Locust bean Gum as Superdisintegrant – Formulation and Evaluation of Nimesulide Orodispersible Tablets

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Summary

Orodispersible tablets disperse instantaneously in the mouth so that they can be swallowed without the aid of water. The aim of the present study was to formulate nimesulide orodispersible tablets using locust bean gum as a natural superdisintegrant. The gum was evaluated for powder flow properties, swelling index and loss on drying. Excellent powder flow properties were observed, swelling index was found to be 20 which indicated appreciable capability of locust bean gum to be used as superdisintegrant.

The prepared tablets were evaluated against standard superdisintegrant i.e. crosscarmellose sodium. Disintegration time of tablets containing 10 % locust bean gum was found to be 13 seconds. The prepared batches were also evaluated for wetting time, water absorption ratio, effective pore radius, porosity, *in vitro* and *in vivo* disintegration time, *in vitro* release and stability studies. Wetting time was found to reduce from 19 ± 2 to 11 ± 3 sec (A1–A4) and 51 ± 2 to 36 ± 3 sec (B1–B4). Effective pore radius and porosity were found to be increase with increase in polymer concentration. The superdisintegrant property of locust bean gum may be due to concentration dependent wicking action leading to formation of porous structure which disintegrates the tablet within seconds.

In-vivo results were complementary to in-vitro disintegration time results. The in-vitro release studies were compared against marketed nimesulide fast dissolving tablets (Nimulid MD). Stability studies showed that there was no significant change in hardness, friability, tensile strength and assay of the prepared formulations. The f_2 values (in comparison with Nimulid MD) of 92.27 and 98.19 were obtained with A3 and A4 batches respectively.

Key words: superdisintegrant, orodispersible tablet, locust bean gum, cross carmellose sodium, nimesulide

Mączka chleba świętojańskiego jako środek przyspieszający rozpad – skład i ocena Nimesulidu w formie tabletek ulegających rozpadowi w jamie ustnej

Streszczenie

Tabletki ulegające rozpadowi w jamie ustnej rozpuszczają się natychmiast w jamie ustnej, dzięki temu mogą być przyjęte bez popicia wodą. Celem pracy było opracowanie składu tabletek Nimesulidu, ulegających rozpadowi w jamie ustnej z użyciem mączki chleba świętojańskiego, jako naturalnego środka przyspieszającego rozpad. Oceniono mączkę pod względem właściwości płynięcia, wskaźnika

pęcznienia i strat przy wysychaniu. Zaobserwowano doskonałe właściwości płynięcia. Wskaźnik pęcznienia wyniósł 20, co oznacza znaczne możliwości wykorzystania mączki jako środka przyspieszającego rozpad.

Przygotowane tabletki oceniono w porównaniu do standardowego środka przyspieszającego rozpad, tj. kroskarmelozy sodowej. Czas rozpadu tabletek zawierających 10% mączki chleba świętojańskiego wyniósł 13 sekund. Przygotowaną partię zbadano pod względem czasu nawilżania, szybkości pobierania wody, faktycznego promienia pora, porowatości, czasu rozpadu *in vitro* i *in vivo*, uwalniania *in vitro* i stabilności. Czas nawilżania zmniejszył się z 19 ± 2 do 11 ± 3 s (A1–A4) i z 51 ± 2 do 36 ± 3 s (B1–B4). Faktyczny promień pora i porowatość zwiększały się wraz ze zwiększaniem się koncentracji polimeru. Właściwości przyspieszania rozkładu mączki chleba świętojańskiego, mogą być wynikiem działania zależnego od stężenia pochłaniającego prowadzącego do powstania struktury porowatej, która rozkłada tabletkę w ciągu kilku sekund.

Wyniki *in vivo* uzupełniły wyniki badań czasu rozpadu *in vitro*. Badania uwalniania *in vitro* porównano z dostępnymi komercyjnie szybko rozpuszczającymi się tabletkami Nimesulidu (Nimulid MD). Badania stabilności wykazały, że nie było istotnych zmian w twardości, ścieralności, wytrzymałości na rozciąganie przygotowanych preparatów. Wartości f2 (w porównaniu z Nimulidem MD) 92,27 i 98,19 uzyskano z partii A3 i A4.

Słowa kluczowe: środek przyspieszający rozpad, tabletka ulegająca rozpadowi w jamie ustnej, mączka chleba świętojańskiego, kroskarmeloza sodowa, Nimesulid

INTRODUCTION

The oral route of drug delivery is the most preferred route of administration of drugs for systemic action. The tablet is the most widely used oral dosage form because of its convenience in terms of self-administration, compactness, non-invasive and economical to manufacture. In case of conventional tablets, bed ridden, children and old age patients often face swallowing problems leading to poor patient compliance. To overcome these problems fast disintegrating tablets also known as orodispersible tablets are prepared which when placed on tongue disintegrates within seconds and the drug dissolves or get dispersed in saliva [1]. The technologies used for preparation of orodispersible tablets include lyophilization [2], moulding [3], direct compression [4], cotton candy process [5], spray drying [6], sublimation [7] and nanonization [8]. These techniques are based on the principles of increasing porosity and/or addition of superdisintegrants and water soluble excipients in the tablets [9]. Direct compression technique utilizes use of superdisintegrants which disintegrate the tablet within seconds. Superdisintegrants such as sodium starch glycolate, cross carmellose sodium and crosspovidone have swelling and capillary action based mechanism of superdisintegration. Another mechanism of super disintegration of tablets is by the liberation of carbon dioxide from chemical reaction between citric acid/ tartaric acid with sodium bicarbonate, sodium carbonate, potassium bicarbonate [10]. Ion exchange resins like Indion 414 have also been explored for their superdisintegrant property which acts by swelling mechanism [11]. Plant products nowadays are widely used as an alternative to synthetic products due to ease of local accessibility, lower prices as compared to synthetic products, biocompatible, biodegradable nature and environment friendly nature. Some natural superdisintegrants explored by researchers include plantago ovate [12], mango peel pectin [13], rhodiola rosea [14], ocimum americanum [15] and aloe vera [16].

