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PREFORMULATION EVALUATION OF PSORALEA CORYLIFOLIA SEEDS, PONGAMIA PINNATA SEEDS, AND HOLARRHENA ANTIDYSENTERICA LEAVES: A RESEARCH STUDY

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ABSTRACT

Herbal constituents have a profound enhancement in drug discovery for numerous present diseases. Many of these parts are constricted from pharmaceutical discoveries because of vital reasons like pharmacodynamics and pharmacokinetics. The main objective of this study is to evaluate all the preformulation parameters for further study. The herbal drug remains a mainstay of approximately 75-80% of the world's population, particularly in growing countries, for primary health care due to higher cultural acceptability, higher compatibility with the human frame, and lesser side effects. Herbal drugs encompass plants or its component to deal with injuries, diseases and also promote health.

Keywords: -

Bakuchi, Holarrhena antidysenterica, Karanj, Kutaj, Pharmacognosy, Pongamia pinnata, Psoralea corylifolia, Quality assessment

1. INTRODUCTION

Various plant species are generally utilized in Ayurveda, and their right healing impact is directly proportional to authentic raw material. Psoralea corylifolia Linn. it belongs to the family Fabaceae, generally regarded as 'Bakuchi', it is utilized in the Ayurvedic system of medicine for the treatment of various topical illnesses however specifically for the remedy of skin illnesses like psoriasis, leukoderma, and leprosy.[1] Holarrhena Antidysenterica (L.) Wall, its miles a medicinal plant located in India particular in Himalayan ranges. It is used in Ayurveda. The plant is likewise having intense monetary importance. It is extensively utilized in pathologic situations but most commonly used as an anti-diarrheal. It is additionally had antipsoriatic properties.[2] Pongamia Pinnata it belongs to family Leguminosae. Karanja oil is used to treat eczema, psoriasis, skin ulcers, dandruff and to promote wound healing.

2. DRUG PROFILE

2.1 Bakuchi seed [3,4,5,6]

Fig: Bakuchi seeds and their plant

Synonyms: Psoralea corylifolia, Babchi, Babacha, Babichi

Botanical Name: Psoralea Corylifolia.

Family: Fabaceae

Properties: Antibacterial, Antifungal, Aromatic, Bitter, Diaphoretic**,** Diuretic and Laxative.

Chemical constituents: Phytochemical studies indicated that coumarins, flavonoids, and

meroterpenes are the main components of P. corylifolia P. corylifolia extract contains numerous phytochemicals, including flavonoids (neobavaisoflavone, isobavachalcone, bavachalcone, bavachinin, bavachin, corylin, corylifol.

Use- Bakuchi controls vitiligo spot because it helps in shrinking the white patches, the darker area slowly covers all white skin area, which leads to visible skin changes due to its anti- psoriatic properties. Bakuchi helps to treat various skin disorder like itching, red papules, itching eruptions, eczema, ringworm, rough and dis coloured dermatosis, dermatosis with fissures due to its Blood Purifier properties.

Dose- 3-6 gm of the seed of bakuchi in powder used in dosages.

2.2 Karanj seed [7,8]

Fig: Karaj seed and seed powder

Synonyms: Pongamia glabra, Millettia pinnata

Botanical name: - Pongamia pinnata

Family: - Fabaceae

Properties: - Karanja oil is most commonly used in skin problems like boils, abscess, and eczema. This is due to its Ropan (healing) and antiseptic properties.

Chemical constituents-

Six compounds (two sterols, three sterol derivatives and one disaccharide) together with eight fatty acids (three saturated and five unsaturated) have been isolated from the seeds of Pongamia pinnata. Oleic acid occurred in highest amount (44.24%), stearic (29.64%) and palmitic (18.58%) acids were the next in quantity.

Use- In skin care, Karanja Oil is used to treat eczema, psoriasis, skin ulcers, dandruff and to promote wound healing. Karanja Oil is also used for its insecticidal and antiseptic properties. Used in herpes, boils, abscess and eczema. Heals Aging Skin, Damaged, Dry, Cracked Skin.

2.3 Kutaj leaves [9,10,11,12]

Fig: Kutaj leaf powder and their fruits

Synonyms: - Holarrhena antidysenterica

Botanical name: - Holarrhena pubescens

Family: - Apocynaceae

Properties: - Anti-tubercular, hypotensive, antiprotozoal, hypoglycemic, antispasmodic, antifungal, antidiarrheal, anticancer, Antibacterial, Anthelmintic, Astringent, Anti-hemorrhoid, Ant amoebic, Hemostatic, Blood purifier properties.

