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Study on Marine Diversity as a Source of Binder

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ABSTRACT

Background: *Binders are the prominent inactive ingredient in development of solid dosage form. Varieties of natural and synthetic binders are available and many are in use by pharmaceutical industry. The scope of identifying the need of binder with different property and varying viscosity still exists. Sargassum wightii is brown seaweed belongs to the class Phaeophyceae, is widely distributed in tropical and temperate oceans. It belongs to the family Sargassaceae and order Fucales.*

Method: *Aqueous soxhlet extraction method was used for the extraction of gum. The extracted gum was incorporated as binder in the formulation of tablets using Acyclovir as the model drug by wet granulation method. The prepared acyclovir tablets were compared with tablets prepared using standard binders such as Acacia and Methyl cellulose.*

Results: *The result shows that the granules prepared with Sargassum wightii binder shows good flow properties as that of Acacia and Methylcellulose and can be compressed into tablets. The prepared Acyclovir tablets with Sargassum wightii shows good result for friability and hardness test from a concentration 12.5 to 25%. The prepared tablets get disintegrate within 3 minutes and shows a complete drug release within 1 hour.*

Conclusion: *Hence on comparing with Acacia and Methyl cellulose Sargassum wightii binder shows good binding property and safely be used as a pharmaceutical binder for the formulation of tablets.*

Keywords: Natural binders, *Sargassum wightii*, Extraction, Acyclovir, Pharmaceutical excipient.

INTRODUCTION

Binders hold the ingredients in a tablet together. Binders ensure that tablets and granules can be formed with required mechanical strength, and give volume to low active doses tablets. Binders are usually starches, sugars, cellulose or modified cellulose such as microcrystalline cellulose, hydroxypropyl cellulose, lactose, or sugar alcohols such as xylitol, sorbitol. Seaweeds or marine macro algae are primitive non-flowering plants without true root, stem and leaves. They form one of the commercially important marine living renewable resources. They are the only source for the production of phytochemicals such as Agar, Carrageenan and Algin. Seaweeds are utilized for the production of phytochemicals such as agar, carrageenan and alginate which are widely used as gelling, stabilizing and thickening agents in many industries such as food, confectionary, pharmaceutical, dairy, textile, paper, paint and varnish, etc. *Sargassum wightii*, is one of the marine macro-algal genera belonging to the class *Phaeophyceae*, is widely distributed in tropical and temperate oceans. It belongs to the family *Sargassaceae* and order *Fucales*.

The aim of my study is to develop a potential binder from the seaweed *Sargassum wightii* which meet the current industrial needs. The specific objective of the study may be stated as follows:

- To identify the potential of *Sargassum wightii* as seaweed as novel source of binder.
- To collect and identify the seaweed *Sargassum wightii*
- To establish method of extraction of *Sargassum wightii*
- To evaluate the extracted gum for their suitability as pharmaceutical binder
- To formulate the dosage form
- To do the comparative study with existing binders

MATERIAL AND METHODS

Acyclovir (Chemdyes corporation, Rajkot), Acacia (Sara fine chemicals, Baroda), Methyl Cellulose (Research lab, Mumbai), Cross povidone (Chemdyes corporation, Rajkot), Lactose monohydrate (Nice chemicals Pvt. Ltd, Edappally), Magnesium stearate (Nice Chemicals Pvt. Ltd, Edappally), Talc (Nice chemicals Pvt. Ltd, Edappally).

Sample collection and identification

The sea weed *Sargassum wightii* was collected from Thirumullavaram beach of Kollam, Kerala and was identified by Dr. Sr. Tessy Joseph, HOD, Dept. of Botany, Nirmala College, Muvattupuzha.

Extraction of Sargassum wightii

Aqueous soxhlet extraction method was used for the extraction of *Sargassum wightii*. The dried samples of *Sargassum wightii* were taken and powdered to form a fine particle. It was then filled in the soxhlet apparatus. The apparatus was then fixed above the round bottom flask and placed in the heating mantle. A sufficient quantity of water was added into the soxhlet apparatus. The reflux condenser was fixed over the soxhlet apparatus and started the extraction at 40°C. Continue the extraction for 2 days for the complete extraction of the sample. The extracted sample was taken for distillation to remove the methanol and kept the sample for drying. The dried sample was packed in a container.

Preparation of Acyclovir granules

Wet granulation method was used for the preparation of Acyclovir tablet granules. *Sarrgassum wightii* gum was used as a binder at different concentration (2.5%, 5%, 7.5%, 10%, 12.5%, 15%, 20%, and 25%), while Acacia (5%) and methyl cellulose (5%) were used as standard. The required quantity of Acyclovir, Lactose and Crosspovidone were taken in a mortar triturated to form a fine powder. To this binder solution was added and mixed thoroughly to form dough mass. The mass passed through sieve No: 22 to obtain wet granules. The wet granules were dried at 60°C in hot air oven. The dried granules were passed through sieve No. 36 to break the aggregates. Talc (1%) and magnesium stearate (0.5%) were added to the dried granules and blended in a poly ethylene bag (Table 1) [5].

Table 1: Formula used for the preparation of acyclovir granules.

Excipients	**Quantity for 1 tablet (mg)**									
	Sargassum wightii								**Acacia**	**Methyl cellulose**
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**
Acyclovir	25	25	25	25	25	25	25	25	25	25
Lactose	68	65.5	63	60.5	58	55.5	50.5	45	65.5	65.5
Binder (%)	2.5	5	7.5	10	12.5	15	20	25	5	5
Crosspovidone	3	3	3	3	3	3	3	3	3	3
Talc	1	1	1	1	1	1	1	1	1	1
Magnesium stearate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total (mg)	100	100	100	100	100	100	100	100	100	100

Pre-compression evaluation of Acyclovir granules

The flow properties of granules were characterized in terms of angle of repose, Carr's index and Hausner's ratio. The bulk density and tapped density were determined from this data Carr's index and Hausner's ratios were calculated [6,7].

