Photochemical Screening of plant of family *"Solanaceae"*

AWANTIKA JOSHI

MOTIRAM BABURAM, GOVT.P.G COLLEGE HALDWANI

(NANITAL)

Photochemical Screening of plant of family

"Solanaceae"

A DISSERTATION

SUBMITTED TO

MOTIRAM BABURAM, GOVT.P.G COLLEGE HALDWANI (NANITAL)

AFFILIATED TO

KUMAUN UNIVERSITY , NANITAL (UTTARAKHAND)

SUBMITTED BY:

AWANTIKA JOSHI

ROLL NO . 22013066001

FOR THE PARTIAL FULFILLMENT OF

REQUIREMENTS

FOR

THE AWARD FOR DEGREE OF MASTERS OF

SCIENCE IN CHEMISTRY

UNDER THE SUPERVISION OF

DR. RANJANA SHAH

CANDIDATE'S DECLARATION

I hereby declare that this dissertation work titled ("**Phytochemical screening of plant of family "Solanaceae")** represents my own work which has been done for the partial fulfillment of the Degree of master's in Chemistry under the supervision of **Dr.RANJANA SHAH**, Assistant Professor Department of Chemistry. This dissertation work has not been submitted for the award of any degree, diploma, association or fellowship of any university or institute.

AWANTIKA JOSHI

MSC 4TH SEMESTER

ORGANIC CHEMISTRY

CERTIFICATE

MOTIRAM BABU RAM GOVT. PG.COLLEGE HALDWANI, (NANITAL)

This is to certify that the dissertation entitled ("**PHYTOCHEMICAL SCREENING OF PLANTS OF THE FAMILY SOLANACEAE**") submitted to the **Department of Chemistry**, **M.B.GOVT.P.G.COLLEGE HALDWANI(NANITAL), KUMAUN UNIVERSITY** in partial fulfillment of the requirement for the degree of Master of Science in Chemistry, is a record of bonified research and carried out by AWANTIKA JOSHI under the supervision of **Dr.RANJANA SHAH** and no part of this dissertation has been submitted, either in part or full for any other degree or diploma. This assistance and help received during the course of investigation and course of literature has been duly acknowledged.

DATE :- 14.05.2024

DR. RANJANA SHAH

DEPATMENT OF CHEMISTRY

M.B.G.P.G COLLEGE

SIGNATURE:

ACKNOWLEDGEMENT

I would like to express my deep and sincere gratitude to my supervisors and my parents & friends who have been a constant support and source of inspiration throughout the project work.

This satisfaction that accompanies the successful completion of any task would be incomplete without the people mentioned above whose ceaseless cooperation made it possible,and their consistent guidance and encouragement crown all efforts with success.

I take the privilege to express my deep and profound sense of gratitude towards **my project mentor Dr**. **RANJANA SHAH** as she gave me complete freedom to work in any area of my interest and helped me in all possible ways she can.

My Thanks and Appreciation also goes towards my friends in making this project and also to those people who willingly helped me out with all their abilities.

(MSC CHEMISTRY)

Contents:

1 ABSTRACT

India with its knowledge of rich ancient traditional systems of medicine provides a strong base for the utilization of a large number of plants in general healthcare. Large number of herbal drugs existing in India, very few has been studied systematically so far. Solanum xanthocarpum is an important medicinal herb in Ayurvedic medicine. Various studies indicated that Solanum xanthocarpum possesses antiasthmatic, hypoglycemic, hepatoprotective, antibacterial and insect repellent properties. The present review aims to document the medicinal properties of Solanum xanthocarpum and its potential prospects for the further scientific investigation for the development of effective therapeutic compounds.

2 INTRODUCTION

Herbal medicines are being used by nearly about 80% of the world population, primarily in developing countries for primary health care.

Assessing the current status of health caresystem in adequacies of synthetic drugs is likely to be more glaring in the coming years.

It has been reported that there has been an alarming increase in number of diseases and disorders caused by synthetic drugs prompting a switch over to traditional herbal medicine. India has over 1,08,276 species of bacteria, fungi, animals and plants already identified and described.

Considerable research on pharmacognosy, chemistry, pharmacology and clinical therapeutics has been carried out on ayurvedic medicinal plants.

Natural products, including plants, animals and minerals have been the basis of treatment of human diseases.

The current accepted modern medicine or allopathy has gradually developed over the years by scientific and observational efforts of scientists. However, the basis of its development remains rooted in traditional medicine and therapies.

