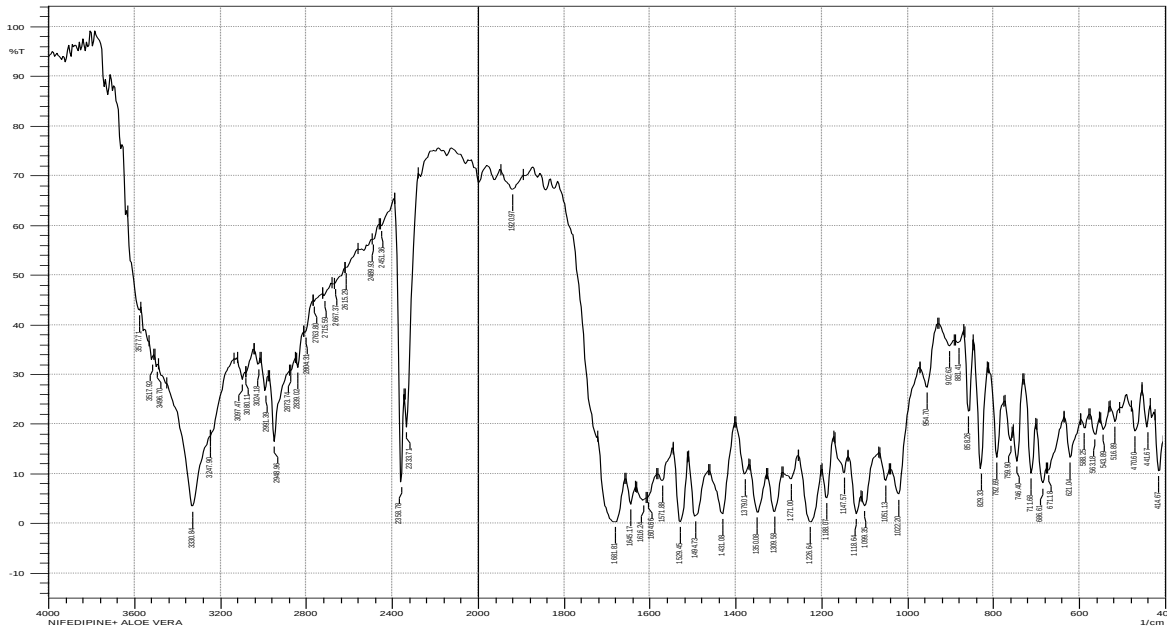

Figure 3: IR spectra of physical mixture Nifedipine with *Aloe vera* gel powder

The formulations of Nifedipine tablets using *Aloe Vera* gel powder has been employed with varied drug : polymer ratios. The bulk granules were evaluated for pre-compression and post compression parameter studies. The results of bulk density and angle of repose (<25^0) indicated good free flow properties of the granules. This was further supported by lower compressibility index and Hausner's ratio values. The compressed tablets possessed uniform weight and drug content in each of the batch formulation with acceptable hardness and friability values (**Table 5**). The *in-vitro* drug release profile of the formulations showed a slow and sustained release of nifedipine over a period of 12h. (**Fig.4**). It was observed that the *Aloe Vera* gel powder concentration had a direct positive influence over the retarding characteristics of drug release from the tablet dosage form.