Locust bean gum also called as carob bean gum is a galactomannan vegetable gum extracted from the seeds of the Carob tree (*Ceretonia siliqua*), mostly found in the Mediterranean regions. Locust bean gum has been widely used in food industry as a thickening and gelling agent [17]. Locust bean gum has also been reported to have bioadhesive and solubility enhancement properties [18, 19].

Nimesulide (4'-nitro-2'-phenoxy methane sulfonanilide) is a weakly acidic non-steroidal anti-inflammatory drug (BCS class II), is widely used in the treatment of the management of a variety of painful and inflammatory conditions like post-operative pain, primary dysmenorrhea and painful osteoarthritis. It shows high anti-inflammatory, antipyretic, and analgesic activities in addition to low toxicity, a moderate incidence of gastric side effects, and a high therapeutic index [20].

Owing to extensive swelling properties of locust bean gum, the purpose of the present study was to evaluate locust bean gum as a superdisintegrant in the formulation of nimesulide orodispersible tablets.

Locust bean gum powder was evaluated for powder flow properties (bulk density, tapped density, angle of repose, carr's consolidation index, hausner ratio), swelling index and loss on drying. The prepared batches of orodispersible tablets (using locust bean and standard superdisintegrant) were evaluated for parametric tests of tablets (thickness, diameter, hardness, tensile strength and friability), wetting time, water absorption ratio, effective pore radius, porosity, packing fraction, moisture uptake studies, in-vitro and in-vivo disintegration time, in-vitro release and stability studies.

MATERIALS

Nimesulide and cross carmellose sodium were received as gift samples from Park Pharmaceuticals, Baddi, India. Locust bean gum was obtained as gift sample from Lucid Gums, Mumbai, India. Avicel PH-101 was procured from Sigma Aldrich, USA. Talc and magnesium stearate were purchased from S. D. Fine Chemicals Ltd. Mumbai, India. All other chemicals and reagents were of analytical grade and were used as such.

METHODS

Evaluation of powder properties of locust bean gum

The locust bean powder was evaluated for flow properties including bulk density, tapped density, angle of repose, carr's compressibility index and hausner ratio.

Swelling index

The study was carried out using a 100 ml stoppered graduated cylinder. The initial bulk volume of 1 gm of locust bean gum was noted. Water was added in sufficient quantity to produce 100 ml of a uniform dispersion. The dispersion was stored at room temperature and the sediment volume of the swollen mass was measured after 24 hour. The swelling index was calculated as

$$\text{Swelling index} = \frac{V_2 - V_1}{V_1} * 100$$

Where: V_1 and V_2 are initial volume of material before hydration and volume of hydrated material, respectively.

Viscosity

Viscosity of 1% solution of (w/v) locust bean gum was measured at 37±1 °C using searle type viscometer, DV-2 +LV Brookfield Viscometer, USA with spindle number 62 at different rpm.

Determination of pH

The pH of 1% solution of (w/v) locust bean gum was determined using digital pH meter (EI products, India) at 37°C.

Loss on drying

Loss on drying technique (LOD) is used to determine high levels of moisture or solvents present in the sample. The material sample was weighed (W_1) and heated in an oven for 2 hrs. Sample was cooled in the dry atmosphere of a desiccator, and then reweighed (W_2). % LOD was calculated by

$$\% \text{ LOD} = (W_1 - W_2 / W_1) * 100$$

Preparation of tablets

Orodispersible tablets containing 100 mg of nimesulide were prepared by direct compression method and the different formulae employed in the study are shown in table 1. The drug and excipients were passed through 60 mesh sieve ensure better mixing. Avicel PH 101 was used as a directly compressible diluent. The directly compressible mixture were compressed using mutipunch tableting machine (AK Industries, India) fitted with 8.40 mm flat faced punch and die set possessing 50 ton compression force. Before compression, the surface of die and punch were lubricated with magnesium stearate.

Evaluation of tablets
Diameter and thickness

A calibrated vernier calliper was used for diameter and thickness evaluation of tablets.

Table 1. Formulation code table of the formulated tablet batches

Tabela 1. Kod składu przygotowanych partii tabletek

Ingredients (mg)	A1	A2	A3	A4	B1	B2	B3	B4
Nimesulide	100	100	100	100	100	100	100	100
Locust bean gum	6.25	12.5	18.75	25	–	–	–	–
Crosscarmellose sodium	–	–	–	–	6.25	12.5	18.75	25
Avicel PH 101	138.75	132.5	126.25	120	138.75	132.5	126.25	120
Talc	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Magnesium stearate	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Hardness

The hardness of the tablets was determined by using a Hardness testing apparatus (Monsanto hardness tester). A tablet hardness of about 4-5 kg/cm^2 is considered adequate for mechanical stability. Determinations were made in triplicate.

