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Research Article

# COMPARATIVE STUDY OF DIFFERENT BINDER CONCENTRATION OF ALOE AS NATURAL BINDER IN THE PREPARATION OF PARACETAMOL TABLET

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**Abstract**
Natural binders like different starches, gums, mucilage dried fruits possess binding capacity and are much safer and economical than polymers like PVP. The aim of the work was to compare different concentration of Aloe vera mucilage as a binder for preparation of Paracetamol tablet. The results of the study revealed that 5% aloes mucilage concentration shows good drug release pattern for conventional oral tablets of Paracetamol. Thus, it can be concluded that 5% *Aloe vera* mucilage may be used as a binder in tablet formulation and possess a high potential for substitution for other more expensive binders.

## INTRODUCTION

Tablet binders are one of the most essential elements in the formulation of a tablet. Binders or adhesives are the substances that promote cohesiveness. It is utilized for converting powder into granules through a process known as granulation. Flow property/fluidity is required to produce tablets of a consistent weight and uniform strength. Compressibility is required to form a stable, intact compact mass when pressure is applied. These two objectives are obtained by adding binder to tablet formulation and then proceeding for granulation process [1].

## MATERIALS AND METHODS

### A. Extraction of mucilage from aloes

Freshly cut aloes is cleaned with water. A new blade is used to cut the outer scale of the aloes and the mucilage is peeled with it. The peeled off mucilage is then triturated using mortar and pestle to make it ready for use.

### B. Preparation of Paracetamol tablets

The measured amount of Paracetamol powder is taken into the mortar and one by one the excipients are added to it with regular trituration with the pestle. After addition of the rest of the excipients the natural binder (aloes) is added for 2% concentration along with few drops of water. It is then made into tight dough by using hand. The dough is then smeared onto sieve number 10 to form granules. Resultant granules are then taken into a petri dish and put into a tray drier for 20 minutes. Dried granules are then separated into 10 sections of 600mg of powdered drug. One by one the granules are introduced into the tablet punching machine. Same experiment is repeated for 3%, 4%, 5% concentration of binder. Evaluation is carried out for different concentrations and then compared among each other [2].

### C. Pre-formulation studies

#### Angle of Repose

The angles of repose of the four consecutive sample binder concentrations are determined by fixed cone method. In this method the weighed granules are made to flow through the funnel under gravitational force. The cone shaped heap thus formed is then used to calculate the angle of repose by the formula [3]

$$\tan \theta = h/r$$

Where, θ= angle of repose, h= height of the heap, r= radius of the heap

#### Bulk Density

It is the density of the bulk mass of the granules. Bulk density is determined by introducing accurately measured mass of the granules into the graduated measuring cylinder. The volume taken by the granules of different batches of varying binders are then recorded and the bulk density is calculated by the formula:

$$\text{Bulk density} = \frac{weight\ of\ the\ powder\ blended}{bulk\ volume} \quad [3]$$

#### Tap density:

Tapped density is the density of the final mass of the granules after it has been tapped for 100 times from a fixed and recorded height. The final volume is recorded and the tapped densities of the four concentrations are recorded by the following formula:

$$\text{Tapped density} = \frac{weight\ of\ the\ granules}{tapped\ volume} \quad [3]$$

### D. Evaluation of prepared tablets

#### Tablet hardness

The hardness of any tablet is an important factor to be determined in pharmaceutical industry. The hardness tests for different tablets are

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determined using a device called Monsanto tester. The tablets are kept against the piston in a horizontal manner and increasing pressure is implied on it until the tablets are broken into pieces. The reading is noted for each tablet from scale on the tester body. According to survey all branded paracetamol tablets have hardness limit ranging between 4 to 10kg/cm sq [4].

**Friability of Tablets**

Friability of the four prepared batch of tablets is determined by Roche Friabilator. 20 tablets of each batch are subjected into the friabilator at 25rpm for 4 minutes. The weight of the tablets before and after the experiment was compared. The percentage weight loss was calculated and used to determine their individual percentage friability.

**Tablet Disintegration Test**

Disintegration test for tablets is carried out in tablet Disintegration test apparatus. The apparatus contains distilled water as disintegrating medium. The temperature was made to stay at a constant temperature of 37±5ºC. The time taken for tablets of different concentration to disintegrate completely is recorded and then compared with each other. Disintegration time of tablets was found to be 4min, 5min 30sec, 8min & 12 min for 2%, 3%, 4% & 5% respectively [4]

**Tablet Dissolution Test**

The dissolution test for the four batches of Paracetamol tablets were carried out using Phosphate buffer having pH of 6.8(37±0.5ºC). The bath volume was taken to be 900ml. At an interval of one-hour 1ml of sample was taken out, filtered and again recovered with same volume of fresh medium. The filtered sample is diluted with fresh medium and then analyzed for drug dissolution concentration by using UV spectroscopy [5]

