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ORIGINAL RESEARCH ARTICLE

Isolation and Evaluation of Tamarind Seed Polysaccharide as a Natural Suspending Agent

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ABSTRACT

The Tamarind seed polysaccharide (TSP) possesses properties like high viscosity, broad pH tolerance, no carcinogenicity, mucoadhesive nature, and biocompatibility. Since suspensions are thermodynamically unstable, it requires a suspending agent which reduces the rate of settling and permits easy redispersion of any settled particulate matter. So an attempt was made to use this polysaccharide as suspending agent in the formulation of Nimesulide suspension. The formulations were prepared and compared with the marketed product. All the formulations were redispersed uniformly without any deposits. The average size of the particles in the suspension was found to be 35.4 µm and the minimum and maximum particle size were 17.3 and 70.3 µm respectively. The drug content of all the formulations was in the range of 95-98.3%. The rheological study of the formulation F3 indicated that as the RPM increases the viscosity decreases, confirming the shear thinning nature of the suspension. The suspension was found to be stable during the entire period of study. Hence the present work confirms that the isolated TSP powder can be used as an effective suspending agent. But the feasibility of isolation of TSP powder in large scale needs to be studied in future.

KEYWORDS Nimesulide, Tamarind seed polysaccharide, Suspending agent, Rheology

INTRODUCTION

A pharmaceutical suspension, like other disperse systems, is thermodynamically unstable, thus, making it necessary to include in the dosage form, a stabilizer or suspending agent which reduces the rate of settling and permits easy redispersion of any settled particulate matter both by protective colloidal action and by increasing the consistency of the suspending medium[1]. Plant Mucilage are pharmaceutically important polysaccharide with wide rang of applications such as thickening, binding, disintegrating, suspending, emulsifying, stabilizing, and gelling agents. They have been also used as matrices for sustained and control release drugs[2]. Mucilage because of its colloidal nature and viscosity can be used to suspend insoluble substances in liquids and help in preventing sedimentation. Drugs that are insoluble or poorly soluble in water are ideal candidates for formulating into suspension. It also prevents degradation of drug and improves stability of drug [3]. Nimesulide is a non steroidal anti-inflammatory drug that is useful in the treatment of pain associated with fever. It is highly effective in reducing pain associated with osteoarthritis, rheumatoid and other degenerative joints disorders, low back pain, dysmenorrheal, gynecological condition, thrombophlebitis, dental pain and inflammations. It has some severe side effects such as epigastria pain, heartburn, nausea, diarrhea, vomiting, peptic ulcer and hepatic impairments. Nimesulide is having half-life 1.56 to 4.95 hr which requires frequent dosing to maintain plasma concentration[4]. Various works have been reported with respect to usage of Nimesulide for paediatric purpose[5, 6]. Tamarind seed polysaccharide which is obtained from the seed kernel of Tamarindus indica possesses properties like high viscosity, broad pH tolerance, noncarcinogenicity, mucoadhesive nature, and biocompatibility. It is used as stabilizer, suspending agent, thickener, gelling agent, and

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binder in food and pharmaceutical industries[7, 8]. The purpose of this study was to isolate a natural pharmaceutical excipient from tamarind seed and to check its utility as an effective suspending agent in the formulation of pharmaceutical suspensions. The prepared suspension was compared with that of a marketed product and evaluated for various parameters like sedimentation volume, archeology and particle size analysis as assessment parameters.

MATERIALS AND METHOD

Materials:

Nimesulide was obtained as a gift sample from Panacea Biotech, Lalru,Punjab. Tamarind seed powder was purchased from the local market. Citric acid, Methyl paraben, Propyl paraben and Vanillin flavor were purchased from S.D. Fine Chemicals, Mumbai, India.

Isolation of Tamarind Seed Polysaccharide:

TSP was isolated by taking 20 g of tamarind kernel powder and added to 200 ml of cold distilled water to prepare slurry. The slurry was poured into 800 ml of boiling distilled water. The solution was boiled for 20 min with continous stirring. The resulting solution was kept overnight, and centrifuged at 5000 rpm for 20 min. The supernatant liquid was separated and poured into twice the volume of absolute alcohol with continuous stirring. The precipitate obtained was washed with absolute ethanol and air-dried. The dried polymer was powdered, passed through sieve no.60 and stored in a desiccator until further use[9].

TSP powder characterization:

The bulk density and tap density of the isapgol mucilage powder were determined using tap density tester (USP) ED – 1020 (Electro lab). Also the flow properties of the powder were also found.

Formulation of suspension:

The required quantity of TSP powder was taken in a mortar. A small quantity of water was added and triturated. To this Nimesulide was added and triturated to form a paste. The preservatives, methyl and propyl paraben, citric acid, and flavor vanillin was added and further triturated to form a homogenous mixture. Citric acid was used to adjust the pH. The mixture was transferred to a calibrated bottle and the volume was made up using sufficient quantity of water.

