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Quality control and pharmacognostical activity of *Psoralia corylifolia* Linn.

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ABSTRACT

Plants have been the basis of many traditional medicines throughout the world for thousands of years and continue to provide new remedies to mankind. Plants have been one of the important sources of medicines since the beginning of human civilization. The recent resurgence of plant remedies resulted from several factors, such as effectiveness of plant medicines and lesser side effects compared with modern medicines. Seed of leguminous plant Psoralea corylifolia Linn. (syn: Cullen corylifolium Linn.) is one of the most popular Traditional Chinese Medicine and officially listed in Chinese Pharmacopoeia. Bakuchi (P. corylifolia) is an annual herb growing throughout the plains of India. The plant is of immense biological importance, and it has been widely exploited since ages for its magical effect against several skin diseases, such as psoriasis, leukoderma, and leprosy. This plant is also pharmacologically studied for its chemoprotective, antioxidant, antimicrobial, and anti-inflammatory properties. This review attempts to highlight the available literature on P. corylifolia with respect to its ethnobotany, pharmacognostic characteristics, traditional uses, chemical constituents, and summary of its various pharmacologic activities and clinical effects. Other aspects, such as toxicology and precautions are also discussed. This will be helpful to create interest toward Bakuchi and may be useful in developing new formulations with more therapeutic and economical value.

Keywords: *Psoralia corylifolia*, Bakuchi, phytoconstituents, pharmacological activities

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INTRODUCTION

Bakuchi consists of dry ripe fruits of *Psoralea corylifolia* Linn. (Fam.Leguminosae), an erect, 0.3-1.8 m high annual herb (Figures1-2), distributed throughout the plains of India, especially in the semi-arid regions of Rajasthan and Eastern districts of Punjab, adjoining Uttar Pradesh. It is also found throughout India in Himalayas, Dehradun, Oudh, Bundelkhand, Bengal, Maharastra, some valley in Bihar, Deccan, and Karnataka. This plant is also widely distributed in the tropical and subtropical regions of the world, especially China and Southern Africa. Fruits, dark chocolate to almost black with pericarp adhering to the seed-coat, 3-4.5 mm long, 2-3 mm broad, ovoid-oblong or bean shaped, some what compressed, glabrous rounded or mucronate, closely pitted, seeds campylotropous, nonendospermous, oily and free from starch, odourless, but when chewed smell of a pungent essential oil felt, taste, bitter, unpleasant and acrid [1-2].

Figure1- ***Plant of Psoralea corylifolia***

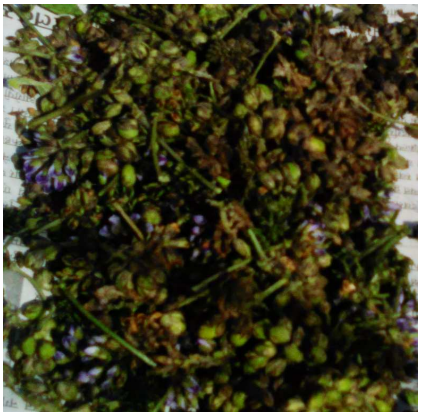

Figure 2- ***Seed of Psoralea corylifolia***

The most amazing aspect of this plant is that every part of it is useful. Roots, stems, leaves, seeds, and whatever blooms it has, all are used to treat a variety of skin problems, such as leukoderma, skin rashes, infections, and others. It is given the name "Kushtanashini" (leprosy destroyer). *P. corylifolia* is a very ancient remedy for leukoderma; it has been tried extensively not only by the practitioners of the Indian medicine but also by the followers of the Western system. The furanocoumarins, which contain psoralens, promote pigmentation. The powder is used by Vaidyas internally for leprosy and leukoderma, psoriasis and externally in the form of paste and ointment. Oil has a powerful effect on the skin streptococci [3].

