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Review Article

A Detail Review on Phytochemistry and Pharmacology of *Solanum Viarum*

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ABSTRACT

The Solanum viarum belongs to the solanaceae family. It is generally known as apple soda plant. Solanaeace family consists of 75 genera and over 2000 species. The various parts of the plant like root, stem, fruit and seeds are used for medicinal purpose. Plant's pharmacological activity depends on the phytochemical constituents. It is used for treating various diseases like dysentery, diabetes, inflammation and respiratory disorder. Phytochemical studies of this plant have shown the presence of many phytochemical constituents, like steroidal glycosides alkaloids, including solasonine, solasodine and solamargine. It also has many other substances like flavonoids, saponins and minerals etc. Solanum viarum extract and their compounds have shown many pharmacological effects including antipyretic, antioxidant, analgesic, antibacterial, antifungal, antimicrobial and anticancer activities. The roots of Solanum viarum are used for the treatment of skin.Also leaves of solanum viarum are used for treating pyretic problems.

INTRODUCTION

In India, the advancement of Ayurveda is influenced by the medicinal benefits of herbal remedies [1]. The traditional medical system is utilized as home cures in addition to Ayurveda [2]. Because they have few adverse effects, several herbal plants are being employed extensively for medical purposes. Our research indicates that it is also quite effective. Although Solanum viarum (S. viarum) is an invasive shrub or herb, its fruit is extremely deadly and lethal. Because of its intrusive character, it has recently become a major problem in the United States [3]. It originated in Brazil and Argentina and has since expanded to Mexico, the United States, and Honduras.[4].The plant is appertained to locally as Sodom apple and tropical soda pop . Solanaceae is the family to which Solanum viarum belongs.Which has further than 2000 species and

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75 rubrics[5]. Cattle, white-tailed deer, feral gormandizers, and other beast consume the plant's mature fruits. The morphology and physiology of xerophytes are adapted to preserve water and extensively store large quantities of water during dry periods [6]. *Solanum viarum* (also known as S. khasianum) is a xerophytic perennial shrub that is generally distributed in Brazil, Argen-tina, and India [7]. In India, this species is mainly distributed in Manipur, Assam, Sikkim, Arunachal Pradesh, West Bengal, Khasi, Orissa'Jaintia, and Naga Hills, including the upper Gangetic plains[8]. In Himachal Pradesh, this species is mainly set up in the Solang Valley, Hamirpur, Kullu, and Solan sections[9]. The Gujjar and Gaddi lines of the Chamba and Kangra sections use this shrub to cure a variety of mortal as well as cattle problems [10]. Solanum viarum is native to Brazil and Argentina, and was first discovered in the United States in 1988, having presumably been introduced throug h defiled seed or other agrarian products. It crowds out native species and probe for beast[11]. Its niche is terrestrial, in fields, rights- of- way, and open timber. It's spread by beast and wildlife, similar as raccoons, deer, feral swillers, and catcalls feeding on fruits. It's classified as a noxious weed or plant in Alabama, Florida, Mississippi, North Carolina, Texas, and Vermont, and in California and Oregon it's a counterblockade pest. The weed of solanum viarum is a banned noxious in Arizona and Minnesota; and also banned in Massachusetts; and a plant pest in South Carolina and Tennessee. It's also listed as a league 1 noxious weed in Virginia, along with gaint hogweed[12]. Since its prolusion into the U.S., tropical soda pop apple has spread swifty, and presently infests an estimated one million acres of bettered ranges, citrus groves, sugarcane fields, dikes, vegetable crops, sod ranches, forestlands(oak hammocks and cypress heads), natural areas, etc. in Alabama, Florida, Georgia, and Mississippi. Although it can be a trouble to a variety of niche, it tends to be most problematic in ranges in the Mid South.It's controlled by triclopyr fungicide. Gratiana boliviana, the tropical soda pop apple flake beetle, has been used successfully as an agent of natural pest control to reduce the corn ucopia of this factory in the united states, particularly [13].

Table 1: Taxonomical classification [14]

Kingdom	**Plantae**
Subkingdom	Viridiplantae
Subdivision	Embryophyte
Division	Tracheophtya
Class	Mangoliopsida
Subclass	Asteranae
Order	Solanales
Family	Solanacae
Genus	Solanum
Species	*Solanum viarum*

Fig1: - Solanum Viarum

Discription: -

Solanum viarum is a 50-150cm tall, erect with branches and stem that are hairy at the base and have recuvred pinpoints up to 5mm long. Also the petioles and the veins on the upper and lower shells of the leaves have longest, straight spines that can reach a length 0of 2cm.

Leaves- the leaves are bluntly lobed roughly round, up to 20cm long and 15cm wide,with distinctly undulating margins. They are genrally dark green, shiny on top and duller underneath.

Flowers- the more distant flowers are frequently male alone, and the white flowers are 1.5cm across and arranged on clusters of 1-5 on pedicles that are about 1cm long. About 3-5cm long sepals, a white, relatively narrow corolla with relaxed petals, and pale yellow anthers.[15]

Fruits-up to 400 brown, flattened discoid seeds, 2-3mm in diameter, are contained in this globose berry, which is mottled green when young and turns yellow as its age. New shoots will grow from the buds on roots.