Evaluation of suspension:

Drug-Excipient interaction studies: The physical mixture of pure drug and isolated tamarind seed polysaccharide powder in the ratio 1:1 were subjected to I.R spectral studies using FTIR spectrophotometer (FTIR 8400 S, Shimadzu, Japan).

Sedimentation Volume: Each suspension (50 ml) was stored in a 50 ml measuring cylinder for 7 days at 35°C. Observations were made at every hr for 7 hr and then every 24 hr for 7 days. The sedimentation volume, F (%), was then calculated using the following equation:

$F = 100V_u/V_o$

Where, V_u is the ultimate volume of the u sediment and V_O is the original volume of the of suspension.

Rheological Behavior: The viscosity of the prepared and marketed suspensions was determined using Brookefield's viscometer (Model DV II). The viscosity values were determined at 10, 12, 20, 30, 50, 60 and 100 rpm at 25°C using spindle No. 2. The All determinations were made in triplicate and the results obtained are expressed as the mean values.

Particle size analysis: The particle size distribution in the suspension was determined using optical microscope (Olympus LITE image). The suspensions were mixed thoroughly and a drop of the suspension was taken on a slide and spread into a thin film. A total of 100 particles are counted and their size is determined. The minimum, maximum and average particle size in micrometers is tabulated.

Redispersion: Fixed volume of each suspension (50 ml) was kept in calibrated tubes which were stored at room temperature for various time intervals (5d, 10…45 d). At regular interval of 5 d, one tube was removed and shaken vigorously to redistribute the sediment and the presence of deposit if any was recorded.

Drug content: Amount equivalent to 50mg of drug was taken, vortexed with 50ml of acetone and filtered. The resulting filtrate was diluted suitably and the drug content was estimated using UV-VIS spectrophotometer (UV-1601, Shimadzu) at 450 nm[10].

Stability studies: The prepared formulations were stored in accelerated storage condition of 40 ± 2^0C and 75 ± 5% RH for a period of 45 days and observed for changes in physical appearance and drug content.

RESULTS AND DISCUSSION

The results of powder analysis are shown in (**table 1**). The compatibility between the drug and isolated mucilage powder was found to be good by the I.R spectral studies which are indicated in (**Fig.1, 2**). No major differences in the peak were observed in IR spectral studies. Suspensions of Nimesulide were prepared using TSP powder as suspending agent in various concentrations (**Table 2**). The properties of the prepared suspension were compared with that of a marketed product. The sedimentation rate was observed for a period of 7 days. Of the prepared suspensions formulation F3 was found to be in close comparison with that of the marketed product. The sedimentation behaviors of the formulations are indicated in (**Fig 3**). All the formulations were redispersed uniformly without any deposits. This formulation was further evaluated for its rheological properties and particle size distribution. The average size of the particles in the suspension was found to be 35.4 µm and the minimum and maximum particle size were 17.3 and 70.3 µm respectively. The drug content of all the formulations was in the range of 95-98.3%. The rheological study of the formulation F3 indicated that as the RPM increases the viscosity decreases, confirming the shear thinning nature of the suspension (**Fig 4**). The drug content of all the formulations was in the range of 96-99.3%. The suspensions were stable in accelerated storage conditions and the drug content does not vary to larger extent during the period of study. Also there was no change in the physical appearance of the formulations. The present study suggests that the isolated TSP powder can be used as an effective suspending agent in suspensions. The feasibility of isolation of TSP powder in large scale needs to be studied in future.

Table 1: Isolated TSP powder characterization

Parameters	Observed values
Bulk Density	0.24
Tap density	0.363
Carr's index	19.11
Hausner's ratio	1.23
Angle of repose	13°
Average particle size	185µm

Table – 2: Formulations of suspension

Ingredients (in mg)	Formulation Code			
	F1	F2	F3	F4
Nimesulide	500	500	500	500
Tamarind seed polysaccharide	250	500	750	1000
Citric acid	200	200	200	200
Methyl paraben	150	150	150	150
Propyl paraben	100	100	100	100
Vanillin flavour	5	5	5	5
Purified water q.s to ml	50	50	50	50

