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Ethnobotanical and phytopharmacological review of *Scindapsus officinalis* ("*Gajapippali*")

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ABSTRACT

Scindapsus officinalis (*S. officinalis*) holds a reputed position in Ayurvedic system of medicine. It has been ethanobotanically used to treat diarrhea ("*atisara*"), worm infestation ("*krmiroga*"), and as antipyretic. Literature survey on *S. officinalis* was carried out via electronic search in PubMed, SciFinder, Scirus, Google Scholar, Agricola and Web of Science and a library search. Results revealed that a very specific botanical description of the plant is still not available. The plant is mistaken within the hybrids and other plants of genus *Scindapsus* and family Araceae. Since ethnobotanically the plant is of much importance, chemistry of the plant yet needs to be fully explored. Thus the need of the hour is to comprehend the fragmented information available on the botany, traditional uses, phytochemistry and pharmacology of *S. officinalis* which could help in the correct identification of the sample and avoid adulteration due to mistaken identity.

1. Introduction

The genus *Scindapsus* Schott (1832) contains about 35 species from Northeastern India to Western Polynesia [1]. It is an epiphytic climbing shrub, with ovate oblong, ovate oblong cordate or oblong lanceolate leaves [2], bisexual flowers and naked spathe [3]. Florets are without perianth, each having four stamens and a one-celled ovary with a solitary basal ovule [4]. About fifteen species of the plant and numerous hybrids, all of which are evergreen, root clinging climbers with juvenile and adult stages, belong to this genus [5]. The various species of genus *Scindapsus* include *Scindapsus caudatus*, *Scindapsus decursivus* Schott (Sylhet, Bangladesh), *Scindapsus giganteus* Schott (Penang, Singapore), *Scindapsus glaucus* Schott (Khasaya Paras, Nepal), *Scindapsus officinalis* Schott (*S. officinalis*) (India, Burma), *Scindapsus peepla* Endl (Sylhet, Bangladesh), *Scindapsus pertusus* Schott (Coromandel, South Konkan), *Scindapsus pinnatifidus* (Roxb.) [6], *Scindapsus pictus* (*S. pictus*), *Scindapsus scortechinii*, *Scindapsus hederacea*, *Scindapsus perakensis*, *Scindapsus crassipes*, *Scindapsus beccarii* and *Scindapsus cuscuaria* [7]. *S. officinalis*, a plant with perennial stem, is a large epiphytic climber with adventitious aerial roots growing on trees and rocks [8]. The mature inflorescence without the spathe is transversely sliced into pieces and dried [9] and is commonly known as "*Guj-pippul*" [10]. In Ayurvedic system of medicine, it is known to cure "*atisara*" (diarrhea), "*svasa*" (dyspnea), "*kanthmaya*" (throat diseases) and "*krimi*" (parasitic infestation) (Figure 1) [11].

Figure 1. Leaf and fruit of *S. officinalis*.

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2. Botanical description

2.1. Habitat

S. officinalis is a common plant in tropical forests of many parts of India, Myanmar [12], China [13] and Nepal [14]. In India the plant is cultivated for its fruits at Midnapur, Bengal [9,13,15,16] and is found in southern cities of Calicut and Cochin. It is also present in Rosa thicket in managed sal (*Shorea robusta* Gaertn.) forests of Gorakhpur region [17]. Reaching the northeastern states, the plant is strikingly noticeable in Phangpui National Park situated at Blue Mountain, Mizoram [18] and Kurung Kumey, East Kameng and West Kameng districts of Arunachal Pradesh. According to GPS, in the location with coordinates of 27°57.176′ N and 93°09.877′ E, the density of the plant is 0.3/m^2 area in 100 m^2 quadrate size [19]. In Mayanmar, the plant is frequently present in Chappedong, Moulmein, Rangoon and Monghir mountains [13].

2.2. Morphology

The leaves of *S. officinalis* are large (upto 25 cm long), leathery [9], with dark green peduncle. They are solitary with terminal much shorter than the petiole [7]. Their shape is ovate, elliptic ovate or nearly orbicular, caudate acuminate with rounded or slightly cordate base. The primary nerves are distinct [16], marked with the presence of dilated or winged petiolar sheaths [14,16,20]. The stem of the plant is as thick as a little finger [7] and turns almost woody when old [20]. The roots of the plant are adventitious and aerial, clinging on trees and rocks [21]. The flowers are densely arranged in the cylindrical spadix [9], which is elongated with greenish yellow stigma [7], and the filaments are flat and thickened at the tips [3].

