and rosiglitazone in pharmaceutical dosage form.

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Evaluation of *Leucaena leucocephala* Seed Gum as Suspending Agent in Sulphadimidine Suspensions

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Leucaena gum derived from seeds of *Leucaena leucocephala* has been evaluated as a suspending agent. Suspensions of sulphadimidine powder were prepared with different concentrations of leucaena seed gum, and tragacanth gum, and compared. Studies indicate that this gum may be used as a pharmaceutical adjuvant and as a suspending agent depending on its suspending ability and the stability of the resulting suspension.

Gums are employed in food, pharmaceutical and cosmetic industries as binders, emulsifiers, suspending agents and disintegrating agents, and as coating materials in microencapsulation. They are also used as stabilizers, thickeners and binders, in various industries such as paper, textile, paint, ink, and petroleum products. The vast application of the plant gums in various industries is because of their low cost, ready availability and the important properties, which they confer on products[1-3]. With the increase in demand for natural gums, it has become necessary to explore the newer sources of gum to meet the industrial demands.

While evaluating alternative sources of gum, some workers[4-6] have reported the presence of large quantity of gum in the seeds of *Leucaena leucocephala* belonging to the family *Leguminosae*. Alternatively, systematists place it in the *Mimosoideae* sub-family of the *Mimosaceae* family[4,5]. The isolated and purified leucaena seed gum is known to be non-toxic and upon oral administration have indicated a very high LD_{50} of 1.85 g/kg in mice[7]. While continuing our studies on this gum we have already reported its utility as binder[7] as well as disintegrating agent[8]. The rheological properties of the gum were also studied[9]. We now report on usefulness of the gum as a suspending agent. Suspending ability and suspension stability were used as the basis for evaluating the performance of leucaena seed gum as a suspending agent.

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Sulphadimidine was obtained as gift sample from IDPL, Hyderabad. Benzoic acid, tragacanth and polyethylene glycol were purchased from Loba Chemie, Mumbai and Glaxo Laboratories India Ltd., Mumbai, respectively. All other reagents were of analytical grade. Leucaena seeds were obtained from our medicinal garden and processed. Leucaena seed gum, prepared and stored in vacuum desiccator after isolation and purification in our laboratory, was used in this study.

Sulphadimidine (10% w/v) suspensions were prepared using leucaena seed gum as suspending agent in the concentration range of 1-4% w/v. The required amount of sulphadimidine (150 μm), leucaena seed gum (150 μm) along with required volume of distilled water (preserved with 0.1% w/v benzoic acid) were blended in a mixer (Model SP-16, Sumeet Electronic Mixer, Mumbai) for 2 min at speed 4. The speed and time required for suspending the content was fixed, after evaluating a series of suspensions, primarily on the basis of sediment volume. The revolution per minute of this mixer at speed 4 was about 15 000, which was determined with the help of Digital Tachometer (Model TM 3011, Saiki, Japan). For comparison, suspensions containing 1, 2, 3, and 4% w/v tragacanth were similarly prepared.

The suspensions were placed in a 100 ml stoppered measuring cylinder and stored undisturbed at room temperature. The final or ultimate volume of sediment (Vu) were measured and recorded daily for the first week and thereafter weekly for eight weeks. The sediment height in relation to the original volume (Vo) was expressed as sedimentation ratio (F).

The degree of flocculation was calculated from the following equation[10], $\beta = (Vu/Vo)/(V\alpha/Vo) = Vu/V\alpha$, where, Vu is the ultimate sediment volume in flocculated system and $V\alpha$ is the ultimate sediment volume in deflocculated system.

The pH of each of the prepared suspension was measured using a pH meter (Systronics Digital pH meter, Sr. No. 272, μ pH system 361), at weekly intervals for 4 w. For ease of redispersibility, 10 ml of each suspension was poured into four calibrated tubes, which were stored at room temperature for 1, 2, 3 and 4 w. At the end of each storage period, each tube was shaken at constant moderate rate of 30 shake/min. The time(s) taken to redisperse the sedimented suspension was recorded.