Formulation of acyclovir tablets

Acyclovir tablet granules prepared with different binder concentrations were compressed into 100 mg tablet each batch containing 25 tablets using rotary multi-station tablet punching machine using a die size of 6 mm round and flat punches. The prepared tablets were packed in a well closed container for further studies [8].

Post compression evaluation of Acyclovir Tablets

General appearance

The morphological characterizations which include size, shape, color, presence or absence of odour, taste and surface texture of the tablets was determined.

Thickness and Diameter

Five tablets were picked from each formulation randomly and thickness and diameter was measured individually. It is expressed in mm and standard deviate on was also calculated. The tablet thickness and diameter was measured using Screw gauge.

Hardness

Hardness indicates the ability of a tablet to withstand mechanical shocks while handling. The hardness of the tablet was determined using Monsanto hardness tester. It is expressed in kg/cm^2. Five tablets were randomly picked and hardness of the same tablets from each formulation was determined. The mean and standard deviation values were also calculated.

Friability test

Friability test is performed to assess the effect of friction and shocks, which may often cause tablet to chip, cap or break. Roche Friabilator was used for the purpose. Pre-weighed samples of ten tablets were placed in the Friabilator, which was then operated at 25 rpm for 4 minutes or ran upto 100 revolutions. After 100 revolutions the tablets were dusted and reweighed. Compressed tablets should not lose more than 1% of their weight.

The % friability was then calculated by the following formula:

Percentage friability = (Initial weight-final weight) / (Initial weight) × 100

Weight variation

Twenty tablets were randomly selected from each batch and individually weighed using an electronic balance. The average weight was calculated. The percentage deviation from average weight was reported.

Disintegration tests

Using disintegration test apparatus, six tablets were picked at random from each formulation placed in the basket individually. The water bath was thermostatically set at 37 ± 1ºC. The time that took the tablet to disintegrate was recorded using a stop watch.

***In vitro* drug release studies**

In vitro drug release studies were performed by using USP dissolution test apparatus. The drug release profile was studied 90 ml of 0.1 N HCl buffer at 37 ± 2°C. Rotational speed of the paddle at 50 rpm. Aliquots of 5 ml of dissolution medium were withdrawn at specific time intervals filtered and replaced with fresh medium. The absorbance of the samples was measured by UV spectrophotometer at 252 nm.

Drug content estimation

Weigh and powder 20 tablets. Disperse a quantity of powder containing 0.1 g of Acyclovir in 60 ml of 0.1 M NaOH with the aid of ultrasound for 15 minutes and dilute to 100 ml with 0.1 M NaOH and filter. To 15 ml of the filtrate add 50 ml of water, 5.8 ml of 2 M HCl and sufficient water to produce 100 ml. To 5.0 ml of this solution add sufficient 0.1 M HCl to produce 50 ml and mix well. Measure the absorbance of the solution at the maximum at about 252 nm, using 0.1 M HCl as the blank. Calculate the content of $C_8H_{11}N_5O_3$ taking 560 as the specific absorbance at 255 nm.

Accelerated stability study for F7 formulation

Accelerated stability study for tablets of F7 formulation were carried out at 40^0C ± 2^0C /75% RH ± 5% RH for 3 days in open condition in a humidity chamber. The samples were withdrawn at every 24^{th} hour and evaluated for colour change. Also the third day samples were evaluated for the hardness, thickness, friability, percentage weight variation, drug content and dissolution time.

RESULTS AND DISCUSSION

Preparation of acyclovir granules

This is discussed in Table 2.

Table 2: Result for precompression evaluation of acyclovir granules.

Binder concentration (%)	Formulation code	Derived properties		Flow properties		
		Bulk density (gm/cc)	Tapped density (gm/cc)	Angle of repose in degree	Carr's index (%)	Hausner's ratio
2.5	F1	0.40 ± 0.01	0.47 ± 0.01	33.23 ± 0.76	14.89 ± 0.315	1.17 ± 0.00
5	F2	0.42 ± 0.01	0.48 ± 0.01	32.29 ± 0.18	12.5 ± 0.26	1.14 ± 0.00
7.5	F3	0.40 ± 0.02	0.47 ± 0.02	32.98 ± 0.82	14.26 ± 3.14	1.17 ± 0.04
10	F4	0.40 ± 0.01	0.46 ± 0.01	31.60 ± 0.15	13.00 ± 1.77	1.15 ± 0.02
12.5	F5	0.39 ± 0.01	0.46 ± 0.01	29.93 ± 0.19	14.89 ± 0.317	1.17 ± 0.004
15	F6	0.41 ± 0.01	0.47 ± 0.01	30.44 ± 0.45	12.76 ± 0.271	1.14 ± 0.00
20	F7	0.42 ± 0.01	0.48 ± 0.01	28.44 ± 0.23	12.44 ± 3.90	1.14 ± 0.05
25	F8	0.39 ± 0.01	0.46 ± 0.00	26.57 ± 0.33	13.67 ± 1.34	1.15 ± 0.01
Acacia (5%)	F9	0.42 ± 0.01	0.49 ± 0.01	28.20 ± 0.21	14.17 ± 5.00	1.16 ± 0.06
Methyl Cellulose (5%)	F10	0.43 ± 0.01	0.47 ± 0.00	22.50 ± 0.39	8.51 ± 2.12	1.09 ± 0.02

Bulk density

The bulk density of Acyclovir tablet granules were shown in the Table 2**.** The granules prepared with *Sargassum wightii* binder was found to be in the range of 0.39 ± 0.01 to 0.42 ± 0.01gm/cc. The bulk density of Acyclovir tablet granules formed with Acacia was found to be 0.42 ± 0.01 and Methyl cellulose found to be 0.43 ± 0.01 gm/cc.

