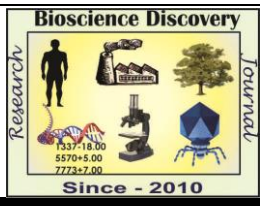
Print & Online, Open Access, Research Journal Available on http://jbsd.in
ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)
Research Article



Studies in the phytochemical analysysis and biological activities of leaves of *Solanum surattense* burm.f A medicinally important plant

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Article Info

Received: 15-10-2017,
Revised: 22-12-2017,
Accepted: 30-12-2017

Keywords:
Solanum surattense, chemical constituents, alkaloids, phytochemical screening and antidiabetic

Abstract

Today India is alarming force in generic world of pharmaceutical market steel in the last twenty years because this is of the country which is a rich storehouse of medicinal plants. All natural products can be termed bioactive molecules, as every diverse molecule possesses one kind or multiple kinds of biological oblique pharmacological activities. Ethno botanical and traditional uses of natural compounds, especially of plant origin received much attention in recent years as they are well tested for their efficacy and generally believed to be safe for human use. In our present investigation phytochemical analysis of *Solanum surattense* young leaves has been evaluated for the presence of bioactive compounds using various polarity solvents including Methanol, Ethanol, Petroleum ether, chloroform and water. The study revealed the presence of alkaloids, terpenoids, flavonoids, anthraquinones, tannins, saponins, glycosides, photo tannins, steroids, carbohydrates and phenols. The results also suggested that 80 % ethanolic extract of *S. surattense* has a promising therapeutic potential.

INTRODUCTION

An important feature of phytochemical studies is the operation of a number of alkaloid surveys ranging from searches for alkaloid containing plants to investigate plants in a particular Order (Henry, 1949). Approximately 2000 alkaloids have been isolated from more than 100 plant families. Some of the families are specially noted for their alkaloid positive members, for example- Solanaceae, Papaveraceae and Apocynaceae. Alkaloids are generally specific for a particular genus, family or order, but there are exceptions too. Alkaloids are found in those parts of plants where there is great vitality and growth. From these location alkaloids are often transferred to parts like seed hulls and bark. Mookherjee S (1968) and screened 43 species of Solanaceae from India for steroidal alkaloids especially solasodine studied Indian species of Datura (10 species), for their alkaloids content,

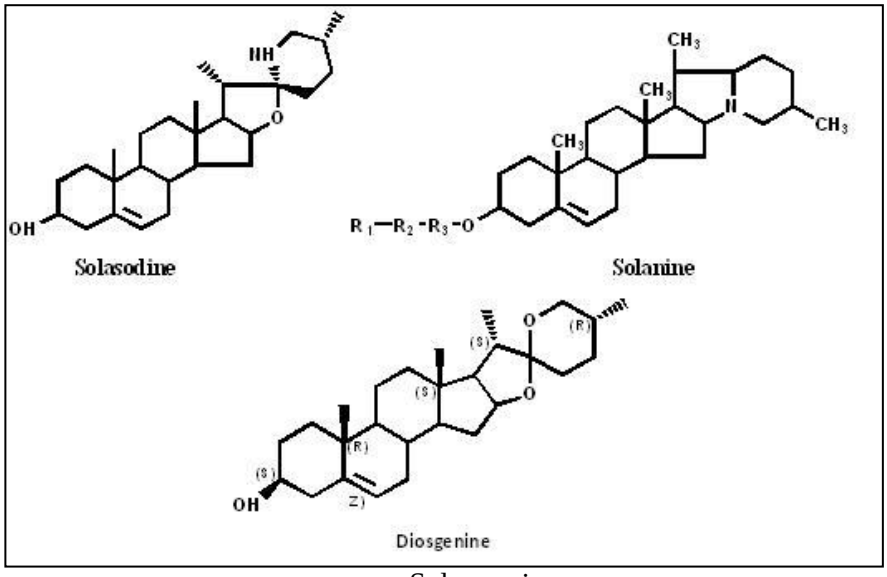
Solanum surattense Burm. F belongs to the family of Solanaceae. It is a commonly growing perennial herbaceous weed. It is considered as one of the most useful traditional medicine in India. In Hindi it is known as Katai, Katali, Ringani, Bhatakataiya, Chhotikateri and in English as Febrifuge plant, yellow berried nightshade. *Solanum surattense* is distributed throughout India, Sri Lanka, South East Asia, Malaysia and tropical Australia. It has been used traditionally for curing various ailments such as fever, cough, asthma, diabetes and rheumatism in south Indian traditional medicines. The antidiabetic potential of the fruit

was studied in diabetic rats (Parmar *et al.*, 2010) and Gupta *et al.*, 2005). The ethanol and methanol extracts of *S. surattense* showed strong antibacterial activity against *Pseudomonas aeruginosa* (Kar *et al.*, 2006). Wound healing activity Ghani *et al.*, 2010), physicochemical activity (Kumar *et al.*, 2010) and antioxidant potential (Meena *et al.*, 2010) of the plant is also evaluated.