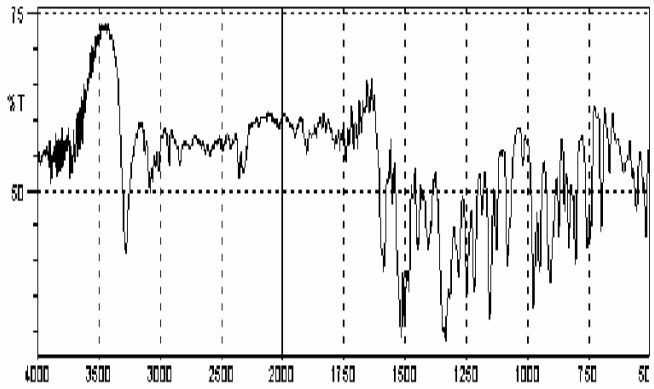

Fig.1 I.R. Spectra of pure drug Nimesulide

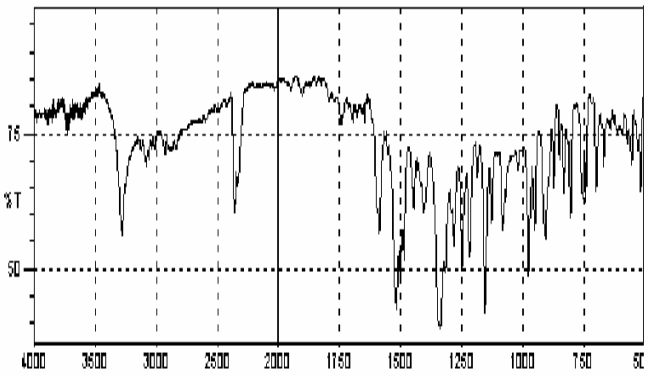

Fig.2 I.R.Spectra of physical mixture of TSP powder with Nimesulide

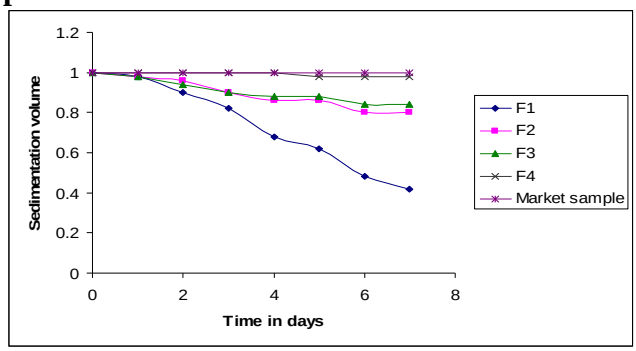

Fig.3Sedimentation volume of the formulations

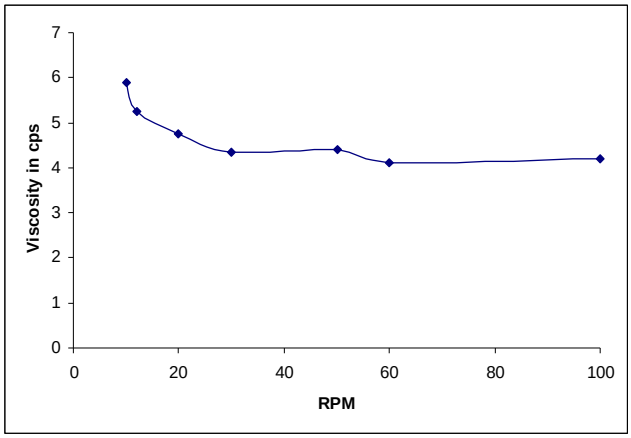

Fig.4 Effect of RPM on viscosity

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REFERENCE

1. Zografi G, Schott H, Swarbrick J. Disperse Systems:In: Remington's Pharmaceutical Sciences. 18th ed. Mack Publishing Co, Easton, PA; 1990. 257.
2. S.L.Deore, S.S.Khadabadi. Standardisation and pharmaceutical evaluation of chlorophytum borivilianum mucilage. Rasayan J Chem. 2008; 1(4): 887-892.
3. Odeku O.A, Kinlosotu O. D. A preliminary evaluation of Khaya gum as an emulsifying agent. West Africa J Pharm. 1997; 11(1): 30–33.
4. Singla A.K., Chawla M., Singh A. Nimesulide: some pharmaceutical and pharmacological aspects- an update. J Pharm Pharmacol. 2000; 52: 467-486.
5. Lecomte, T. Monti, M. G. Pochobradsky. Antipyretic effects of nimesulide in paediatric practice: A double-blind study. J Curr Med Res and Opinion, 1991; 12(5): 296-303.
6. Gupta Piyush, Sachdev H.P.S. Safety of oral use of nimesulide in children: Systematic review of randomized controlled trials. Indian Pediatrics. 2003; 40(6): 518-531.
7. Sano M, Miyata E, Tamano S, Hagiwara A, Ito N, Shirai T. Lack of carcinogenicity of tamarind seed polysaccharide in B6C3F mice. Food Chem. Toxicol. 1996; 34: 463-67.
8. Rao PS, Srivastava HC. Tamarind in industrial gums. In: Whistler RL. 2nd ed., Academic Press, New York, 1973; 369-411.
9. Rao PS, Ghosh TP, Krishna S. Extraction and purification of tamarind seed polysaccharide. J Sci Ind Res. 1946; 4: 705.
10. Kamalapurkar O.S., Harikrishna Y. UV spectrophotometric estimation of Nimesulide. Eastern Pharmacist. 1997; 40(478): 145-146.