Chemical constituents-

H. antidysentery – Concessidine, connessimine, conkurchine, holadiene, holarrhenine, holarrhimine, kurchine, holarrhine, kurchicine, holadysine,mholadysaine, holantosines A & B; kurchaline, kurchiphyllamine, holacetine etc W. tinctoria – isoricinoleic acid, B-sitosterol, B-amyrin, lupeol, rutin, cycloartenine, cycloeucalenol, wrightiadione etc.

Use- Kutaj has most prominent benefit in managing diarrhoea and dysentery due to its antimicrobial activity. It is also useful for managing bleeding piles due to its astringent property. cleaning wounds with Kutaj water helps in faster wound healing due to its Ropan (healing) and Sita (cold).

3. EXPERIMENTAL

3.1 PHARMACOGNOSTIC INVESTIGATION

- **Authentication of herbal drug**

The first step in the standardization of herbal drugs is the correct identification of the plant. The plant was authenticated by the Department of Dravyaguna, MGACH & RC, Salod (H), Wardha. The specimen of the plant has been submitted to the Department of Drvyaguna for future reference.

- **Organoleptic evaluation**

Organoleptic assessment of raw material is done by means of sense organ viz. skin, eyes, tongue, nose and ear which consist of evaluation of drug by color, odor, taste, size, shape, and by some unique features like contact and texture.

- **Solubility analysis**

The saturation solubility of Psoralea Corylifolia seeds, Pongamia pinnata seeds, and Holarrhena antidysenterica leaves powder was determined in distilled water and Methanol extra quantity of the drug was added to 25ml of methanol, the solution was shaken in a shaker for 24 hours, to dissolve the drug. The content was then filtered through the Whatman filter paper. Filtrate become certainly diluted with Methanol and analyzed spectrophotometrically. The same procedure was used for different solvents. Same procedure carried out for distilled water solubility.

3.2 PHYSICOCHEMICAL EVALUATION [13],[14],[15]

The % of physicochemical value like a loss on drying, Total ash, Acid insoluble ash, Water-soluble Ash, Water-soluble extractive, and Alcohol-soluble extractive had been performed as per the Indian pharmacopeia.

- **Loss on drying**

Loss on drying is an extensively used test method to determine the moisture content material, although occasionally it may refer to the loss of any volatile matter from the sample. Loss on drying compares the weight of the product sample before and after drying.

Calculation: -

Weight of Petri dish + given sample = W_1,

After drying weight of Petri dish + given sample = W_2.

Loss on drying % = $(W_1 – W_2)$ x 100.

- **Determination of Total ash**

About 2 to 3 of the sample was correctly weighed in a tarred silica dish at a temperature not exceeding 450 ˚C till it become free from carbon content, then it became cooled and weighed. The percentage of total ash was calculated based on an air-dried sample and expressed as % w/w.

- **Determination of Acid insoluble ash**

The total ash obtained from above method was boiled for five minutes with 25 ml of diluted HCL; the insoluble matter obtained was collected on an ash less filter paper (Whatman filter paper No.40.), washed with warm water and ignited to constant weight. The percent of acid insoluble ash calculated with reference to the air-dried drug.

- **Water-soluble Ash**

The ash obtained in the determination of total ash was boiled for five minutes with 25 ml of water. The insoluble matter was collected on ash less tilter paper and washed with hot water. The insoluble ash was transferred into a tarred silica crucible and ignited for 15 minutes at a temperature not exceeding 450˚C. The weight of the insoluble matter was subtracted from the weight of the total ash. The difference in weight was considered as the water-soluble ash was calculated about the air-dried drug.

Extractive values

- **Determination of Water-soluble extractive**

5 g of test sample was weighed and macerated with 100 ml of chloroform water in a closed flask for 24 hours, intermediate shaking in the course of 6 hours and allowed to stand for 18 hours. Then it filtered rapidly by filter paper, taking precautions against the loss of solvent. 25 ml of the filtrate was taken and evaporated to dryness in a tarred flat-bottomed shallow dish at 105˚ C.

Determination of Alcohol-soluble extractive

Procedure for water-soluble extractive was followed for the determination of alcohol-soluble extractive, only 90% Ethanol was used instead of chloroform water.

3.3 PHYSICAL CHARACTERISTIC

Bulk density

It is the proportion of the given weight of powder and its bulk volume. It is determined by transferring a correctly weighed quantity of powder sample to the graduated cylinder with the aid of a funnel the initial volume was noted. The ratio of the weight of the volume occupied was calculated.