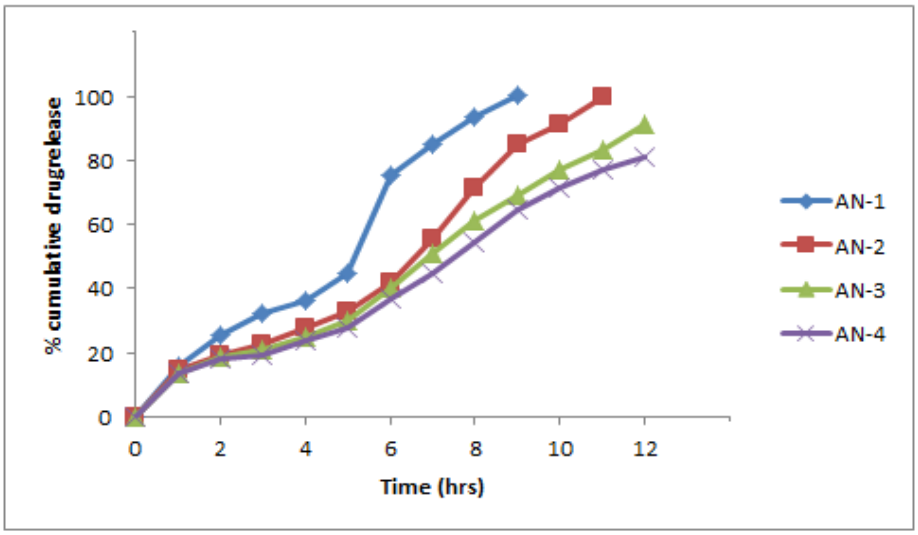

Figure 4: *In-vitro* dissolution profile of formulated nifedipine tablets

Table 1: Composition of Nifedipine tablets using *Aloe vera* gel powder

Sl.No.	INGREIDIENTS (mg)	AN-1	AN-2	AN-3	AN- 4
1.	Nifedipine	20	20	20	20
2.	*ALOE VERA*gel powder	20	40	60	80
3.	Magnesium stearate	4	4	4	4
4.	Purified Talc	8	8	8	8
5.	Dicalcium phosphate (q.s)	200	200	200	200

Table 2: Phytochemical investigation of *Aloe vera* gel powder

Sl.No.	Phytochemical tests	Observations
1.	Test for Alkaloids (Wagner's test)	Passes
2.	Test for Carbohydrates (Molish's test)	Passes
3.	Test for Proteins	Passes
4.	Test for Tannins (Ferric chloride test)	Fails

Table 3: Flow properties of *Aloe vera* gel powder

Sl.No.	Parameters	Value
1.	Bulk desnity (g/ml)	0.33
2.	Tapped density (g/ml)	0.38
3.	Carr's index(%)	13.15
4.	Hausner's ratio	1.15
5.	Angle of repose(^{0})	$23^0 73'$

Table 4: Pre-Compression Parameters of Granules

Sl.No.	Formulation Code	Bulk Density* (g/ml)	Tapped Density* (g/ml)	Carr's Index* (%)	Hausner's Ratio*	Angle of Repose*
1.	AN-1	0.49±0.002	0.56±0.003	12±0.11	1.14±0.002	$21^0 55'$±0.14
2.	AN-2	0.47±0.002	0.58±0.002	18±0.12	1.23±0.002	$23^0 19'$±0.13
3.	AN-3	0.47±0.002	0.57±0.002	12±0.12	1.14±0.004	$19^0 79'$±0.14
4.	AN-4	0.45±0.002	0.52±0.002	9±0.12	1.10±0.002	$23^0 39'$±0.012

*Average of the three determinations

Table 5: Post Compression Parameters

Sl.No.	Formulation Code	Weight variation* (mg)	Hardness* (kg/cm^2)	Friability* %	Drug content* %
1.	AN-1	204±3.12	4.4±0.057	0.47±0.015	100.4±1.4
2.	AN-2	203±3.33	4.8±0.1	0.32±0.o13	96.7±2.6
3.	AN-3	200±2.49	5.6±0.12	0.24±0.013	101.6±3.1
4.	AN-4	199±3.61	5.6±0.046	0.21±0.013	97.2±2.8

***Average of the three determinations**

CONCLUSION

The present study revealed that the plant based *aloe vera* gel powder proved to be potential and economical sustained release retarding agent in the development of extended release solid dosage forms.

ACKNOWLEDGEMENT

The authors would like to thank the management Gokula Education Foundation for providing the necessary facilities to carry out the research work.

REFERENCES

1. Jyotsana Madan, AK Sharma, Ramnik Singh, Fast Dissolving Tablets of *Aloe Vera* Gel, Tropical JPharma Res, 8(1): 63-70, 2009.
2. Soumik Ghosh, Nansrisaha Ghosh, SubalDebnath, G. Ganesh kumar, Raja Chakraborty, SaikatSen, Formulation and evaluation of sustained release dosage form of nifedipine hydrochloride using multi-unit chitosan treated alginate, Int. J. Pharm. Biomed. Res.,1(4): 124-131, 2010.
3. Subramanian K, Narmadha S, Vishnupriya U and Vijayakumar V, Release characteristics of Aspirin and Paracetamol drugs from tablets with Aloe Vera gel powder as a drug carrier, Drug Invention Today: 424-428, 2010.
4. Kokate CK, Purohit AP and Gokhale SB, Text book of Pharmacognosy,38th ed,2(9),NiraliPrakashan,Racha na enterprises, Pune. India: 7135-445, 2010.
5. http://www.pharmacopoeia.cn/v29240/usp29nf24 s0_c1174.html

***Corresponding Author:**
Dr. S. Bharath*
Department of Pharmaceutics,
M. S. Ramaiah College of Pharmacy,
M.S.R.Nagar, M.S.R.I.T. Post,
Bangalore-54, India.