Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 7, Issue 4, 2015

Short Communication

INVESTIGATIONS ON NOVEL BIO-BINDER ISOLATED FROM *AEGLE MARMELOS* USED IN IBUPROFEN TABLETS

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Received: 30 Dec 2014 Revised and Accepted: 25 Jan 2015

ABSTRACT

Objective: Binders are agents used to impart cohesive qualities to the powdered material during the production of tablets. Thus the aim of present research work was to formulate the oral tablets of Ibuprofen by using *Aegle marmelos* fruit gum as a binder.

Methods: In this study oral tablets of ibuprofen were formulated by using aegle marmelos fruit gum as a binder. Granules of ibuprofen were prepared by using binder solution of gum in the concentrations 2, 4, 6, 8 and 10 %. The tablets were compressed by using the single punch tablet machine and the prepared tablets were evaluated.

Results: All the evaluation parameters were found to be within the Pharmacopoeial limits at binder concentration 6-8 %. Drug release from tablets decreased with increase in binder concentration and tablets containing binder concentration of 6 % shows more optimum results.

Conclusion: Thus the *Aegle marmelos* gum was found to be useful for the preparation of uncoated tablet dosage form.

Keywords: Ibuprofen, *Aegle marmelos* gum, Binder, Drug release.

Oral tablet Manufacturing is the most significant in all Pharmaceutical manufacturing. In recent years, the way of tablet Manufacturing has been likely to head in new directions [1]. *Aegle marmelos*, a plant indigenous to India has been used by the inhabitants of the Indian subcontinent for over 5000 years and commonly known as bael [2]. Natural binders are widely used in pharmaceutical industries as excipients and additives due to their low toxicity, biodegradable, availability and low cost. Natural binders like different starches, gums and mucilage possess binding capacity and these are much safer and economical than PVP (polyvinyl pyrrolidone) [3]. Therefore, the rationale of this study is to develop the novel approach to enhance the use of natural excipients in the formulation development of dosage form due to ease availability at an affordable prize, high safety margin and higher productivity. Hence, the present study is aimed to enhance the use of natural plant based excipients as a binder to formulate ibuprofen uncoated tablets. Fruit gum was obtained from fruits of *Aegle marmelos* belonging to family Rutaceae is indigenous to India and it was standardized. For this about 2kg of fresh immature fruit of *Aegle marmelos* were purchased from a local market. After removal of the seeds, the fresh immature fruits were sliced, homogenized and extracted with cold water containing 1% (w/v) sodium metabisulphate. The crude mucilage was centrifuged at 3000 rpm for 5 min and the gum was precipitated from the supernatant with acetone. The precipitated gum was washed several times with acetone; the obtained cream coloured product was dried under vacuum in a dessicator. The well dried gum was powdered in mortar, passed through sieve No. 100 and solublized in distilled water. The concentrated solution was precipitated in acetone. The precipitate was separated and dried at 60°C. The dried gum was powdered and stored in tightly closed container for further usages [4]. And the obtained gum was standardized by determining loss on drying, percentage of total ash and pH of gum solution. The loss on drying was found to be less than 8% w/w. Percentage of total ash content was found to be less than 8% w/w and pH of 1% gum solutions was alkaline.