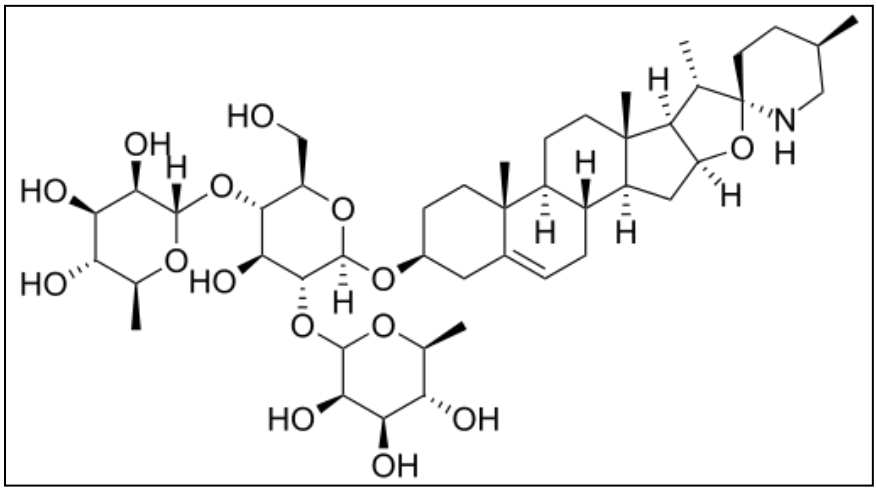
Phytochemical investigation of the *S. surattense* reported to have number of alkaloids (Siddiqui and Faizi 1983) and (Manjunath and Shadaksharaswamy, 1942). Sterols (Kusano *et al.*, 1973), saponins (Tupkari *et al.*, 1972) and flavonoids and their glycosides (Debey & Gupta 1936) and especially it have high concentration of solasodine, a starting material for the synthesis of cortisone and sex hormones. Pharmacological activities such as antibacterial and antifungal, antinociceptive (Rahman *et al.*, 2003), antioxidant (Siddharthan *et al.*, 2007), hypoglycaemic (Kar *et al.*, 2006) and larvicidal (Sharma and Srivastava, 2007). Some of the common alkaloids are Cocaine, Atropine, Quinine, Vinaistine and Nicotine. Under natural condition alkaloid yield of plants is very meagre, these being present in small quantities, (0.612% to 0.498%).

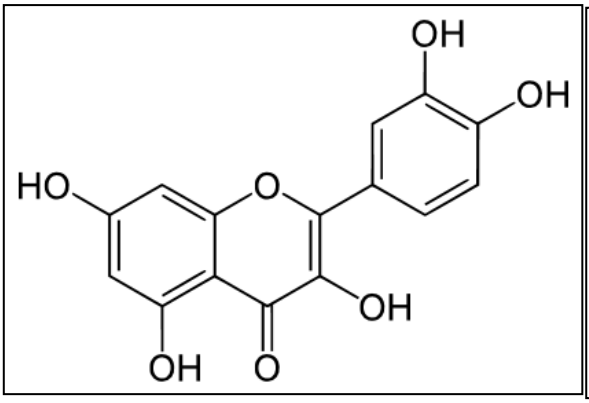
S. surattense root contains solanin, solanidine a waxy substances and fatty acids. It also contains alkaloids, tannins, sugars, starch, fats, oils, proteins mucilage, lignins, and calcium oxalate. A fruit contains diosgenin, solasonine, solamargin, β-solamargin and solasodine, Petals contains apigenin and stamens contain quercetin, diglycoside and sitosterol.

