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Formulation and in Vitro Anthelmintic Activity Study of Herbal Suspension of Dry*Saraca indica* Bark Extract

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ABSTRACT:
The colour, taste, and other organoleptic characteristics of the suspension were assessed. The PH, sedimentation volume, redispersibilty, and flow were the physicochemical characteristics that were studied. A stable suspension has a long shelf life and may be readily poured and redispersed homogeneously with mild shaking. The most stable pharmaceutical suspensions are flocculated, suggesting that the suspended particles have formed a loose, semi-rigid structure by physical bonding. A three-way herbal suspension was assessed for sedimentation ratio. The S(3) type of herbal suspension demonstrates that sedimentation is superior to the S(1) and S(2) forms.To know the anthelmintic activity of dry *Saraca indica* bark extract, the present investigation wasperformed. Toknow the anthelmintic property of dry*Saraca indica* bark extract we used only herbalsuspension method. The herbal suspension of dry *Saraca indica* bark extract displayed anthelmintic property in a dose- dependent manner. The formulation (suspension) and dry *Saraca indica* bark extracts were more potent than the positive control (Albendazole) as far as the anthelmintic property was concerned. Those effects were more or less similar in cases of suspension and dry extract. The overall results indicate that all the suspension were stable and both dry extract and suspension were better than positive control. Negative control (distilled water with tween 80) did not show any activity against earthworm.

Key words: Dry *Saraca indica* bark extract, herbal suspension, anthelmintic activity, Pheretimaposthuma

I. INTRODUCTION: -

About one-third of the world's population is afflicted by helminthiasis, also referred to as worm infestation, which is one of the most common parasite infections in both industrialised and developing nations. Around 1.5 billion individuals worldwide are infected with soil-transmitted helminths (STH), according to the WHO[1]. Of all the nations, India has the highest prevalence of STH, accounting for one-fourth of all cases worldwide. STH is most common in children between the ages of one and fourteen[2]. Overall prevalence of STH in India ranges from 13% to 66%[3].The worms often reside in the liver, gastrointestinal system, and other organs. To treat helminthiasis, anthelmintic medications such as albendazole, diethyl carbamazine, and ivermectin are commonly used. However, these medications have significant side effects, including hepatotoxicity, appetite loss, light headedness, nausea, vomiting, headaches, and diarrhoea. Looking for anthelmintic medications that are more effective while minimising negative effects is therefore required. Eighty percent of the world's population gets their primary healthcare from traditional medicines and plant extracts, which contain active ingredients[4].

The plant *Saraca indica*Linn, family-caesalpinaceae is commonly known as Ashoka in Hindi, Ashoka tree in English. On the basis of literature survey barks of *Saraca indica* had been selected for present study. In Ayurveda, a traditional system of medicine, *Saraca indica* is cited for treatment of many disorders. Its leaf can be used in the treatment of analgesic and CNS depressant activity. Flowers are used to antiulcer, antidiabetic and antimenorrhagic activity. Leafs are used to possess as an anthelmintic activity. Considering it as a potential anthelmintic agent, its bark claimed to have anthelmintic activity[5].

As we know, the oral route of drug administration is the most important method of administrating drugs for systemic effects. Except in few cases, parenteral route is not routinely used for

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self-administration of medication. It is probable that most of drugs used to produce systemic effects are administered by the oral route. Ayurvedic herbal formulation were also administered preferentially by orally route. Designing of oral herbal formulation is still date a challenge in modern pharmaceutics. There are number of medicinal herbs in traditional system of medicine which are time tested, useful for the number of ailments. In the present study, barks of *Saraca indica* were selected for developing the herbal suspension[6].

II. MATERIAL ANDMETHODS:

The test drug is dry extract of*Saraca indica* bark extract(S.I.B.E) which was collected from Kisalaya herbals limited. They analyzed the dry extract in their laboratory.

Formulation of herbal suspension (S.I.B.E):-

Suspensions are heterogeneous consisting of two phases a solid in liquid dispersion in which the particles are of colloidal size. The solid particles act as disperse phase whereas liquid vehicles act as the continuous phase. Suspensions are generally taken orally or parenteral route. They are also used for external application.

Formulation: -Following additives are used in the preparation of suspensions-

Flocculating agents: In suspensions, the solid particles are well dispersed in dispersion medium i.e. vehicle. The dispersion can be improved by adding a surfactant or protective colloid which act as flocculating agent. The flocculating agent acts by reducing the surface tension and thereby improving the dispersion of solids and minimize flocculation e.g., sodium lauryl sulphate, tweens, spans and carbowaxes, etc. are commonly used as a flocculating agents.