The method essentially consisted of holding the sample tube straight in upright position between two fingers with thumb at the bottom and the middle finger at the top, followed by almost uniform rotation through 180° and brought back through the same path. The pair of successive upward and downward movement, each of approximately equal force, constituted one complete shake. The number of shakes required for complete elimination of sediment from the bottom of the tube was recorded. At this juncture, the sample was observed for homogeneity of suspension and the total time(s) recorded to redisperse the sedimented suspension. This was based on the empirical understanding that not more than that force should be required and the same that is routinely applied by the consumer in the event of "shake well before use". Maximum care was taken to exert approximately the same amount of force every time and the same time interval.

The sedimentation volume profile of the suspensions with leucaena seed gum and the reference gum tragacanth are shown in figs. 1 and 2, respectively. The dispersed particles of sulphadimidine prepared with 1% and 2% w/v tragacanth were found to sediment at faster rate than those pre-

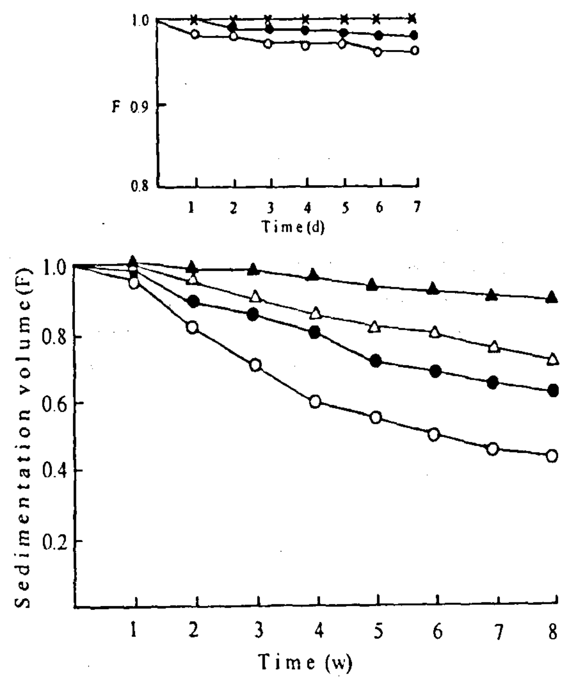

Fig. 1: Sedimentation profile of sulphadimidine suspensions.

Ambient sedimentation behaviour of sulphadimidine suspensions prepared with leucaena seed gum of different concentrations such as 1% w/v (-O-), 2% w/v (-●-), 3% w/v (-△-), 4% w/v (-▲-). Inset shows first seven days' sedimentation behavior such as 1% w/v (-o-), 2% w/v (-•-), 3 and 4% w/v (-x-).

pared with equivalent concentrations of leucaena seed gum. Suspension prepared with 3% w/v leucaena seed gum showed a constant decline in the sediment value with respect to time. On the other hand, in case of 3% w/v tragacanth, an initial decline within four weeks of storage followed by more or less asymptote over the remaining period. In case of suspension with 4% w/v leucaena seed gum, it may be pointed out that the sedimentation was least over the entire period of eight weeks. However, 4% w/v tragacanth showed almost no change over the entire period of the study.

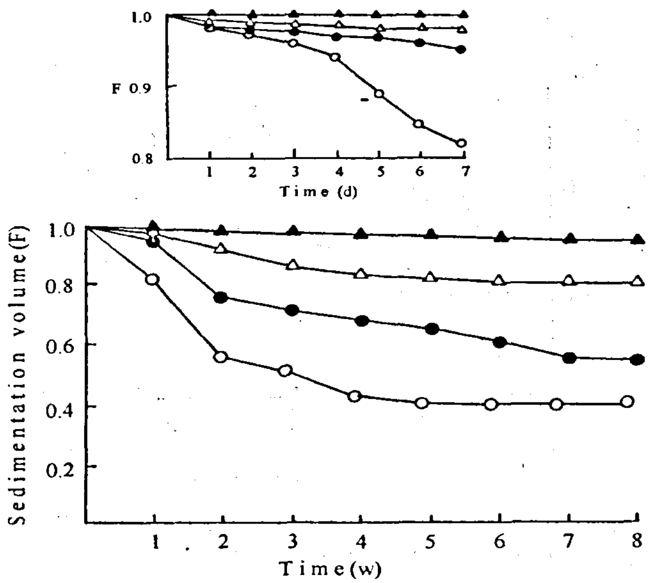

Fig. 2: Sedimentation profile of sulphadimidine suspensions.

Ambient sedimentation behaviour of sulphadimidine suspensions prepared with tragacanth of different concentrations such as 1% w/v (-○-), 2% w/v (-●-), 3% w/v (-△-), 4% w/v (-▲-). Inset shows first seven days' sedimentation behavior.