The fruits of *P. corylifolia* consist of a sticky oily pericarp (12% of the seed), a hard seed coat and kernel. Chopra et al found that the seeds contain an essential oil (0.05%), nonvolatile terpenoid oil, a dark brown resin (8.6%), essential oil from seed 20.15% and alkaloid (7.4%) substance. Dymock stated that the seeds contain 13.2% of extractive matter, albumin, sugar, ash 7.4%, and traces of manganese. The essential oil contains limonene, α-elemene, γ-elemene, β-caryophylenoxide, 4-terpineol, linalool, geranylacetate, active component psoralen, angelicin, and bakuchiol. Siddhiqui isolated psoralidin and isopsoralen, along with the above constituents. Two new benzofuran derivatives-corylifonol and isocorylifonol-were isolated from the seeds. The seeds also contained flavonoids, such as corylifolean, corylifolin, corylifolinin, bakuchicin, psoralidin, isopsoralidin, bavachin, isobavachin, bavachinin, bavachalcone, isobavachalcone, 7-O-methyl bavachin, bavachromanol, corylin, corylidin, corylinal, 4-O-methyl bavachalcone, neobavaisoflavone, bavachromene and neobavachalcone [3-4].

EXPERIMENTAL SECTION

Method of preparation of the Cũrna

The samples used were of pharmacopoeial quality. Samples were washed, dried and grinded and individually passed through sieve of 180 µm separately then weighed separately, mixed in specified ratio and passed through 355 µm to obtain a homogenous blend. It was stored in an airtight container to protect from light and moisture. Sample of *Psoralia corylifolia* was collected from Gursari village, Majhagwan, Satna, Madhya Pradesh.

Physicochemical analysis

Physicochemical analysis such as the percentage of ash values and extractive values, loss on drying at 105° C and pH of filtrate of 10% w/v aqueous solution were carried out according to the official methods prescribed in Indian Pharmacopoeia [5] and the WHO guidelines on quality control methods for medicinal plant materials [6-7]. Fluorescence analysis was carried out by the method of Chase and Pratt [8].

Preliminary phytochemical screening

Preliminary phytochemical evaluation was carried out by using standard procedure [9-11].

High Performance Thin Layer Chromatography (HPTLC)

For HPTLC, 5 g of coarsely powdered drug was taken in 250 ml Stoppard conical flask & extracted with 100 ml ethanol for 24 hours by maceration technique with occasional shaking. The extract ((25 ml of) thus prepared was

further diluted to 100 ml. A portion from this extract (25ml) was concentrated on a water bath and used for HPTLC. Similarly ethanol extract was prepared for the both the samples. HPTLC of the extracts of all the test and reference samples was carried out on Silica Gel 60 F254 precoated plates (0.2 mm thickness; from Merck India Limited). Camag Linomat 5 applicator was used for band application and Desaga Video documentation Unit 3 was used for documentation of fingerprints profile. (7.5: 2.5). The plate was developed over a distance of 10 cm in a saturated development chamber **(**Twin trough chamber **(**10×10 cm with SS lid, and visualized under visible light, UV (254nm and 366nm). The plates were also visualized after spraying with 5% methanolic-sulphuric acid followed by heating at 105^0C for 5-7 min [12-13].

Test for microbial limits

Following tests were carry out as per standard methods [8-9, 14-15] to determine the microbial load in five batches of *Psoralia corylifolia* curna, a formulated compound drug powder of pharmaceutical substances

1.Enumeration of *Staphylococcus aureus* /gm
2.Enumeration of *Salmonella sp./gm*
3.Enumeration of *Pseudomonas aeruginosa/gm*
4.Determination of *E.coli*
5.Determination of total bacterial plate count (TBC)
6.Determination of Yeast and mould.

The microbiological tests were determined using specified agar and enrichment media from Himedia and Privet Limited Mumbai.

RESULTS AND DISCUSSION

Powder in brown in colour, odour less; taste distinctive very bitter. The powder completely passes through 355μm and not less than 50 percent through 180 μm.