Friability

Twenty tablets were weighed and placed in a Roche friabilator and rotated at 25 rpm for 4 min. The tablets were taken out, dedusted and reweighed. The weight loss should not be more than 1 %. The percentage friability of the tablets was calculated by the formula:

$$\text{Percentage friability} = \text{Repeated twice}$$

$$= \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} * 100$$

Measurement of tablet tensile strength

The tablet tensile strength is the force required to break a tablet by compressing it in the radial direction and is measured using a monsanto hardness tester. For measuring the hardness of the tablets, the plunger of the hardness tester is driven down at a speed of 20 mm/min. Tensile strength for crushing (T) is calculated using equation:

$$T = 2F / \pi dt$$

Where: F is the crushing load, and d and t signify the diameter and thickness of the tablet, respectively.

Wetting Time

A piece of tissue paper (10.75×12 mm) folded twice was placed in a culture dish (d=6.5 cm) containing 6 ml of water (containing a water soluble dye eosin). A tablet was carefully placed on the surface of tissue paper and the time required for water to reach the upper surface of the tablet was noted as the wetting time [21].

Water Absorption Ratio

Test was done with the same procedure as that of wetting time. In this test initial weight of tablet was taken before placing on petri dish. After complete wetting the wetted tablet was then weighed. Water absorption ratio, R was determined using the equation:

$$R = 100\ (W_b - W_a)/W_b$$

Where: W_a is weight of tablet before water absorption and W_b is weight of tablet after absorption [21].

Effective pore radius ($R_{eff.P}$)

Reff.P of the powder blend was determined using method reported by Rana et al [22]. In this method a micropipette tip (2ml, transparent) was completely filled with powder and weighed (W_i). Then n-hexane (surface tension (γ) 18.4 mN/m) was poured dropwise on bedtop till the solvent filtered out at the bottom of the tip. The tip was reweighed (W_f). The experiments were repeated 3 times:

$$R_{eff.P} = W_f - W_i / 2\pi\gamma$$

Porosity

Porosity is a measure of the void spaces in a material, and is a fraction of the volume of voids over the total volume, between 0–1, or as a percentage between 0–100 percent.

The porosity of the tablets was calculated as follows:

$$\varepsilon = 1 - \frac{m}{\rho^*_{\text{true}} V}$$

Where: ρ true is the true density of the mixture, m and V are the weight and volume of the tablet, respectively.

The true density of the powder was found using true density meter (SMART PYCNO 30). True density was calculated using two pressure readings. Initially helium gas was pressurised in a known reference volume. This reading was taken as first pressure reading. Then the gas is allowed to pass to sample cell containing the sample material. There is a drop in pressure as compared to initial pressure and this dropped pressure is taken as second pressure reading. Then material volume is calculated from which true density is calculated. When Helium is used initially vacuum is necessary to remove air from the pores of the sample. After that purging with Helium gas is done. Then the normal procedure is followed.

Tablet packing fraction

The tablet packing fraction f should be in subscript is a measure of the degree of consolidation or compactness of the tablet. Tablet packing fraction was determined by the following method:

$$\text{Packing fraction } (P_f) = w/ \pi r^2 t\rho$$

Where: w is the weight of a tablet, r is radius, t is thickness and ρ is the particle density.

Ten tablets were used in each measurement. The radius and thickness of tablets were measured using a vernier calliper. The apparent particle density of the drug powder was determined using liquid paraffin displacement method. Firstly, the weight of a specific gravity (SG) bottle filled with liquid paraffin and the weight of the SG bottle containing a sample of the drug powder (1 g accurately weighed) was noted and then was filled with liquid paraffin. The final weight was determined. The determination was executed in triplicate, and mean results were used in the calculation of Pf. If the packing fraction is very high, fluid is unable to penetrate in the tablet which leads to slower disintegration [23].

In vitro disintegration time

Disintegration time for FDTs was determined using USP disintegration apparatus with borate buffer (pH 8.4, 900 ml at 37°C) as the disintegrating medium. To comply the test all tablets should disintegrate within 3 minutes as per official requirements.

In vivo disintegration time

In vivo disintegration time was judged in five healthy male volunteers for each batch of tablets. The volunteers were previously well-versed for purpose of the study. All the volunteers were instructed to rinse their oral cavity with distilled water prior to the test. Each volunteer was asked to place one tablet on the tongue and stopwatch was started immediately. Volunteers were strictly told not to chew or swallow the tablets, licking was allowed. The end point for disintegration was taken when there were no lumps left in the oral cavity. After the test was concluded, volunteers were told to rinse there mouth properly.

Moisture uptake studies

Orodispersible tablets usually contain high content of hydrophilic excipients which leads to increased chances of moisture uptake, so they need special attention towards their storage and packaging. Therefore, moisture uptake studies are strongly recommended for orodispersible tablets [24]. The test was performed by keeping ten tablets in a desiccator (containing calcium chloride) for 24 hours at 37 °C to assure complete drying. The tablets were then weighed and stored for 2 weeks at 75% humidity. A saturated solution of sodium chloride was kept at the bottom of the desiccator for three days to achieve required humidity. On the tenth day tablets were re-weighed and the percentage increase in the weight was recorded (Table 3).

Drug content

Twenty tablets were weighed and powdered. An amount of the powder equivalent to 100 mg of nimesulide was dissolved in 100 ml of pH 8.4 alkaline bo-

rate buffer, filtered, diluted appropriately and analysed for drug content at 397nm using UV-Visible spectrophotometer (Systronics 2202, India).

In vitro dissolution Studies

In vitro drug release of the prepared batches was determined using eight stage USP dissolution apparatus II (Lab India, DS 8000). The dissolution test was performed using 900 ml of alkaline borate buffer (pH 8.4) at 37 ± 0.5 °C. The speed of rotation of paddle was set at 100 rpm. At a predetermined time interval, 5 ml samples were withdrawn, filtered through whatman filter paper, amply diluted and analysed using UV-Visible spectrophotometer (Systronics 2202) at 397 nm. All experiments were run in triplicate.