Tapped density

The tapped density of Acyclovir tablet granules were shown in Table 2. The granules prepared with *Sargassum wightii* binder was found to be in the range of 0.46 ± 0.00 to 0.48 ± 0.01. The tapped density of granules with Acacia was found to be 0.49 ± 0.01 and for Methyl cellulose it was found to be 0.47 ± 0.00.

Carr's index

From the results shown in Table 2, it was found that the granules prepared with *Sargassum wightii* binder shows the Carr's index in the range of 12.44 ± 3.90 to 14.89 ± 0.31% implying the granules have good flow property. The Carr's index of granules formed with Acacia was found to be: 14.17 ± 5.00% and for Methyl cellulose it was found to be: 8.5 ± 2.12%. Acacia shows good flow property and Methylcellulose shows excellent flow property.

Hausner's ratio

The Hausner's ratio of acyclovir granules were shown in Table 2. The acyclovir tablet granules prepared with *Sargassum wightii* was observed to be in the range of 1.14 ± 0.03 to 1.17 ± 0.04 which signifies that granules have good flow property. The Hausner's ratio of granules with Acacia was found to be: 1.16 ± 0.06, which shows good flow property, and for Methyl cellulose it was found to be: 1.09 ± 0.02 which shows excellent flow property.

Angle of repose

The angle of repose of Acyclovir granules were shown in Table 2. From the result it was found that the granules prepared with *Sargassum wightii* was found to be in the range of 26.57°± 0.33 to 33.23° ± 0.76. The angle of repose of granules with Acacia was found to be: 28.20° ± 0.21 and for Methyl cellulose it was found to be 22.50° ± 0.39. The granules formed with *Sargassum wightii* binder and Acacia shows good flow property, while that of granules formed with Methyl cellulose shows excellent flow property (Figures 1-8).

Formulation of acyclovir tablets

The prepared tablets were evaluated for general appearance, hardness, friability, weight variation, thickness, diameter, disintegration study, Percentage drug content, dissolution study using methods specified in Indian Pharmacopoeia.

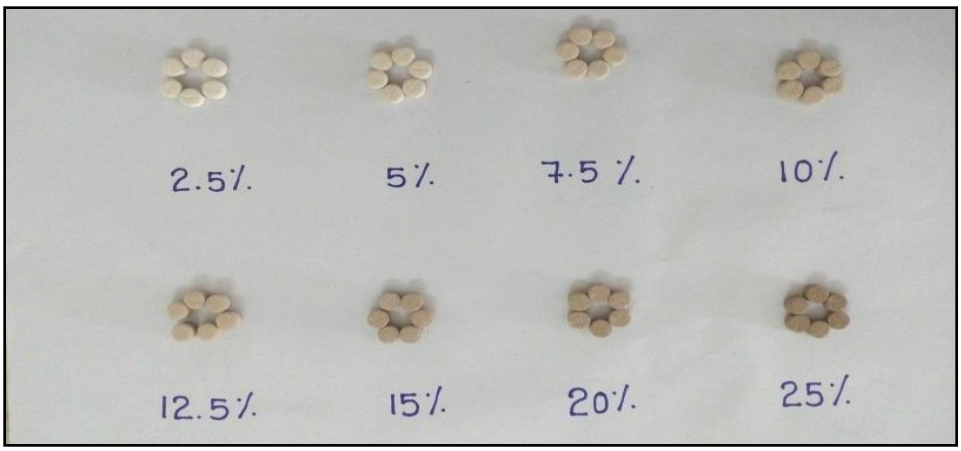

Figure 1: Tablets prepared with *Sargassum wightii* at different concentration.

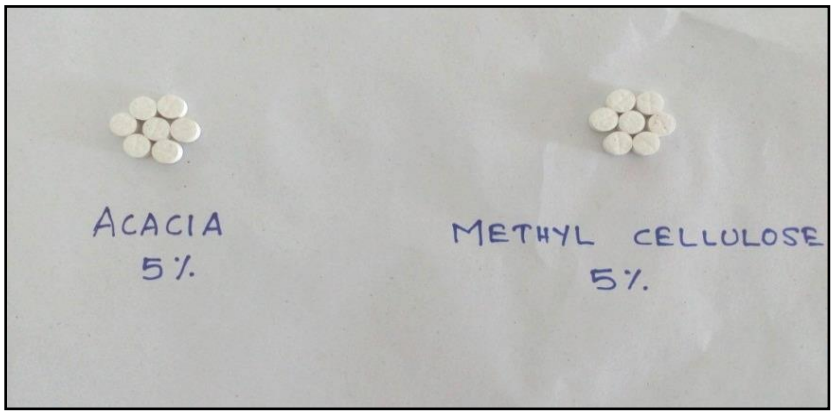

Figure 2: Tablets prepared with acacia and methyl cellulose.

Table 3: Result for post compression parameters of acyclovir tablets.

