



**COMPARATIVE CHEMICAL ANALYSIS OF DIFFERENT PARTS OF SOLANUM
VIRGINIANUM**

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ABSTRACT

Solanum virginianum belongs to the family Solanaceae, with medicinal properties as per folk medicine. *Solanum virginianum* is used for treating in cough and fever in India, especially Kawardha Kabirdham District in Chhattisgarh. The purpose of this analysis is to exhibit up-to-date and comprehensive information about phytochemistry, pharmacological activities of the plant and has an insight into the opportunities for the future research and development of plant. The objective of the present study was to analysis of phytochemistry of different part of *Solanum virginiaum*. Phytochemicals present in leaves, stem, roots and fruit of *Solanum virginianum* was studied by physiochemical tests. It was found that various phytochemical were present in high proportion like alkaloids, terpenoids, glycosides, flavonoids, saponins, coumarins, tannin, proteins and amino acids.

**Keywords: Medicinal plant; *Solanum virginianum*; Antimicrobial activity;
Phytochemicals, Solanaceae, alkaloids, terpenoids**

INTRODUCTION

Herbal medicines have become more popular in the treatment of many diseases due to the popular belief that green medicine is safe, easily available and has

fewer side effects. Secondary metabolites of plants serve as defense mechanisms against predation by many microorganisms, insects and herbivores. Phytochemical

composition and respective biological activities are important to understand the therapeutic potential of medicinal herbs. Among other, phenolic compounds are the most widely explored phytochemicals for therapeutic potential in different medicinal plants. Most of these studies conclude that pharmacological activities of any medicinal plant are due to the presence of secondary metabolites. Secondary metabolites usually consist of the phenolic compounds, alkaloids, tannins, saponins, carbohydrates, glycosides, flavonoids, steroids, etc. Most phenolic compounds such as flavonoids, glycosides, triterpenoids, flavonons, carbohydrates and anthraquinones are commonly present in most of the medicinal plants. All of these secondary metabolites and particularly phenolic compounds have been reported as scavengers of free radicals and also have been considered as good therapeutic candidates for free radical related pathologies [1]. Several plants have been studied for quantification of secondary metabolites, such as *Jatropha* [2], *Clerodendron colebrookianum* and *Zingiber cassumunar* [3], *Spondias mombin* [4] and leaves of *S. hyderabadensis* [5]. *S. virginianum* L. is a diffuse and very prickly under shrub belonging to the family Solanaceae. It is found growing commonly in various regions of the world on sandy soils and is distributed throughout India. It

is commonly called as yellow-berried nightshade in English, kantakari in Sanskrit and nelagulla in Kannada. It is one of the members of dashamula of Ayurveda [6].

A wide range of phytochemicals such as alkaloids, phenolics, flavonoids, sterols, saponins, glycosides, fatty acids, tannins, and amino acids have been identified from different parts of the plant. The plant is extensively used in various systems of medicine including Ayurveda. The plant is used traditionally to treat asthma, chest pain, leucoderma, scorpion bite, and sterility in women.

Taxonomy

It is a spiny medicinal herb with woody base in north eastern states of India [7]. *Solanum Virginianum* 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. The fruits are glabrous, globular berries, green and white strips when young but becomes yellow when matured. 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 ripe [7]. 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. 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. Another 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.

Botanical classification of *Solanum virginianum* L

Table 1 shows the Botanical classification of *Solanum virginianum*. L.

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

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

Common names of *Solanum virginianum* L

In India it is known by its various vernacular names, the most commonly used ones are Vanabharata, Badikateri (Hindi), Kateli (Urdu), Kirugullia, Heggulla, (Kannad), Cheru Vazhuthina, Putirichunda (Malyalam), Tella Mulaka (Telgu), Kandiarivaddi (Panjab) [7].

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, neochronogenic, chronogenic and caffeic acids. Petals yielded apigenin, stamens gave quercetin diglycoside and sitosterol. The unsaponifiable matter of fruit contain two sterols, one of which is carpesterol. [8] Noted the presence of coumarins, scopolin, scopoletin, esculin and esculetin from plant parts of *S. xantocarpum*; constituents were separated through column chromatography [9] reported the following steroidal constituents namely, cycloartanol, cycloartenol, sitosterol, stigmasterol, campesterol, cholesterol, sitosterol glucoside, stigmasterol glucoside, solamargine and beta-solamargine from fruit extracts. [10] showed that fruits have

more alkaloids than any other organs in the plant species and alkaloid productivity vary under different organic solvents [11]. 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. [12] reported and quantified bioactive steroidal glycoalkaloid – khasianine in addition to solasonine, solamargine through HPTLC.

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 lever 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.

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 [13], reported that *S. Virginianum* possesses the ability to degrade carbofuran residues in rice field soil and therefore the plant species may further be investigated for its phytoremedial role.