Stability testing

The prepared batches were evaluated for stability studies. During the full duration of study temperature and pressure of about 40 ± 2°C and 75% RH respectively were maintained. The formulations were analysed at 0 day, 1 and 3 month time interval for hardness, friability, tensile strength and assay.

RESULTS AND DISCUSSION

For characterisation of locust bean gum, powder flow properties, swelling behaviour, viscosity, pH, effective pore radius, porosity and loss on drying were studied. The results of powder flow properties (Table 2) clearly indicate good flow characteristics of the natural polymer. Swelling index was found to be 2000 which point towards good swelling competency of locust bean gum. Viscosity of 1% w/v solution of locust bean gum using spindle number 62 of Brookfield viscometer was found to be 83, 81, 82.5, 80.4 and 78 at 5, 10, 20, 50 and 100 rpm, respectively. pH of 1% w/v solution was found to be 5.79. Loss on drying was obtained to be 13.56% which was well within limits for locust bean gum (max 14%).

Table 2: Powder evaluation parameters

Tabela 2. Wskaźniki oceny proszku

Parameters	Results
Bulk Density(g/cm^3)	0.42
Tapped density(g/cm^3)	0.59
Angle of repose	20.52
Carr's compressibility index (%)	17.85
Hausner ratio	1.12
Swelling index	2000

All the batches of orodispersible tablets were formulated under similar conditions to avoid processing variables. The prepared tablets were evaluated for various physical parametric tests. The diameter and thickness (Table 3) of tablets was found out to be 8.45 ± 0.01 to 8.42 ± 0.03 mm (A1–A4), 8.42 ± 0.04 to 8.41 ± 0.03 mm (B1–B4) and 4.74 ± 0.02 to 4.73 ± 0.03 (A1–A4) , 4.81 ± 0.06 to 4.80 ± 0.05 mm (B1–B4) respectively. Effect of locust bean concentration in different batches had an appreciable effect on tablet hardness and friability. Hardness and friability (Figure 1) were found to be 2.52 ± 0.15 to 6.00 ± 0.10 kg/cm^2 and 0.59 ± 0.04 to 0.24 ± 0.03 % respectively clearly indicating binding potential of locust bean gum. Tensile strength (a parameter of mechanical integrity of tablet) was found to increase from 0.497 ± 0.05 to 1.194 ± 0.18 (A1–A4) confirmed binding capability of locust bean gum. Wetting time, water absorption ratio and in-vitro disintegration time were found to be ranging between 19 ± 2 to 11 ± 3 seconds, 59.96 ± 0.25 to 74.76 ± 0.20 and 20 ± 1 to 13 ± 1 second respectively. Water absorption ratio was found to increase from batch A1 to A4 clearly points towards increase in wicking potential of locust bean gum together with good swelling potential and porosity enhancing property leading to decrease in disintegration time with increase in polymer concentration. $R_{eff.P}$ is an indicator of tablet porosity. $R_{eff.P}$ and porosity (Figure 2 and 3) were found to be ranging from 3.323 ± 0.25 to 3.946 ± 0.36 mm (A1 to A4) and 14.466% to 22.479 % respectively indicating appreciable capability of locust bean gum to increase water penetration due to wicking action which increases porosity thus lowers disintegration time with increase in polymer concentration. Tablet packing fraction was found to be 0.855, 0.833, 0.811 and 0.775 (A1–A4) which indicates towards tablet superdisintegrant property of locust bean gum. Figure 4 depicts the disintegration pattern of orodispersible tablets formulated using locust bean gum as superdisintegrant. *In vivo* disintegration test was also performed on five healthy male volunteers. The in-vivo disintegration time was found to be 19 ± 1 to 11 ± 2 seconds (A1–A4). In vivo performance of the formulated orodispersible tablets using locustbean gum as superdisintegrant is well in line with the in vitro results.

Table 3: Evaluation of the prepared tablets

Tabela 3. Ocena przygotowanych tabletek

Parameters	AI	A2	A3	A4	Bl	B2	B3	B4
Diameter (mm)	8.45 ± 0.01	8.41 ± 0.02	8.44 ± 0.02	8.42 ± 0.03	8.42 ± 0.04	8.45 ± 0.02	8.42 ± 0.05	8.41 ± 0.03
Thickness (mm)	4.74 = 0.02	4.71 = 0.05	4.72 = 0.04	4.73 ± 0.03	4.81 ± 0.06	4.79 ± 0.07	4.80 ± 0.02	4.80 ± 0.05
Friability (%)	0.59 ± 0.04	0.48 ± 0.01	0.38 ± 0.01	0.24 ± 0.03	0.84 ± 0.06	0.87 ± 0.04	0.70 ± 0.02	0.68 ± 0.01
Hardness (kg/cm^2)	2.52 ± 0.15	3.59 ± 0.10	4.25 ± 0.20	6.00 ± 0.10	2.56 ± 0.72	2.87 ± 0.49	3.01 ± 0.77	3.40 ± 0.56
Tensile strength (MNm^2)	0.497 ± 0.05	0.697 ± 0.15	0.995 ± 0.12	1.194 = 0.18	0.402 ± 0.09	0.454 ± 0.07	0.475 ± 0.14	0.537 ± 0.11
Wetting time (sec)	19±2	16 ± 1	15 ±2	11±3	51 =b 2	44±4	38 ±1	36 ±3
Water absorption ratio %	59.96 ± 0.25	66.03 ± 0.66	70.13 ± 0.50	74.76 ± 0.20	52.12 ± 0.66	59.10 ± 0.28	63.29 ± 1.45	70.53 ± 1.10
In-vitro Disintegration time (sec)	20±1	17±2	15±2	13 ±1	65 ±5	55±4	40±6	25 ±5
In-vivo Disintegration time (sec)	19±1	15±2	13 ±3	11±2	63 3:4	52±6	38 ±5	24±2
% Moisture uptake	0.75 ± 0.02	0.60 ± 0.03	0.52 ± 0.04	0.45 ± 0.09	0.77 ± 0.02	0.62 ± 0.04	0.55 ± 0.01	0.47 ± 0.07
Drug content (%)	99.15 ± 0.15	98.99 = 0.25	98.92 ± 0.70	99.12 ± 0.30	95.75 ± 1.03	96.59 ± 0.56	98.22 ± 0.87	97.27 ± 0.92
f_2	69.45	74.56	92.27	98.19	71.13	87.55	81.49	71.80