Binder concentration (%)		Formulation code	Diameter (mm)	Thickness (mm)	Hardness (kg/cm^2)	Friability (%)	Percentage Weight variation (%)
Sargassum wightii	2.5	F1	5.9 ± 0.06	2.55 ± 0.03	1.8 ± 0.33	1.56 ± 0.14	100 ± 0.003
	5	F2	6.0 ± 0.09	2.53 ± 0.02	2.4 ± 0.72	1.43 ± 0.14	99.52 ± 0.003
	7.5	F3	6.0 ± 0.02	2.49 ± 0.02	2.1 ± 0.75	1.72 ± 0.42	101 ± 0.003
	10	F4	6.0 ± 0.04	2.54 ± 0.01	2.6 ± 0.62	1.53 ± 0.37	99.5 ± 0.002

	12.5	F5	6.0 ± 0.02	2.51 ± 0.02	3 ± 0.95	0.94 ± 0.11	100.17 ± 0.003
	15	F6	5.9 ± 0.02	2.49 ± 0.01	3.0 ± 0.298	0.87 ± 0.22	100 ± 0.002
	20	F7	6.0 ± 0.01	2.51 ± 0.01	3.1 ± 0.56	0.69 ± 0.22	100.33 ± 0.002
	25	F8	5.9 ± 0.02	2.50 ± 0.01	3.6 ± 0.51	0.42 ± 0.12	100 ± 0.002
Acacia	5	F9	6.0 ± 0.02	2.53 ± 0.01	4.8 ± 0.33	0.25 ± 0.78	100 ± 0.002
Methyl Cellulose	5	F10	6.0 ± 0.01	2.5 ± 0.01	5.3 ± 0.6	0.17 ± 0.76	100.5 ± 0.002

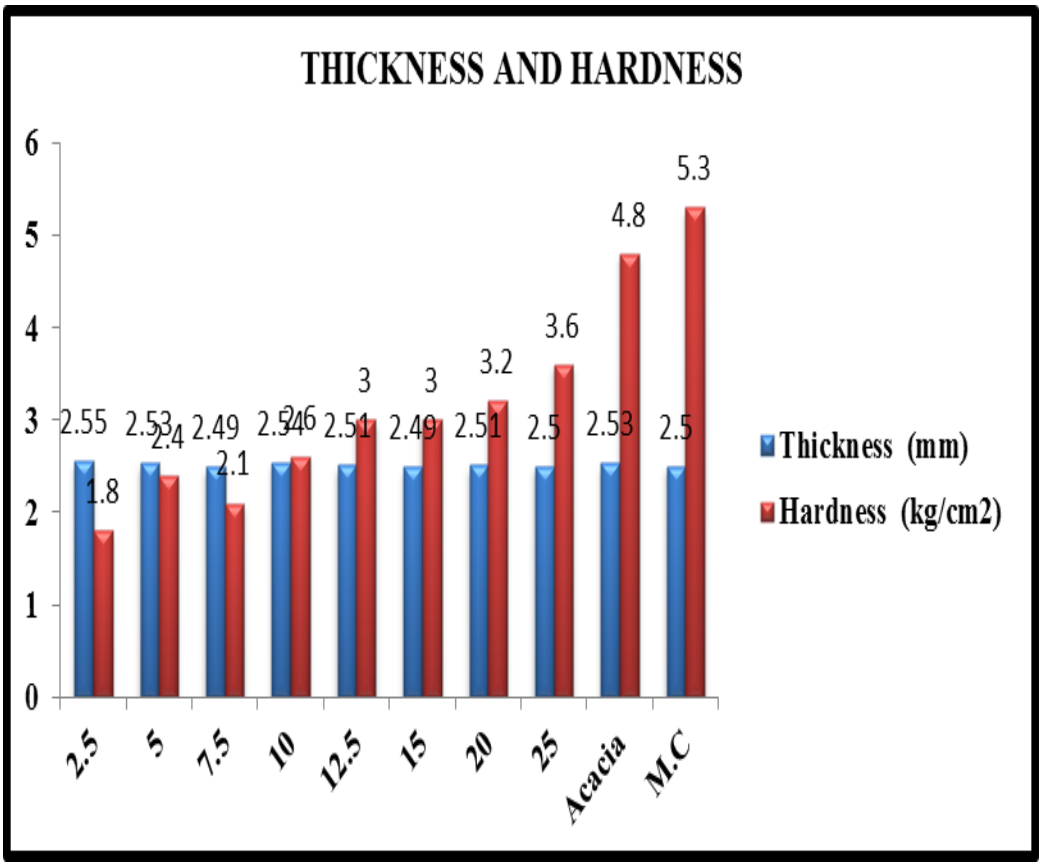

Figure 3: Result for tablet thickness and hardness.