METHODOLOGY

Fresh, healthy and mature plants of *Solanum virginianum* has collected in the month of March from Kawardha area of Kabirdham district. The plant parts (e.g. stem, roots, leaves and fruits) has washed thoroughly in water for removing soil and other foreign particles. The stem and roots has cut into small pieces and dried in shade and subsequently dried in a hot air oven at 40°C for 48 hours. All the plant parts has powdered using grinder and used for making extracts. The major equipment used for the study was UV-VIS Spectrophotometer and chemicals used were of LR and AR grade.

- **Preparation of extracts for phytochemical screening**

100 mg of dried and powdered plant materials were soaked overnight in 25 ml of different solvents namely water, methanol, ethanol, petroleum ether, chloroform, diethyl ether and ethyl acetate. Different extracts were filtered and filtrates were used for qualitative phytochemical analysis.

- **Preliminary phytochemical analysis:**

The preliminary phyto-chemical analysis of crude extracts of leaves, fruits, stem and roots of *S. Virginiaum* were carried out according to the method described by [14].

RESULT AND DISCUSSION

The phytochemical characters of leaves, fruits, stem & roots of *S. Virginiaum* are summarized in **Table 2** and **Figure 1**. The results revealed the presence of alkaloids,

cardiac glycosides and phenols in all the plant parts. Saponins were present in the fruits and leaves of the plant, whereas flavonoids were found in fruits and stem of the plant. Tannins were absent in all plant parts.

S. Virginiaum Preliminary phytochemical screening actually helps in isolating and characterizing the chemical constituents present in the plant extracts and the knowledge of the chemical constituents of plants is necessary to understand herbal drugs and their preparations and finally in discovering the actual value of folkloric remedies [14]. Phytochemicals such as alkaloids, flavonoids, steroids, terpenoids, cardiac glycosides, phenols and saponins present in different extracts exhibit a number of biological activities and protect from most of the chronic diseases.

Table 2: Phytochemical screening of different parts of *Solanum virginiaum*

S. No.	Phytochemical constituents	Plant parts	Aqueous extract	Methanol extract	Ethanol Extract	Petroleum Ether extract	Ethyl Acetate extract	Diethyl Ether extract	Chloroform extract
1.	Flavanoids	Leaves	-	-	-	+	-	-	+
		Fruits	-	+	+	+	-	-	+
		Stem	-	+	+	-	-	-	-
		Roots	-	-	-	-	-	-	-
2.	Terpenoids	Leaves	-	+	+	-	+	+	+
		Fruits	-	+	+	+	+	+	+
		Stem	-	+	+	-	+	+	+
		Roots	-	+	+	+	+	+	+
3.	Steroids	Leaves	+	+	+	+	+	+	+
		Fruits	-	+	+	+	+	+	+
		Stem	-	-	+	-	+	-	+
		Roots	-	+	+	+	+	+	+
4.	Saponins	Leaves	+	+	+	-	-	-	-
		Fruits	+	+	-	-	-	-	-
		Stem	-	-	-	-	-	-	-
		Roots	-	-	-	-	-	-	-
5.	Tannins	Leaves	-	-	-	-	-	-	-
		Fruits	-	-	-	-	-	-	-
		Stem	-	-	-	-	-	-	-
		Roots	-	-	-	-	-	-	-

6.	Alkaloids	Leaves	+	+	+	-	-	-	-
		Fruits	+	+	+	-	-	-	-
		Stem	+	+	+	-	-	-	-
		Roots	+	+	+	-	-	-	-
7.	Cardiac glycosides	Leaves	+	+	+	-	+	+	-
		Fruits	-	+	+	+	-	+	+
		Stem	-	-	+	+	+	+	-
		Roots	-	+	+	+	-	+	-
8.	Phenols	Leaves	-	+	+	-	+	-	-
		Fruits	-	+	+	-	+	-	-
		Stem	-	+	+	-	+	-	-
		Roots	-	+	+	-	+	-	-

