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Short Communication

Preliminary pharmacognostical and phytochemical investigation on *Sterculia foetida* Linn. seeds

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Powdered seed of *Sterculia foetida* (Sterculiaceae) were subjected to successive Soxhlet extraction with chloroform, ethanol and finally with water to get their respective extracts for detailed chemical analysis. Fluorescence character of different extracts and seed powder with various reagents were noted under UV and under normal ordinary light. The total ash value, acid insoluble ash value and water soluble ash value were 3.9, 0.76 and 0.84%, respectively. Loss of weight on drying was 7.65%, the percent yield for chloroform, ethanol, water extracts were 14, 21, 29%, respectively. Preliminary qualitative chemical analysis of extract was found positive for flavonoids, saponins and alkaloids in ethanol extracts. These studies provide referential information for correct identification and standardization of this plant material.

Key words: *Sterculia foetida* seeds, solvent extracts, pharmacognostical analysis, phytochemicals.

INTRODUCTION

Sterculia foetida L. (Sterculiaceae) commonly called “Java olives” in English and “Jangli badam or Pinari” in Hindi is a large evergreen tree found usually in the western and southern parts of India (Sharma and Sanjappa, 1993). It is a tall stately tree, deciduous in the cold season and produces more or less whorled, horizontal branches. The follicles are boat shaped woody bright red when ripe. The seeds are black, ellipsoid, 2 cm long, 10 - 15 in each follicle, not winged.

The tree is useful in many respects. Due to its medicinal properties the plant has attracted attention of many researchers (Nair et al., 1977). The leaves of this plant are used as herbal medicine as aperient, diuretic and as insect repellant (Chopra et al., 1992). The alcoholic leaves extract exhibits significant anti-inflammatory and central nervous (CNS) depressant activity (Naik et al., 2004). Its seeds are roasted and eaten like chestnuts. The seed contains considerable amount of fat. It has been reported that the seed oil is externally and internally given in itch and other diseases of skin, decoction of fruits is mucilageneous and astringent and that of wood boiled with seed oil is said to be employed in rheumatism (Chadha, 1976). The presence of sterculic acid triglycerides in the seeds of *S. foetida* has been reported (Guerere et al., 1985). This triglyceride was found to have direct effects on smooth muscle proliferation when tested on primary as well as subcultures of rabbit aorta smooth muscle cells (Leveille et al., 1982). Seed oil contains high content of cyclopropenoid fatty acids (Miralles et al., 1993). Compounds containing cyclopropenoid rings are associated with several biological properties such as antifungal (Schmid et al., 1988), insecticide, antibiotic, antiviral, hormonal, carcinogenic or antitumoral activities (Salaun, 2000). However, there are no reports on standardization of seed; therefore the present study was designed to explore the pharmacognostical and phytochemical properties of *S. foetida* seeds which is responsible for its pharmacological activities.

MATERIALS AND METHODS

Experimental plant material

Seeds of *S. foetida* L. were collected from local garden Gulbarga, Karnataka (India) during the month of Dec - Jan 2005 and authenticated by Prof. Y. N. Seetaram, Faculty, Department of Botany, Gulbarga University, Gulbarga where a voucher specimen has been deposited in the herbarium (HGUG No. 834).

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Table 1. Percent extractive and colour of successive extracts of *S. foetida* seed.

Solvent	Extractive values (% w/w)	Colour of extracts under ordinary light	Colour of extracts under UV
Chloroform (CE)	14	Light brown	Yellow
Ethanol (EE)	21	Yellowish red	Brown
Water (WE)	29	Black	Dark brown

Table 2. Results of phytochemical screenings of successive extracts of *S. foetida* seed.

Constituents	Chloroform extract (CE)	Ethanol extract (EE)	Water extract (WE)
Alkaloids	+	+	–
Carbohydrates	–	+	+
Glycosides	+	+	–
Steroids	–	+	–
Flavonoids	–	+	+
Phenols	+	+	+
Saponins	+	+	+
Tanins	+	+	+
Proteins and Amino acids	–	+	+

+ = detected, – = not detected

Preparation of extracts

The air-dried seeds were ground to a fine powder and Soxhlet extracted with petroleum ether. The defatted seed cake was then extracted with chloroform, ethanol and water successively to give chloroform extract (CE), ethanol extract (EE) and water extract (WE). The extracts were collected separately and reduced to a small volume under reduced pressure and temperature and stored at 4°C for further use.

Phytochemical screening

The presence of various chemical constituents in plant extracts was determined by preliminary phytochemical screening as described by Trease and Evans (1978).