According to Martin *et al.*[10] the sedimentation volume provides only a qualitative account of flocculation. The degree of flocculation (β) is a more useful parameter, which is the ratio of the ultimate sediment volume in the flocculated and deflocculated system. A comparison of β value (Table 1) of suspensions prepared with tragacanth and leucaena seed gum shows higher values for tragacanth at the 3% and 4% w/v levels. This could be due to thickening properties of tragacanth. At 1% and 2% w/v levels, the β values for leucaena seed gum were higher than tragacanth. These observations show that though tragacanth is a better suspending agent, the leucaena seed gum also showed appreciable suspending properties.

The changes in the pH of suspensions prepared with different percentages of leucaena seed gum and tragacanth are given in Table 1. The pH values were recorded after 24 h and then weekly up to 4 w of storage at room temperature. The pH of the suspensions made with leucaena seed gum and tragacanth ranged from 4.49–5.18 and 4.09–4.54, respectively at concentration levels under consideration (1-4% w/v), thus indicating the acidic nature of the suspen-

TABLE 1: DEGREE OF FLOCCULATION (β) AND pH VALUES OF THE SULPHADIMIDINE SUSPENSIONS ON STORAGE.

Gum	Concentration % w/v	β*	pH after storage for				
			24 h	1 w	2 w	3 w	4 w
Leucaena seed gum	1	2.26±0.06	4.49	4.66	4.80	4.91	5.05
	2	3.30±0.09	4.74	4.81	4.95	4.99	5.12
	3	3.80±0.10	4.83	4.93	5.05	5.11	5.14
	4	4.67±0.12	4.85	4.89	4.93	5.04	5.18
Tragacanth	1	2.09±0.06	4.09	4.20	4.23	4.39	4.42
	2	2.87±0.08	4.12	4.26	4.29	4.35	4.45
	3	4.16±0.11	4.22	4.24	4.28	4.38	5.53
	4	5.01±0.13	4.28	4.36	4.42	4.45	4.54

*All values are expressed as mean±s.d. (n = 3).

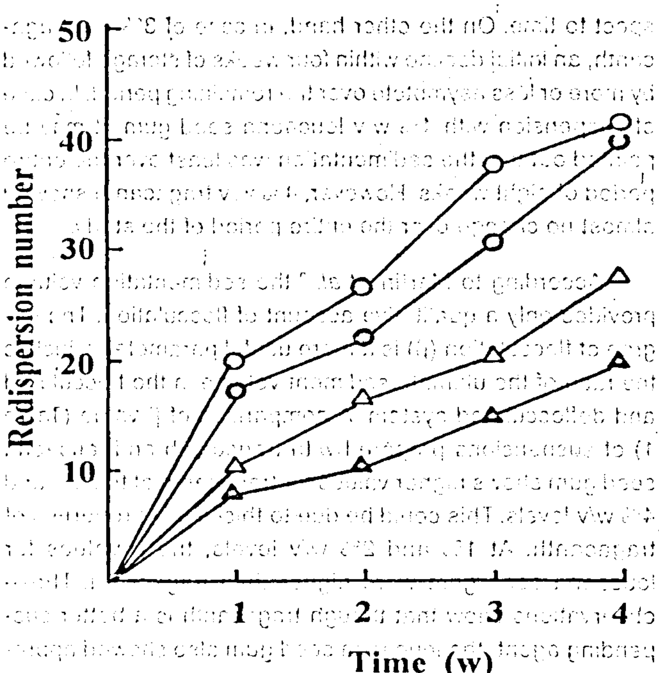

Fig. 3: Redispersion numbers vs. time profile of sulphadimidine suspensions.

The mean redispersion numbers of the sulphadimidine suspensions prepared with leucaena seed gum of different concentrations such as 1% w/v (-O-), 2% w/v (-●-), 3% w/v (-△-), 4% w/v (-▲-).