Chemical structure:-



Solamargin





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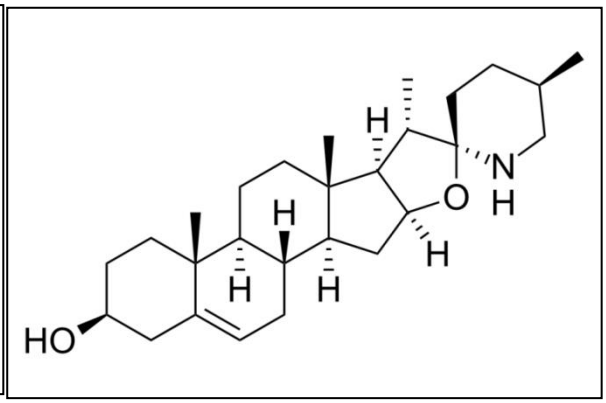
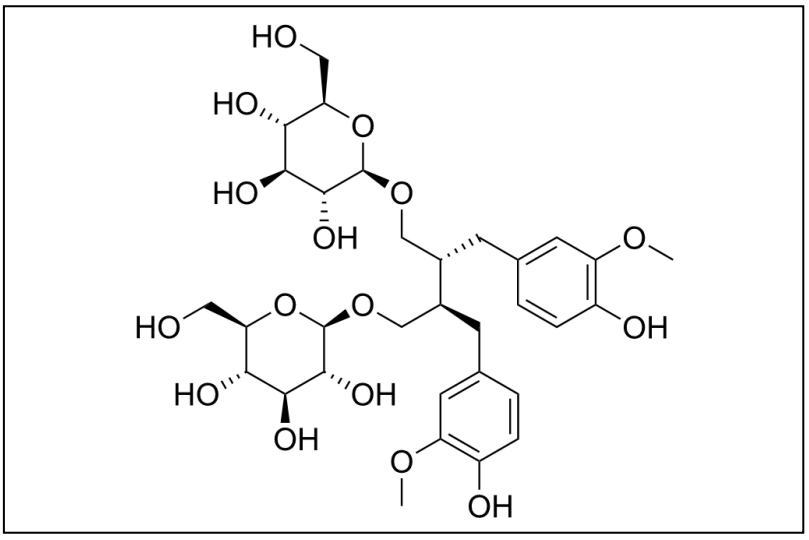
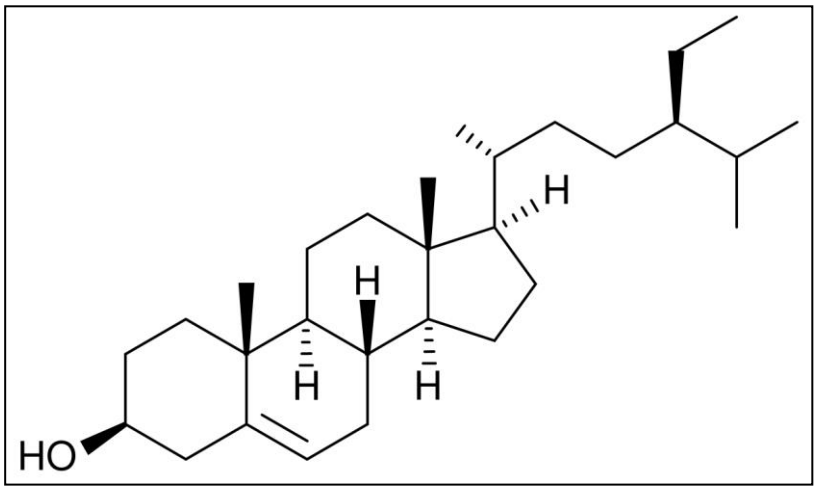


Solasodine



Secoisolariciresinol diglucoside



β-Sitosterol

MATERIALS AND METHODS

Fresh leaves of *S. surattense* were collected during the months of August to September, 2016 (Temperature 28 ±2°c), from Karimnagar, Telangana. The materials were dried in the shade, powdered and stored in airtight containers.

Preparation of Powder

First the site for leaves collection was decided. The whole leaves were collected from same region of Botanical Garden Department of Botany, Karimnagar. Before picking the whole plant, the soil was moistened. The collection of sample was done in between 30th July 2016to 10th August 2016. The leaves of *S. surattense* were separated by scissor then remove the thorns either side of leaves with the help of the blade after at room temperature they were shed dried for 3 days and sun dried for 3days and then milled into coarse powder by a mechanical grinder (Harborne, 1988).

Preparation of Aqueous Extract: - The aqueous extract of each sample was prepared by soaking 100 g of dried powdered samples in 200 ml of distilled water for 12 h. The extracts were filtered using Whatman filter paper No. 42 (125 mm) (Rao et. al., 1995).