Bulk density $= \frac{mass\ of\ the\ powder}{bulk\ volume}$ g/ml

Tapped density

it is measured by transferring a known quantity (25g) of powder into a graduated cylinder and tapping it a specific number of times. The initial volume was noted. The graduated cylinder was tapped three time. The density can be determined as the ratio of the mass of the powder to the tapped volume.

Tapped volume $= \frac{mass\ of\ the\ powder}{tapped\ volume}$ g/ml

Compressibility index

It is the propensity of the powder to be compressed. Based on the apparent bulk density and tapped density the % compressibility of the powder can be calculated by using the following formula:

% Compressibility $= \frac{[(tapped\ density - bulk\ density)]}{tapped\ density} \times 100$

Hausner ratio

It indicates the flow properties of the powder: The ratio of tapped density to the bulk density of the powder is called the Hausner ratio.

Hausner ratio $= \frac{Tapped\ density}{Bulk\ density}$

Angle of repose

The internal angle between the surface of the pile of powder and the horizontal surface is known as the angle of repose. The powder is passed through a funnel fixed to a burette at s height of 4 cm. A graph paper is placed below the funnel on the table. The height and the radius of the pile were measured. The angle of repose of the powder was calculated using the formula: -

Angle of repose= $\tan^{-1}(\frac{h}{r})$

Where, h=height of the heap.

r= radius of the heap

3.4 QUALITY CONTROL TEST FOR PHYTOCHEMICAL ANALYSIS OF HERBAL DRUGS [16,17]

1. Test for steroid

2 gm of powder of given sample was taken in test tube along with 2 ml of chloroform and 2 ml of conc. H_2SO_4. Presence of steroids was confirmed by reddish brown color.

2. Test for alkaloids

Dragendoff's test – The given sample of powder were taken in test tubes and treated with few drops of dilute 2N HCl and 0.5 ml Dragendroff's reagent. Orange to reddish precipitate confirms the presence of alkaloids.

3. Test for glycoside

Killer killani test - 2 gm of given sample of powder was taken in a test tube, 0.5 ml of glacial acetic acid, 1 drop of 5% FeCl3 and conc. H_2SO_4 is added to it. Reddish brown color was seen at the junction of the two liquids. Upper layer turns bluish in color which indicate the presence of glycosides.

4. Test for flavonoid

Take 1 gm of the given sample and few drops of dilute Sodium hydroxide was added. An intense yellow color was observed which became colorless on addition of a few drops of diluted acid, indicating the presence of flavonoids

5. Test for tannin

To the test solution, water and 2ml of 5% FeCl3 were added, formation of blue-black precipitate indicated the presence of tannins.

6. Test for carbohydrate

Molish test- 1 g of powder taken in test tube and 2 drops of fresh 10 % a - naphthol solution was added, followed by gentle addition of 1ml of ethanol, sulphuric acid and few drops of molish reagent after few minutes, formation of purple color indicates the presence of Carbohydrate.

7. Test for protein

Biuret test: 1ml of test solution and few drops of Biuret reagent shows pink color.

4. RESULT AND DISCUSSION

Different parameters for raw material evaluation

Solubility analysis

Table: Solubility of given raw materials

Medium	Bakuchi	Karanj	kutaj
Distilled water	Soluble	Less soluble in water	Soluble
methanol	Soluble	Less soluble in methanol	soluble

Raw material specification of Bakuchi seed powder

Bakuchi powder was evaluated as per the specifications and test procedure mentioned in the WHO guideline and the pharmacopeia. In Given Table shows the limit and result of Bakuchi powder evaluated.

Table: Raw material specification and test observation of Bakuchi seed powder

Sr. no	Specification	Limit	Observation
1	**Organoleptic properties**		Bakuchi
	State	Seed powder	Seed powder
	Colour	Dark brown-black	Dark brown-black
	Odor	Characteristic aromatic	Characteristic aromatic
2	**Physicochemical characterization**		
	Loss on drying	-	7.4 %w/w
	Total ash	NMT 10%w/w	5.4% w/w
	Acid insoluble ash value	NMT 2.5%w/w	0.2 %w/w
	Water-soluble ash value	-	1.55% w/w
	Water-soluble extractive	NLT 20%w/w	21.6 %w/w
	Alcohol soluble extractive	NLT 10%w/w	44 %w/w
	Bulk density	-	0.50 g/ml
	Tapped density	-	0.92 g/ml
	Angle of repose	NMT 40	30.16
	Hausner's ration	-	1.84
	Carr index	-	46 %
	Compressibility index	-	0.84 %

Raw material specification of Kutaj leaves powder

Kutaj leaves powder was evaluated as per the specifications and test procedure mentioned in the WHO guideline and the pharmacopeia. Given Table shows the limit and result of Kutaj powder evaluated.

