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Research Article

EVALUATION OF *DIOSPYROS PEREGRINA* GUM AS A NOVEL BINDER IN TABLET FORMULATION

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ABSTRACT
Various plant gums have been used as binders in tablet formulations. But still finding novel binder for the manufacture of tablets, in pharmaceutical industry. The *Diospyros peregrina* gum was found its binding property. In the present study *Diospyros peregrina* gum was employed as a binding agent in Flurbiprofen tablets at concentrations of 2.0, 4.0, 6.0 and 8.0 % w/w, in comparison with Polyvinyl Pyrrolidine (PVP). The granules were evaluated for moisture content, angle of repose, bulk and tapped densities,Carr Index, Hausners ratio. The tablets were evaluated for thickness, weight variation, hardness, friability, disintegration time and dissolution profiles. Studies showed that increase in binding concentration of *Diospyros peregrina* gum, increases the hardness, increases the disintegration time, decreases the percentage friability and decreases percentage cumulative release. Results obtained indicated that *Diospyros peregrina* gum performed as good as that of PVP as a binder to Flurbiprofen tablets.

KEY WORDS: *Diospyros peregrina*, Flurbiprofen, PVP, Tablets, Binders.

INTRODUCTION

Binders are agents used to impart cohesive qualities to the powdered material during the production of tablets. They impart cohesiveness to the tablet formulation, which ensures that the tablets remain intact after compression as well as improving the free flowing quality.[1] Binding agents are used to impart the structural strength required during the processing, handling and packaging of tablets. A number of plant gums have been used as binding

agents in tablet formulations viz. acacia, guar gum, tragacanth etc.[2] Starches from different sources have been evaluated and used as excellent binders in either mucilage or the dry powdered form.[3-5] Maize and potato starches have been in common use and recently cassava starch appeared in the British pharmacopoeia as an official starch for use as binder. Their use has increased in the tropics where previously recognized starches are unavailable. In evaluation procedure the binder concentrations have direct effect on the crushing strength, friability, disintegration time and tablet dissolution.[6]

Diospyros malabarica (Desr.) Kostel is a tropical plant wide distribution in Indomylasia . The plant shows a widespread along the plains of Ganga and Western Gath. It is most properly known as Gubb in northern and eastern India especially in West Bengal. The viscous pulp obtained from the fruits is used as the rich source of gum.[7-8]

In the present work, Gubb tree gum has been evaluated for its binding properties in a Flurbiprofen tablet formulation in comparison with a standard binder, PVP.

MATERIALS AND METHODS

Flurbiprofen was obtained as the gift sample from Madras Pharmaceuticals,Chennai,India. PVP, Starch, Talc, Magnesium stearate, and other excipients are obtained from S.D.Fine chemicals, Mumbai. The fruit of the gubb tree was collected from the banks of river Bhaghirati,Berhampore, West Bengal, India.

Extraction of the gum:

The fresh Gubb fruits from Gubb Tree (figure 1) were obatained and washed thoroughly. They were cut into pieces and the seeds were removed. Further they were crushed to collect the extract. The extract were further filtered to sieve out the particulate contaminations. The filtrate obtained was dried in oven. Later were milled to obtain as powder. The powdered gum was further stored in a dry container.

Fig 1: Parts of Gubb Tree.

Drug excipient interaction study:

Physical observation

Active ingredient mixed well with all excipients in binary ratio and small portion

of this mixed powder in cleaned and dried vial in stability chamber at 40 ^{o}C ± 5.

FT-IR Studies [10-11]

The IR spectrum of the mixed powders were taken by preparing Potassium bromide pellets under dry condition by using pellet press. The transmission minima (absorption maxima) in the spectra obtained with the sample corresponded in position and relative size to those in the spectrum obtained with the working / reference standards.