Phytochemical Screening

Chemical tests were carried out on the aqueous extract and on the powdered specimens using standard procedures to identify the constituents as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1973).

Alkaloid Determination using Harborne (1973) Method

5 g of the sample was weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was added and covered and allowed to stand for 4 h. This was filtered and the extract was concentrated on a water bath to one quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitated was collected and washed with dilute ammonium hydroxide and then filtered. The residue is the alkaloid, which was dried and weighed.

Test for Cardiac glycosides (Keller-Killani Test)

5ml of each extracts was treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. This was under layed with 1 ml of concentrated sulphuric acid. A brown ring of the interface indicates a deoxysugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout the thin layer.

Test for Flavonoids

Three methods were used to determine the presence of flavonoids in the plant sample (Sofowara, 1993; Harborne, 1973). 5ml of dilute ammonia solution were added to a portion of the aqueous filtrate of each plant extract followed by addition of concentrated H_2S04. A yellow coloration observed in each extract indicated the presence of flavonoids. The yellow coloration disappeared on standing.

Few drops of 1% Aluminium solution were added to a portion of each filtrate. A yellow colouration was observed indicating the presence of flavonoids. A portion of the powdered plant sample was in each case heated with 10ml of Ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute Ammonia solution. A yellow colouration was observed indicating a positive test for flavonoids.

Flavonoid Determination by the Method of Bohm and Kocipai-Abyazan (1994)

10 g of the plant sample was extracted repeatedly with 100 ml of 80% aqueous Methanol at room temperature. The whole solution was filtered through Whatman filter paper No 42 (125 mm). The filtrate was later transferred into a crucible and evaporated into dryness over a water bath and weighed to a constant weight.

Determination of Total Phenols by Spectrophotometric Method

The fat free sample was boiled with 50 ml of ether for the extraction of the phenolic component for 15 min. 5ml of the extract was pipetted into a 50 ml flask, and then 10 ml of distilled water was added. 2 ml of Ammounium hydroxide solution and 5 ml of concentrated amylalcohol were also added. The samples were made up to mark and left to react for 30 min for colour development. It was measured at 505 nm.

Saponin Determination

The method used was that of Obadoni and Ochuko (2001). The samples were ground and 20 g of each were put into a conical flask and 100 cm3 of 20% aqueous ethanol were added. The samples were heated over a hot water bath for 4 h with continuous stirring at about 55^0C. The mixture was filtered and the residue re-extracted with another 200 ml of 20% ethanol. The combined extracts were reduced to 40 ml over water bath at about 900C.

The concentrate was transferred into a 250 ml separatory funnel and 20 ml of Diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated. 60 ml of n-butanol was added. The combined n- butanol extracts were washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation the samples were dried in the oven to a constant weight; the saponin content was calculated as percentage.

Test for Steroids

2ml of acetic anhydride was added to 0.5 g ethanolic extract of each sample with 2 ml H_2S0_4. The colour changed from violet to blue or green in some samples indicating the presence of steroids.

Test for Terpenoids (Salkowski Test)

5ml of each extracts was mixed in 2 ml of chloroform and concentrated H_2S04 (3ml) was carefully added to form a layer. A reddish brown colouration of the interface is formed to show positive results for the presence of terpenoids.

Test for Tannis: About 0.5 g of the dried powdered sample was boiled in 20ml of water in a test tube and then filtered. A few drops of 0.1% Ferric chloride was added and observed for brownish green or a blue-black colouration.

Test for Amino acids

To 3 ml of the extract few drops of 0.2 % Ninhydrin reagent was added and heated. Formation of violet color indicated the presence of amino acids.

Test for proteins Biuret test

To 3 ml of the extract few drops of 10 % Sodium chloride and 1 % copper sulphate was added for the formation of violet or purple color. On addition of alkali, it becomes dark violet.

Millon's test

To 3 ml of the extract few drops of Millon's reagent was added for the formation of red color.

Test for Carbohydrates Molisch's test

To a small amount of the extract few drops of Molisch's reagent was added followed by the addition of conc. H_2SO_4 along the sides of the test tube. The mixture was then allowed to stand for 2 minutes and then diluted with 5 ml of distilled water. Formation of red or dull violet color at the inter phase of two layers indicates the presence of carbohydrates

RESULTS AND DISCUSSION

The present study carried out on the plant samples revealed the presence of medicinally active constituents. The phytochemical characters of the *S. surattense* investigated are summarized in Tables - 1.