Table: Raw material specification and test observation of Kutaj leaves powder

Sr. no	Specification	Limit	Observation
1	**Organoleptic properties**		**Kutaj**
	State	Leaf's powder	Leaf's powder
	Colour	Green	Green
	Odor	Characteristic	Characteristic
2	**Physicochemical characterization**		
	Loss on drying	-	8.41%w/w
	Total ash	NMT 10%w/w	4.65%w/w
	Acid insoluble ash value	NMT 2.5%w/w	2 %w/w
	Water-soluble ash value	-	4.2 %w/w
	Water-soluble extractive	NLT 20%w/w	22% w/w
	Alcohol soluble extractive	NLT 10%w/w	29 %w/w
	Bulk density	-	0.30 g/ml
	Tapped density	-	0.33 g/ml
	Angle of repose	NMT 40	33.30
	Hausner's ration	-	1.031
	Carr index	-	2.61%
	Compressibility index	-	0.03 %

Raw material specification of karanj seed powder

Karanj seed powder was evaluated as per the specifications and test procedure mentioned in the WHO guideline and the pharmacopeia. Given Table shows the limit and result of Karanj seed powder evaluated.

Table: Raw material specification and test observation of Karanj seed powder

Sr. no	Specification	Limit	Observation
1	**Organoleptic properties**		**Karanj**
	State	Oil	Karanj oil
	Colour	Brown to yellowish brown powder	Brown to yellowish brown powder
	Odor	Characteristic	Characteristic
2	**Physicochemical characterization**		
	Loss on drying	-	7.35 %w/w
	Total ash	NMT 10%w/w	3.15%w/w
	Acid insoluble ash value	NMT 2.5%w/w	0.2 %w/w
	Water-soluble ash value	-	2.1 %w/w
	Water-soluble extractive	NLT 20%w/w	34 %w/w
	Alcohol soluble extractive	NLT 10%w/w	28 %w/w
	Bulk density	-	0.49 g/ml
	Tapped density	-	0.66 g/ml
	Angle of repose	NMT 40	35.53
	Hausner's ration	-	1.34
	Carr index	-	22.27%
	Compressibility index	-	0.25 %

- **Loss on drying**

The moisture present in the drug was established in loss on drying. The moisture content of the drug reveals its stability and its shelf-life. High moisture content can adversely affect the active ingredient of the drug. Thus, low moisture content could get maximum stability and better shelf life. Loss on drying of Bakuchi is 7.4% w/w, Kutaj is 8.41% w/w and Karanj is 7.35 % w/w.

- **Total Ash**

Ash constitutes the inorganic residues obtained after the complete combustion of a drug. Thus, the Ash value is a valid parameter to describe and assess the degree of purity of a given drug. Total ash value will determine the number of minerals and earthy materials present in the drug. The total ash value of Bakuchi is 5.4% w/w, Kutaj is 4.65% w/w and Karanj is 3.15 % w/w which indicates that the inorganic content of the Bakuchi, Kutaj, and Karanj powder is below the limit.

Fig: Total ash of Bakuchi, Kutaj, and Karanj powder after ignition

- **Acid insoluble ash:**

The acid-insoluble ash value of the drug denotes the amount of siliceous matter present in the plant. The quality of the drug is better if the acid-insoluble value is low. Acid insoluble ash of Bakuchi is 0.2% w/w, Kutaj is 2 % w/w and Karanj is 0.2 % w/w it indicates that the quality of the drugs is better.

- **Water-soluble ash:**

Water-soluble ash is the part of the total ash content, which is soluble in water. It is 1.55 % w/w for Bakuchi, 4.2 % w/w for Kutaj, and 2.1 % w/w for Karanj.

- **Alcohol soluble extractive**

Fig: Alcohol soluble extract of Bakuchi, Kutaj, and Karanj

PHYTOCHEMICAL ANALYSIS OF RAW MATERIAL

Table: Phytochemical analysis of raw material

SR. no	Specification	Limit	Observation		
	Phytochemical analysis of raw material		Bakuchi	Kutaj	Karanj
1	Test for carbohydrate Molish test	+ve	+ve	+ve	+ve
2	Test alkaloids Dragendoff's test	+ve	+ve	+ve	+ve
3	Test for glycoside Killer killani test	+ve	+ve	+ve	+ve
4	Test for tannin Gelatine test	+ve	+ve	+ve	+ve
5	Test for steroid Salkowski test	+ve in bakuchi and -ve in karanj	+ve	+ve	-ve
6	Test for flavonoid Shinoda test	+ve	+ve	+ve	+ve
7	Test for Protein Burette test	+ve	-ve	+ve	+ve

Phytochemicals are natural bioactive compounds, found in plants and fibres, which act as a defence system against diseases and more accurately protect against diseases. The phytochemical analysis reveals the presence of Alkaloids, glycosides, phenol, Tannin, carbohydrate, Flavonoids, and protein.