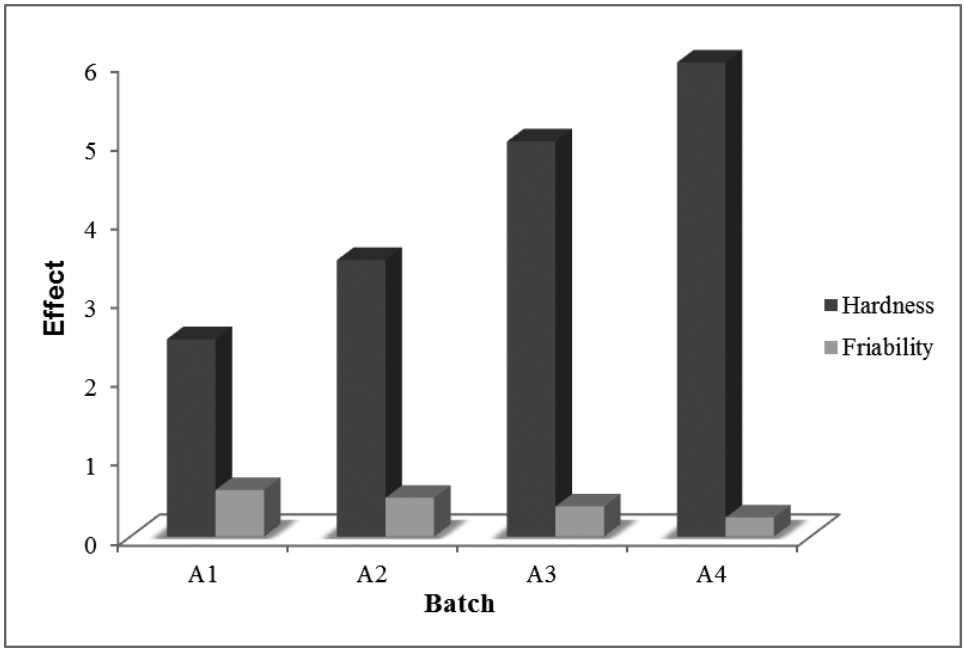

Fig. 1. Effect of locust bean concentration on tablet hardness and friability

Ryc. 1. Wpływ stężenia mączki chleba świętojańskiego na twardość i kruchość tabletek

