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An Updated Review on *Solanum viarum* Dunal

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ABSTRACT

The Solanum viarum Dunal is commonly known as Sodom apple belonging to the family Solanaceae and the family consist of 75 genera and over 2000 species. The main chemical constituents of the plant are steroidal glycoside alkaloid like solasonine, solasodine, solamargine and also have flavonoids, saponins, minerals etc. The various parts of the plant like root, stem, fruit seeds, and flower are used medicinally. The pharmacological property of a plant depends on the presence of phyto constituents in the plant. As per the literature survey, Solanum viarum is reported for number of pharmacological activities, i.e., antioxidant antipyretic, antimicrobial, antifungal, analgesic, anticancer activity, in the treatment of anaemia etc. This review is aim at summarising the published knowledge of the ethno medicinal use, pharmacognosy, phytochemistry and pharmacological activities of Solanum viarum.

Keywords: *Pharmacological use, Solanum viarum dunal, solasodine*

INTRODUCTION

The therapeutic effect of herbal medicines in India conducts to the progression of the Ayurveda [1]. Aside from Ayurveda, the traditional medicinal system is also used as household remedies [2]. Nowadays, herbal plants are widely used for the medicinal purpose due to its minimum side effect and from research it shows high effectiveness also. *Solanum viarum* (*S. viarum*) is an invasive herbs or shrubs. Recently it becomes very problematic in United States for its invasive nature [3]. It is native to Argentina and Brazil and become weed to other countries like Mexico, South America, and U.S. and in India, West Indies, Nepal, Africa, and the Honduras [4]. The plant commonly known as tropical soda apple belonging to the family of Solanaceae and the family consist of 75 genera and over 2000 species [5]. The mature fruits of the plant are eating by cattle's, white tailed deer, feral pigs and other animals [6].

Figure 1: *Solanum viarum fruit [7].*

TAXONOMICAL CLASSIFICATION

Table 1: *Taxonomical classification. [8]*

Kingdom	Plantae
Subkingdom	Viridiplantae
Superdivision	Embryophyta
Division	Tracheophyta
Class	Magnoliopsida
Subclass	Asteranae
Order	Solanales
Family	Solanaceae
Genus	*Solanum* L.
Species	*Solanum viarum*
Synonyms	*Solanum khasianum.* *Solanum chloranthum.* *Solanum viridifiorum.*

VERNACULAR NAMES

English: Tropical soda apple.
Assamese: Tit-bhekuri, Hati-bhekuri.
Malayalam: Kandakarichunda.
Others: Tropical soda apple, Sodom Apple.

DISTRIBUTION AND HABITAT

The tropical soda apple is distributed throughout the north-eastern Argentina, south-eastern Brazil, Uruguay, and Paraguay. Due to its medicinal values it is also cultivated throughout the Asia country like India Nepal and many countries. In the Morni hill tract, the plant tropical soda apple grown at altitude about 700m from the sea level [9].

BOTANICAL DESCRIPTION

S. viarum is mainly known as herb and it also considered as soft wooded shrub native to Florida. The height of the herbs is up to 3 to 6 feet [13]. The thorns which are around 1 to 2 cm in long and the colours of the thorns are white to yellowish, are completely covered on the stem and calyces and on the leaves present the velvet hairs [4]. The flowers are white in colour with yellow colour stamens and this is developed on the stems and on the lower portion of the leaves [14]. The fruits are striped green and light green in unripe condition and when it is ripe the colour is yellow. The leaves are alternate, oval shape in the outline with broad end at base with slightly wavy margins especially on the young leaves. The colour of upper surface of leave is grey-green and the colour of lower surface is greenish-white. And it is 6 to 20 cm in length and 6 to 15 cm wide [4]. The diameter of the roots are 0.6 to 2.5 cm and it situated few inches below the soil [15].

CHEMICAL CONSTITUENTS

The main chemical constituents found in this plant are solasodine, solasonine, solamargine, diosgenin, khasianine, saponins-solakhasianin, natigenin, etc. all is steroidal glycoalkaloid in nature. In the mature condition of the fruit of this plant it highly contains solasodine [10]. It also contains flavonoids, tannins, glycosides, steroids etc. It also contains phenolic compounds which are used in the natural industries for its potential therapeutic activity [11]. It contains also contain chemical constituents like Caffeoylquinic acid (CQA) derivatives, quinic acid and 5-caffeoyl and 3-malonyl-5-caffeoyl-[4-(1beta-[6-(5-caffeoyl) quinate] glucopyranosyl)] [20]. Glycoside has two skeleton one is glycone part another is agylcone part, and the solasodine structured as agylcone glycoside [12].

Table 2: *Chemical constituents isolated from various parts of Solanum viarum dunal.*

Class	Chemical Constituents	Origins	Reference
Phenolics	Viarumacid A Viarumacid B	Fruits	20
Steroidal Glycosides	Solaviaside A Solaviaside B Solaviaside C	Fruits	22
Glyco-alkaloids	Solasodine	Seed	10

MEDICINAL USES

Though the plant *S. viarum* is unknown to all but from, its existing literature survey it shows that the plant is used for the treatment of cancer therapy, Addison's disease (it is a chronic endocrine disorder in which the adrenal gland does not generate enough steroidal hormones) [13]. It is also used for the treatment for rheumatism, chronic asthma, skin disease, obesity, and leukaemia [13]. The chemical constituents which is derived from the plant is also used for the treatment for Palsy disease in which the facial muscle temporarily lost the ability of the strength which leads to paralysis of the face [13]. The chemical constituents like solasodine, and other glycoalkaloid are used for the synthesis of several steroidal products like cortisone [6].