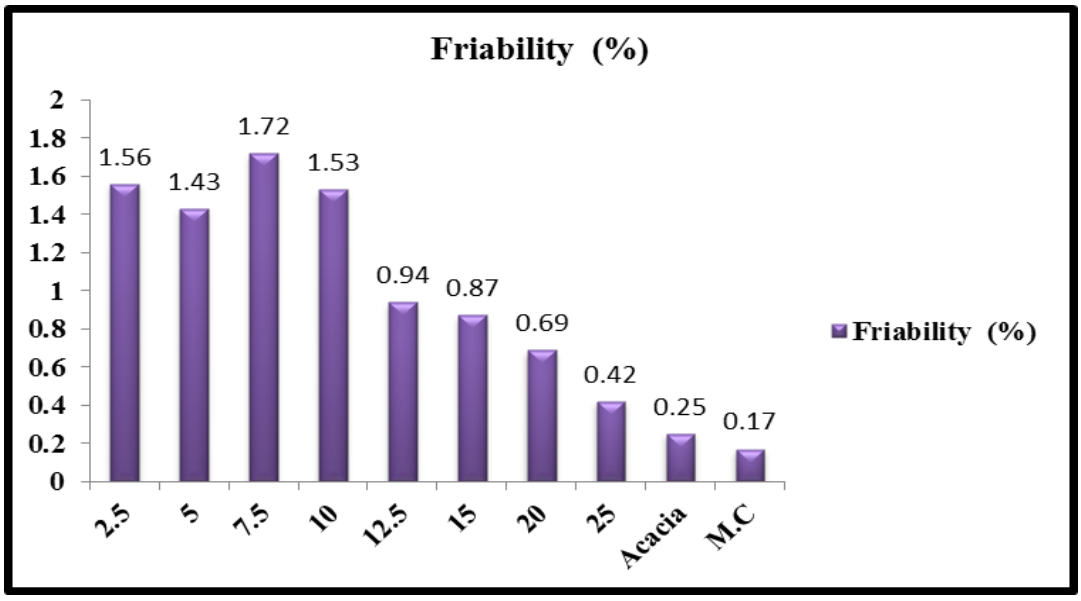

Figure 4: Result for friability test.

Table 4: Result for disintegration time and percentage drug content analysis of acyclovir tablets.

Binder concentration (%)		**Formulation code**	**Disintegration Time (min)**	**Percentage drug content (%)**
Sargassum wightii	2.5	F1	0.85 ± 0.03	99.88 ± 0.12
	5	F2	0.89 ± 0.02	99.54 ± 0.35
	7.5	F3	1.22 ± 0.05	98.50 ± 0.5
	10	F4	1.58 ± 0.03	100.02 ± 1.53
	12.5	F5	1.98 ± 0.02	99.28 ± 0.72
	15	F6	2.01 ± 0.04	97.69 ± 1.31
	20	F7	2.11 ± 0.04	100.5 ± 1.5
	25	F8	2.19 ± 0.01	98.61 ± 0.68
Acacia	5	F9	2.24 ± 0.01	99.45 ± 0.44
Methyl Cellulose	5	F10	2.26 ± 0.02	98.75 ± 1.07

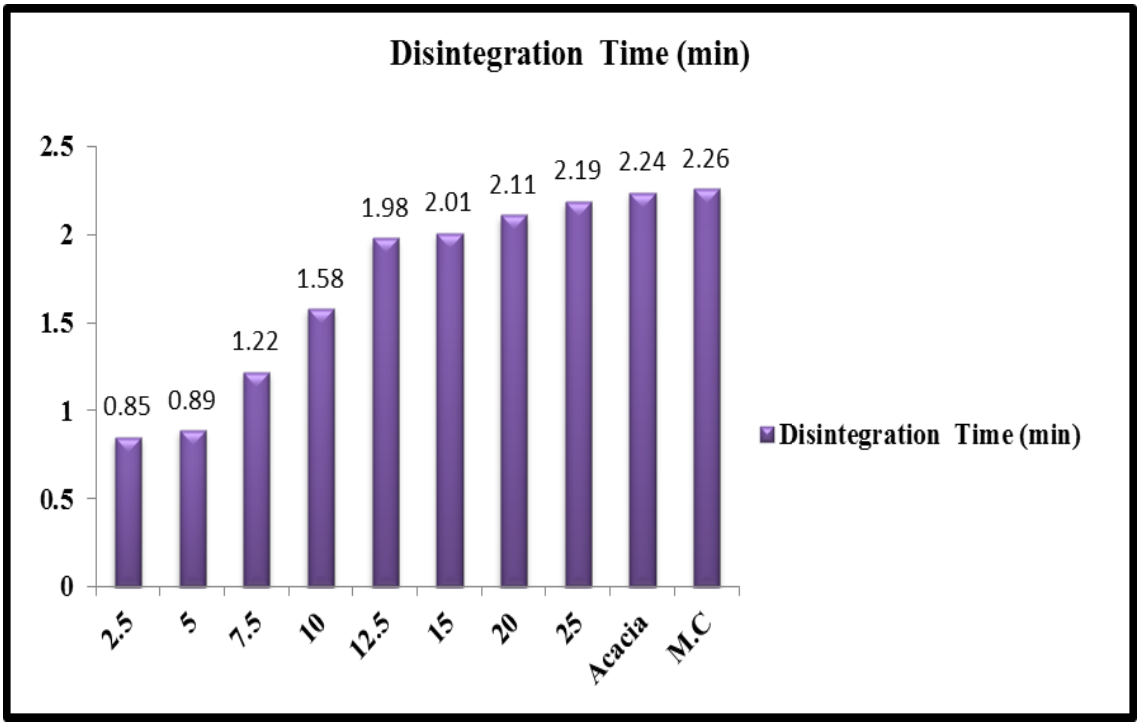

Figure 5: Disintegration time of acyclovir tablet.

Table 5: Percentage cumulative drug release of acyclovir tablets.

Binder conc (%)		Formulation	Percentage cumulative drug release (min)						
			0	**5**	**10**	**15**	**30**	**45**	**60**
Sargassum wightii	**2.5**	**F1**	0.095 ± 0.003	25.128 ± 0.929	50.367 ± 0.369	87.912 ± 1.332	96.987 ± 0.258	97.536 ± 0.9718	99.485 ± 0.23
	5	**F2**	0.094 ±	30.761 ± 3.223	45.347 ± 1.942	69.489 ± 4.356	95.327 ± 3.433	98.478 ± 0.153	99.201 ± 1.302
			0.005						
	7.5	**F3**	0.1584 ± 0.017	35.452 ± 3.034	57.679 ± 2.522	87.987 ± 2.425	92.644 ± 1.723	95.843 ± 0.697	98.855 ± 0.06
	10	F4	0.379 ± 0.06	55.971 ± 2.972	78.327 ± 2.048	85.659 ± 1.667	90.753 ± 2.052	92.698 ± 2.075	98.325 ± 0.785
	12.5	F5	0.295 ± 0.006	41.923 ± 2.99	59.321 ± 2.673	83.325 ± 2.526	90.415 ± 1.866	94.451 ± 3.157	97.329 ± 1.40
	15	F6	0.366 ± 0.017	49.325 ± 0.036	69.325 ± 3.431	80.563 ± 3.27	89.088 ± 2.257	93.722 ± 2.179	98.984 ± 1.00