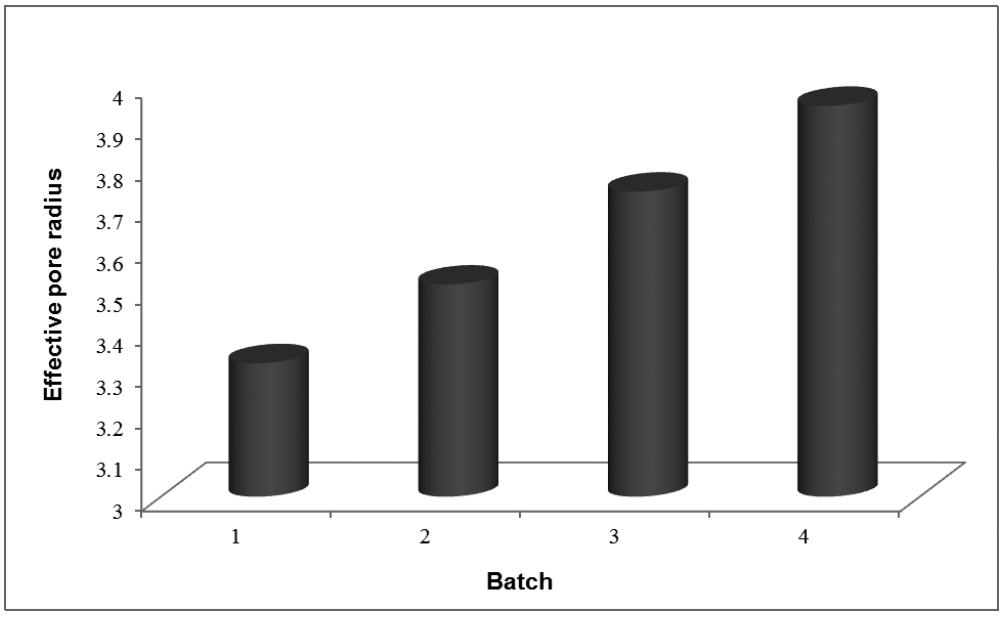

FIG. 2. Effect of locust bean gum on effective pore radius

RYC. 2. Wpływ mączki chleba świętojańskiego na faktyczny promień pora

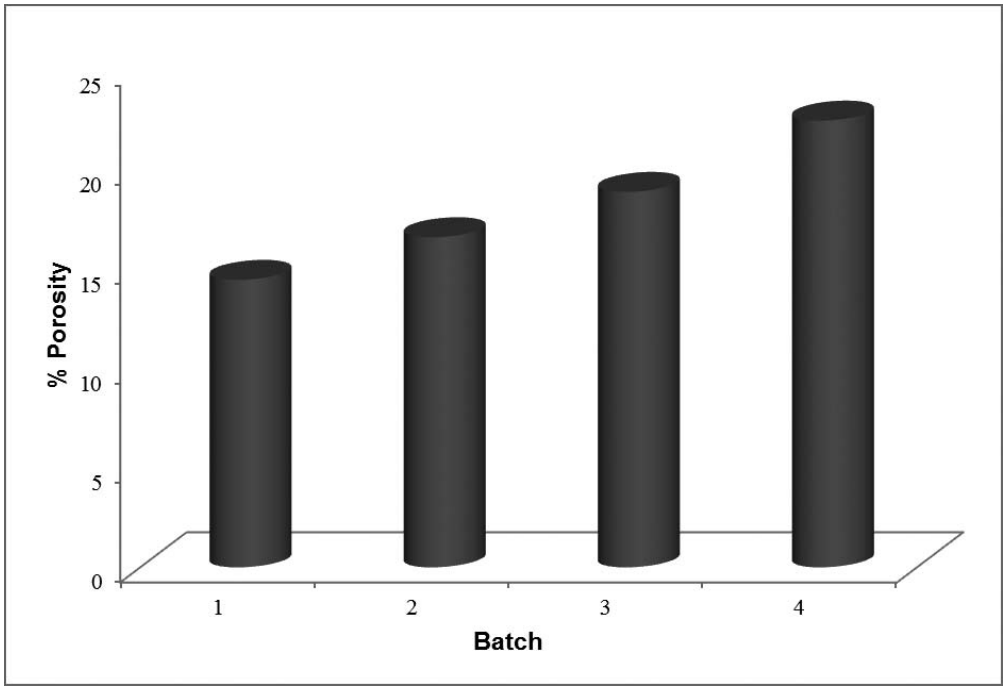

FIG. 3. Effect of locust bean gum on tablet porosity.

RYC. 3. Wpływ mączki chleba świętojańskiego na porowatość tabletek

The moisture uptake study indicates no significant uptake of moisture by the prepared batches during the 10 day test period. Percent moisture uptake was found to be 0.75 ± 0.02 to 0.45 ± 0.09 (A1–A4) and 0.77 ± 0.02 to 0.47 ± 0.07 (B1–B4).

In vitro nimesulide release was 95.13% (A1), 99.80% (A4), 91.58% (B1) and 94.21 (B4) batches of FDTs (Figure 5, 6). The similarity factor (f_2) is a logarithmic transformation of the sum-squared error of differences between the test Tj and reference Rj products over all time points. It is a useful tool for comparison of dissolution profiles when more than three or four dissolution time points are available.

$$f_2 = 50 \times \log\left\{\left[1 + (1/n)\sum_{j=1}^{n} w_j \left|R_j - T_j\right|^2\right]^{-0.5} \times 100\right\}$$

Where: w_j is an optional weight factor. The similarity factor fits result between 0 and 100. It is 100 when the test and reference profiles are identical and tends to 0 as the dissimilarity increases. In order to consider similar dissolution profiles, f_2 values should be close to 100.

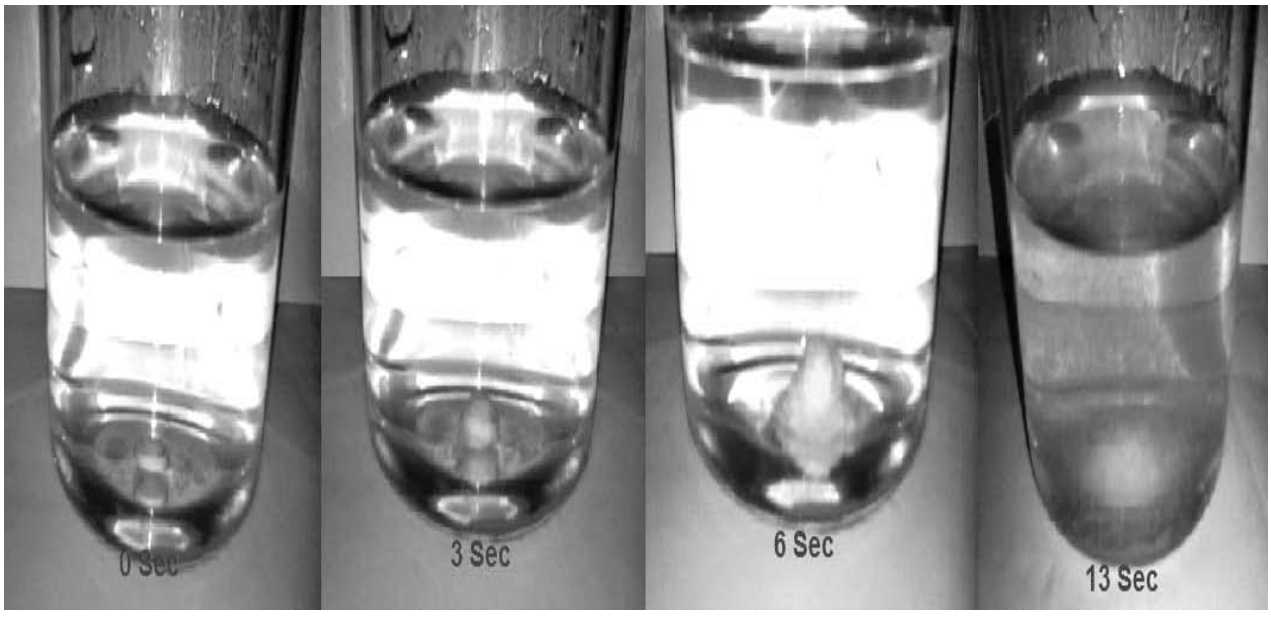

Fig. 4. Disintegration pattern of prepared orodispersible tablets using locust bean gum as superdisintegrant

