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Detection of adulteration of Bakuchi with Cakramardah

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Abstract
In India, about 80% of the rural population depend on medicinal herbs and/or indigenous systems of medicine. The Present work mainly concentrating on adulteration of *Psoralea corylifolia* (Bakuchi) seeds with *Cassia tora* (Cakramardah) seeds in Bangalore local market. The plant Bakuchi is an endangered and medicinally important plant belonging to the family Fabaceae. The plant is well recognized in Indian and Chinese folkloric medicine as a laxative, aphrodisiac, anthelmintic, diuretic and diaphoretic in febrile conditions. The seeds have been recommended in the treatment of leucoderma, leprosy, psoriasis and inflammatory diseases of the skin. Adulterations and substitutions are common in raw material trade of medicinal plants. In general, adulteration is considered as an intentional malpractice. However, in raw material trade unintentional adulteration also exists. This species is very important in herbal medicine and has got varied activities. To overcome this problem in crude drugs (seeds) we investigated adulteration by Pharmacognostic parameters like, Physicochemical, Histological and TLC finger printing studies to find out adulterant. The study shows that intentionally cakramardah seeds are mixed with the bakuchi seeds. These raw herbs belong to same family, seeds and pods are morphologically similar, and identification is difficult when mixed in small quantity.

Keywords: medicinal plants, adulteration, pharmacognosy, leguminous plants

Introduction
The Present work mainly concentrating on adulteration of *Psoralea corylifolia* (Bakuchi) seeds with *Cassia tora* seeds in Bangalore local market, which is called as "Cakramardah". The plant Bakuchi is an endangered and medicinally important plant belonging to the family Fabaceae. The plant is well recognized in Chinese and Indian folkloric medicine as a laxative, aphrodisiac, anthelmintic, diuretic and diaphoretic in febrile conditions. The seeds have been recommended in the treatment of leucoderma, leprosy, psoriasis and inflammatory diseases of the skin. Adulterations and substitutions are common in raw material trade of medicinal plants. In general, adulteration is considered as an intentional malpractice. However, in raw material trade unintentional adulteration also exists. This species is very important in herbal medicines and have varied activities. To overcome this problem in crude drug (seeds) we investigated adulteration by TLC finger printing, physicochemical and histological studies to find out adulterant.

In India, about 80% of the rural population depend on medicinal herbs and/or indigenous systems of medicine. In fact today, approximately 70% of "synthetic" medicines are derived from plants. Popularity among the common people increased the usage of medi cinal plants/herbal drugs. Herbal adulteration is one of the common malpractices in herbal raw material trade. In general, adulteration is considered as an intentional practice. When similarity in morphology drug can be adulterated *Mucuna pruriens* is the best example for unknown authentic plant and similarity in morphology. It is adulterated with other similar papilionaceae seeds. *M. utili* (Sold as white variety) and *M. deeringiana* (sold as bigger variety) are popular adulterants. Apart from this, *M. cochinchinensis*, *Canavalia virosa* and *Canavalia ensiformis* are also sold in Indian markets. Authentic seeds are up to 1 cm in length with shining mosaic pattern of black and brown color on their surface. *M. deeringiana* and *M. utilis* are bigger (1.5-2 cm) in size. While *M. deeringiana* is dull black and *M. utilis* is white or buff colored. (Mitra and Kannan 2007) [9]. In present investigation finding out adulterant from the sample purchased.

Material and methods
Collection: Seeds purchased from the Bangalore local market for the research work and preserved in raw drug museum with number PSO COR/SD/VVPL/11/06/18

Morphology: The seeds of *P. corylefolia* are kidney shaped, 2–4 mm long, 2–3 mm broad and 1–15 mm thick, smooth, oblong, flattened, dark brown with an agreeable aromatic odour and taste. (Variers 1995)

Seeds of *Psoralea corylifolia* **Seeds of *Cassia tora***

Fig 1

TLC fingerprinting profile carried as per (Stahl E 1965). For the histological studies, transverse sections (TS) were prepared and stained (Johansen 1940). Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian Pharmacopoeia (Anonymous 1998) [1]. A standard, Limit for total microbial count provided by WHO Guidelines (1998) was followed and also Indian herbal pharmacopoeia (2002).

