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A Comparative Physicochemical & Phytochemical Study of Leaves, Roots and Stem Barks of Bruhatpanchamoola (A Group of Five Perennial Plants)

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Abstract: Bruhatpanchmoola is a ayurvedic formulation of five perennial plants roots i.e. Bilva {Aegle marmelos (L.) Corr.}, Gambhari (Gmelina arborea(L).), Agnimanth (Clerodendrum phlomoidisL.f.), Shyonaka {Oroxylum indicum(L.) Vent.} andPatla {Stereospermum suaveolens(Roxb.) DC.}. Bruhatpanchmoola is also known as Mahatpanchmoola.[2] Extensive usage of Bruhatpanchmoola plants single or in formulation led to scarcity of the plants, amongst them Shyonaka {*Oroxylum indicum*(L.) Vent.} and Patla {*Stereospermum suaveolens* (Roxb.) DC.} Listed under endangered plants[4,5]. The study reveals that roots of bruhatpanchmoola can be substituted by stem bark or leaves.

Keywords: Bruhatpanchmoola, ayurved, Bilva {Aegle marmelos (L.) Corr.}, Gambhari (Gmelina arborea(L).), Agnimanth (Clerodendrum phlomoidisL.f.), Shyonaka {Oroxylum indicum(L.) Vent.} and Patla {Stereospermum suaveolens(Roxb.) DC.}. physicochemical, phytochemical, roots, leaves, stem barks -

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I. INTRODUCTION

Dashmoola is common ingredient in most of the ayurvedic formulation. The Ayurvedic Patent Medicines mentioned in the Ayurmedline formulary contains Dashmoola drugs about 20 % of total formulations. In the Ayurvedic formulations of India Part - I & II, the Dashmoola drugs contains minimum 48 & maximum 82 formulations out of 635 total formulations[1].

Dashmoola includes Bruhatpanchmoola i.e. five perennial and Laghupanchmoola i.e. five herbs. Bruhatpanchmoola is a formulation of five perennial plants roots i.e. Bilva {Aegle marmelos (L.) Corr.}, Gambhari (Gmelina arborea(L).), Agnimanth (Clerodendrum phlomoidisL.f.), Shyonaka {Oroxylum indicum(L.) Vent.} andPatla {Stereospermum suaveolens(Roxb.) DC.}.Bruhatpanchmoola is also known as Mahatpanchmoola[2].The Bruhatpanchmoola again mentioned in Bhavprakash, said to be used as Kapha-vatashamaka (which diminishes Kapha-vata related ailments means Anti-inflammatory and Analgesic activity) [3]. Extensive usage of Bruhatpanchmoola plants single or in formulation led to scarcity of the plants, amongst them Shyonaka {*Oroxylum indicum*(L.) Vent.} and Patla {*Stereospermum suaveolens*(Roxb.) DC.} Listed under endangered plants[4,5]. Further other three plants are facing same situations. To meet the increased demand of Bruhatpanchmoola and conservation of plants requirement of substitute the roots by arial parts. With this intention this study was planned to evaluate the physicochemical & phytochemical properties of Roots, Leaves & stembarks of Bruhatpanchmoola.

II. MATERIAL METHODS

- Collection of Roots, Leaves & stem barks from natural Habitat.
- Physicochemical analysis:
    1) Foreign matter
    2) Ash value
    3) Acid Insoluble ash
    4) Water Soluble extractive Value
    5) Alcohol soluble Extractive value
- Preliminary phytochemical Studies of study samples in water & Alcohol extract.

a) Collection of Study Samples:

Roots, Leaves & Stem Barks of Bilwa, Agnimanth & Gambhari were collected from Narsingpur Belagavi Karnataka and Patala & shyonak collected from Rahuri Maharashtra. Collected plant materials were indentified & authenticated from Central Research facility KAHER`s Shri. B.M.K. Ayurved College Belagavi.

b) Physicochemical Analysis[6]: Each sample subjected following test

1) DETERMINATION OF FOREIGN MATTER:

Weigh 100 grams of the sample. Spread the sample on a white tail or glass plate uniformly without overlapping. Inspect the sample with naked eye or by means of lens 5x or above. Separate the foreign organic matter (mentioned above) manually. After complete separation, weigh the matter and determine the percentage w/w present in the sample.

