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Research Article

ALOE VERA POWDER BASED MATRIX TABLET FOR ORAL CONTROLLED DELIVERY OF HIGHLY SOLUBLE DRUG

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ABSTRACT

This study mainly aimed for oral control delivery system of highly water soluble drug using aloe vera powder as a carrier for matrix tablet. Ascorbic acid is taken as a model drug for its high solubility. Different concentrations such as 30 %, 40 % and 50 % of matrix tablets of *Aloe Vera* powder are made by wet granulation technique using starch paste as a binder. The formulated granules were further subjected to Quality control test such as Angle of repose (º), Bulk Density, Carr's Index and Hausner ratio. These matrix tablets are then subjected to *in vitro* drug release using USP dissolution apparatus. The amount of ascorbic acid released from the matrix is estimated by using UV spectrometer and this result is compared with marketed ascorbic acid tablets. Formulation containing 40 % matrix was found to be good as compared to other two formulations and shows better controlled release of drug.

Keywords: Ascorbic acid tablet, Aloe Vera powder, Water soluble drug, Controlled drug delivery.

INTRODUCTION

The most convenient and commonly employed route of drug delivery is Oral ingestion due to ease of administration and least sterility constraints, pain free administration, tablets may be formulated to offer rapid drug release or controlled drug release, the latter reducing the number of daily doses required (and in so doing increasing patient compliance). Oral controlled release of drugs with constant release rate has always been a challenge to the pharmaceutical field. There is a high possibility of faster rate of drug release for water soluble drugs if not formulated properly and likely to produce the toxic concentrations, when administered orally.

Ascorbic acid, which is naturally occurring organic compound, is a white solid [1]. Impure form can be yellowish in colour. Ascorbic acid has anti-oxidant properties and dissolves in water giving mild acidic solution. One form of vitamin C is ascorbic acid which is used to cure scurvy caused by deficiency of Vitamin C.

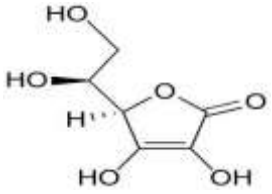

Fig 1: Structure of Ascorbic Acid

This study mainly aimed for oral control delivery system of highly water soluble drug using *Aloe Vera* powder as a carrier for matrix tablet [4]. Ascorbic acid is taken as a model drug for its high solubility. In this paper *Aloe Vera* powder was used as a matrix which is naturally occurring and is most frequently used as drug carrier in pharmaceutical studies. Different concentrations, 30 %, 40 %, 50 % of matrix tablets of *Aloe Vera* powder are made by wetgranulation technique using starch paste as a binder. The amount of ascorbic acid released from the matrix is estimated by using UV spectrometer and this result is compared with marketed ascorbic acid tablets.

MATERIALS AND METHOD

MATERIALS

Chemicals and Reagents

All the reagents were used from Sigma Aldrich and all reagents were analytical grade.

Instrument used: Scientific Dissolution Apparatus USP (*paddle).*

METHODS

Experimental Procedure

Preparation of *Aloe Vera* gel powder

Fresh *Aloe Vera* leaves were collected and taken for the preparation of gel powder. Leaves were washed with double distilled water and then the washed leaves were cut into pieces to collect gel. Gel was washed with Millipore water. After washing the gel it was air dried for two days under ambient condition then kept in a hot air oven at 50°C for 4 days. Solid dry mass were obtained, mass were converted into fine powder by mechanical grinding and sieving. The *Aloe Vera* gel powder is then stored under refrigeration