Ryc. 4. Etapy rozpadu tabletek z mączką chleba świętojańskiego jako środkiem przyspieszającym rozpad tabletek w jamie ustnej

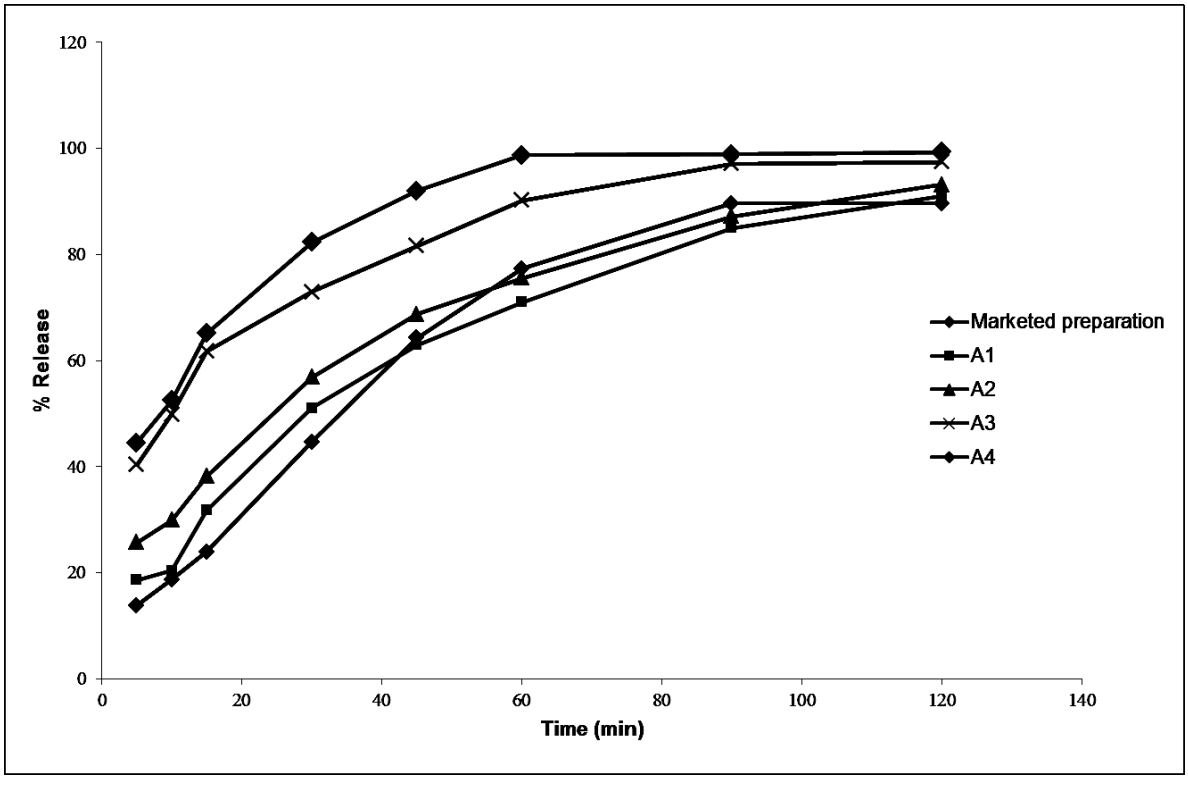

Fig. 5. *In vitro* release of Nimesulide from prepared orodispersible tablets using locust bean gum as superdisintegrant

Ryc. 5. Uwalnianie Nimesulidu *in vitro* z tabletek z mączką chleba świętojańskiego jako środkiem przyspieszającym rozpad tabletek w jamie ustnej

