



PROMISING PHARMACEUTICAL PROSPECTIVE OF ‘JAVA OLIVE’- *STERCULIA FOETIDA* LINN (STERCULIACEAE)

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ABSTRACT

Medicinal trees have been used both in the prevention and cure of various diseases of human and their pets with the advent of human civilization. Many system of therapy have been developed primarily based on plant. Plant polysaccharides comply with many requirements expected of pharmaceutical excipients such as non toxicity, stability, availability and renewability. They are extensively investigated for use in the development of solid dosage forms. Several medicinal trees and their products are still in home remedies and they represent a substantial proportion of the global drug market. These medicinal plants gain further importance in the region where modern medical health facilities are either not available or not easily accessible. *Sterculia foetida* L. Sterculiaceae is a tree with digitately lobed leaves, 5-7 leaflets, elliptic, margin entire, flowers in axillary panicles. The edible seeds eaten roasted or fried; seed used as adulterant for cacao; seed are also eaten as purge/dewormer; oil from seeds have uses in local culinary and traditional medicine; oil as an illuminate; fiber obtain from the bark used as cord; pulpwood; timber yields gum or glue used in bookbinding; fire wood and charcoal. In this context, the present study has shown the hidden potentiality of *S. foetida*, Sterculiaceae for its medicinal and economical importance.

Key words: Medicinal trees, *Sterculia foetida*, Sterculiaceae, Natural gum, Excipients, Medicinal and Economical importance.

INTRODUCTION

Sterculia foetida L is a tropical plant belonging to the Sterculiaceae family which is also called as ‘Java-Olive’, ‘Bastard poon tree’, ‘Hazel sterulia’, ‘Skunk tree’, ‘Poon tree’, and ‘Sam-rong’ in Thai. In India it is known as ‘Janglibadam’ (Hindi, Bengali), ‘Gorapu-badam’ (Tamil). It is a large tree growing up to 4 meter in height and 3 meter in girth, with the branches arranged in whorls and spreading horizontally [1-3]. The seed of *S. foetida* are of exalbuminous type which has starchy cotyledons and are straight with a small radical. It is numerous 3-4 inch long, ellipsoid, oblong, 1,5-1,8cm slate colored with yellow caruncle on one side at the base. The seed have a pleasant taste and are sometimes eaten. Edible oil called sterculia oil is present in the testa as well as the kernel. The total oil content is about 34 % [4,5].

Plant materials collection

The plant specimen was collected near the areas of Mahatma College of Dental Sciences, Puducherry. The specimen was then identified by Dr. K. Kadavul,

Taxonomist, Tagore Arts and Science College, Puducherry. A voucher specimen was kept in the department of Pharmacognosy, MTPG&RIHS, Puducherry for further reference (Ref. no: 0127/2012).

PHARMACOGNOSTICAL STUDIES

Hypocotyl and shoot tip explants derived from the seedling of *S. foetida* were placed on MS medium supplemented with various cytokinin and auxin combination. Cytokinin like N-benzyl amino purine (BAP), kinetin (KN), thidiazuron (TDZ) and auxin like indole acetic acid (IAA), naphthalene acetic acid (NAA), and indole butyric acid (IBA) were supplemented either individually or in combination. The regenerated shoots were separated and placed on the rooting medium augmented with different auxin like IAA, IBA and NAA (0.1-2mg/L). IAA (2 mg/L) induced 3-4 roots from the cut end of the micro shoots. Rooted plantlets were acclimatized to field condition by placing them in post containing sterilized and, soil, and manure mixture (1:1:1) and subsequently transfer to field with 40% survival [6].

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Fig 1. Habit and Habitat of *Sterculia foetida* Linn.

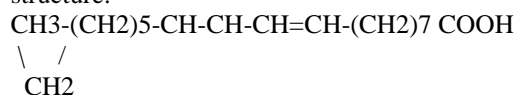


Fig 2. Fruit and Seeds of *Sterculia foetida*



PHYTO CHEMICAL STUDIES

The seed kernel contains 53-55% of a pale yellow oil which polymerizes rapidly at 240⁰-250⁰C and even to some extent at lower temperature. Recently pure sterculic acid has been isolated from the total fatty acid of the oil by low temperature, fractional crystallization. On the basis of physical constants, spectroscopic data, and degradative and synthetic studies it has been given the following structure.



Oil was recovered from a portion of the extract and found to have the following characteristics⁷.

- Specific gravity (40⁰C)..... 0.9239
- Refractive index (40⁰C)..... 1.4662
- Acid value..... 5.7
- Saponification value..... 177.5
- Iodine value (wigs)..... 74.0

Analysis of fatty acid composition in fixed oil extracted from *S.foetida* seed done with the help of GC-MS. The structural identification was done by preparing FAME of the fixed oil and then subjected to GC-MS

wherein flame ionization detector was used. The oil constitution of 7 fatty acid whose carbon chain length, degree and position of unsaturation were determined from the characteristic ionization and fragmentation of FAME resulting from GC-MS electron impact, chemical ionization modes. The fatty acid found in the oil were methyl esters of Tetradecanoic acid (Myristic acid) (1.65%), Hexadecanoic acid (Palmitic acid) (11.87%), 9-Octadecenoic acid (20.50%) [7], 10-Octadecadienoic acid (Linoleic acid) (20.50%), 8-(2-Octacyclopropane-1-yl) octanoic acid (Sterculic acid) ((6.76%) [8,9]. It also contains Isocutellarin, Procyanidin-B-D-glucuronide, 6-O-B-D glucuronyl leteolin and cyanidine-3-O-glucoside isolated from leaves. Leucoanthocyanidine-3-O-alpha-L-rhamnopyranoside and quercetin rhamnoside isolated from root [10].