Determination of physico-chemical parameters

The seeds of the plant were subjected for determination of physicochemical parameters like organoleptic evaluation, foreign organic matter, swelling factor, total ash value, acid insoluble ash value, water soluble ash value, determination of crude fibre, loss on drying (Raghunathan, 1976), alcohol soluble extractive, chloroform extractive, water soluble extractives (Usha et al., 1984) and fluorescence studies (Chase and Pratt, 1949).

RESULTS AND DISCUSSION

Keeping in view of the ethnopharmacological importance of *S. foetida* seeds, preliminary studies were undertaken for standardization. Organoleptic evaluation showed the following characters: colour- - light yellow, sensation - - coarse, taste - - bitter and odour - - mild aromatic. The organoleptic studies indicated important characteristics such as typical tongue sensitizing aromatic taste, aromatic odour, etc, which are useful diagnostic characters. Mean ash values (%) was found to be 3.9 (total), 0.76 (acid insoluble ash), 0.84 (water soluble ash). Total ash value was relatively low, which may be due to low content of carbonates, phosphates, silicates and silica. Ash value is useful in determining authenticity and purity of drug and also these values are important quantitative standards (Kokate et al., 2006). Foreign organic matter in the seed was 5.36%; this may be due to first hand collection of plant material from non polluted area (Khandelwal, 2005). Percent weight loss on drying was 7.65%, which is not too high, hence could discourage bacterial, fungal, or yeast growth (African Pharmacopoeia, 1986). No considerable swelling in seeds upon soaking was observed possibly due to absence of considerable muscillage in seeds. Crude fibre value was found to be 7.1%, determination of crude fibre is useful in distinguishing between similar drugs or in the detection of adulteration. It also helps to remove the more resistant parts of plant organs which can be used for microscopic examination. The mean values of different solvent extractives are shown in Table 1. Extractive value was highest in water and alcohol indicating the possibility of considerable amount of polar compounds in seeds. Preliminary phytochemical screening of alcoholic extracts indicated high concentration of flavonoids, alkaloids, along with other constituents (Table 2) like glycosides, saponins and steroids. These secondary metabolites are known to posses various pharmacological effects and may be

Table 3. Fluorescence analysis of powdered seeds of *S. foetida.*

Powdered drug	Visible/Day light	UV 254 nm (short)	UV 365 nm (long)
Powder as such	Yellow	Brown	Blackish brown
Powder + 1 M NaOH	Yellowish brown	Dark yellowish brown	Dark brown
Powder + 1% $C_6H_3O(NO_3)_3$	Yellow	Black	Blackish brown
Powder + CH_3COOH	Brown	Brownish yellow	Light yellow
Powder + 1 M HCl	Black	Brown	Dark brown
Powder + dil. HNO_3	Yellowish brown	Red	Dark green
Powder + 5 % I_2	Yellowish brown	Dark brown	Black
Powder + 5 % $FeCl_3$	Orange	Brown	Brownish black
Powder + HNO_3 + 25% NH_3	Dark yellowish brown	Brown	Brownish black
Powder + CH_3OH	Red	Brown	Blackish brown
Powder + 50% HNO_3	Yellowish brown	Brown	Dark brown
Powder + 1 M H_2SO_4	Blackish brown	Black	Black
Powder + dil. NH_3	Yellowish brown	Light brown	Brown
Powder + Conc. HNO_3	Yellowish brown	Brown	Dark brown
Powder + 10% $K_2Cr_2O_7$	Deep yellow	Yellowish brown	Black
Powder + 25% NH_3	Yellowish brown	Brown	Blackish brown

responsible for various pharmacological effects of *S. foetida* seeds.

The result of fluorescence studies of seed powder using different reagents are given in Table 3 and that of the extracts is shown in Table 1. Fluorescence is an important phenomenon exhibited by various chemical constituents present in plant material. Some constituents show fluorescence in the visible range in day light. The ultra violet light produces fluorescence in many natural products (e.g. alkaloids like berberine), which do not visibly fluoresce in day light. If the substances themselves are not fluorescent, they may often be converted into fluorescent derivatives by applying different reagents hence some crude drugs are often assessed qualitatively in this way and it is an important parameter of pharmacognostical evaluation (Ansari, 2006).

Conclusion

The parameters which are reported here can be considered as distinctive enough to identify and decide the authenticity of this drug in herbal industry/trade and this can be included as microscopic standards in Indian Herbal Pharmacopeia.

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