	20	F7	0.239 ± 0.013	59.441 ± 3.853	79.987 ± 3.456	86.103 ± 1.814	95.329 ± 1.953	98.985 ± 0.26	99.036 ± 0.332
	25	F8	0.451 ± 0.059	39.483 ± 3.112	62.325 ± 2.04	71.575 ± 3.292	85.369 ± 4.092	87.398 ± 3.115	98.485 ± 1.307
Acacia	5%	F9	0.499 ± 0.067	45.445 ± 4.15	66.116 ± 3.895	86.992 ± 5.091	90.525 ± 3.241	95.123 ± 4.102	98.796 ± 1.20
M.C	5%	F10	0.089 ± 0.015	50.551 ± 0.738	87.818 ± 0.603	88.582 ± 3.311	90.452 ± 3.171	91.707 ± 2.286	99.675 ± 0.185

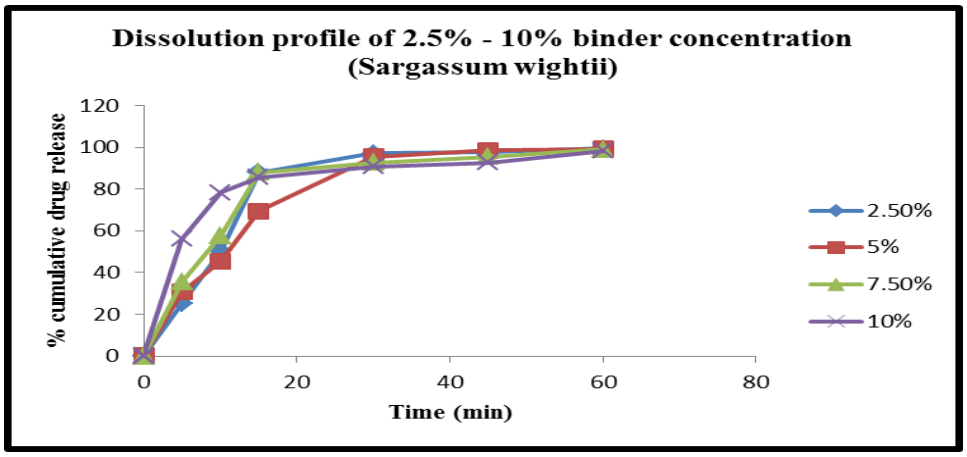

Figure 6: *In-vitro* drug release study of acyclovir tablets (*Sargassum wightii* 2.5% to 10%).

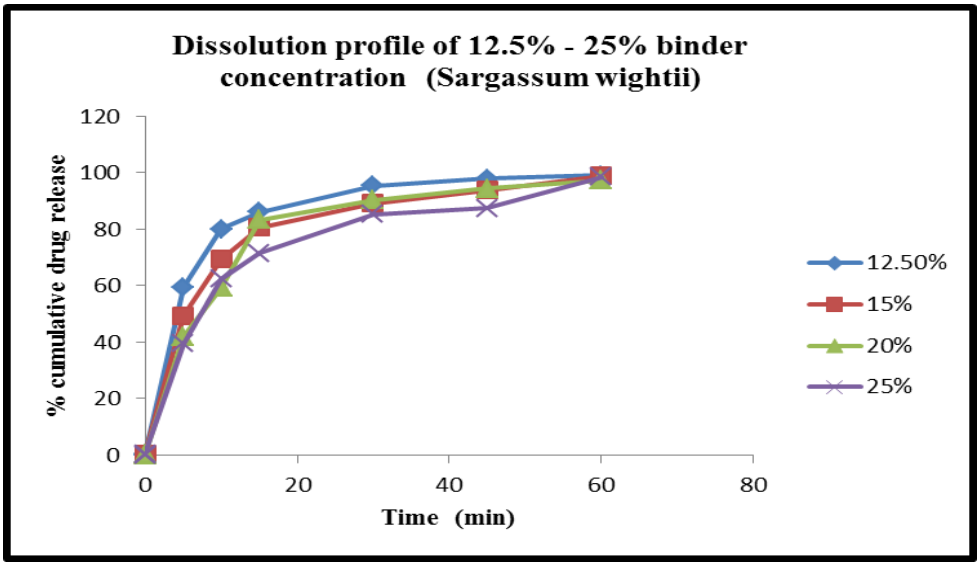

Figure 7: *In-vitro* drug release study of acyclovir tablets (*Sargassum wightii* 15% to 25%).