Selection of scientific and systematic approach for the biological evaluation of plant products based on their use in the traditional systems of medicine forms the basis for an ideal approach in the development of new drugs from plants. One such plant is Solanum xanthocarpum (SX) Schrad. & Wendl. (Family: Solanaceae) commonly known as the Indian night shade or Yellow berried night shade (English) and kantakari (Sanskrit).

It is a prickly diffuse, bright green perennial herb, woody at the base, 2–3 m height, found through out India, mostly in dry places as a weed along roadsides and waste lands. SX has held a place of some importance in the Hindu Materia Medica, primarily as an expectorant and antipyretic.

Various medicinal properties are attributed to it, particularly in the treatment of asthma, chronic cough and catarrhal fever.

It is one of the members of the dashamula (ten roots) of the Ayurveda.

Figure 1: Solanum xanthocarpum image

Taxonomic classification

Kingdom - Plantae

Subkingdom - Tracheobionta

Division - Magnoliophyta

Class - Magnoliopsida

Subclass - Asteridae

Order - Solanales

Family - Solanaceae

Genus - Solanum

Sanskrit: Kantkari, Nidigdhika

Hindi: Kateri, Kattay

Gujarati: Bhoringni, Bhonya-ringani

Tamil: Kantankattiri

Malayalam: Kantkariccunta, Kantakarivalutana, Kantankattiti

Telugu: Callamulaga, Pinnamulaka, Nela

- ## Geographical Source

It occurs throughout India, in dry situations as a weed along the roadsides and wastelands. It is naturally propagated by seed in waste lands. It is also distributed in Ceylon, Asia, Malaya, Tropical, Auastrana and Polynessia *mulaka, Vakudu.*

- ## Morphology

A very prickly diffuse bright green perennial herb, somewhat woody at the base; stem is somewhat zigzag; branches are numerous, the younger ones clothed with dense stellate omentum; prickles are compressed, straight, yellow, glabrous and shining, often exceeding 1.3 cm.

Leaves are usually 5-10 in numbers and 2.5-5.7 cm in length, ovate or elliptic, sinuate or sub pinnatified, obtuse or sub acute, stellately hairy on both sides, sometimes becoming nearly glabrous in age, armed on the midrib and often on the nerves with long yellow sharp prickles, base usually rounded and unequal-sided; petiole 1.3-2.5 cm long, stellately hairy.

The berries are green and white strips when young but yellow when mature. They are 1.3-2 cm in diameter, yellow, or white with green veins, surrounded by the enlarged calyx. Seeds are 2.5 mm in diameter and glabrous

Calyx is nearly 1.3 cm long, densely hairy and prickly; tube short, globules. Lobes are 11 mm long, linear-lanceolate, acute and hairy outside. Filaments are 1.5 mm long, glabrous; anthers 8 mm long, oblong lanceolate, opening by small pores.

Ovary is ovoid, glabrous; style glabrous.

- ## Traditional uses

In ancients 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.

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. Linctuses prepared from the stamens of flowers is prescribed for chronic cough in children (Bangasena).

The whole plant is used traditionally for curing various ailments.

Decoction of the plant is used in gonorrhea; 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.

The plant is also known to have pest repellent properties and used as a contact poison and mollusicide. Roots are one of the constituents of well known Ayurvedic preparation "*Dasmul Asava*" and used as an expectorant, cough, asthma, and chest pain in Ayurvedic medicine.

Fruits are edible and used by the local people as folk medicines in treating throat infections and other inflammatory problems. The stem, flowers and fruits are prescribed for relief in burning sensation in the feet accompanied by vesicular eruptions. The antispasmodic, antitumor, cardiotonic, hypotensive, antianaphylactic and cytotoxic activities are also reported.Fruit juice is useful in sore throats and rheumatism.

A decoction of the fruits of the plant is used by tribal and rural people of Orissa, India for the treatment of diabetes. The fruits are eaten as an anthelmintic and for indigestion.

Figure 2: Fruting in Solanum xanthocarpum

- **PHYTOCHEMISTRY**

Chemical examinations of berries of SX were initially done by Saiyed and Kanga, which led to the isolation of glycoalkaloid, solasonine.

From the non alkaloidal portion, a glycoside of β-sitosterol with galactose as a sugar moiety has been obtained along with two phenolic substances, which could be identified as methyl caffeate and caffeic acid.

The fruits are reported to contain several steroidal alkaloids like solanacarpine and solamargine. Other constituents like caffeic acid coumarins like aesculetin and aesculin, steroids carpesterol, diosgenin, campesterol, daucosterol and triterpenes like cycloartanol and cycloartenol were reported from the fruits.