Preparation of granules:

Weighed quantity of Flbiprofen is taken. Microcrystalline cellulose, Starch and were sifted through #40 mesh sieve and mixed for 10 minutes in rapid mixer granulator as shown in table 1. The binder solution containing PVP K30 (4%) / Gum solution(2%,4%,6%,8%) in water was added slowly to the above ingredients of respective formulation and mixed at slow speed, after complete addition of binder solution, mix well to get the granules. The wet granules were loaded in a tray dryer and dried till the moisture content of granules are NMT 6%. The dried granules were sifted through #20 mesh sieve. Talc and magnesium stearate were loaded in planetary mixer along with the above granules and mixed well for 2mins at slow speed. The prepared granules were further evaluated for the bulk density, Tapped density, Carr Index, Hausner ratio and Angle Of Repose.[9]

Compression of Flurbiprofen tablets:

The quantity of granules selected was compressed using a 27 stationary double rotary compression machine (Cadmach, India) using 19.2×8.9 mm round flat surface .It was compressed to obtain hardness in the range of 6-7 kg/cm2 to form a uniform tablet . The compressed tablets were further evaluated.

Table 1 : Formulation profile study

Sr.No	Formulation	F_1(mg) ,2%	F_2 (mg),4%	F_3(mg),6%	F_4(mg),8%	PVP(mg),4%
1	**Flurbiprofen**	250	250	250	250	250
2	**Starch**	30	18	15	20	18
3	**MCC**	20	16	15	12	16
4	**Gum(binder)**	6	12	18	24	12
5	**Talc**	1	1	1	1	1
6	**Magnesium Stearate**	1	1	1	1	1
Average Weight		308	308	308	308	308

Percentage purity:

Weigh and powdered 20 tablets. Accurately weighed a quantity of the powder equivalent to 0.5 g of Ibuprofen, extracted with 60 ml of *chloroform* for 15 minutes and filtered.The residue was washed with three quantities, each of 10 ml, of *chloroform* and gently evaporate the filtrate just to dryness in a current of air. The residue was dissolved in 100 ml of *ethanol (95%),* previously neutralized to *phenolphthalein solution*, and titrate with *0.1M sodium hydroxide* using *phenolphthalein solution* as indicator.

Invitro Dissolution Studies

Medium :pH 7.2 Phosphate Buffer
Apparatus : Dissolution Apparatus IP Type – I
RPM :100
Temperature : 37°C ± 0.5°C
Time : 60 minutes

Preparation of sample solution:

Apparatus was set as per above conditions, one tablet placed each of the six dissolution vessels and started the dissolution test. After specified, a portion of the medium was separately filtered from each vessel through 0.5 micron membrane filter. The filtrate was collected after discarding first 10 ml of the filtrate. 5ml of this solution transferred into 50 ml volumetric flask and the volume was made up with water, further 5 ml of the resulting solution was pipetted out into 50 ml volumetric flask and the volume was made up with water and mixed. Determine the amounts of Ibuprofen dissolved by employing UV absorption at the wavelengths of maximum absorbance at about 221 nm for ibuprofen on portions of the solution under test passed through filter paper, diluted if necessary, using 0.2cm quartz cell.

RESULT AND DISCUSSION

Drug Excipient-compatibility study:

FTIR spectra of plain The I.R study shows in figure 2 characteristic peak of Flurbiprofen at around 1700 cm^{-1} and around 2920 cm^{-1} due to its characteristics carboxyl and hydroxyl stretching .[10-11] The I.R graphs obtained clearly shows that there is no significant change in the nature of the peaks. The results of IR spectra of active ingredients and excipients also revealed that no considerable change was observed in bands of Flurbiprofen, hence it indicates the absence of any interaction between the drug, polymer and excipients used in the tablet. Hence there is no interaction between them.