2) ASH VALUE ESTIMATION:

Weigh accurately 2 grams of the air dried drug in a tared platinum or silica dish and incinerate at a temperature not exceeding 450°c for 3 hours until free from carbon, cool and weigh. Calculate the percentage of ash with reference to air-dried drug

3) ACID INSOLUBLE ASH:

Boil the ash obtained by the method mentioned above. Add 25 ml of dilute hydrochloric acid for 15 mins. Collect the acid insoluble ash in a pre weighed crucible along with the ash less filter paper kept in muffle furnace for an hour at around 450°c ± 5°c. Calculate the percentage of acid insoluble ash with reference to the air dried drug.

4) DETERMINATION OF WATER SOLUBLE EXTRACTIVE

Macerate 5 g of the air dried drug, coarsely powdered, with 100 ml of chloroform water in a closed flask for twenty-four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105º, to constant weight and weigh. Calculate the percentage of alcohol-soluble extractive with reference to the air-dried drug.

5) DETERMINATION OF ALCOHOL SOLUBLE EXTRACTIVE

Steps are similar to those mentioned in the Water soluble extractive. Use alcohol (90%) instead of chloroform water.

c) PRELIMINARY PHYTOCHEMICAL SCEREENING[7]:

Extract obtain in Water soluble & Alcohol soluble Extractive value of each sample were subjected for following phytochemical analysis

1) TEST OF CARBOHYDRATES:

Molisch's Test (General Test) :2 – 3 ml aq. Extract + few drops of alpha naphthol solution in alcohol shake and add concentrated H_2SO_4 from sides of test tube - Violet ring is formed at the junction of two liquids.

2) Test for reducing Sugars

Benedict's test: Mix equal volume of Benedict's reagent and test solution in the test tube.Heat in boiling water bat for 5 minutes. Solution appears green, yellow or red depending on amount of reducing sugar present in test solution.

3) Test for Monosaccharides:

Barfoed's Test: Mix equal volume of Barfoed's reagent and test solution. Heat for 1 –2 minutes in boiling water bath and cool. Red precipitate is observed

4) Tests for Hexose Sugars:

Selwinoff's Test (for Ketohexose like fructose); Heat 3 ml Selwinoff's reagent and 1 ml test solution in boiling water bath for 1 to 2 minutes. Red colour is found.

5) TEST FOR PROTEINS:

Million's Test for Proteins: Mix 3 ml. T. S. with 5 ml. Millions Reagent gives white precipitate. Warm precipitate turns brick red or the precipitate dissolves giving red coloured solution.

6) TESTS FOR AMINO ACIDS:

Test for Tyrosine: Heat 3 ml T. S. and 3 drops Million's reagent solution. Solution shows dark red colour.

7) TESTS FOR TANNINS AND PHENOLIC COMPOUNDS:

To 2–3 ml of aqueous or alcoholic extracts, add few drops Lead acetate solution White Precipitate

8) TESTS FOR STEROIDS:

Salkowski reaction: To 2 ml of extract, add 2 ml of chloroform and 2 ml concentrated H_2SO_4. Shake well. Chloroform layer appears. Red and acid layer shows greenish yellow fluorescence.

9) TESTS FOR CARDIAC GLYCOSIDES:

Test for Deoxysugars (Keller – Killani Test): To 2 ml extract, add glacial acetic acid, one drop 5% $FeCl_3$ and concentrated H_2SO4. Reddish brown colour appears at junction of the two liquid layers and upper layer appears bluish green.

10) TESTS FOR ANTHRAQUINONE GLYCOSIDE:

Borntrager's test: to 3ml extract add dil. H_2SO4 Boil and filter. To cold filtrate add equal volume of benzene or chloroform. Shake well seperate the organic solvent. Add ammonia. Ammonical layer turns pink or red.