Formulations were developed by using Ibuprofen as a model drug. The five different batches of tablet formulations were prepared by wet granulation method. Granules of ibuprofen were prepared by using binder solution of gum in the concentrations 2, 4, 6, 8 and 10 % in distilled water and dried at 60^0C in oven [5, 6]. The granules were evaluated for fineness, percentage of particle size and angle of repose as in table 1. The tablet formulation was developed for 600 mg tablet weight using 400 mg of ibuprofen, 164, 152, 140, 128 and 116 mg of microcrystalline cellulose and 2-10 % w/v of *A. marmelos* gum as the tablet binder. The tablets were compressed by using single punch tablet machine and the prepared tablets were evaluated for content uniformity, hardness, friability, disintegration time and dissolution study [7]. Dissolution study was carried out in 900 ml 0.2M phosphate buffer (pH 6.8) medium using paddle type dissolution test apparatus and absorbance of the sample was measured at 264 nm using ultraviolet spectrophotometer, Simadzu (Pharmaspec1700). Evaluation of granules was observed that the percentage of fines was reduced as the concentration of binder was increased. All batches showed good flow property (angle of repose, 28.9 ± 0.84^0 to 31.2 ± 0.92^0) and exhibited a good uniformity in content (96.98±1.71 to 98.82±1.72 %). The hardness of tablet increased with increase in the percentage of binding agent (7.0±0.37 to 7.8±0.33 kg/cm^2) shown in table 2. The friability values decreased with increase in binder concentration and the disintegration time also increased with increase in binder concentration (8 min±2.5 to 20 min±2.3).

Table 1: Evaluation of granules prepared from *Aegle mormelos* gum

Characteristics	Binder concentration (%w/w)				
	2	4	6	8	10
Fineness	24.1±0.72	22.5±0.93	18.2±0.82	16.7±0.84	12±0.71
Particle size (mm)	0.720±0.10	0.724±0.09	0.760±0.12	0.772±0.09	0.780±0.11
Angle of repose(^{0})	28.9±0.84	29.1±0.82	29.84±0.91	30.12±0.94	31.2±0.92

Data are expressed mean±standard deviation (SD, N=3)

Table 2: Evaluation of Tablets prepared from *Aegle mormelos* gum as a binder

Characteristics	Binder concentration (%w/w)				
	2	4	6	8	10
Content uniformity (%)	96.98±1.71	98.82±1.72	98.80±1.70	98.78±1.82	96.98±1.70
Hardness (kg/cm²)	7.0±0.37	7.1±0.42	7.2±0.46	7.6±0.38	7.8±0.33
Friability (%)	1.50±0.41	1.30±0.44	1.00±0.42	0.75±0.33	0.68±0.32
Disintegration time (min)	8±2.5	10±2.4	15±2.8	18±2.6	20±2.3
% Drug release at 90 min	96.89±1.86	98.92±1.88	98.9±1.92	94.6±1.94	94.1±1.87

Data are expressed mean±standard deviation (SD, N=3)

All the evaluation parameters were found to be within the Pharmacopoeial limits at binder concentration 6-8 %. Dissolution study showed that the drug release from the tablets containing 2-10 % binder was more than 90 % in 90 min represented in fig. 1.

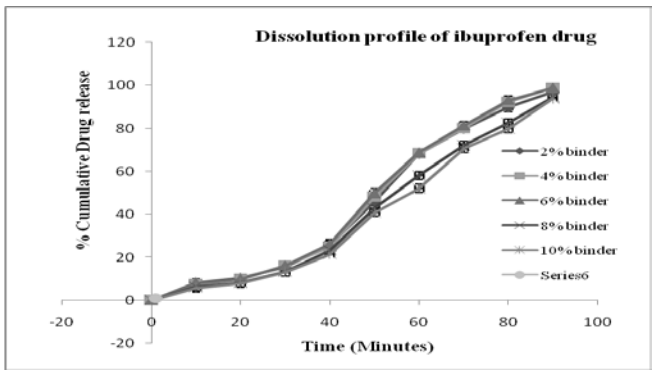

Fig. 1: Dissolution study showed that the drug release from the tablets containing 2-10% binder was more than 90% in 90 minutes

It was concluded that the drug release from tablets decreased with increase in binder concentration and tablets containing binder concentration of 6 % shows more optimum results. Thus, the *Aegle marmelos* gum was found to be useful for the preparation of uncoated tablet dosage form. And it can substitute more expensive binders. Therefore, *Aegle marmelos* gum as a natural material can be widely used in the field of drug delivery, because it is readily available, cost-effective, eco-friendly, potentially degradable, and compatible due to its natural origin.

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