Physiochemical analysis

Physicochemical analysis was subjected to various analytical parameters average value of total ash content 6.88%, acid insoluble ash 0.53%, water in soluble ash 2.54%, alcohol soluble extractive 27.05%, water soluble extractive 34.9%, hexane soluble extractive 29.65%, acetone soluble extractive 13.48%, methanol soluble extractive 29.83% and loss on drying(LOD) at 105 ^{0}C 5.60 % (Table 1).

Table 1: Physiochemical analysis of *Psoralia corylifolia*

S.N.	Parameters	Results
1.	Loss on drying at 105 ^{0}C	5.60 %
2,	Total ash content	6.88%
3.	Acid insoluble ash	0.53%
4.	Water in soluble ash	2.54%
5.	Ethanol soluble extractive	27.05%
6.	Water soluble extractive	34.9%
7.	Methanol soluble extractive	29.83%
8.	Hexane soluble extractive	29.65%
9.	Acetone soluble extractive	13.48%

Table 2: Preliminary phytochemical screening of extracts of *Psoralia corylifolia* (+ present, -absent)

S.N.	Parameters	Results
1.	Alkaliods	+
2,	Carbohydrate	-
3.	Flavonoids	+
4.	Resins	+
5.	Saponins	+
6.	Tannins	+
7.	Protien	-
8.	Steroids	-

Preliminary phytochemical screening

The preliminary phytochemical test was performed on the extracts of plant of *Psoralia corylifolia*. They show the presence of the alkaloid, resin, saponin, tannin and protein (Table 2).

Fluorescence analysis

The fluorescence analysis is a tool for the determination of constituents present in the plant that gives an idea on its chemical nature. Therefore fluorescence analysis of the powder was carried out and data has been presented in (Table 3).

Table 3: Fluorescence analysis of *Psoralia corylifolia*

S. No.	Powder + Reagents	Observation at 254 nm	Observation at 366 nm
1.	Only Powder	Green colour	Green colour
2.	Powder + Iodine water	Light Yellow	Whitish Green
3.	Powder + 50% KOH	Light Yellow	Green
4.	Powder + 1N NaOH in Methanol	Light Green	White
5.	Powder + Acetic acid	Light Yellow	Purple
6.	Powder + 50% HNO_3	Yellowish Brown	Dark Brown
7.	Powder + Conc.H_2SO_4	Dark Brown	Black
8.	Powder + 1N HCL	Light Green	Light Green
9.	Powder + 1N NaOH	Light Green	Green
10.	Powder + 50% H_2SO_4	Light Green	Green

High Performance Thin Layer Chromatography (HPTLC)

The TLC plates were examined under ultra violet light at 254 nm; at 366 nm and at visible light for both before and after derivatization with 5% methanolic-sulphuric acid reagent (Figures 3). The R_f values and colour of the bands obtained were recorded (Table 4-7).