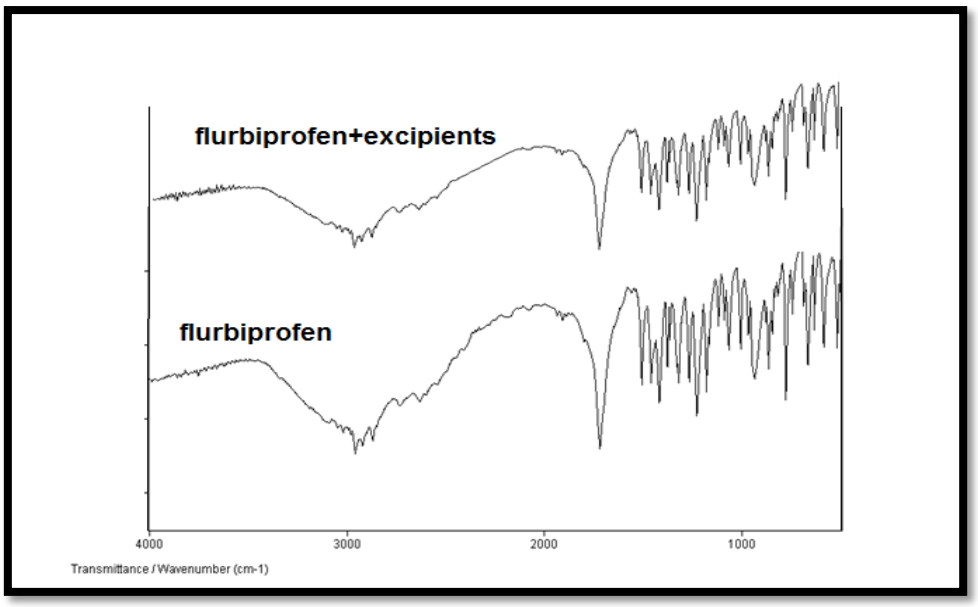

Fig 2: A comparative study of the I.R of the Flurbiprofen and interacted value

Evaluation of Flurbiprofen tablet:

In the following study, the novel binder was compared with the PVP. For this four different formulations ($F_1$to F_4) were prepared at various concentrations of gum 2%,4%,6%8% by weight basis. It was then compared with the F_5 formulation containing 4% PVP. Initially the comparison of the flow properties of the granules were carried out. The result showed as in **table 2** that almost all the formulations showed a good flow property. Later they were evaluated depending on the various evaluation parameters like- weight variation, hardness, disentrigation, friability, etc.

The studies as enlisted in **table 3**, clearly shows that there is a increase in the hardness as the percentage of the binder was increased but it resulted in the prolonging of the disentrigation time. Even the friability also showed a reduction with the increase in the amount of the binder. Further they were subjected to the in-vitro dissolution test.

From the data obtained from dissolution study it was clear that with the increase in the percentage of the binder, the rate of dissolution also got prolonged. Namely the formulations,F_1 and F_2 showed a maximum drug release after 90 minutes as 98.2% and 77.56%. where the F_5 formulation prepared by using 5% PVP showed almost similar release profile to that of F_2 formulation as 78.23%,even the release patter when compared to F_2 was found to be similar **figure 3**. Whereas F_3, F_4 was found to have the maximum drug release after 90 minutes to be 57.23 and 52.23 respectively. It can be concluded from the above data that 1% to 4% is ideal for normal uncoated tablet

formulation. Whereas beyond it it showed a tendency for prolonged release system.

This can be further justified from the kinetic drug release study as mentioned in **table 4** . It was observed that r^2 value for first order for F_1 and F_2 formulations was found to be higher that showed a considerable decrease for F_3 and F_4 formulations. It can be predicted that if studied for prolonged release it can be used as a controlled or sustained release matrix system.

Table 2:Physical evaluations of Flurbiprofen granules

Sl.No	Formulation	Bulk density (g/cc)	Tapped density (g/cc)	Carr's Index (%)	Hausner's Ratio	Angle Of Repose (degree)
1.	**F- 1**	0.71	0.62	14.30	1.19	29.5
2.	**F- 2**	0.58	0.67	11.58	1.22	30.6
3.	**F- 3**	0.59	0.57	11.22	1.12	29.4
4.	**F- 4**	0.78	0.46	11.6	1.11	28.8
5.	**F- 5(PVP)**	0.63	0.78	10.22	1.32	31.3

Table 3:Physical evaluations of Flurbiprofen tablets

Sl.No	Formulation	Weight variation	Friability (%)	Hardness (kg/cm^3)	Moisture content (%)	Disentrigation time (mins)
1.	**F- 1**	±2.29	0.65	4.2	6.4	4.2
2.	**F- 2**	±2.40	0.62	4.4	7.1	7.3
3.	**F- 3**	±2.15	0.67	4.8	4.2	15.6
4.	**F- 4**	±1.58	0.64	4.6	4.6	20.6
5.	**F- 5(PVP)**	±1.71	0.63	4.9	6.3	5.12