***RESULT AND DISCUSSION***

Angle of response was found to be 26.07˚, 23.57˚, 21.07˚& 18.47˚ for 2%, 3%, 4% & 5% binder concentration respectively. Bulk Density was found to be 0.58g/ml, 0.56g/ml, 0.55g/ml& 0.53g/ml for 2%, 3%, 4% & 5% binder concentration respectively. Tap Density was found to be 0.79g/ml, 0.77g/ml, 0.76g/ml& 0.75g/ml for 2%, 3%, 4%& 5% binder concentration respectively. Hardness of the tablet was found to be 5kg/cm sq., 5kg/cm sq., 6kg/cm sq. & 7kg/cm sq. for 2%, 3%, 4%& 5% binder concentration respectively [4]. Percentage Friability of tablets was found to be 1.33%, 1.16%, 1.17% & 0.83% for 2%, 3%, 4% & 5% binder concentration [4].

***CONCLUSION***

The main aim of the present study was to evaluate aloes mucilage as a prospective binder in paracetamol tablets carried out by a comparative study of various binder concentrations (2%, 3%, 4% & 5%) in 600 mg paracetamol tablets. Standard excipients were used in various formulations of paracetamol tablets with the inclusion of aloes mucilage as a natural binder. Mucilage was extracted by scrapping the leaves of the plant and triturated. The general procedure was then followed and the tablets were subjected to testing of physical parameters. The dough made was smeared and passed through sieve number 10 and dried in the tray drier at 60˚C for 15 minutes until fine sized granules were formed. The powder was weighed accurately for individual binder concentrations then subjected to tablet compression. Parameters like Angle of repose, tap density, bulk density, tablet hardness, friability, dissolution test and disintegration test were determined for each of the four batches of different binder concentration. In which the 5% concentration of binder emerged as the most suitable from the rest. Therefore, from the above data it may be concluded that the use of aloes mucilage as a natural binder in paracetamol tablets at 5% binder concentration as a potential alternate is possible, as it is cost effective, low toxic, easily biodegradable, has abundance of availability and shows good results.

**Table 1: Formulation table of tablet**

| Ingredients | 2% conc. per tablet (mg) | 3% conc. per tablet (mg) | 4% conc. per tablet (mg) | 5% conc. per tablet (mg) |
|---|---|---|---|---|
| Paracetamol | 300 | 300 | 300 | 300 |
| Starch | 60 | 60 | 60 | 60 |
| Lactose | 205.8 | 199.8 | 193.8 | 187.8 |
| Magnesium stearate | 6 | 6 | 6 | 6 |
| Talc | 3 | 3 | 3 | 3 |
| Propyl Paraben | 1.2 | 1.2 | 1.2 | 1.2 |
| Binder | 24 | 30 | 36 | 42 |

**Table 2: Formulation evaluation result**

| Formulation | 2% | 3% | 4% | 5% |
|---|---|---|---|---|
| **Angle of repose** | 26.07˚ | 23.57˚ | 21.07˚ | 18.47˚ |
| **Bulk Density (g/ml)** | 0.58 | 0.56 | 0.55 | 0.53 |
| **Tap Density (g/ml)** | 0.79 | 0.77 | 0.76 | 0.75 |
| **Friability (%)** | 1.33 | 1.16 | 1.17 | 0.83 |
| **Hardness (kg/cm²)** | 5 | 5 | 6 | 7 |
| **Disintegration (min)** | 4 | 5.5 | 8 | 12 |

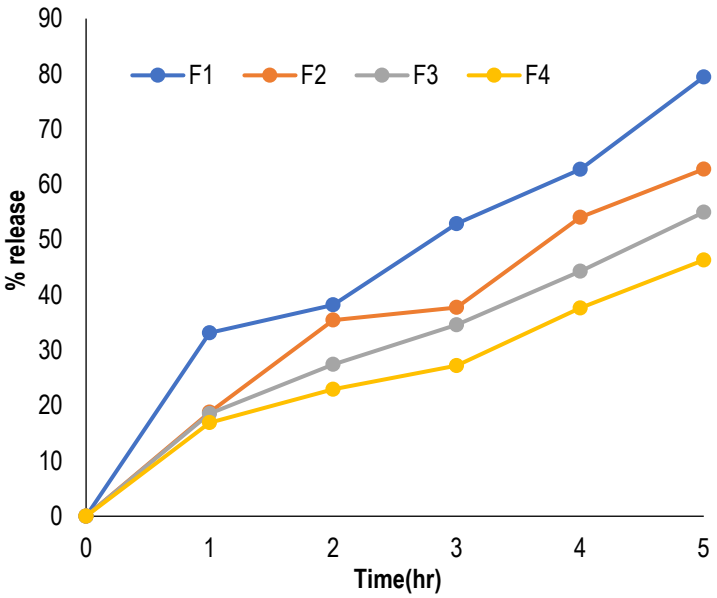


**Fig 1: In vitro release profile of prepared tablet**

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***CONSENT FOR PUBLICATION***

The authors declare no conflict of interest.

***COMPETING INTERESTS***

The authors declare that they have no competing interests.

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