11) TESTS FOR FLAVONOIDS:

Take a small quantity of residue. Add lead acetate solution. Yellow coloured precipitate formed.

12) TEST FOR PENTOSE SUGAR:

Bial'sOrcinol test: to boiling Bial'sreagent add few drops of test solution. Green or purple coloration appears.

13) TEST FOR ALKALOID

Hager's test: 2-3 ml extract add Hager's reagent yellow coloured precipitate formed.

Results of Physicochemical Studies:

Table 1: Showing Physiochemical analysis result of all plants parts

Plant	Bilwa			Agnimanth			Patala			Shyonak			Gambhari		
Parameters	Roots	Stem bark	Leaf	Roots	Stem bark	Leaf	Roots	Stem bark	Leaf	Root	Stem bark	Leaf	Root	Stem bark	Leaf
Foreign matter	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Ash value %	3.040	6.669	7.823	3.364	6.485	2.366	3.364	6.485	2.366	1.633	7.462	8.473	3.770	6.673	9.653
Acid insoluble ash %	0.648	0.597	3.227	0.648	2.227	1.379	0.648	2.227	1.379	0.384	0.696	1.932	0.244	0.197	1.732
Water soluble extractive %	10.421	12.678	11.451	6.947	7.431	14.843	6.947	7.431	14.843	46.172	10.635	16.456	22.208	26.129	8.770
Alcohol soluble extractive %	9.432	9.376	4.544	5.792	3.453	12.308	5.792	3.453	12.308	29.085	4.283	5.671	12.572	13.274	6.995

RESULT OF PRELIMINARY PHYTOCHEMICAL STUDIES IN WATER EXTRACT

Plants	CH	R.S	MONO	PS	HS	PR	AA	ST	CG	AG	FL	AL	TP
Root													
B	+ ve	+ ve	+ ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
A	+ ve	+ ve	+ ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
P	+ ve	+ ve	-ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
S	+ ve	+ ve	-ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
G	+ ve	- ve	+ve	+ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
Stem bark													
B	+ ve	+ ve	-ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
A	+ ve	+ ve	+ ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ve	-ve	+ve
P	+ ve	-ve	+ ve	-ve	- ve	-ve	-ve	-ve	-ve	-ve	+ ve	-ve	+ ve
S	+ ve	+ ve	+ ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
G	+ ve	+ ve	+ ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ve	-ve	+ve
Leaf													
B	+ ve	+ ve	+ ve	-ve	- ve	- ve	- ve	-ve	-ve	-ve	+ ve	-ve	+ ve
A	+ ve	+ ve	-ve	-ve	- ve	+ ve	+ ve	-ve	-ve	-ve	+ ve	-ve	+ ve
P	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	- ve	-ve	-ve	+ ve	-ve	+ ve
S	+ ve	- ve	+ ve	-ve	- ve	- ve	- ve	-ve	-ve	-ve	+ ve	-ve	+ ve
G	+ ve	+ ve	- ve	-ve	- ve	+ve	+ ve	- ve	-ve	-ve	+ ve	-ve	+ ve

RESULT OF PRELIMINARY PHYTOCHEMICAL STUDIES IN ALCOHOL EXTRACT

Plants	CH	RS	MONO	PS	HS	PR	AA	ST	CG	AG	FL	AL	TP
Root													
B	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	+ve	+ ve	+ve	+ ve
A	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	+ve	+ ve	+ve	+ ve
P	+ ve	+ ve	- ve	+ve	- ve	+ve	+ ve	+ve	-ve	+ve	+ ve	+ve	+ ve
S	+ ve	+ ve	- ve	-ve	- ve	+ve	+ ve	+ve	-ve	-ve	+ ve	+ve	+ ve
G	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	-ve	+ ve	-ve	+ ve
Stem bark													
B	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	+ve	+ ve	+ve	+ ve
A	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	-ve	+ ve	+ve	+ ve
P	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	-ve	-ve	+ ve	+ve	+ ve
S	+ ve	+ ve	-ve	-ve	- ve	+ve	+ ve	+ve	-ve	-ve	+ ve	+ve	+ ve
G	+ ve	+ ve	+ ve	-ve	- ve	+ve	+ ve	+ve	+ve	+ve	+ ve	+ve	+ ve
Leaf													
B	+ ve	+ ve	+ ve	+ve	- ve	+ve	+ ve	-ve	+ve	-ve	+ ve	-ve	- ve
A	+ ve	+ ve	+ ve	+ve	- ve	+ve	+ ve	+ve	-ve	+ve	+ ve	+ve	+ ve
P	+ ve	+ ve	- ve	+ve	- ve	-ve	+ ve	-ve	-ve	+ve	+ ve	+ve	+ ve
S	+ ve	+ ve	- ve	+ve	- ve	+ve	+ ve	-ve	-ve	+ve	+ ve	-ve	+ ve
G	+ ve	+ ve	-ve	+ve	- ve	+ve	+ ve	-ve	-ve	+ve	+ ve	-ve	+ ve