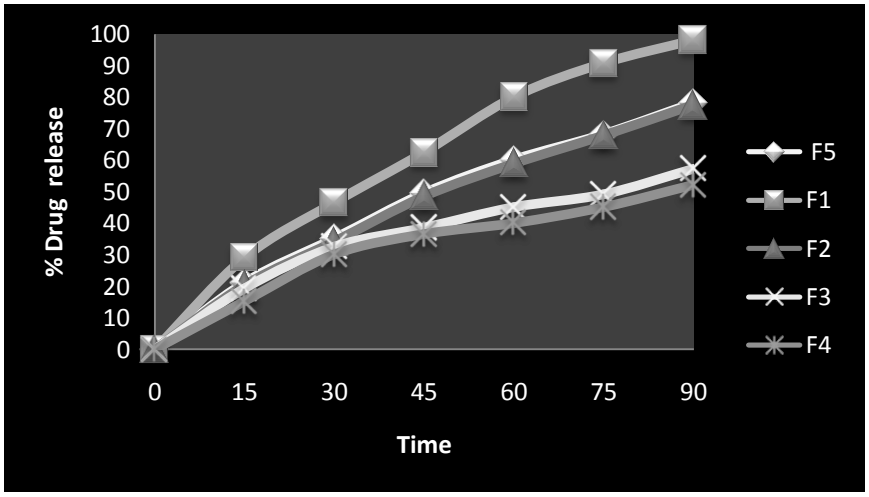

Figure 3: Comparative *in-vitro* drug release of formulations

Table 4: Release kinetics study of the various formulation

Sl .No	Formulations	Regression coefficient(R^2) values of various release kinetics			
		Zero order	First order	Hixon Crowell	Higuchi
1.	F_1	0.901	0.980	0.664	0.968
2.	F_2	0.979	0.992	0.715	0.971
3.	F_3	0.932	0.977	0.646	0.943
4.	F_4	0.928	0.968	0.658	0.936
5.	F_5	0.975	0.992	0.707	0.975

CONCLUSION

From the present study, it can be conclude that gum from the Gubb tree can be used as binding agent in tablet formulations and may be substituted for more expensive binders like PVP used as a comparison for the drug release.

REFERENCE

1. King RE, Tablets in Remington's Pharmaceutical Sciences, 15th Ed. Mack Pub. Coy. Easton, Pennnsylvania, **1975**: 1587.
2. Banker GS., Anderson NR., "Theory and practice of industrial pharmacy." 3rd

edition by Varghesee publishing house, Mumbai, **1987**: 321.

3. Nasipuri RN, Evaluation of Cocoyam Starch as Tablet Binder and Diintegrant *Acta Pharm Helv*. **1979**; 54 (2): 48-53.
4. Tsige G, Alexander SN, Evaluation Starch Obtained From Esente Ventricosum As a Binder and Disintegrant For Compressed Tablets. *J.Pharm. Pharmacol*. **1993**; 45(307): 317-320.
5. Iwuagwu MA, Evaluation of Some Soluble Starches a Lubricants in the Formulation of Compressed Tablet, *World Pharm. J*. **1991**; 8(1): 19-23.
6. Ibezim EC, Ofoefule SI, Omeje EO, Onyishi VI, Odoh UE, The Role of Ginger Starch as a Binder in Acetaminophen Tablets. Scientific Research and Essay , **2008**; 3(2): 046-050.
7. Sasidharan, Biodiversity documentation for Kerala- Flowering Plants, **2004**; part 6: 271.
8. Singh A, Monograph on Indian *Diospyros* L. (Persimmon, Ebony) Ebenaceae, **2005**; 45(2):193.
9. J.Staniforth, Pharmaceutics-the science of dosage form design, 2nd ed., Churchill livingstone, London ;**2002**: 207-208
10. Anand pradhakar, Mheaswari.m, Kdam.S.S, Preparation and characterization of Flurbiprofen beads by melt solidification. *Aaps pharmascitech*., **2008**;4:65.
11. Gaxia F, Yannli Y,Formulation of of flurbiprofen ethanolamine complex and their in vitro permeation across the skin. *Asian journal of pharmaceutics* .**2008**; 3:120-130.