Steroidal glycoalkaloids are naturally occurring, secondary plant metabolites that are formed in a number of foods including potatoes, tomatoes, and eggplants.

Although they are reported to be potentially toxic, glycoalkaloids and hydrolysis products without the carbohydrate side chain (aglycons) also have beneficial effects.

These include lowering of cholesterol, protection against infection by Salmonella typimurium as well as against cancer, and potentiation of general anesthetics that act by inhibiting cholinesterase and of a malaria vaccine. Solanidine, but not the parent glycoalkaloids, exhibited estrogenic activity in an in vitro assay.

The fruit of SX contains alkaloid saponins which can be extracted in alcohol and have a heart stimulating function. The detailed study on this plant resulted in the isolation of solasonine and solasodine, ß-sitosterol, and carpesterol.

The fruits contained 20.71% of dry seeds, 4.62 of pericarp and 74.67 percent of moisture. The powdered seeds were extracted with benzene and yielded 19% of greenish-yellow oil which did not contain nitrogen or sulphur.

The composition of the oil was calculated as oleic acid, 42.93; linolic acid, 36.18; palmitic acid, 5.37; stericacid, 9.77; arachidic acid, 0.35, and unsaponifiable matter, 1.2 percent.

- **Sola-sodine**

SX has a high concentration of solasodine alkaloid, a spiroketal alkaloid sapogenin with a heterocyclic nitrogen atom, which is the starting material for the manufacture of cortisone and sex hormones.

The berries are the main source of solasodine and diosgenin. Solasodine is N-analogue of diosgenin and used as a steroidal precursor in the steroid drug industry for the manufacture of corticosteroids, antifertility drugs, anabolic steroids etc. It is present in the form of a glycoside in most of the berries of the plant belonging to the genus *solanum* and the glycoalkaloids are variously known as solasonine, solamargine etc. with the common spiro aminoketal alkaloid or aglycon namely solasodine. The solasodine content of the berries of SX is reported to vary from 1.1% to 4.6% [30] depending apparently on climatic and soil conditions.

It has been observed that berries collected in autumn (September, October) yielded only solasonine and solamargine without any trace of solasurine which was obtained from the material collected in summer (May, June). The solasodine content of the unripe berries was 1.7% (on dry weight basis) as against 0.75% noted for the ripe berries.

Solasodine has been estimated by various methods by many workers viz. gravimetric, nonaqueous, potentiometric, Chromatography, Colorimetric and even RIA. A number of analytical methods like high performance thin-layer chromatography (HPTLC), and high-

performance liquid chromatography (HPLC), capillary electrophoresis, gas chromatography (GC), are available for determination of solasodine from its plant. Solasodine does not have a conjugated double bond in its structure.

S. Emmanuel et al. (2006) reported satisfactory content of solasodine (0.84%) in the plant. Further, they reported that the control of temperature, time of extraction and concentration of hydrochloric acid has some influence on the percentage recovery of solasodine. In no case extraction, hydrolysis, basification and purification temperature should be high throughout the process of estimation as it may affect in actual recovery of solasodine due to over heating.

Pure white crystals of solasodine could be obtained with 196-197°C m.p. Solasodine is a nitrogenous analogue of diosgenin which can be converted to progesterone a steroidal sex hormone used in the oral contraceptive industry.

The studies of S. Emmanuel, (2006) revealed that solasodine showed anti-inflammatory activity against carrageenan induced paw oedema in rats. The tested extract and its constituent solasodine showed significant reduction of the inflammatory reaction from 19.5 to 56.4%. M. R. Heble et al. (1968) reported the isolation and identification of ß-sitosterol and diosgenin from callus tissues of SX. Chemical examination of SX berries also resulted in the isolation of diosgenin.

Although only trace amounts of the steroidal alkaloid solasonine and solanine were detected earlier, the tissue cultures of SX have yielded ß-sitosterol and diosgenin in quantities much higher than that obtained from the growing plant.