The spathe is deciduous [20], coriaceous and oblong with stout, short and terete peduncle [16]. The spathe is about 4–6 inches in length [7] and green outside ultimately yellow within. It terminates by a long acumen [20]. The fruits contain berries which are confluent [9] and fleshy (Nepal origin) [14]. The ovary is densely packed [20], truncate, one-celled with one seed attached in an oblique manner [8]. There is a marked presence of grooves with short four-celled anthers [20]. Substance of the ovary is replete with rigid, sharp, vertical bristles which readily detach and stick in the skin causing pain and itching [8]. The seed has hard testa [3]. The seed is ovate cordate [7,16], kidney-shaped [22] or horseshoe-shaped and is covered by a membrane [23] with the dimensions of 0.3–0.4 cm in width, 0.4–0.6 cm in length which is smooth, shiny, grayish-brown with a dent [22]. Hilum overlies the chalazal end and is marked by an irregularly bordered scar. The micropyle is dorsal to the hilum and is subtended dorsally by a thickened ridge [23].

2.3. Microscopy

Epipremnum and *Scindapsus* are characterized by simple vascular bundles and axial bundles [24].

2.3.1. Fruits

The microscopy showed loosely arranged, thin-walled parenchymatous cells having isodiametric cells filled with brown content and numerous acicular crystals of calcium oxalate [22].

2.3.2. Spadix

Transverse section of the spadix of the fruits of *Scindapsus* revealed a central lobed axis with hollow central core and lobed inflorescence axis. The axis bears radial circle of fruits which are separated from each other by thin radial septa (covering membrane) [25], and also present in sclereids which are branched with arms that project into intercellular spaces (trichosclereids). In lamina distinct idioblasts are present [26].

3. Adulteration

It is of great concern that the plant is often adulterated knowingly or unknowingly due to mistaken identity. Significant pharmacognostical variations were observed in the marketed samples of the fruits collected from five different districts of Uttar Pradesh. Besides macroscopy and microscopy, quantitative estimation of the powder with fluorescence analysis depicted adulteration in the samples [27].

3.1. Adulteration with Piper chaba Hunter (P. chaba)

"*Gajapippali*" (*S. officinalis*) has long been a drug of controversial origin. According to Bhavaprakasa, a lexicon of Ayurveda, *P. chaba* ("*Cavika*" or "*cavya*") has usually been considered as probable adulterant of *S. officinalis* [28]. In Ayurvedic system of medicine "*pippalimula*" *i.e.* root of *Piper longum* (family Piperaceae) is used as "*pratinidhi dravyas*" (substitute drug) for fruit of "*gajapippali*" [29]. Latin name *S. officinalis* is given for "*gajapippali*" and in the same work "*gajapippali*" as well as "*cavya*" are the common names of *P. chaba* [30]. Since the morphology of leaf sheath of *S. officinalis* resembles that of six species of *Piper* [31], it is equated with *P. chaba* and is also used as diaphoretics, sudorifics, antidiarrheals, antiasthmatics and stomachics [32]. *S. officinalis* is used as the biological source for the isolation of piperine, which illustrates significant antimutagenic activity against 2-aminoanthracene-induced mutagenicity and was non-toxic [33]. "*Cavika*" and "*gajapippali*" (*P. chaba* and *Scindapsus*) are alike in their properties, but "*gajapippali*" is more potent as expectorant than "*cavika*" [34].

3.2. Adulteration with Balanophora species

Balanophora fungosa J. R & G. Frost (Balanophoraceae) is a root parasite with a coral-like fleshy body and superficially resembles *Scindapsus*, but it is neither reported to be of any medicinal value [35] nor matches the characteristic pharmacognostic features of *S. officinalis* as seeds, stone cells, epidermis, starch, calcium oxalate crystals, vascular bundles and oil globules are absent in *Balanophora* [36]. Sliced and dried inflorescence of *Balanophora indica* is also sold as "*attittippali*" (another vernacular name of *S. officinalis*) [9]. "*Gajapippali*" is also mistaken with male or female inflorescence of *Borassus flabellifer* Linn [37].

3.3. Adulteration with Pothos scandens

Dried, transverse pieces of *S. officinalis*, known as "*Gujpippul*" are important in Hindoo Materia Medica but are sold by the druggist under the name Roxb. *Pothos scandens*. It is employed in India as a remedy for putrid fever [38,39] and its decoction is used for rheumatic complaints [40].