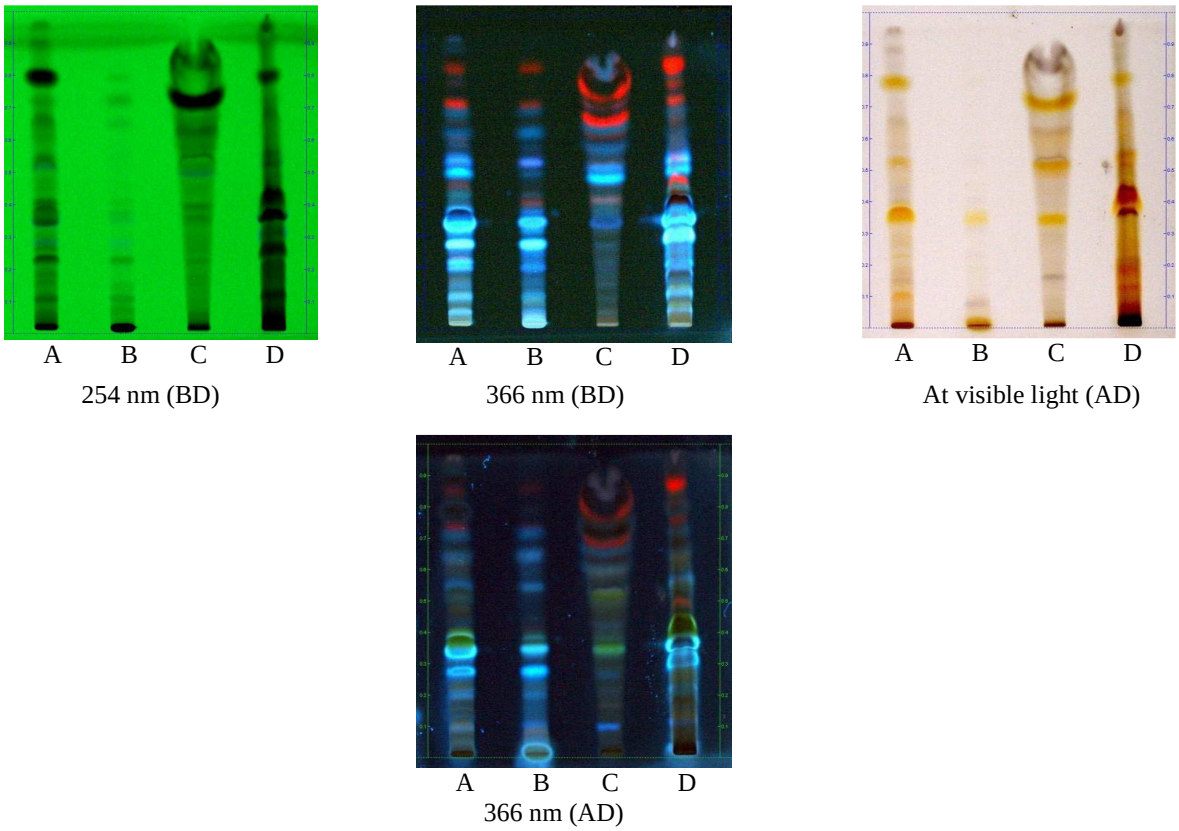

Figure 3. HPTLC Finger prints of test solution of *Psoralia corylifolia* at 254 nm, 366nm and visible light (before derivatization -BD and after derivatization-AD)

Test Solution of Psoralia corylifolia in Gursari village, Majhagwan,, Satna, Madhya Pradesh A-Ethanolic extract, B-Methanolic extract, C-Hexane extract and D-Acetone extract.

Table 4 : R_f values of test solution of *Psoralia corylifolia* at 254 nm (before derivatization)

S.NO.	R_f value	***Psoralia corylifolia***			
		Ethanol extract	Methanol extract	Hexane extract	Acetone extract
1.	R_f1(Dark Green)	0.11	0.11	NA	0.11
2.	R_f2(Dark green)	0.24	0.24	NA	0.24
3.	R_f3 (Black)	NA	NA	NA	0.26
4.	R_f4 (Dark Green)	NA	0.36	NA	0.36
5.	R_f5 (Dark Green)	0.40	NA	0.40	0.40
6.	R_f6(Black)	NA	NA	NA	0.45
7.	R_f7 (Dark Green)	0.54	NA	0.54	0.54
8.	R_f8 (Dark Green)	NA	NA	0.62	NA
9.	R_f9 (Black)	0.72	NA	0.72	NA
10.	R_f10(Black)	0.80	NA	NA	0.80

NA-Major spot not appeared

Table 5 : R_f values of test solution of *Psoralia corylifolia* at 366 nm (before derivatization)