Table -1 Photochemical screening of young Leaves of various extracts of *S. surattense.*

Sl No	**Chemical components**	**Methanol**	**80%Ethanol**	**Chloroform**	**Pet Ether**	**Water**
1	Alkaloids	+	+	-	+	+
2	Cardiac glycosides	+	+	+	+	+
3	Flavonoids	+	+	+	+	+
4	Phenols	-	-	-	-	-
5	Saponins	+	+	-	+	+
6	Steroids	+	+	+	+	-
7	Terpenoids	+	+	-	+	+
8	Tannins	+	+	-	-	-
9	Amino acids	+	+	-	-	+
10	Proteins	-	+	+	-	+
11	Carbohydrates	+	+	-	-	+

"+" Present, "-" Absent

The qualitative screening of phytochemical constituents on leaf extract of *S. surattense* reveals the presence of alkaloid, saponin, tannins, flavonoids, proteins etc. Pure isolated alkaloids and their synthetic derivatives are used as basic medicinal agents for their analgesic, antispasmodic and bacterial effects (Stray, 1998). They exhibit marked physiological activity when administered to animals.

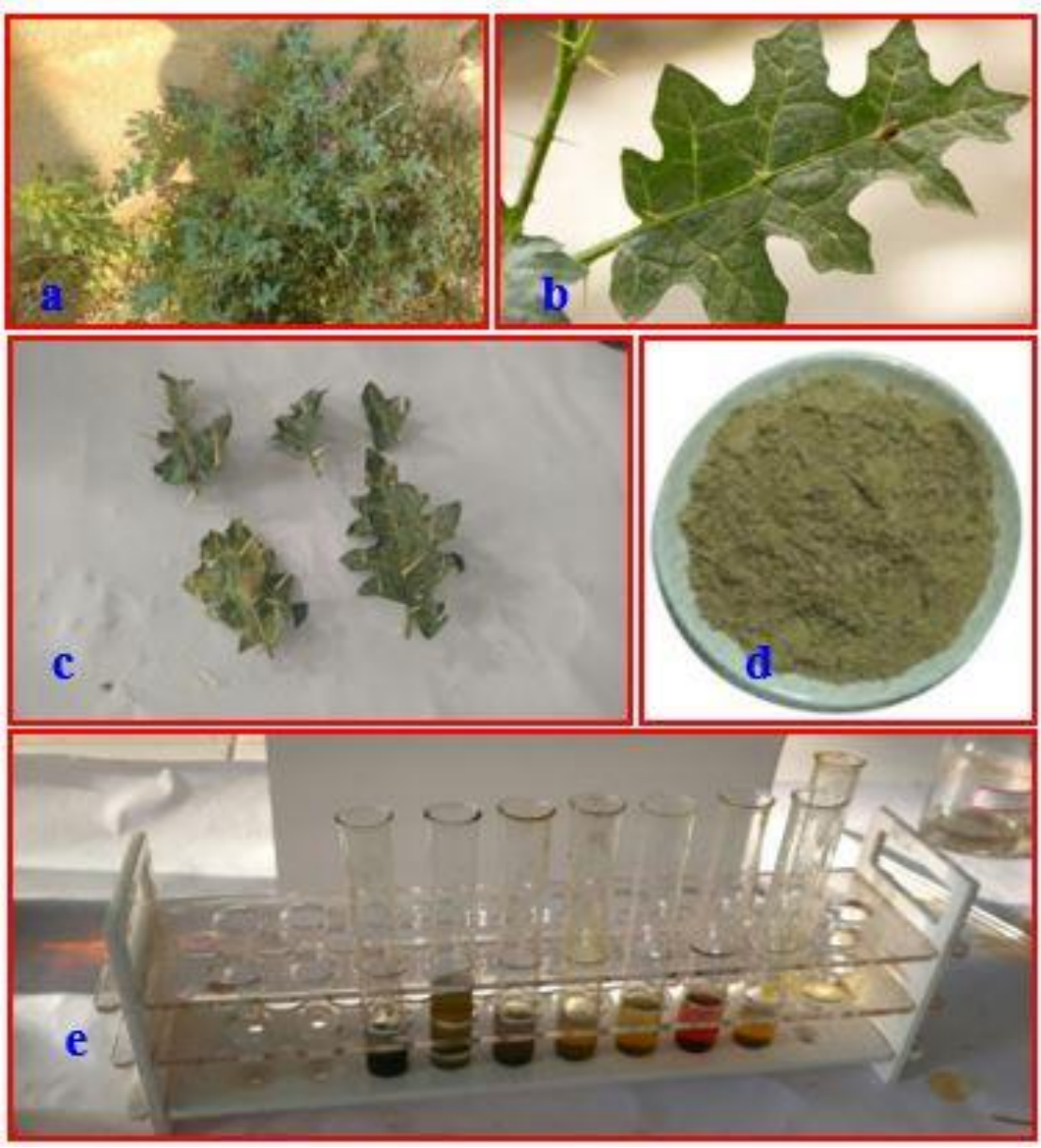


Fig: I -Studies in the Phytochemical Analysysis and Biological Activities of Leaves of *Solanum surattense* a) Showing the plant with fruits **b)** Showing the single leaf view **d)** Air Drying of Plant leaves on water absorber filter paper. **e)** Air dried leaf parts are grinded with Morter and pistil **f)** The Results of Phytochemical Analysis is kept in the test tubes with stand

coagulating red blood cells. Some of the characteristics of saponin include formation of forms in aqueous solution, haemolytic activity, cholesterol binding properties and bitterness (Sodipo *et al.*, 2000). These properties bestow high medicinal activities on the leaf extract from *S. surattense*. Tannins are also known antimicrobial agent. Tannins (commonly referred to as tannic acid) are water soluble polyphenols that are present in many plant foods. Tannins are water soluble plant polyphenols that precipitate proteins. Tannins have been reported to prevent the development of microorganisms by precipitating microbial protein and making nutritional protein unavailable for them (Sodipo *et al.*, 1991). The growth of many fungi, yeasts, bacteria and viruses was inhibited by tannins (Chung *et al.*, 1998). Phytotherapatically tannin containing plants are used to tract nonspecific diarahoea, inflammations of mouth, throat and slightly injured skins.

In the present study, the observed alkaloid content in *S. surattense* could be responsible for their much acclaimed medicinal values though the exact mode of action is poorly understood. Saponins are a special class of glycosides which have soapy characteristics. It has the property of precipitating and

Biological activities