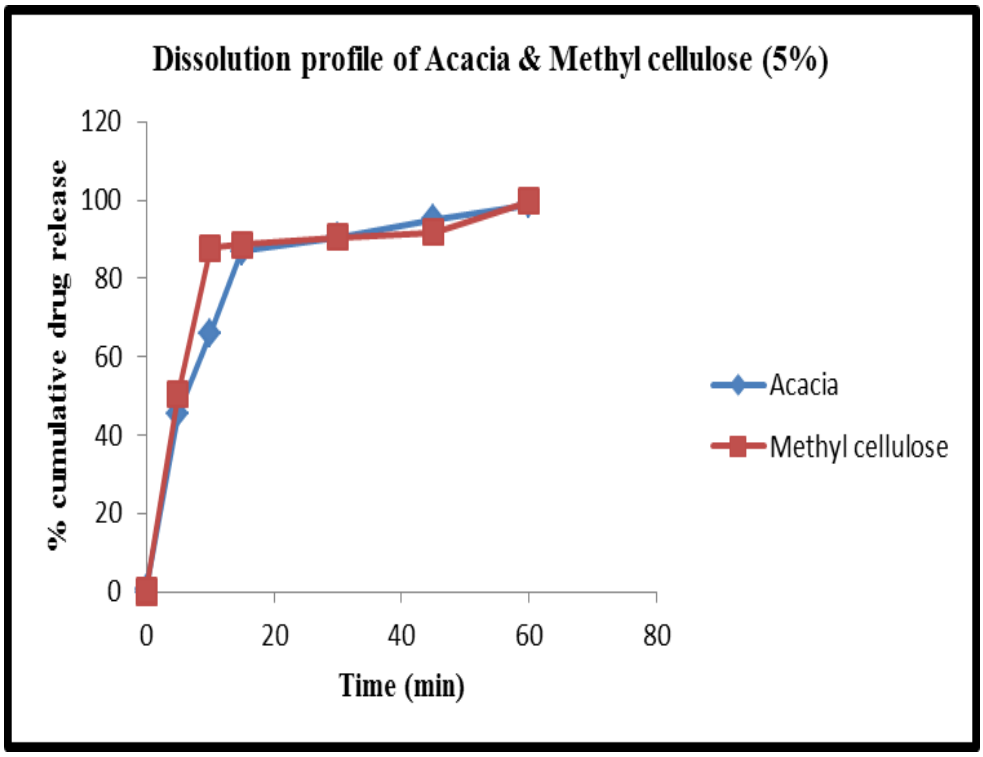

Figure 8: *In-vitro* drug release study of acyclovir tablets (Acacia - 5% and methyl cellulose - 5%).

General appearance

All the formulated tablets for acyclovir using different binders were found to be circular in shape and good physical appearance. The tablets prepared with *Sargassum wightii* binder shows colour difference from light brown to dark brown based on the binder concentration and had a slight fishy odour smell. Tablets prepared with Acacia and Methyl cellulose was found to be white in colour with no characteristic odour.

Thickness

At a constant compression force, tablet thickness varies with changes in die fill, particle size distribution and packing of the powder mix being compressed and with tablet weight, while with a constant die fill thickness varies with variation in compression force. The thickness of all formulated tablets was measured using Screw gauge. The tablets of all the formulations prepared with *Sargassum wightii* showed thickness in the range of 2.49 ± 0.01 mm – 2.55 ± 0.03 mm as shown in Table 3. For tablets prepared with Acacia was found to be: 2.53 ± 0.01 and for Methyl cellulose it was found to be: 2.5 ± 0.01. There was a slight variation in the thickness of tablets.

Hardness

Tablets require certain amount of strength and hardness to withstand mechanical shocks during manufacture, packaging and shipping. The hardness was found to be in the range 1.8 ± 0.33 to 3.6 ± 0.51 kg/cm^2 for tablets formed with *Sargassum wightii* as shown in Table 3. The tablets prepared with binder concentration 2.5% to 10% fails the test for hardness and binder concentration from 12.5 to 25% passes the test for hardness. For Acacia the Hardness was found to be 4.8 ± 0.33 kg/cm^2 and for Methylcellulose was found to be 5.3 ± 0.6 kg/cm^2 which passes the test for hardness. The formulation F_5, F_6, F_7, F_8, F_9 and F_{10} were found to be within the IP limit 3-6 kg/cm^2 hence these tablets passes the test for hardness. It was observed that hardness increases with increasing binder concentration.

Friability test

Adequate tablet hardness and resistance to friability are necessary to prevent damage to the tablet during manufacture, packing and transport. Percentage friability of tablets less than 1% was considered acceptable. Percentage friability of tablets prepared from *Sargassum wightii* binder ranged from 1.72 ± 0.42% to 0.42 ± 0.12% as shown in Table 3 The tablets prepared with *Sargassum wightii* having concentration 2.5%, 5%, 7.5%, 10%, shows friability greater than 1% which fails the friability test and binder concentration 12.5%, 15%, 20%, 25% shows friability less than 1%, which passes the friability test. The percentage friability of Acacia was found to be 0.25 ± 0.78% and for Methyl cellulose it was 0.17 ± 0.76% which passes the test for friability. The formulation F5, F6, F7, F8, F9 and F10 were found to be within the IP limit less than 1% hence these tablets passes the test for friability. As the concentration of binder increases the friability decreases.

Weight variation

The average weight of acyclovir tablet was 100 mg. The weight variation was found to be in the range of 99.5 ± 0.002 to 101 ± 0.003 mg for tablets prepared with *Sargassum wightii* binder as shown in Table 4. For tablets prepared with Acacia it was found to be: 100 ± 0.002 and for Methylcellulose it was found to be 100.01. The obtained results indicated that all tablets of different formulations were within the IP limit ± 7.5%. The tablets pass the test for weight variation.

Disintegration time

Disintegration test is a measure of the time required under a given set of conditions for a group of tablets to disintegrate into particles. The tablet disintegration test was used for providing simple and useful means for monitoring and controlling the quality of tablets. It also gives an insight of release pattern of formulation. For uncoated tablets the time specification for disintegration is

15 min. From the result shown from Table 4, the disintegration time of acyclovir tablets range from 0.85 ± 0.03 min sec to 2.19 ± 0.01 min for tablets prepared with *Sargassum wightii* depending on the concentration of binder. For tablets prepared with Acacia the disintegration time is 2.24 ± 0.01 min and for methyl cellulose it was found to be 2.26 ± 0.02 min. From the result it shows that all batches of tablets disintegrate within 3 minutes and passes the disintegration test. As the concentration of binder increase the disintegration decreases.