Thickening agents: These are hydrophilic colloids which form colloidal dispersion with water and increase the viscosity of the continuous phase, so that the solid particles remain suspended in it for a sufficient long time to measure a uniform accurate dose. The thickening agents used to stabilize suspensions are classified into three major groups – polysaccharides, inorganic agents and synthetic compounds.

Polysaccharides: -Two types of polysaccharides are used now days. These are: -

(i) Natural Polysaccharides

- Gum Acacia
- Tragacanth
- Starch
- Sodium alginate

(ii)Semi Synthesis

- Methyl Cellulose
- Sodium car boxy methyl cellulose
- Microcrystalline Cellulose

Inorganic Agents: -

- Clay
- Aluminium hydroxide

Synthetic Compounds: -

- Carbomer (Car boxy vinyl polymer)
- Colloidal silicone dioxide

Wetting agents: -These are the substances which reduce the interfacial tension between solid particles and liquid medium thus producing a suspension or required quality. This may be achieved by adding a suitable wetting agent which is absorbed at the solid/liquid interface in such a way that the affinity of the particles for the surrounding medium is increased and the interparticle forces are decreased. For example, alcohol in tragacanth, glycerin in sodium alginate and poly sorbate in oral and parenteral suspension.

- **Preservatives:** -A suitable preservative is needed to preserve suspensions against bacterial growth. Preservatives selected should be effective against a wide range of microorganisms. Benzoic acid, sodium benzoate, methyl paraben and propyl paraben are commonly used as preservative in suspensions.
- **Organoleptic additives: -**Coloring agents, sweetening agents and flavoring agents are generally incorporated in oral suspensions. A suitable perfume and color is incorporated in suspensions which are meant for external use.

Procedure: -

Suspension containing 200mg/ml, 100mg/ml and 50mg/ml of dry extract of *Saracaindica* bark extract was prepared according to the formulation shown in (Table -1). The dry extract was prepared on Kisalaya herbal limited. Initially the suspension vehicle was prepared using water as a vehicle, sodium CMC as the suspending agent, sodium benzoate as the preservative and sucrose as a sweetener. The dry extract was wet and dispersed in the suspension vehicle. The suspensions were stored in amber glass bottles for future analysis[7].

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Table-1 Formulation of suspension of Saraca indica bark dry extract

Sl No	Ingredients	Formulations		
		S(1)mg	S(2)mg	S(3)mg
1	*Saraca indica* bark dry extract	50	100	200
2	Sodium CMC	0.1	0.1	0.1
3	Sucrose	0.1	0.1	0.1
4	Sodium benzoate	0.1	0.1	0.1
5	Water	10ml	10ml	10ml

(A) Evaluation of herbal suspension (S.I.B.E): -

The suspension was evaluated for its organoleptic properties like colour, odour, and taste. The physiochemical parameters studied were PH, sedimentation volume, redisperbility and flow (Table-2).A stable suspension can be redispersed homogeneously with moderate shaking and can easily pour throughout its shelf life. The most stable pharmaceutical suspensions are flocculated i.e. the suspended particles are bonded together physically to form a loose, semi rigid structure. The suspended particles are said to upload each other while exerting no significant force on the liquid. The sediment particles of a flocculated suspension can be redispersed easily at any time with moderate shaking.

Sedimentation Method: This method is commonly used for evaluating the physical stability of suspension (Table- 3) &(Table-4).

Procedure: The measurement of sedimentation volume is the most important parameter in the evaluation of the stability of suspension. It is determined by keeping a measured volume of the suspension in a graduated cylinder in an undistributed position for a definite period of time and noted ultimate height (Hu) of the sediment and initial height of the total suspension. The sedimentation volume(F) is the ratio of the ultimate height and initial height (Hu/Ho). The sedimentation volume can be plotted against time. The graph indicates the sedimentation pattern of suspension on storage. A stable suspension shows a horizontal or less steep curve[8].

