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A Holistic Approach on Review of *Solanum virginianum*. L.

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ABSTRACT

Solanum virginianum L (Syn.: *Solanum xanthocarpum* Schrad. & H. Wendl.), commonly known as wild eggplant or nightshade plant, is a prickly herb found in most of the parts of the Asia and Australia of the world. It belongs to family Solanaceae, has spines throughout the plant. Fruits are globular and edible, flowers appear in cymes or sometimes solitary and are blue in colour, leaves are elliptical or ovate and are full of spines, stems appear green when young and brownish when matured. Various phytoconstituents have been found, the major constituent is alkaloid. It has vital role in various traditional as well as medicinal uses for curing internal and external physiological disorders. This plant has also been used for phytoremediation as it possesses the ability to degrade carbofuran residues in rice field soil and therefore the plant species may further be investigated for its phytoremedial role.

INTRODUCTION

Solanum xanthocarpum Schrad and Wendl (Family: Solanaceae; English name: yellow berried nightshade), a prickly herb is an important plant species in Ayurveda and folklore medicine since time immemorial but there are meager reports in literature about its other potentials [1].

Distribution

Reported to occur in Ceylon and Malacca through South East Asia, Malaya, tropical Australia and Polynesia [2]. Very commonly found throughout Indian plain from seashore to hills up to 1000 m high.

Taxonomy

It is a spiny medicinal herb with woody base in north eastern states of India [4]. *Solanum xanthocarpum* is a prickly diffuse bright green perennial herb, woody at the base, 2–3m height and found throughout India, mostly in dry places as a weed on roadsides and waste lands [5]. The fruits are glabrous, globular berries, green and white strips when young but become yellow when matured [6]. Flowers are blue in color, fruit types are berry globule 1.25–2 cm in diameter and the fruits are edible. The plant bears globular, berry type fruits, about 1.3 cm in diameter, which is yellow or white in color with green veins. The fruits are glabrous, globular berries, green and white strips when young, but yellow when mature [7].

The stems are greenish grey with innumerable spines, and the flowers bright blue. The berries are green when unripe and of different shades of yellow when ripe⁸. Stem branched much and younger ones clothed with dense, stellate and tomentose hairs. Prickles are compressed straight, glabrous and shining, often 1-3 cm long. Leaves ovate or elliptic, sinuate or subpinnatifid, obtuse or subacute, stellately hairy on both sides, armed on the midrib and often on the nerves with long yellow sharp prickles. Petiole is long, stellately hairy and prickly [3]. Flowers are in cymes or sometimes reduced as solitary. Calyx tube is short,

globose and lobes linear-lanceolate, acute, densely hairy and prickly. Corolla purple, lobes deltoid, acute, and hairy outside. Anther filament is long, glabrous and anthers open by a pore. Ovary is ovoid and glabrous. Berry yellow, green-blotched and surrounded by enlarged calyx. Seeds are glabrous.

Table 1: Botanical classification of *Solanum virginianum* .L.

Kingdom	Plantae
Division	Spermatophyta
Sub- Division	Angiospermae
Class	Dicotyledonae
Sub-class	Gamopetalae
Series	Bicarpellatae
Order	Polemoniales
Family	Solanaceae
Genus	<i>Solanum</i>
Species	<i>virginianum</i> .L

Table 2: Common names of *Solanum virginianum* .L.[3]

Sanskrit	Kantkari, Dusparsa, Ksudra, Kantakarika, Dhavani, Nidigdha, Agnidamani.
Marathi	Dorall ringani
English	Wild eggplant
Hindi	Katai
Bengal	Kantkari
Tamil	Kandan- kattiri
Gujarati	Bhoyaringani
Telugu	Callamulaga, Nella molunga
Oriya	Bheji begun, Ankranti

Phytochemistry/Chemical constituents

Steroidal alkaloid solasodine is the principal alkaloid. Alcoholic extracts of the plant contain fatty and resinous substances. Solasonine is present in fruits .Fruits contains solasonine, solamargine, solanocarpine, beta –solamargine and solanocarpidine. Dry fruits contain traces of isochlorogenic, neochlorogenic, chlorogenic and caffeic acids .Petals yielded apigenin, stamens gave quercetin diglycoside and sitosterol. The unsaponifiable matter of fruit contain two sterols, one of which is campesterol [1]. Tupkari et. al [9]. noted the presence of coumarins, scopolin, scopoletin, esculin and esculetin from plant parts of *S. xanthocarpum* ; constituents were separated through column chromatography Kusano et. al [10] reported the following steroidal constituents namely, cycloartenol, cycloartenol, sitosterol, stigmasterol, campesterol, cholesterol, sitosterol glucoside, stigmasterol glucoside, solamargine and beta-solamargine from fruit extracts.

Manye et. al. [11] showed that fruits have more alkaloids than any other organs in the plant species and alkaloid productivity vary under different organic solvents. Hussain et. al [12]. in addition to alkaloid content also determined the presence of flavanoids and saponin apart from the presence of tolerable level of heavy metals like Cu, Fe, Pb, Cd and Zn. Shankar et. al [13] reported and quantified bioactive steroidal glycoalkaloid – khasianine in addition to solasonine , solamargine through HPTLC.