Percentage drug content

The percentage drug content of Acyclovir tablets from each batch was uniform as shown in Table 4 and ranged from 99.50 ± 0.5% to a 100.5 ± 1.5% for tablets prepared with *Sargassum wightii*. For tablets prepared with Acacia it was found to be 99.45 ± 45% and for Methyl cellulose it was found to be 98.75 ± 1.07%.

***In-vitro* dissolution profile**

The dissolution test measures the time required for a percentage of the drug substance in a tablet to go into solution under a specified set of condition. It is one of the most important quality control test performed on pharmaceutical dosage form. *In – vitro* dissolution profile of different formulations were shown in Table 5.

The formulation F1 shows a drug release from 0.095 ± 0.003 to 99.485 ± 0.23. F2 shows a drug release from 0.094 ± 0.005 to 99.201 ± 1.302. F3 shows a drug release from 0.1584 ± 0.017 to 98.855 ± 0.06. F4 shows a drug release from 0.379 ± 0.06 to 98.325 ± 0.785. F5 shows a drug release from 0.295 ± 0.006 to 97.329 ± 1.40. F6 shows a drug release from 0.366 ± 0.017 to 98.984 ± 1.00. F7 shows a drug release from 0.239 ± 0.013to 99.036 ± 0.332. F8 shows a drug release from 0.451 ± 0.059 to 98.485 ± 1.307. F9 shows drug release from 0.499 ± 0.067 to 98.796 ± 1.20 and F10 shows a drug release from 0.089 ± 0.015 to 99.675 ± 0.185. All the formulation shows a drug release near to 100 percentages at the end of 1 hour.

Accelerated stability study

Colour: Pale brown in colour.

Table 6: Result for accelerated stability study of F7 formulation.

Formulation code	Diameter (mm)	Thickness (mm)	Hardness (kg/cm^2)	Friability (%)	% weight variation	Disintegration time	% drug content
F7	6.0 ± 0.01	2.52 ± 0.01	3.1 ± 0.23	0.84 ± 0.31	101 ± 0.002	2.08 ± 0.03	98.82 ± 1.13

Table 7: Percentage cumulative drug release of stability samples of F7 formulation.

Time (min)	0	5	10	15	30	45	60
Percentage cumulative drug release	0.219	52.531	78.358	84.189	95.11	96.548	99.98

The colour of F7 tablets which was kept for stability analysis was found to be pale brown in colour which was same as that of initial sample. From the Tables 6 and 7 it was found that there was no any significant change in the hardness, friability, thickness, Diameter, Disintegration time, Percentage drug content and percentage cumulative drug release between initial sample and that of third day sample.

CONCLUSION

The *Sargassum wightii* binder can be extracted by means of Soxhlet aqueous extraction method. The pre-compressional parameters of Acyclovir granules prepared with *Sargassum wightii* Acacia and Methyl Cellulose were evaluated based on the Angle of repose, Carr's index and Hausner's ratio the prepared granules show good flow property. By comparing with granules formed with Acacia and Methyl cellulose, the overall powder blend of Acyclovir tablet granules formed with *Sargassum wightii* were good and suitable for compression. The tablets of each batch containing 25 tablets were prepared by wet granulation method. The tablets prepared with *Sargassum wightii* binder shows a colour variation from light brown to dark brown based on the concentration of the binder and the tablets had a slight fishy odour smell.

The prepared tablets show a slight variation in the thickness. The tablets prepared at a concentration from 2.5% to 10% fails the test for hardness and tablets prepared at a concentration from 12.5% to 25% passes the test for hardness. Also the tablets prepared with Acacia and methyl cellulose also passes the test for hardness which was within the IP limit 3-6 kg/cm^2. The percentage friability of formulation F5, F6, F7, F8, F9 and F10 was within the IP limit of 1%. Hence the tablets prepared with

Sargassum wightii at a concentration from 12.5% to 25% and also with acacia and methyl cellulose also passes the friability test. All the formulation tested for weight variation test indicates that all tablets of different formulation were within the IP limit ± 7.5%. Hence the tablet passes the weight variation test. The disintegration tests for all the formulation were performed and it was found that all the tablets pass the disintegration test. From the result of *in-vitro* dissolution test it was found that all the tablets shows a 100 percentage drug release at the end of 1 hour. There was a fast drug release had happened at zero time and about 80 percentage of drug release had happened at the end of 45 minutes.

The percentage drug content of Acyclovir tablets of each formulation were uniform and percentage drug content was almost 100 percentages. Hence from the various evaluation test performed for Acyclovir tablets shows that as the concentration of binder increase the hardness increase and friability decreases. Also as the concentration of binder increase the disintegration time decreases. The binder concentration *Sargassum wightii* can be used at a concentration from 12.5% to 25%.

The accelerated stability analysis of F7 formulation formulated with *Sargassum wightii* binder at a forced stability condition of 40°C ± 2°C /75% RH ± 5% RH shows that there was no any significant variation in the colour between the initial sample and third day sample. The third day sample which is stability sample was evaluated for its diameter, thickness, hardness, friability, percentage weight variation, disintegration time, percentage drug content, and percentage cumulative drug release. From the results it was found that F7 formulation was stable with no any significant changes with that of initial sample. Hence as a conclusion, we can say that the *Sargassum wightii* binder is good for the preparation of tablets with a concentration ranges from 12.5% to 25%.

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