Results and discussion

Physicochemical constants

There were no earlier reports on theses parameters; this is the first report of this kind adulterant raw herb under study. The study reveled the unique ash and extractive values for the species. The organoleptic studies showed totally different. Physicochemical constants and organoleptic characters values see Table- 1

Table 1: Physicochemical and Organoleptic Parameters

Physicochemical Constants				
Parameters	***Psoralea corylifolia***		***Cassia tora***	
	Values	**Limits**	**Values**	**Limits**
TA	6.8%	NA	6.05%	NA
AIA	0.85%	NA	1%	NA
ASE	17%	NA	8.1%	NA
WSE	19%	NA	17.9%	NA
Organoleptic Parameters				
Parameters	*Psoralea corylifolia*		*Cassia tora*	
	Values	Limits	Values	Limits
Taste	BItter	NA	Sweet	NA
Color	Black	NA	Brownish white	NA
Odour	Aromatic	NA	Mild	NA
Texture	Rough	NA	Smooth	NA

NA-Not Available, TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble Extractive)

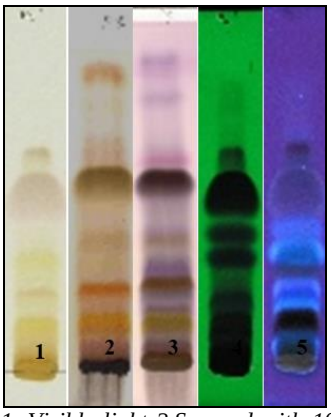
TLC finger printing profile

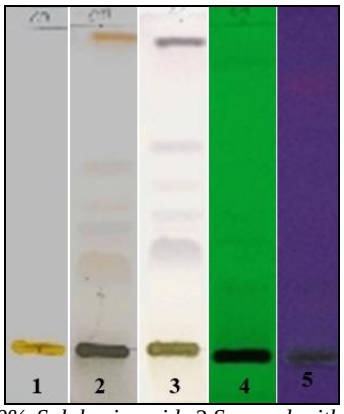
Both the raw herbs were subjected to phytochemical investigation for evaluation of their chemical profile. Methanolic extract of seed powders were investigated for TLC finger print profile. Among various combinations of polar and non- polar mobile phase tried, the maximum resolution was found with toluene: ethyl acetate at the ratio of 9:1 v/v. The TLC plate showed five fluorescence bands when observed under UV at 366 nm and UV 254 nm in *P. corylifolia*. Where as in *C. tora* no fluorescence bands were seen. In both samples, after derivatization with sulfuric acid and anisaldehyde reagent, respectively eight and five different colour bands was seen on the plate (Figure 2) in *P. corylifolia*. In *C. tora* five bands were noticed on the plate after derivatization of sulfuric acid and anisaldehyde reagent (Figure 2) by showing the presence of various compounds in both samples. Rf value of each band was calculated (Table 2). It was observed maximum bands are present in *P. corylifolia*, only five bands were observed in adulterated seed extract indicating that the there is no similarities in chemical profiling.

Table 2: TLC finger printing Profile

TLC Finger Printing Profile *Psoralea corylifolia*								
Under Visible Light								
Rf Values	0.04	0.15	0.23	0.32	0.54	0.64	-	-
Sprayed with 10% H_2SO_4								
Rf Values	0.06	0.13	0.23	0.38	0.56	0.87	-	-
Sprayed with Anisaldehyde								
Rf Values	0.06	0.12	0.16	0.27	0.39	0.57	0.63	0.81
Under Short UV (254 nm)								
Rf Values	0.04	0.2	0.32	0.4	0.5	-	-	-
Under Long UV (366 nm)								
Rf Values	0.08	0.18	0.23	0.34	0.4	-	-	-

TLC Finger Printing Profile *Cassia tora*								
Under Visible Light								
Rf Values	-	-	-	-	-	-	-	-
Sprayed with 10% H_2SO_4								
Rf Values	0.28	0.38	0.45	0.57	0.97	-	-	-
Sprayed with Anisaldehyde								
Rf Values	0.32	0.41	0.51	0.62	0.94	-	-	-
Under Short UV (254 nm)								
Rf Values	-	-	-	-	-	-	-	-
Under Long UV (366 nm)								
Rf Values	-	-	-	-	-	-	-	-





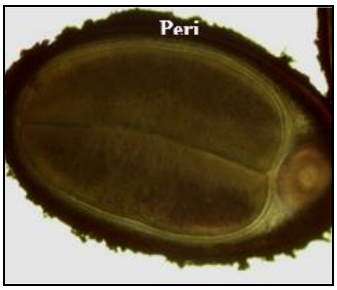
1. Visible light 2.Sprayed with 10% Sulphuric acid, 3.Sprayed with Anisaldehyde reagent 4.Observed under short UV (254 nm), 5.Observed under long UV (366 nm)