Abbreviations: B: Bilwa, A: Agnimantha, P:Patala, S: Shyonak, G: Gambhari
CH: Carbohydrate, RS: Reducing Sugar, Mono: Monosaccharaides, PS: Pentose sugar, HS: Hexose sugar, PR: Protein, AA: Amino Acid, ST: Steroids, CG: Cardiac Glycoside, AG: Anthraquinone Glycoside. FL: Flavonoids, AL: Alkaloids, TP: Tannin & Phenolic compounds

III. DISCUSSION

In Bilwa ash value is more in leaf (7.823%) than Stem bark (6.669%) & roots (3.040%). Acid insoluble ash value is more in leaf (3.227%) than Roots (0.648%) and stem bark (0.597%). Water soluble extractive value is more stem bark (12.678%) than root (10.421%) and leaf (11.451) but the values are very nearer to each other. Alcohol soluble extractive value more in stem bark (9.376%) than root (9.432) & leaf (4.544%) but stem bark value nearer to root.

In Agnimanth ash value is more in stem bark (6.485%) than root (3.364%) & leaf (2.266%). Acid insoluble ash value is more in stem bark (2.227%) than root (0.940%) & leaf (1.379%). Water soluble extractive value is more in leaf (14.843%) than root (6.947%) and stem bark (7.431). Alcohol soluble extractive value is more in leaf (12.308%) than root (5.792%) and stem bark (3.453).

In Patala ash value is more in leaf (7.980%) than root (5.035%) & Stem bark (2.228%). Acid insoluble ash value is more in leaf (5.369%) than root (1.726%) & stem bark (0.149%). Water soluble extractive value is more in stem bark (29.136%) than root (26.841%) and leaf (18.165%). Alcohol soluble extractive value is more in stem bark (18.862%) than root (15.705%) and leaf (10.882%).

In shyonak ash value is more in leaf (7.980%) than root (5.035%) & Stem bark (2.228%). Acid insoluble ash value is more in leaf (5.369%) than root (1.726%) & stem bark (0.149%). Water soluble extractive value is more in stem bark (29.136%) than root (26.841%) and leaf (18.165%). Alcohol soluble extractive value is more in stem bark (18.862%) than root (15.705%) and leaf (10.882%).

In Gambhari ash value is more in leaf (9.653%) than root (6.673%) & Leaves (3.770%) . Acid insoluble ash value is more in leaf (1.732%) than Roots (0.244%) and stem bark (0.197%). Water soluble extractive value is more stem bark (26.129%) than root (22.208%) and leaf (8.770). Alcohol soluble extractive value more in stem bark (13.724%) than root (12.572%) & leaf (6.995%).

Foreign matter is nil in all samples because samples were collected from natural habitat & taken for studies

Preliminary phytochemical in water & alcohol extract shows that similarity in presence of phytochemical like carbohydrate, Monosaccharide, Proteins, Amino acids, Tannins & Flavonoids in individual plants root, stem barks & leaves.

Conclusion: Study results reveals that all the plants root can be substituted by stem bark or leaves. That helps to conserve the plants. To bring in to therapeutic practice further experimental & clinical studies are required.

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