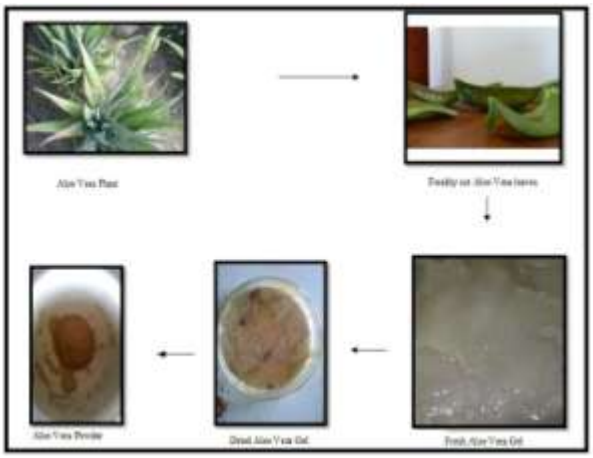

Fig 2: Preparation of Aloe Vera gel powder from Aloe Vera Plant

QUALITY CONTROL TEST FOR GRANULES

Angle of Repose (º) The angle of repose value for Aloe Vera powder was determined by the funnel method (Reposogram) [2]. The accurately weighed powder blend was taken in a funnel. The height of the funnel was adjusted in such a way that the tip of the funnel

just touches the apex of the heap of the powder. The powder was allowed to flow through the funnel freely onto the surface. The diameter of the powder cone was measured and angle of repose was calculated using the equation

$q = \tan^{-1}(h/r)$

h= height of the powder cone

r = radius of the powder

Bulk Density

Loose bulk density (LBD) and tapped bulk density (TBD) of Aloe Vera powder were determined using bulk density apparatus [2]. Accurately weighed powders were placed in 10 ml graduated measuring cylinder. Initial volume was observed. The graduated cylinder was tapped 10-15 times from a distance of 14±2mm. The tapped volume was measured to the nearest graduated unit. The LBD and TBD were calculated in using the formula.

$LBD = \frac{Mass}{Bulk\ density}$

$TBD = \frac{Mass}{Tapped\ density}$

LBD= weight of the powder of the packing

TBD= weight of powder/tapped volume of the packing.

Compressibility Index (Carr's Index)

The compressibility index of the Aloe Vera powder was determined by Carr's compressibility index [2]. Carr's index (%) can be calculated by using the formula:

Carr's Index $= \left(\frac{TBD-LBD}{TBD}\right)100$

Hausner ratio

It is an indirect method to determine the powder flow property. It is a very important parameter to be measured since it determines the mass of uniformity of the dose [2].

Hausner ratio $= \frac{TBD}{LBD}$

Preparation of matrix tablet

Talc and Magnesium Stearate (2:1) were mix together in appropriate mixture. Aloe Vera gel powder is mixed with Active pharmaceutical ingredient (API) and diluents. 10 % starch paste w/v was mixed with above mixture. Granules were then passed through sieve no 1680 µm. Then granules were dried and were passed through 1190 µm. Then dried passed granules were than mix with lubricant and was made tablet. The composition of tablet formulations contain 150 mg of API (Ascorbic acid powder) were made according to Table. Those tablets were used in dissolution studies and other release characters and absorbance was measured at λ_{max}= 265nm using UV spectrometer.

Table 1: Composition of matrix tablet containing 30 %, 40 %and 50 % of Aloe Vera Powder

Ingredients	Quantity present in each matrix tablet (mg)		
	M1	**M2**	**M3**
API	150	150	150
Aloe Vera powder	135	180	225
Starch	45	45	45
CMC	106.5	61.5	16.5
Talc	9.0	9.0	9.0
Magnesium Stearate	4.5	4.5	4.5
Total Weight	450	450	450

RESULT AND DISCUSSIONS

Angle of Repose (º): The angle of Repose of the prepared powdered granules was found to be 33.22° and can be considered as Fair type of flow.

Bulk Density: Bulk density of the powder was found to be 0.47 and tapped density was found to be 0.59.

Carr's index: Compressibility index of *Aloe Vera* powder was 20.33% and can be considered as fair type of flow

Hausner's ratio: The ratio is found to be 1.25 and has acceptable flow properties.

In –vitro drug release studies of Aloe Vera based matrix tablet:

Aloe Vera powder was found to good hydrophilic matrix carrier and used well in present study in the design for oral ingestion of highly soluble ascorbic acid drug. Ascorbic acid tablets were prepared by wet granulation method using starch paste as binder. Aloe Vera powder was found to have fair/ acceptable flow properties and hence was used in this present study. The flow properties and compressibility was evaluated by Angle of repose and Carr's index respectively [3].