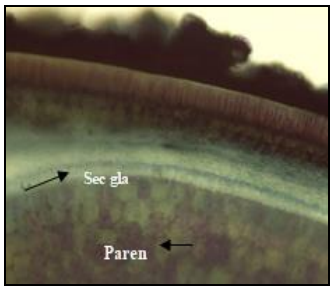
Fig 2: *Psoralea corylifolia* **Fig 3:** *Cassia tora*

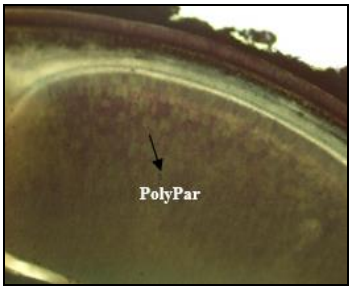
Anatomical studies

T.S of *Psoralea corylifolia*

T.S of seed shows pericarp with prominent ridges consisting of parenchyma depressions, Large secretary glands containing oleoresins, Outer layers palisade epidermis much thickened, Cotyledon present with polygonal parenchyma cells, Three layers of polygonal parenchymatous cells on adhaxial surface.





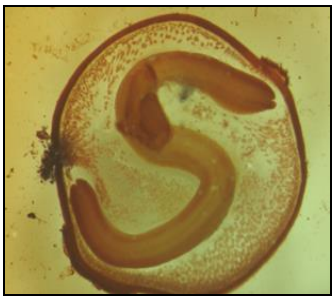


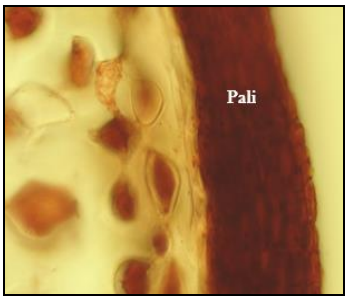
Peri- Pericarp, Coty- Cotyledon, Sec gla-Secretary glands, Poly par- Polygonal parenchyma.

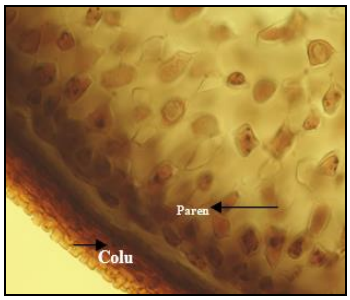
Fig 4 **Fig 5** **Fig 6** **Fig 7**

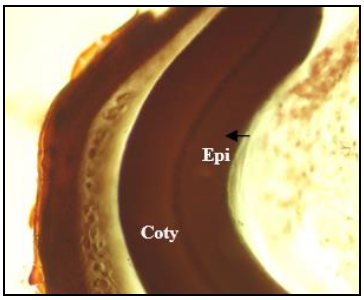
T.S of *Cassia tora*

T.S of seed shows thick and smooth cuticle cells are longitudinally arranged, palisade cells composed of closely, radially arranged, non-lignified cells, Columnar cells by thick walled dumb-bell shaped cells and thick walled parenchyma cells, Parenchyma cells forming inner layer of the testa these testa differentiated into tangentially, Cotyledon covered by single layered of epidermis and externally covered by cuticle and few layers of palisade cells of mesophyll.









Pali-Plisade, Colu- Columnar cells, Paren- Parenchyma cells, Coty- Cotyledon, Epi- Epidermis.

Fig 8 **Fig 9** **Fig 10** **Fig 11**

Microbial limit test

Results obtained for microbial assay of *P. corylifolia* showed 4000 (4.0 x 10^3 Cfu/gm) colonies for aerobic bacteria and 1500 (1.5 x $10^{3)}$ for yeast, for the seed *C. tora* 3200 (3.2x 10^3 Cfu/gm) colonies for aerobic bacteria and 800 (0.8 x 10^3 Cfu/gm) colonies for yeast and moulds, which are for below the limits of international guidelines. Limits referred by WHO guidelines 1998, Indian herbal pharmacopoeia 2002. Total aerobic bacterial count (TABC): $\leq 1X10^7$ & Total yeast and mould count (TYMC): $\leq 1x10^5$.

Discussion

From the above parameters studied this shows that intentionally cakramardah seeds are mixed with the Bakuchi seeds. These raw herbs belong to same family, seeds and pods are morphologically similar, and identification is difficult when mixed in small quantity. This may be due to suppliers are illiterate and not aware of about authentic raw herb supply, and non-availability and lack of scientific knowledge about the required raw herb.

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