PHARMACEUTICAL STUDIES

The *in vitro* release profiles indicated that tablets prepared from *S.foetida* gum had higher retarding capacity than tablets prepared with Hydro methyl cellulose K15M prepared tablets. The differential scanning calorimeter result indicated there are no interactions of *S. foetida* gum with diltiazem hydrochloride. It was observed that release of the drug followed through surface erosion and anomalous diffusion. Thus, it could be concluded that *S. foetida* gum could be used a controlled release matrix polymers [11]. Many polysaccharide rich plant materials are successfully used as matrix formers in modified release dosage form. Some natural polysaccharides have even shown environmental responsive gelation characteristic with the potential to control drug release according to specific therapeutic needs one among them is *S.foetida* [12]. Sterculic oil is extracted from seed of the *S. foetida* tree. The oil contains unique fatty acid known to suppress a bodily enzyme associated with insulin resistance which could indirectly help with reducing belly fat [13].

Gum/Ophthalmic Delivery System

Study of *S.foetida* gum showed it could be good polymer candidates for the formulation of different ocular dosage forms like solution or viscous solution drops, nano particles, Nano suspension or Suspension, Micro or Nano emulsion, Lotion, Gels, Hydro gels, in-situ forming gels, ointments, inserts, films, mini tablets etc.

Gum/ Controlled Release Excipients

S.foetida gum was studied as a hydrophilic matrix polymer for controlled release preparations. Result concluded it can be used as a controlled release matrix polymer.

PHARMACOLOGICAL STUDIES

CNS Depressant/ Anti- Inflammatory

Extract of leaves on various animal models showed CNS depressant activity and anti-inflammatory activity observed as decreased exploratory activity in mice and potentiation of pentobarbitone sleeping time in normal and chronic pentobarbitone treated mice. The extract also

showed significant anti inflammatory activity in acute carrageenan induced rat paw edema [14].

Mitogenic Activity

Mitogenic activity of sterculic acid, a cyclopropenoid fatty acid: Sterculic acid isolated from *sterculia foetida* oil was identified as one of the Mitogenic principles [15].

Antimicrobial / Cytotoxicity

Study yielded tannins, 2-Deoxy sugar, Leucoanthocyanin and Benzopyrone nucleus. Results showed antibacterial activity, inhibiting *S.aureus* and *E. coli*. Antiprotozoal assays also showed inhibiting of growth of *E.histolytica*. In a situ cell death detection kit, it showed apoptotic like changes [16].

Toxic and Antifeedent Activity

Study of the seed crude extract showed *S.foetida* acted as insecticide to Asian army worm and as antifeedent to the semi polar, *Achaea janata*, indication a dual mode of action against the different pest larvae treated [17].

Anti Obesity

Oil extracted from the seed of the *S.foetida* tree may be reducing belly fat and help product against obesity related issues. The fatty acid content of Sterculic oil may inhibit the action of an enzymes associated with insulin resistance which may indirectly reduce belly fat. The data from rodent studies suggest a potential for developing a natural nutritional supplement [18].

Anti-fertility activity

3% *S.foetida* oil in the diet, which supplied approximately 105mg of Sterculic acid per rat per day (based on the 10g of feed intake daily), definitely delayed sexual maturity of the female rat as determined by the criteria of age at the time vagina opened and the regularity and length of consecutive estrous cycles. It used in the treatment of Nausea and also used in the treatment of Skin diseases [19].

Antioxidants

The *in vitro* anti oxidant activity of methanolic extract of *S. foetida* by using the following analytical method: 1. 1-diphenyl-2-picrylhydrazyl (DPPH) free

radical scavenging, nitric oxide radical inhibition, superoxide anion radical scavenging inhibition of Xanthine oxidase activity and the inhibition of oxidation of beta-carotene. Result of methanolic extract of *S. foetida* was compared with the activity of respective standard drug and the extract was found to be equipment with the standard in all the tested method. The flavonoid present in the *S. foetida* may believe to be responsible for it anti-oxidant activity [20].

Economical Uses

Edibility/Culinary and socio-economical Uses

Fruit contain peanut like oily kernels which is edible and more or less laxative when eaten raw. Kernel sometime used to adulterate cacao. The oil resembles olive oil and may be useful for culinary purposes [21]. Backyard planting; Boundary marker; Coastal protection/stabilization; Commercial planting; Erosion control: Large roadside tree; Riparian management; Shade tree; Specimen tree; urban greening; Wild grafting [22].

DISCUSSION AND CONCLUSION

The generic name is based on the Latin word, 'stercus', meaning 'manure', which is referred to the smell of the flowers of some species. The malodorous nature of tree is emphasized in the species name 'foetida' meaning 'Stinking'. Food: The seeds have a pleasant taste and are sometime eaten. Edible oils are obtained from the seed. Fodder: The leaves contain up to 2.66% calcium and are also good source of protein and phosphorus, meeting nutritional requirement of ruminants. The kernel meal contains about 31% crude protein. Fibers: Cord is made from the bark fibers. Timber: The timber is grayish-white and soft but is harder than most of species of the genus. It is very perishable when exposed to the weather or is in contact with the ground although it is fairly durable for interior work. Used locally for doors of huts, dugout canoes, boat planking, guitars and carved toys. Gum or resin: A gum that resemble 'gum tragacanth', is obtain from the trunk and branches and is used for bookbinding, and similar purposes. Lipids: An unusual feature of the seed is that oils present in the testa as well as the kernel. The total oil content is about 34%. Medicine: Leaves and barks have considerable medicinal value; in Ghana, seed are taken as a purgative. Oil from the seed is extracted on local scale to be used in medicine.

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