In this study, the presence of tannins might have accounted for the sharp taste of *S.surattense* and have been reported to hasten the healing of wounds and inflamed mucous membrane. Flavonoids are potent water soluble antioxidants and free radical scanvengers, which prevent oxidant cell damage, have strong anticancer activity (Salah *et al.,* 1995). Flavonoids in intestinal tract lower the risk of heart disease. As antioxidants, flavonoids from these plants provide anti-inflammatory activity. This may be reason *S.surattense* have been used for the treat ment of wounds, burn and ulcers in herbal medicine. Apart from these secondary metabolites, due to the abundantly presence of protein in leaf of *S. surattense* which can serve many of the medicinal properties exhibited by the plants. For example, a variety of proteins have been isolated in medicinal plants and found to be bioactive against certain ailments (Tsao *et al.,* 1990).

The presence of the above said phytochemical constituents could account for the much medicinal properties of *S. surattense* for the treatment of various diseases/ailments such as cough, liver problem, stomach-ache, skin diseases, inflammation, jaundice, tooth ache etc which are reported by various workers (Pronob Gogoi *et al.,* 2012).

Alkaloids are significance for defense and survival of plants. The significance of medicinal plants is directly associated with the wide range of chemical compounds produced by different biochemical pathway. High alkaloid value of *S.surattense* and *Nicotiana plumbaginifolia* justify the wide use in traditional system of medicine.

Conclusion

Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. The use of traditional medicine is widespread and plants still present a large source of novel active biological compounds with different activities, including anti-inflammatory, anti- cancer, antiviral, and antibacterial and cardio protective activities. Even today plant materials continue to play a major role in primary health care as therapeutic remedies in developing countries. The millenarian use of *S. surattense* in folk medicine suggests that they represent an economic and safe alternative to treat various diseases. As the pharmacologists are looking forward to develop new drugs from natural sources, development of modern drugs from *S. surattense* can be intended for their better monetary and therapeutic utilization.

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How to cite this article

Venkateshwarlu M, Odelu G, Babitha Kumari. D, Nagaraju. M, and Ugandhar T, 2018. Studies in the phytochemical analysysis and biological activities of leaves of *Solanum surattense* burm.f A medicinally important plant. *Bioscience Discovery*, **9**(1): 114-121**.**