Uses

Medicinal uses as described in Traditional and Folklore

Solanum xanthocarpum used by the local people as folk medicines in treating throat infections and other inflammatory problems [14]. The fruits are known for several medicinal uses like anthelmintic, antipyretic, laxative, anti-inflammatory, anti-asthmatic and aphrodisiac activities [15]. The fruit paste is applied externally to the affected area for treating pimples and swellings [16]. The various parts of the plant are reputed in indigenous Hindu Medicine to have high medicinal value in various diseases like cough, asthma, fever, heart disease etc [17]. The plant extract of *S. xanthocarpum* also possesses insecticidal and molluscicidal properties [18]. Its fruits are eaten as an anthelmintic and for indigestion. Its root is an expectorant, used in Ayurvedic medicine for cough, asthma, and chest pain [19]. It has been used in Ayurveda for a variety of therapeutic purposes. As natural remedies, its fruit juice is used in sore throats and rheumatism; decoction of the plant is used in gonorrhoea; paste of leaves is applied to relieve pains;

seeds act as expectorant in cough and asthma; roots are expectorant and diuretic, and are also useful in the treatment of fever, coughs, asthma and chest pain. One of such plant in the indigenous system of medicine (Kantkari) Charaka and Sushruta used the extract of entire plant and fruits in internal prescription for bronchial asthma, tympanitis, misperistalsis, piles and dysuria and for rejuvenation. Kantkari Ghrita of Charaka is specific for cough and asthma [20]. Linctus prepared with stamens of kantkari flowers is prescribed for chronic cough in children (Bangasena). Roots are one of the constituents of well-known Ayurvedic preparation "Dasmul Asava" [20]. In ancient Ayurveda, plant is described as pungent, bitter, digestive, alternative astringent. Stems, flowers, fruits are bitter, carminative. Root decoction used as febrifuge, effective diuretic and expectorant [21]. The plant has been used traditionally for curing various ailments. Fruit juice is useful in sore throats and rheumatism; decoction of the plant is used in gonorrhoea; paste of leaves is applied to relieve pains; seeds act as expectorant in cough and asthma; roots are expectorant and diuretic, useful in the treatment of catarrhal fever, coughs, asthma and chest pain [22].

Stem, flowers and fruits are bitter and carminative. It is employed in cough, asthma and pains in chest, being used in the form of a decoction. They are prescribed for relief in burning sensation in the feet accompanied by vesicular watery eruptions. Leaves are applied locally to relieve pain. The juice of berries is used in sore throat. Like roots, seeds are also administered as an expectorant in asthma and cough. The plant is credited with diuretic properties and is used to cure dropsy. Its juice is mixed with whey and ginger and given in fevers. The juice of the leaves, mixed with black pepper, is prescribed in rheumatism. An Ayurvedic compound Arkadhi, with this herb is useful in dengue fever, acute bronchitis and fevers accompanied by chest-affections. The macerated plant in coconut oil is given to cattle at the time of calf delivery. A decoction of roots or crushed fruits with mine salt is given to cattle for stomachache or constipation. It forms a constituent of herbal cough remedy koflet (Himalaya) and is reported to promote expectoration [23].

Medicinal Use of Kantkari or *Solanum Virginianum* Linn

Kantkari (*Solanum Virginianum* L.) is a very prickly perennial herb. In ayurveda it is used in preparation of various medicines. This herb is used in treatment of epilepsy, pain relieving, head ache, migraine, hair fall, bronchial asthma, skin problems, cough and other diseases. Ayurvedic medicine Swasari Kwath contain Kantkari along with other herbs. It is also used in preparation of chyavanprash. Dashmularista which is ayurvedic tonic contain roots of this plant. Kantkari is very good liver tonic. its decoction is very beneficial in liver swelling and infection. It is used in Cough, Epilepsy, Liver Swelling and infection, Vomiting and nausea during pregnancy, Improves chances of conceiving baby, Migraine, Hair fall, Tooth ache.

Other uses

Phytoremediation

Phytoremediation is an aesthetically pleasing mechanism that can reduce remedial costs, restore habitat and clean up concentration rather than entombing it in place or transporting the problems to phynylcarbamate pesticide widely used for rice insect – Nilaparvata lugens but when it is sprayed about 99% of pesticide remain residually in the environment. Teerakun et. al [24] reported that *S. xanthocarpum* possesses the ability to degrade carbofuran residues in rice field soil and therefore the plant species may further be investigated for its phytoremedial role.

CONCLUSION

Herbal medicines are gaining growing interest because of their cost effective and eco-friendly attributes, urgent need to meet the ever growing demand of medicinal plants in the market and it will pose a challenge for researchers, farmers, conservationist and policy makers to manage and use our natural resources wisely. In future the standardization and stabilization studies on *Solanum virginianum*. L can be carried out which can help in proving it to be a promising source in pharmaceutical as well as nutraceutical industry.

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