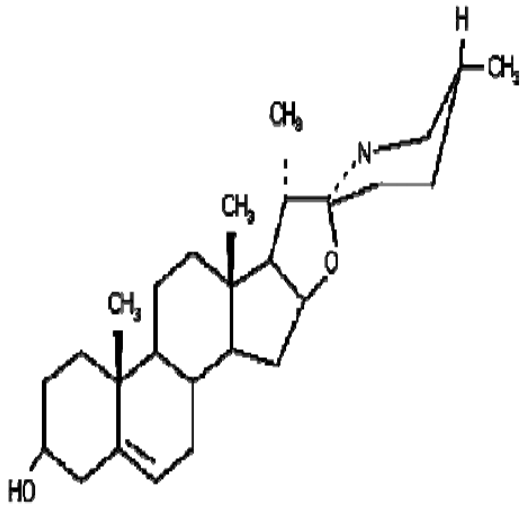
- ## Carpesterol

Carpesterol was the first compound isolated from the lipid fraction of plant, more than three decades ago no structural studies of the sterol have been reported. Because it was hoped that a structural knowledge of carpesterol would shed some light on the biogenetic pathway leading to solasodine ,which is the major alkaloid accompanying carpesterol in SX and commonly found among many other ***solanum* species.**

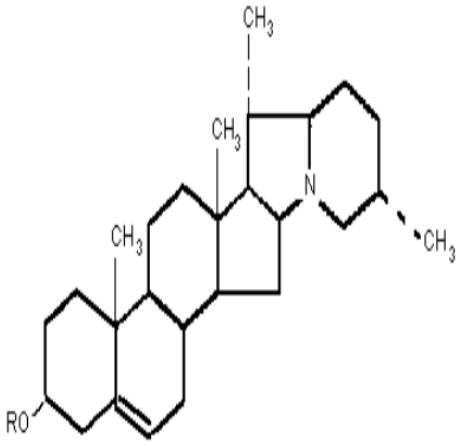
Saiyed and Kanga (1936) isolated the substance carpesterol along with a steroidal alkaloid glycoside.

Subsequent investigations of extracts from SX showed the presence of diosgenin and β-sitosterol.

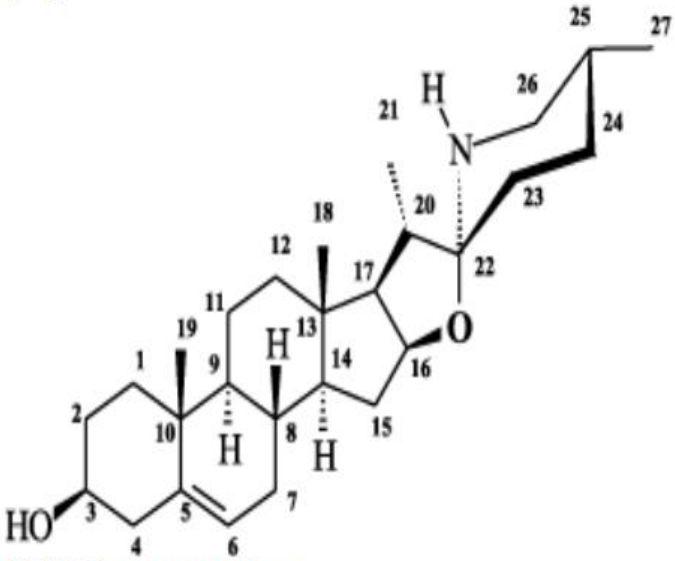
- **PHYTOCHEMICAL CONSTITUENTS OF *SOLANUM XANTHOCARPUM***