Root- the root system can be rather large,with feeder roots that are 1-2cm in diameter and 1-2m from the plant's crown, positioned a many cm below the ground.[16]

Medicinal Use- In India, S. viarum is being cultivated in numerous countries, and collected from the wild in others, for a variety of traditional and ultramodern uses. *Solanum viarum* is used to cure a variety of mortal as well as cattle problems. [17]

1. *S. viarum* is also illustrated for its ethno-medicinal significance, as it is genrally used by locals to treat gastrointestinal, dermatological, and cadaverous-muscular issues. [18]

2. The roots of S. viarum are used as a diuretics.It also help for the proper functioning of the liver and bladder. Some country it is used for the treatment of skin.These are secondary metabolitesof shops that have a ntioxidant parcels and function as free radical impediments as they prop in the prevention of several habitual ails by oxidative stress[19].

3. The fruits of S. viarum contain a high attention of an alkaloid, solasodine that's used in the invention of steroid hormones similar as contraceptives and

shows salutary effect on mortal health. Leaves are also used as herbal medicines for treating pyretic problems [20].

Phytoconstituents

S. viarum is a medicinal condiment which contains colorful chemical ingredients like solasodine, solasonine, solamargine, diosgenin, khasianine, saponins-solakhasianin, natigenin, etc. All are steroidal glycoalkaloid in nature [21]. The plant also contains phenolic composites along with flavonoids, tannins, glycosides, steroids, etc. It also have affeoylquinic acid (CQA) derivations, quinic acid and 5- caffeoyl and 3-malonyl-5-caffeoyl-[4- (1beta-[6-(5-caffeoyl) quinate] glucopyranosyl) [22].

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 [23]. 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.

Anti-Oxidant Activites

Plants include many phytochemicals, which function as antioxidants and have a significant role in health protec-tion. Such substances reduce the risk for chronic diseases like inflammatory cytokines and healing disorders [24]. The plant contains various antioxidants, including phenols, vitamins, carotenes, phytic acids, and phytoestrogens Previous research has revealed that most therapeutic plants have antioxidant char-acteristics that can defend the human body from both cellular oxidation and infections Nature has consistently provided an extensive variety of medicinal components, leading to the isolation of several contemporary drugs from natural sources [25].

Anti-Microbial Activites

Antibiotics have transfigured the remedy of several bacilli disorders, although their uncritical use has resulted in a terrifying growth in antibiotic resistance among bac-teria, thus requiring the development of new antimicrobial agents [26]. Natural products, whether pure chemicals or refined plant extracts, provide an unlimited promise for current medicinal leads because of the extraordinary accessibility of a chemical variety [27]. Arbuscular mycorrhizal (AM) fungi have been utilized to improve the health, nutrients, and production of medicinal crops as well as to preserve fertile soil, which is more directly linked to sustainable yields and high-quality end products [28]. Silver nanopar-ticles (AgNPs) include high-sensitivity bimolecular detec-tion, diagnostic drug delivery, sanitization antimicrobials, therapeutics, catalysis, and microelectronics [29].

Analgesic And Anti-Inflammatory Activity

It has been observed that inflammation usually occurs by the harm caused by fungal infections, bacterial and viral, physical factor, and weak immune responses to living tis-sues. The primary goal of the inflammatory reaction is to locate and remove the dangerous chemicals and secondarily, to eliminate harmful tissue components, and to assist in the healing of organs, affected tissues, or systems [30]. An inflammatory response is mediated by macrophages, and neutrophils which produce various negotiators reliable for the initiation, development, endurance, stabilization,

and final resolution of the critical state of inflammation [31]

Anticancer Activity

Cancer poses a significant challenge to public health, result-ing in approximately 10 million fatalities annually world-wide. A substantial quantity of epidemiological evidence suggests a strong link between fruit consumption and a reduced risk of numerous types of cancer [32]. Different extracts of Solanum sp. have anti-tumor and pro-apoptotic potential against many types of cancers. Several studies have shown the effect of plant extracts of Solanaceae members as cytotoxic and found vari-ous types of compounds in the extracts like phenolic com-pounds, flavonoids, carotenoids, chlorophyll, polyphenols, tannins, anthocyanins, alkaloids, solamargine, solanine, carbohydrates, phytosterols, and withaferin-A. [33].

Antipyretic Activities

Antipyretic drugs can be grouped into three general categories based on their mechanisms of action. These include corticosteroids, aspirin and the other NSAIDs, and acetaminophen. Each exerts its effects at different points in the febrile response pathway. Although not generally used for antipyresis, corticosteroids suppress fever through direct and indirect mechanisms. They block the transcription of pyrogenic cytokines and inducible COX via interactions involving the glucocorticoid receptor.299,300 They downregulate the synthesis of cytokine receptors and, by inducing lipocortin 1, they secondarily inhibit the activity of phospholipase A2, a critical enzyme in the prostaglandin synthetic pathway, which leads to fever suppression.[34]

CONCLUSION

In this modern days herbal medicine is becoming the safest drugs to use for various disease. Herbal medicine are widely used for its high therapeutic effect with less side effect and safer for human use. This plant also have various medicinal properties due to its phytoconstituents isolated by different researchers like phenolic compounds along with flavonoids, tannins, glycosides, steroids, etc. It also have affeoylquinic acid (CQA) derivatives, quinic acid and 5- caffeoyl and 3-malonyl-5-caffeoyl-[4- (1beta-[6-(5-caffeoyl) quinate] glucopyranosyl) and many more. These phytoconstituents give this plant a various pharmacological activities like Antioxidants, Anticancer, Antibacterial activity, Insecticidal activity, Antifungal activity and many more. 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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