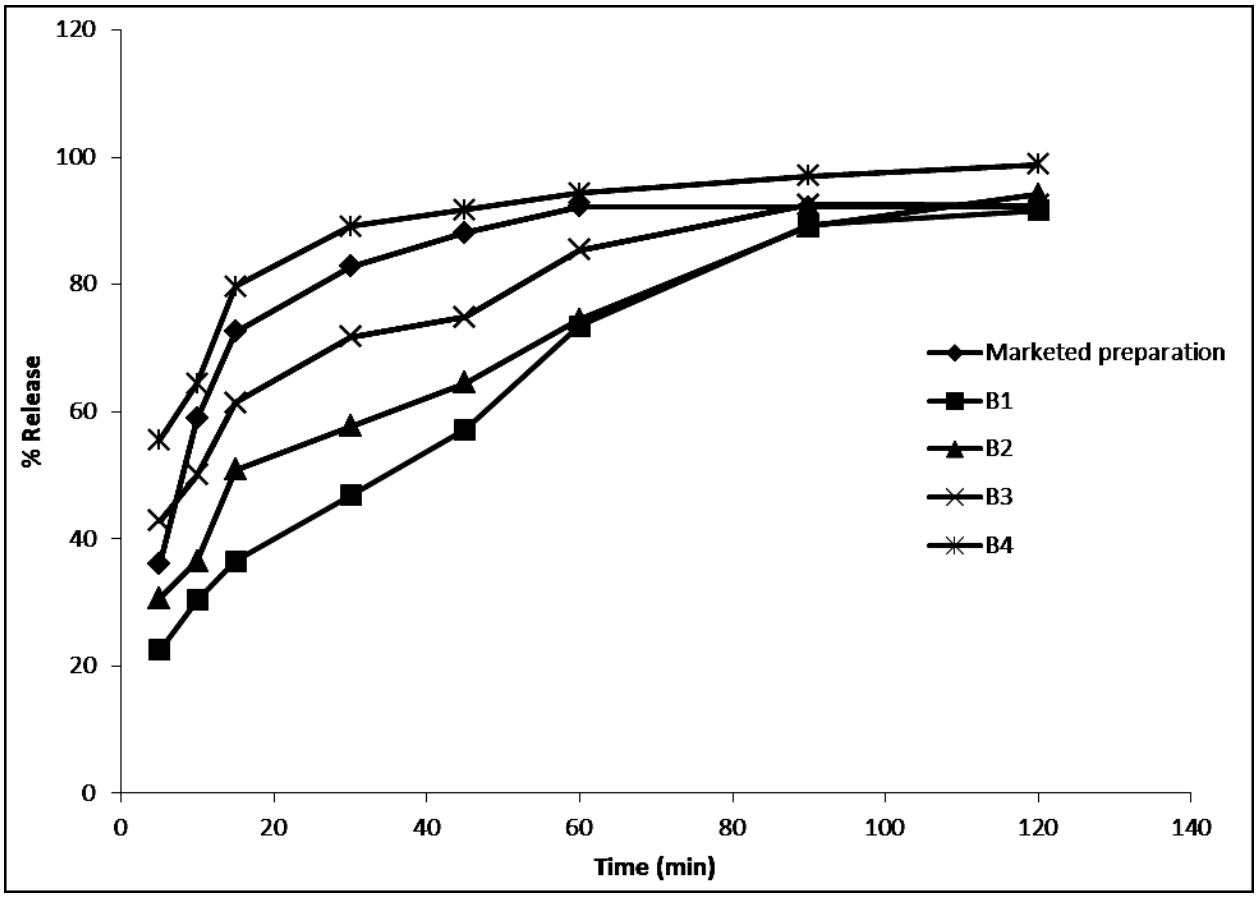

Fig. 6. *In vitro* release of Nimesulide from prepared orodispersible tablets using crosscarmellose sodium as superdisintegrant

Ryc. 6. Uwalnianie Nimesulidu *in vitro* z przygotowanych tabletek z kroskarmelozą sodową jako środkiem przyspieszającym rozpad tabletek w jamie ustnej

The results obtained from the calculation of f_2 factor showed that there is a similarity of dissolution profiles between A1 to A4 and B1 to B4 and Nimulid MD tablets. However A3 and A4 batches showed f_2 values of 92.27 and 98.19 respectively which were highest amongst all the formulated batches.

Stability studies for the prepared batches containing locust bean gum as superdisintegrant was performed which indicated that there was no significant change in tablet harness, friability, tensile strength and drug content (Table 4).

CONCLUSION

In the present study the superdisintegrant property of locust bean gum has been explored. Extensive swelling, porosity and wicking action of the natural material in the orodispersible tablet formulation were found to be contributing its superdisintegrant action. The tablets disintegrated much faster and consistently when locust bean gum was used as superdisintegrant compared to cross carmellose sodium. Locust bean gum and modified locust bean gum could be used for different applications in tablet dosage forms and may be explored as high functionality excipient for future applications.

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Table 4: Stability study data of prepared locust bean orodispersible tablets

Tabela 4. Badania stabilności tabletek z mączką chleba świętojańskiego ulegających rozpadowi w jamie ustnej

Batch	Parameter (Months)											
	Hardness			Friability			Tensile strength			Drug content		
	0	1	3	0	1	3	0	1	3	0	1	3
A1	2.52 ± 0.15	2.51 ± 0.10	2.49 ± 0.20	0.59 ± 0.04	0.60 ± 0.02	0.063 ± 0.03	0.497 ± 0.05	0.492 ± 0.03	0.490 ± 0.01	99.15 ± 0.25	99.01 ± 0.10	98.92 ± 0.25
A2	3.59 ± 0.10	3.56 ± 0.40	3.52 ± 0.30	0.48 ± 0.05	0.49 ± 0.05	0.50 ± 0.08	0.697 ± 0.15	0.692 ± 0.20	0.687 ± 0.10	98.45 ± 0.19	98.42 ± 0.12	98.36 ± 0.05
A3	4.25 ± 0.20	4.23 ± 0.10	4.21 ± 0.05	0.38 ± 0.01	0.39 ± 0.05	0.41 ± 0.09	0.995 ± 0.12	0.991 ± 0.05	0.989 ± 0.01	99.76 ± 0.57	99.72 ± 0.10	99.65 ± 0.15
A4	6.0 ± 0.10	5.9 ± 0.25	5.85 ± 0.10	0.24 ± 0.01	0.25 ± 0.02	0.27 ± 0.05	1.194 ± 0.18	1.188 ± 0.03	1.182 ± 0.02	99.98 ± 0.25	99.85 ± 0.13	99.72 ± 0.21

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