(+) = present and (-) = not detected

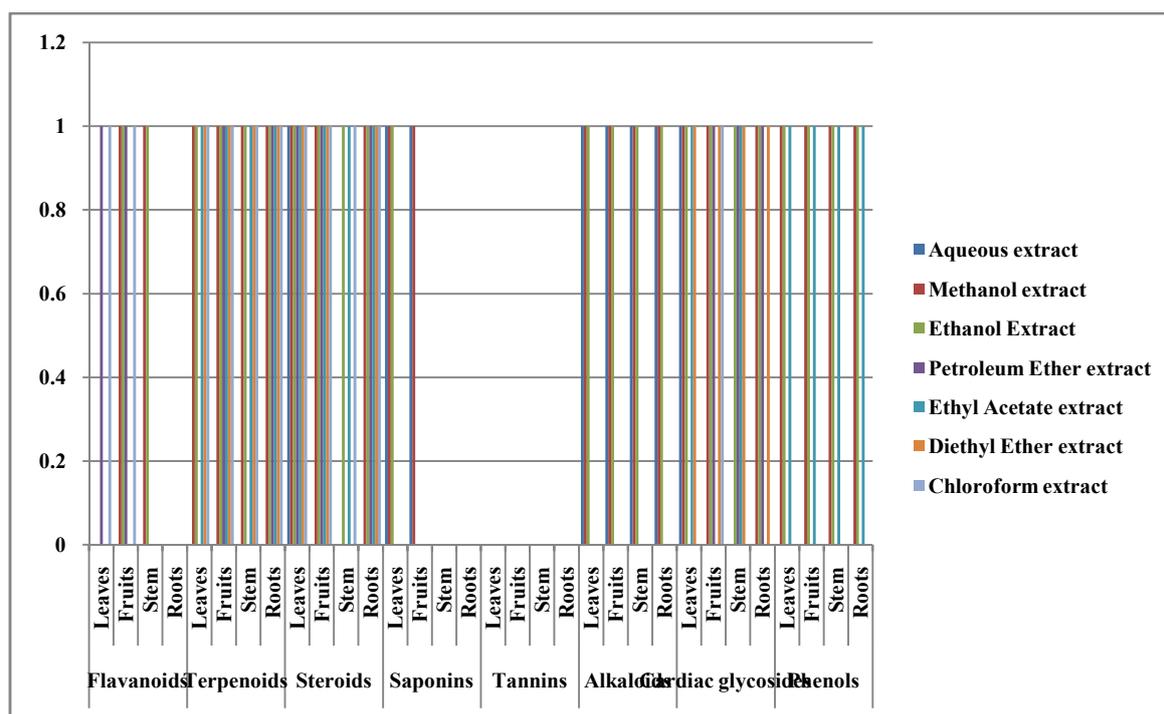


Figure 1: Phytochemical screening of different parts of *Solanum virginiaum*

CONCLUSION

The phytochemical screening of the different plant parts showed the presence of important active phytoconstituents which have been described to have tremendous medicinal values in literature. Thus, the present investigation revealed that the whole plant of *S. Virginiaum* is a potential source of useful drugs. Further studies may be taken up for establishing marker compounds in the roots, leaves and stem of

the said species through structure elucidation using various spectroscopic techniques.

REFERENCES

- [1] Mradu G, Saumyakanti S, Sohini M, Arup M. HPLC Profiles of Standard Phenolic Compounds Present in Medicinal Plants. *Int J Pharmacog Phytochem Res*, 2012, 4:162-167.

- [2] Nwokocha, A. Blessing, I. O. Agbagwa and B.E. Okali, Comparative phytochemical Screening of *Jatropha* L. Species in the Niger Delta. Research J. of phytochemistry, 2011, 5: 107-114.
- [3] Majaw S, Moirangthem J. Qualitative and quantitative analysis of *Clerodendron colebrookianum* Walp. Leaves and *Zingiber cassumunar* Roxb. Rhizomes. Ethnobotanical leaflet, 2009, 13: 578-89.
- [4] Njoku V.O. Obi, C. and Onyema, O. M. Phytochemical constituents of some selected medicinal plants. Imo State University, P.M.B. 2000, Owerri, Nigeria.
- [5] Linga Rao M, Savithamma N. Quantification of primary and secondary metabolites of *Svensonia hyderabadensis* – A rare medicinal plant. Int. J. Phar Phram Sci. 2012. 4: 519-21.
- [6] Rita P, Animesh DK. An updated overview on *Solanum virginiaum* Schrad and Wendl. Int J Res Ayurveda Pharm. 2011. 2(3): 730-5.
- [7] Kirtikar, Kanhoba Ranchoddas (1849-1917). Indian medicinal plants / by K. R. Kirtikar, B. D. Basu, and an I.C.S.
- [8] Tupkari SV, Saoji AN, Deshmukh VK. Phytochemical study of *Solanum xanthocarpum*. 1972. Planta Med. 22 (6): 184-187.
- [9] Kusano G, Beisler J, Sato Y. Steroidal constituents of *Solanum xanthocarpum*. Phytochem. 1973. 12(2): 397-401.
- [10] Manye Y, Xinsheng H, Ming L. A Preliminary study on Alkaloids in *Solanum xanthocarpum* Schrad Et Wendl. J Mianyang College Economy Technol. 1995-2004.
- [11] Hussain I, Rehman S, Amin R, Khan FU, Chishti KA. Phytochemical composition and heavy metal contents of *Xanthium strumarium* and *Solanum xanthocarpum*. World Appl Sci J.; 2010. 10(3): 294-297.
- [12] Shanker K, Gupta S, Srivastva SK, Singh SC, Gupta MM. Simultaneous determination of three steroidal glycoalkaloids in *Solanum xanthocarpum* by high performance thin layer chromatography. J. Pharm Biomed Anal.; 2011, 54(3): 497-502.
- [13] Teerakun, M., Reungsang, A., Phytoremediation of carbofuran in soil. Songklanakarin J. Technon., 2004, 26 (Suppl.1): 171-176.
- [14] Kantamreddi VSSN, Lakshmi YN, Kasapu VVVS, Preliminary phytochemical analysis of some important Indian plant species. Int. J. Pharm. Bio Sci. 2010. 1: 351-358.