S.NO.	R_f value	***Psoralia corylifolia***			
		Ethanol extract	Methanol extract	Hexane extract	Acetone extract
1.	R_f1(Sky Blue)	0.06	0.06	NA	NA
2.	R_f2(Brick Red)	0.08	0.08	0.08	0.08
3.	R_f3 (Sky Blue)	0.11	0.11	NA	0.11
4.	R_f4 (Sky Blue)	0.20	0.20	NA	0.20
5.	R_f5 (Fluorescent)	0.28	0.28	NA	0.28
6.	R_f6(Fluorescent)	0.33	0.33	NA	0.33
7.	R_f7 (Blue)	0.36	0.36	0.36	0.36
8.	R_f8 (Red)	NA	0.42	0.42	0.42
9.	R_f9 (Brick Red)	NA	NA	NA	0.47
10.	R_f10(Fluorescent)	NA	NA	0.48	NA
11.	R_f11(Fluorescent)	0.51	NA	NA	0.51
12.	R_f12(Blue)	0.54	0.54	0.54	0.54
13.	R_f13(Blue)	NA	NA	0.58	NA
14.	R_f14 (Blue)	0.64	0.64	0.64	00.64
15.	R_f15(Brick Red)	NA	NA	0.67	NA
16.	R_f16(Blue)	0.69	0.69	0.69	0.69
17.	R_f17(Brick Red)	0.73	NA	0.73	0.73
18.	R_f18 (Blue)	NA	NA	0.82	NA
19.	R_f19 (Brick Red)	0.83	0.83	NA	0.83

NA-Major spot not appeared

Table 6: R_f values of test solution of *Psoralia corylifolia* at 366 nm (after derivatization)

S.NO.	R_f value	***Psoralia corylifolia***			
		Ethanol extract	Methanol extract	Hexane extract	Acetone extract
1.	R_f1(Brown)	0.07	NA	0.07	0.07
2.	R_f2(Blue)	0.10	0.10	0.10	NA
3.	R_f3 (Gray)	NA	NA	NA	0.18
4.	R_f4 (Blue)	0.21	0.21	NA	NA
5.	R_f5 (Blue)	0.28	0.28	NA	NA
6.	R_f6(Sky Blue)	0.32	NA	NA	0.32
7.	R_f7 (Sky Blue)	0.34	0.34	NA	0.34
8.	R_f8 (Brick Red)	0.36	0.36	0.36	0.36
9.	R_f9 (Brick Red)	NA	NA	NA	0.42
10.	R_f10(Light Yellow)	NA	NA	0.52	NA
11.	R_f11(Blue)	0.54	0.54	NA	NA
12.	R_f12(Blue)	NA	NA	0.62	0.62
13.	R_f13(Blue)	0.65	0.65	NA	NA
14.	R_f14 (Brick Red)	NA	NA	0.68	NA
15.	R_f15(Brick Red)	0.72	0.72	NA	NA
16.	R_f16(Blue)	0.78	NA	0.72	NA
17.	R_f17(Red)	NA	NA	NA	0.87

NA-Major spot not appeared

Table 7: R_f values of test solution of *Psoralia corylifolia* at day light (after derivatization)

S.N.	R_f value	*Psoralia corylifolia*			
		Ethanol extract	Methanol extract	Hexane extract	Acetone extract
1.	R_f 1(light yellow)	0.10	NA	NA	NA
2.	R_f 2(Gray)	NA	NA	0.16	NA
3.	R_f 3 (Yellow)	0.36	0.36	0.36	NA
4.	R_f 4 (Red)	NA	NA	NA	0.38
5.	R_f 5 (Red)	NA	NA	NA	0.42
6.	R_f 6(Yellow)	0.53	NA	0.53	NA
7.	R_f 7 (Yellow)	NA	NA	0.71	NA
8.	R_f 8 (Yellow)	0.78	NA	NA	0.78
9.	R_f 9 (Red)	NA	NA	NA	0.94

NA-Major spot not appeared

The microbial profile of the *Psoralia corylifolia* sample was found satisfactory. Total bacterial plate counts (average 195 cfu/g), Yeast and Moulds (average 18 cfu/g) counts were reported less than the limit set by WHO and pathogenic bacteria, i.e. *Salmonella sp., Pseudomonas aeruginosa*, *Staphylococcus aureus* and *E. coli* were found to be absent (Table 8 and Figures 4.1-4.6).