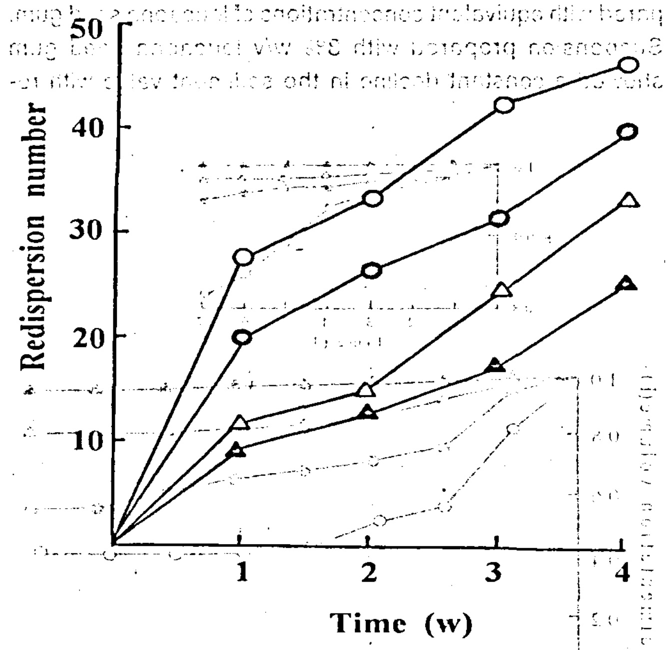

Fig. 4: Redispersion numbers vs. time profile of sulphadimidine suspensions.

The mean redispersion numbers of the sulphadimidine suspensions prepared with tragacanth of different concentrations such as 1% w/v (-O-), 2% w/v (-●-), 3% w/v (-△-), 4% w/v (-▲-).

sions. The variation in the pH of the suspensions prepared with leucaena seed gum were higher as compared with that recorded in the suspensions prepared with tragacanth. The change in pH that occurred could be attributed to hydrolysis or microbial decomposition. The microbial decomposition of the suspension made with leucaena seed gum seems to be more feasible given their neutral character.

Since the suspension produces sediment on storage, it must be readily dispersible so as to ensure the uniformity of the dose[11]. Hence the evaluation of ease of dispersion is important in assessing the acceptability of a suspension[12]. Redispersibility is the minimum time taken to redisperse the sediment over a period of time under the conditions documented under experimental conditions. Less is the time taken to redisperse the sediment, the better is the redispersibility. The redispersion figures (in seconds) for the sulphadimidine suspensions prepared with different concentration of leucaena seed gum and tragacanth after four weeks' storage at room temperature are recorded. Graphical representation of data is presented in figs. 3 and 4. As can be seen, redispersibility in case of leucaena seed gum was better at higher concentrations since the redispersion number decreases over time. From the studies, it is concluded that the leucaena seed gum may be used as a suspending agent for pharmaceuticals and hence as a potential pharmaceutical adjuvant[3,7-9].

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Isolation and *in vitro* Biological Activities of a Rare Triterpenoid from the roots of *Trewia polycarpa*

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The *n*-hexane soluble fraction of the ethanolic extract of the roots of the plant *Trewia polycarpa* yielded a rare triterpenoid of taraxarane series, 3ß-acetoxytaraxaren-14-en-28-oic acid (I) whose identity has been confirmed by spectroscopic studies. This is the second report on the isolation of I from nature and first from the genus *Trewia*. Compound I exhibited prolongation of prothrombin time and also showed mild antibacterial and antifungal activities.

Trewia polycarpa Benth. (Euphorbiaceae) is used in the traditional Ayurvedic medicine under the name *Gambhari Prathinidhi*[1]. As no chemical or biological screening has been carried out on this plant, the roots which find use in medicine were taken up for the study. The roots of *T. polycarpa* were collected from Thiruthuraipoondi (Nagapattinam District, Tamil Nadu) and identified in the Survey of Medicinal Plants Unit (CCRAS, Govt. of India), Tirunelveli, Tamil Nadu. A voucher specimen has been retained in the herbarium of Sri Ramachandra Medical College and Research Institute, Chennai (Pharma No.02/98). Shade dried and coarsely powdered roots (2.5 kg) were extracted exhaustively with 90% ethanol (3x6 l) at room temperature. After 72 h the solvent was decanted, distilled over boiling water-bath and concentrated *in vacuo* to obtain the crude extract (yield: 44 g /1.75% w/w).

The ethanolic crude extract was successively shaken with *n*-hexane and chloroform. The *n*-hexane fraction on standing overnight afforded an amorphous powder which on column chromatography over silica gel (100-200 mesh) yielded a crystalline compound (I). [m.p. 289-291°; R_f 0.64

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