Matrix tablets which were prepared by wet granulation method were then subjected to dissolution studies using Scientific Dissolution apparatus (USP) paddle type where water was used as a dissolution medium as the drug is highly water soluble. Paddle was rotated at 50 rpm for 1 hour. Withdraw suitable volume of sample and dilute with water up to 100 ml and absorbance was measured at 265 nm.

Different Concentrations such as 30 %, 40 % and 50 % of Aloe Vera based matrix tablets were prepared and their graph was plotted (Percentage drug release versus Time in hours) and was compared with % drug release in same time for marketed ascorbic acid tablet.

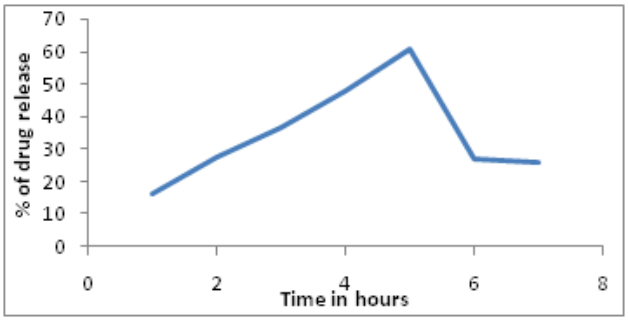

Fig 1 : Percentage of Drug release containing 30 % matrix tablet

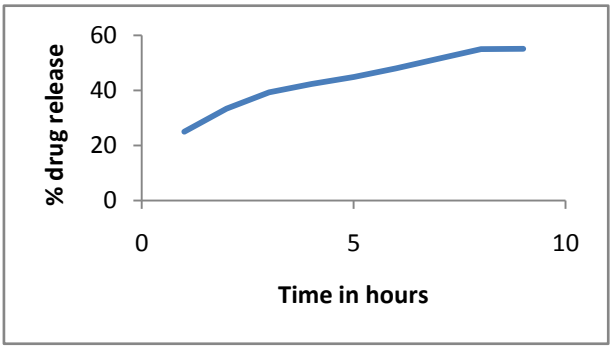

Fig 2: Percentage of drug release containing 40 % matrix tablet

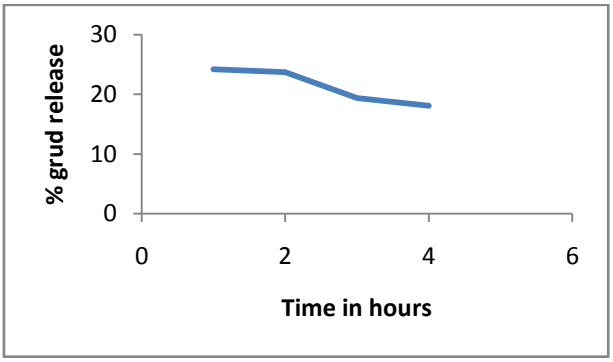

Fig 3: Percentage of drug release containing 50 % matrix tablet

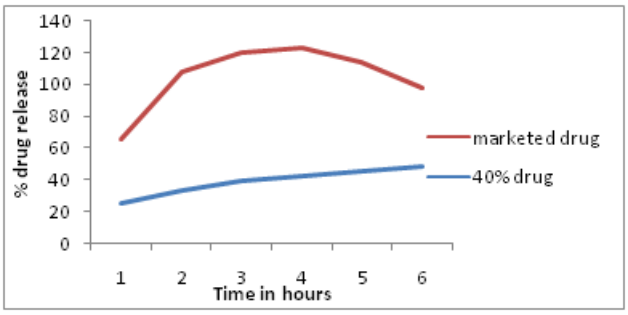

Fig 4: Comparison of percentage of drug release between best formulation (40 %) tablet and marketed drug

CONCLUSIONS

In present study three different concentrations of *Aloe Vera* based matrix tablets were prepared by wet granulation method using starch paste as binder. Quality control tests for granules were carried out. It was found that Aloe Vera Powder has acceptable flow properties and was further used for tablet formulations. Out of three formulations prepared 40 % matrix contained formulation was found to be good as compared to other two and shows controlled release of drug where as marketed drug show high release rate at first hour and then release rate was decreasing slowly.

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