PHARMACOLOGICAL ACTIVITIES

The plant shows different pharmacological activities due to presence of its specific chemical constituents, like the alkaloids are shows analgesic property, flavonoids present in the plants shows antioxidant property. For the treatment of bronchitis steroids are useful [16]. Several pharmacological activities like antibacterial activity, antifungal activity, anti-insecticidal activity, anti-pyretic activity, analgesic activity, antioxidant activity, anti-cancer activity have been reported by researchers. The *Solanum viarum* is a rare plant and in this plant few work has been done, which is enlist below in Table 3.

Table 3: *List of research reported on Solanum viarum dunal.*

Sr. No.	Year	Authors	Research work	Parts used	Extract	Dose Range	Model	Finding
1.	2018	MeenaKausaret al.	Pharmacological evaluation of Solanum viarumdunal leaves extract for analgesic and antipyretic activity.	Leaf	Ethanolic extract	100mg/kg, 200mg/kg	Animal model (wistar rat)	From this study it concluded that the leaves extract of Solanum viarum has antipyretic activity at a single dose level of 100mg/kg and 200mg/kg. The result also shows that the extract has analgesic activity. And it work through both central and peripheral route and also supressing the prostaglandin synthesis [17].
2.	2013	V. Ramesh et al.	Determination of lethal concentration of tropical soda apple, Solanum viarum (dunal) against common cutworm, Spodopteralitura.	Fruit	n-hexane and benzene, benzene and ethyl acetate, ethyl acetate and acetone	In a ratio of 50: 50	Poison food bioassay (Leaf disc bioassay)	The plant has the potent insecticidal activity. In this study different solvent systems are used like benzene and ethyl acetate in 1:1 ratio, n-hexen and benzene (1:1) and ethyl acetate and acetone but there is not shown any significant effect. But in water and acetone alone shows potent insecticidal effect [18].
.	2013	S.Arivudai-nambiet al.	Anti-Insect Activity of Fruit Extract from Tropical Soda Apple	Fruit	n-hexane and benzene, benzene and ethyl acetate, ethyl acetate	In a ratio of 50: 50	Poison food bioassay (seedling spray bioassay),	It shows insecticidal activity against A. gossypii, and 33% mortality shows. The extraction is done by

			(Solanum viarum Dunal) Against Aphis gossypii (Glover) (Hemiptera: Aphididae)		and acetone individually and also in combination		and Tropical bioassay (Direct bioassay)	aqueous method as well soxhlation process [18].
4.	2012	Jaishree. V et al.	A Comparative Evaluation of In Vitro Antioxidant, Antimicrobial and Cytotoxic Properties of Microwave and Soxhlet Assisted Extracts of Solanum viarum Fruits	Fruit	Methanolic extract.	1000 µg/ml, 500 µg/ml, 250 µg/ml, 125 µg/ml, 62.5 µg/ml, 31.25 µg/ml	In-vitro model	In this investigation in-vitro evaluation is done for antioxidant, anticancer and antibacterial activity by two process one is soxhlet extraction method and microwave assisted method. The results shows that is has antioxidant activity in soxhlet extraction rather than microwave assisted. And shows anticancer activity against HeLa cell line at different dose level. It also shows antibacterial effect [19].
5.	2012	Shi-Biao Wu et al.	Antioxidant Glucosylated Caffeoylquinic Acid Derivatives in the Invasive Tropical Soda Apple, Solanum viarum	Fruit	Methanolic extract.	-	In-vitro	In this investigation they isolate two new molecule from Solanum viarum fruit in methanolic extract. From this study is also conclude that the plant shows antioxidant activity [20].
6.	2011	V. Manimega laiet al.	Studies on Isolation and Identification of VAM Fungi in Solanum viarum Dunal of Medicinal Plants				In-vitro	In this experiment they isolate arbuscularmycorrhizal fungi from the root of the Solanum viarum plant [21].
7.	2009	Masateru O No et al.	Isolate Steroidal Glycosides from the Fruits of Solanum viarum	Fruit	Methanolic extract.	-	Invitro (by NMR spctroscopy)	In this investigation they isolated 10 compound from methanolic extract of fruit by the NMR spectroscopy and HPLC. In this experiment temethanolic extract of Solanum viarum fruit was introduce to the silica gel and Diaion HP20 and then isolated the compound [22].

CONCLUSION

Nowadays, the herbal medicines are widely used for its high therapeutic effect and as well as low side effect, and also are safer for human beings. *S. viarum* is a medicinal plant which is used as traditionally for its high therapeutic values due to its phytoconstituents. The

solanaceae family along with *S. viarum* is more popular for the main phytoconstituents solasodine which is glycol-alkaloidal in nature. Along with solasodine, solamargine is also an active constituent of the plant and for the presence of solamargine the plant shows anti-cancer activity. *S. viarum* is superabundant source of minerals, vitamins, flavonoids, alkaloids, glycosides etc. The conventional uses of *S. viarum* are treatment for Addison disease, in cancer therapy, skin disease, in obesity, rheumatism etc. However, much more work has to be done on this plant to explore its phyto-pharmacological activities and the mechanism of action of the reported active principles has to be identified in future.

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CONFLICT OF INTEREST

None

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