Table7: Determination of Microbial Load of *Psoralia corylifolia*

S.N.	Parameters	*Psoralia corylifolia*	Permissible Limits API part II
1.	*Staphylococcus aureus /g*	Absent	Absent
2.	*Salmonella spp. /g*	Absent	Absent
3.	*Pseudomonas aeruginosa /g*	Absent	Absent
4.	*E.coli*	Absent	Absent
5.	*Total Total microbial plate count* (APC)	195cfu/g	10^5 /gm
6.	*Total Yeast & mould.*	18cfu/g	10^3 /gm

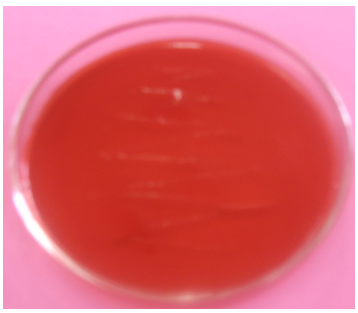

Figure 4.1. Showing negative result for *Staphylococcus aureus*

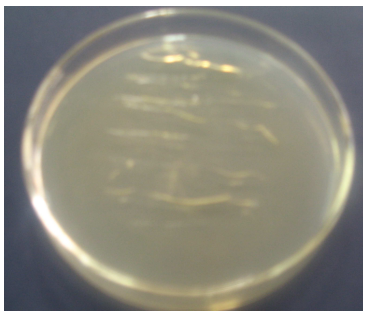

Figure 4.2.Showing negative results for *Pseudomonas aeruginosa*

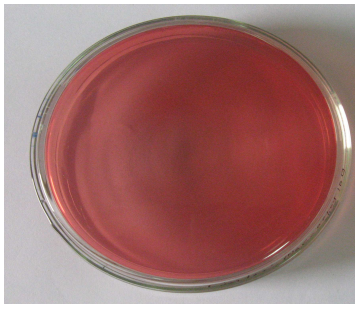

Figure 4.3.Showing negative result for *E.coli*

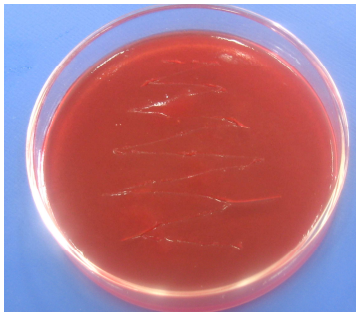

Figure 4.4.Showing negative result for *Salmonella* sp.

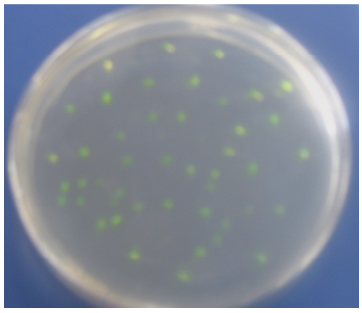

Figure 4.5. Showing Total Bacterial plate Counts

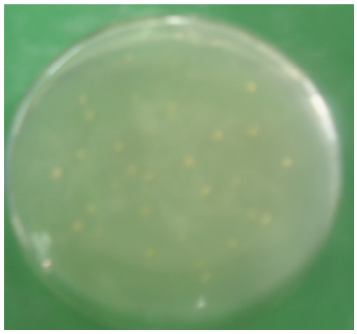

Figure 4.6.Showing Yeast & Moulds

Figure 4. Photographs of Microbiological limit test in *Psoralia corylifolia*

CONCLUSION

The Pharmacognostical features of *Psoralia corylifolia* studied in the present study have been utilized in developing standards of this plant which will be useful in the detection of its identity and authenticity. The parameters such as physiochemical analysis, preliminary phytochemical test, fluorescence analysis and HPTLC studied add to its quality control and quality assurance for proper identification.

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