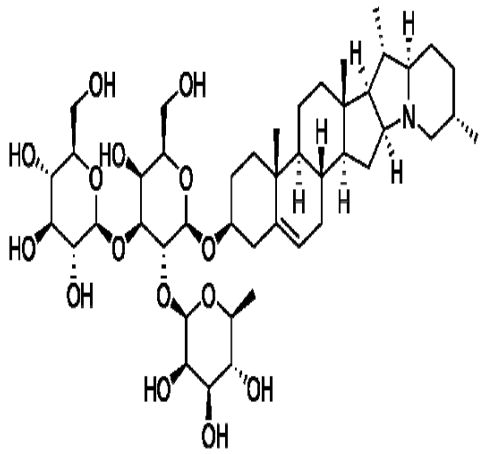
(A) Solasodine



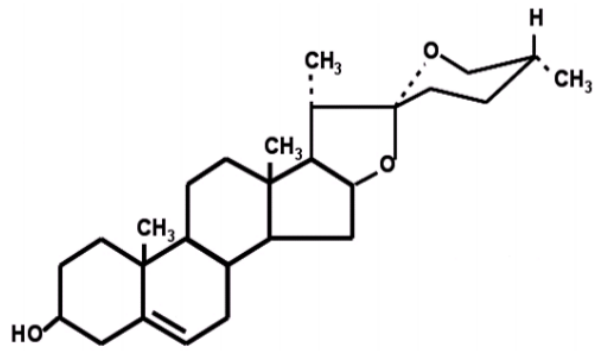
(B) Solanidine



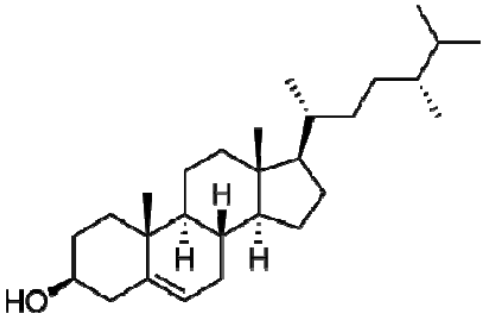
(C) Solasonine



(D) Solanine



(E) Diosgenin (steroidal saponin)



(F) Campesterol (sterol)

Figure 1. Structures of some phytoconstituents isolated from *Solanum xanthocarpum*

Pharmacological Activity

Antiasthmatic Properties

Bronchial asthma is an inflammatory disorder of the airways characterized by various airway obstruction, airway eosinophilic inflammation and bronchial hyper responsiveness [37] and is a global health problem that results from a complex interplay between genetic and environmental factors [38]. Among several respiratory diseases affecting man, bronchial asthma is the most common disabling syndrome. Nearly 7–10% of the world population suffers from bronchial asthma.

Despite the availability of a wide range of drugs, the relief offered by them is mainly symptomatic and short lived. Moreover the side effects of these drugs are on going to identify effective and safe remedies to treat bronchial asthma.

A pilot study on the clinical efficacy of SX and *Solanum trilobatum* in bronchial asthma were undertaken to prove the significant use of herbs in treatment of asthma [7].

Major literature data supports use of whole plants. Gautam et al. (2008) evaluated the therapeutic effect of ethanolic extract of SX i.e. asthma relieving or antihistaminic, antiallergic property [10].

Gautam et al. (2008) studied effects of SX extract on some of the parameters like smooth muscle relaxation, and antagonism of asthma mediators such as histamine, eiosinophils and protection against mast cell degranulation which seemed to be prominent in pathophysiology of asthma [10].

Further they showed that ethanol extract of SX shown a significant antihistaminic activity in histamine induced contraction in goat tracheal chain preparation. Thus, the significant inhibition of histamine induced contractions produced by ethanol extract of SX flower on

isolated goat tracheal chain preparation indicates that the SX flower has antihistaminic (H1-receptor antagonist) action.

While screening the all three extracts of flowers of SX, results were indicative that only ethanolic extract of SX at a dose of 50 and 100 mg / kg reduced milkinduced eiosinophilia of statistical significance. SX at a dose of (50-100 mg/kg, i.p) showed significant mast cell stabilization as compared to standard drug Disodiumchromoglycate (DSCG).

SX is widely used by practitioners of the Siddha system of medicine in southern India to treat respiratory diseases [15].

The powder of whole dried plant or a decoction is used for this purpose. Govindan et al. (1999) showed that treatment with SX improved the pulmonary functions to a significant level in patients suffering from mild to moderate asthma.

Subjective relief from asthmatic symptoms was reported by the patients an hour after administration of SX powder.

The effect lasted for about 6–8 h. However, responses observed were apparently less when compared to that of deriphilline or salbutamol.

A decrease in forced expiration volume and peak expiration flow rates are indicative of both large and small airway obstruction and muscle power [39].

The dose of SX was well tolerated and no untoward effects were reported. SX is a safe medicine in the traditional system and has been used by mankind over many centuries.

It was suggested that relief from the symptoms of bronchial asthma produced by SX may be due to:(a) a bronchodilatoreffect, (b) reduction in the bronchial mucosal edema, and/or (c) reduction.

Pharmacology:

The plant Solanum surattense is commonly used in Indian traditional medicine for curing various ailments such as gonorrhea, rheumatism, respiratory diseases, asthma and fever (23), constipation, and diarrhea (24). In the ayurvedic preparation of dashmularishta the constituent is the root of Solanum surattense which is used as a tonic for lactating mothers (25). The fruit of S. surattense traditionally uses for wound healing (26). The ethanol extract of S. surattense is exhibited pronounced wound healing capacity than other solvent extracts (27). Ahmed et al., (28) have been reported that the fruit extract of S.surattense has diuretic and serum electrolyte regulation properties and significantly increased the urine output in a dose-dependent manner. Chauhan et al., (29) have been reported that S. surattense is used for the treatment of urinary