1. Test for alkaloids

In the above sample test for alkaloids is found positive. Bakuchi, Kutaj and karanj shows the positive. Hence bakuchi, kutaj, and karanj pass the test, Alkaloids possess antispasmodic, analgesic, bactericidal effects. Alkaloids are the active principles producing many essential effects in protecting the body.

2. Test for glycoside

In the above sample test for glycoside is found positive. Bakuchi, Kutaj and karanj shows the positive. Hence bakuchi, kutaj and karanj passes the test.

3. Test for flavonoid

In the above sample test for flavonoid is found positive. Bakuchi, Kutaj and karanj shows the positive. Hence Bakuchi, kutaj, and karanj pass, it is the most important group of polyphenol compounds in plants. Flavonoids are a group of plants metabolites that provide health benefits through cell signalling pathways and antioxidant effects.

4. Test for tannin

In the above sample test for tannin is found positive. Bakuchi. Kutaj and karanj show the positive. Hence bakuchi, kutaj, and karanj pass the test and produce blue.

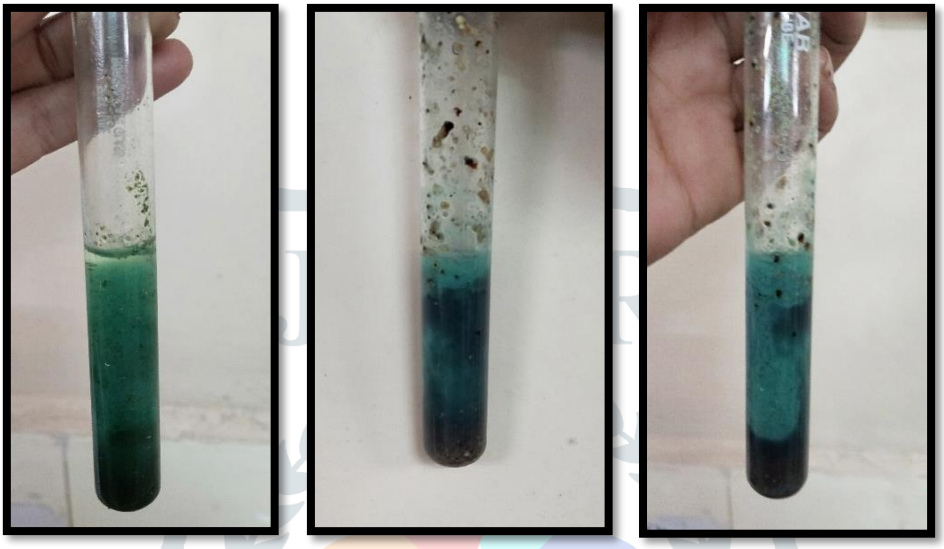

Fig: It indicate that the Gelatin test of Tannin produces blue color it means that the sample test for tannin is found positive.

6. Test for carbohydrate

Carbohydrates play important role in the storage of glucose and in the homeostasis of glucose and fatty acids in the liver. In the above sample test for carbohydrates is found positive. Bakuchi, Kutaj and karanj shows the positive. Hence Bakuchi, Kutaj and karanj passes the test.

7. Test for protein

In the above sample test for protein is found positive. Kutaj and karanj show the positive and bakuchi shows the negative. Hence Kutaj and karanj pass the test and produce blue.

Conclusion

Estimate all the parameter of Psoralea Corylifolia seeds, Pongamia pinnata seeds, and Holarrhena antidysenterica leaves as per WHO guideline and the pharmacopeia. Bakuchi is one of the important medicines in the ayurvedic pharmacopoeia being in practise since ancient time. The plant used both internally and externally. Fruit is used in more than 8 disease conditions. The seeds are used internally in 24 disease condition, the most common being laxative, aphrodisiac and diuretic and externally in 8 conditions, the most common disorder like leprosy and leukoderma. Seed oil is used in leprosy both internally and externally. the plant of Holarrhena antidysenterica has the potential to develop drug against various enteric, skin condition and diabetes. H. antidysenterica has been traditionally used to treat

condition like diarrhoea, dysentery, and helminthic diseases. But with emergence of new methods in the last few years, experimental studies made it possible to discover more pharmacological properties of the plants such as anti-inflammatory, anti-oxidant and anti-malarial conditioning. results have been reported regarding the evalution activities discussed in the research paper.

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