(A) Anthelminticactivity: -

The Anthelmintic activity was performed on adult Indian earthworm Pheretima posthuma due to its anatomical and physiological resemblance with the intestinal round worm parasites of human beings[9]. Indian adult earthworm collected from moist soil and washed with normal saline to remove all fecal matter were used for anthelmintic activity. Different concentrations of (50mg/ml, 100mg/ml and 200mg/ml in distilled water with Tween 80) of dry extract were prepared. 10ml of each concentration of dry extract of *Saraca indica*bark was delivered to Petri dish. Then six worms (same type) were placed in it (Table-5). Similarly, for each concentration of the herbal suspension, six worms were used (Table - 6).Time for paralysis was noted when the worm did not revive in dry extract of *Saraca indica* bark. Time of death of worms were also recorded when the worm lost their motility followed by fading away of their body colour. Albendazole (50mg/ml, 100mg/ml and 200mg/ml) were used as reference[10](Table- 7).

III. RESULT AND DISCUSSION: -

(A) Evaluation of herbal suspension (S.I.B.E):-

The herbal suspension was evaluated to know its colour, odour, pH, sedimentation volume, redisperbility and flow. The result of the above mentioned parameters have been indicated in the (Table-2).In addition the results of stability study of the herbal suspension suggest that all suspensions (S(1), S(2) and S(3)) are stable. (Table -3).

Three possible form of herbal suspension (S.I.B.E) were evaluated for sedimentation ratio. S(3) form of suspension shows sedimentation ratio 1 after 270 minute which is better than S(1) and S(2) forms of herbal suspension[8] (Table - 4).

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Table- 2: Evaluation of Herbal Suspension

Sl. No.	Evaluation Parameter	Inference
1	Colour	Dark brown
2	Odour	Characteristics
3	Taste	Astringent
4	pH	7
5	Sedimentation volume	1
6	Redispersibilty	Very good
7	Flow	Easy and uniform

Table- 3: Results of rate of sedimentation of suspension form of drugs

Sl. No.	Time in (min)	Ultimate height (Hu)ml	S(1)		S(2)		S(3)	
			Final height (Ho)ml	Sedimentation Ratio (Hu/Ho)	Final height (Ho)ml	Sediment ation Ratio (Hu/Ho)	Final height (Ho)ml	Sedimentation Ratio (Hu/Ho)
01	30	100	85	1.17	93	1.07	93	1.07
02	60	100	75	1.13	93	1	92	1.01
03	90	100	65	1.15	92	1.01	92	1
04	120	100	57	1.14	90	1.02	92	1
05	150	100	50	1.14	88	1.02	92	1
06	180	100	45	1.11	85	1.03	92	1
07	210	100	41	1.09	81	1.04	91	1.01
08	240	100	38	1.07	78	1.03	91	1
09	270	100	35	1.08	75	1.04	91	1

Table - 4: Results of stability test of suspension form of drugs

Sl. No.	Sample No.	Time Duration (hrs)	Temperature	Crystal Formation	General appearance
1	S(1)	24	4	×	Good
		48	4	×	Good
		72	4	×	Good
2	S(2)	24	RT	×	Good
		48	RT	×	Good
		72	RT	×	Good
3	S(3)	24	47	×	Good
		48	47	×	Good
		72	47	×	Good

(B)Anthelminticactivity: -

Considering the time taken for paralysis and inducing death, it was found that both dry extract and suspensions were better than positive control (Albendazole) Table 5,6,7. Those effects were dose dependent on each case. Those effects were more or less similar in cases of dry extract and suspension. The overall results indicate that all the suspensions were stable and both dry extract and suspension were better than positive control. Negative control (distilled water with Tween 80) did not show any activity against earthworm.

Table - 5 Anthelmintic activity of Saraca indica barkdry extract (SIBE)

Group	Treatment	Concentration (mg/ml)	Time of paralysis (min)	Time of death (min)
I	Distilled Water	-	-	-
II	*Saraca indica* bark dry extract	50	172	207
III		100	102	152

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IV		200	60	90

Table -6 Anthelmintic activity of *Saraca indica* Bark extract of herbal suspension

Group	Treatment	Concentration (mg/ml)	Time of paralysis (min)	Time of death (min)
I	Distilled Water	-	-	-
II	S(1)	50	160	210
III	S(2)	100	100	165
IV	S(3)	200	50	95

Table -7 Anthelmintic activity of Albendazole

Group	Treatment	Concentration (mg/ml)	Time of paralysis (min)	Time of death (min)
I	Distilled Water	-	-	-
II	Albendazole	50	475	545
III		100	445	480
IV		200	355	430

IV. CONCLUSION: -

Since the suspensions were stable and more effective than Albendazole, they should be studied in detail. Additional to barks, other plants of same plant should be explored thoroughly (using several extracts) to know the exact role of the plant as far as its different biological activities. (e.g. Anthelmintic Activity, etc.) are concerned.

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