tract and kidney stone. The plant of S. surattense are also used in the treatment of cold, worms, insomnia (30), laxative, enlargement of the liver, aphrodisiac activities (31, 32), anti-nociceptive, molluscicidal (33) and antifungal activities (34). Pandey, (35) have been reported that the seed fumes of S. surattense were useful in the treatment of tooth pain and pain from gingival swellings. In India, Rajasthan Mukunda tribes traditionally use the root parts of S. surattense in the treatment of hernia (36). Alcoholic extracts of S. surattense leaf have significant antiulcer potentiality (37) than other solvent extracts. The pharmacological activities of S. surattense are antibacterial, antifungal, antinociceptive (38), antioxidant (39), antidepressant activity (40), hypoglycaemic (41), and larvicidal (42). Several scientific observations and evaluations of S. surattense show the following activities. 3.1. Antimicrobial activity Several studies have been carried out that the plant products have effective antimicrobial activities. The ethanolic leaf extract of Solanum surattense has potential antimicrobial activity against Staphylococcus aureus.

- **Hypoglycemic activity**

The Kondh tribes of Dhenkanal district of Orissa, India use the hot aqueous extract of the matured fruits as a traditional medicine for the treatment of diabetes mellitus.

The aqueous extract showed significant hypoglycemic effect in both normal and streptozotocin induced diabetic rats at dose of 100 and 200 mg/kg. The activity showed by aqueous extract was comparable to that of standard oral hypoglycemic agent glibenclamide.

The experimental resultsindicated that it exhibited a potent blood glucose lowering property both in normal andstreptozotocin induced diabetic rats. The LD50 of the extract was found to be high indicating highmargin of safety [40].

- **Hepatoprotective activity**

Jigrine is a polypharmaceutical herbal formulation containing aqueous extracts of 14 medicinalplants including SX and used for liver ailments.

A. K. Najmi et al. [2005] investigated the DPPH-free radical scavenging activity, hepatoprotective and antioxidant activity of Jigrine against galactosamine induced hepatotoxicity in rats.

CARDIOVASCULAR DRUGS

- Pasnani JS (1988) reported that Abana, a polyherbal formulation containing SX causes: (i) Adirect sensitization of the atrium through an increase in permeability to Ca2+ and (ii) an effectsimilar to withdrawal of chronic ISO administration, i.e. down regulation of beta adrenoceptors.

- **Antifilarial effect**

Lalit Mohan et al. (2006) reported the larvicidal potential of crude extracts of SX and suggested its suitability as an ecofriendly, effective larvicide in the management of mosquito populations and in limiting the outbreak of various vector borne epidemics.

- **MEDICINAL PROPERTIES *of Solanum Xanthocarpum*.**

Solanum xanthocarpum is an important medicinal plant and in recent history this plant is reported for various medicinal properties.

- **Anti-Fertility activity**

Solasodine, an alkaloid of Solanum xanthocarpum possesses antispermatogenic activity. In Dixit VP 1980 study, chronic administration of solasodine (20mg/kg each other day oral for 60 days) rendered male rats and dogs infertile. Mating test showed 87% infertility in rats, this returned to normal after 60 days cessation of drug feeding. Solasodine is well tolerated and inhibits spermatogenesis and Sperm motility. No significant change was noticed in the weight of testes and accessory sex organs. The RNA, protein, sialic acid and glycogen contents of the test were reduced significantly, serum proteins, triglycerides, Serum enzymes (GOT/GPT /Alkaline phosphatase) nonesterified fatty acids levels were in normal range. Solasodine is estrogen free but inhibits testosterone release from dispersed mouse Leydig cells (200 uM significantly inhibited unstimulated and LH stimulated release). Solasodine can be developed as male pill of plant origin.

Significance of Solanum Xanthocarpum

The extensive survey of literature revealed that SX is an important source of many pharmacologically and medicinally important chemicals, especially steroidal hormone

solasodine and other chemicals like solasonine, campestrol, campeferol, diosgenin and various useful alkaloids.

The solasodine is the most studied chemical constituent of SX which has a role in the production of sex hormones. The plant is extensively studied for the various pharmacological activities like antiasthmatic, hepatoprotective, cardiovascular, hypoglycemic and mosquito repellent properties.

Various traditional claims like immunomodulation, hypolipidemic, antibacterial, sexual behaviour, tolerance and dependence is not studied till the date and needs attention in this area to explore further medicinal values of this plant.

Although the results from this review are quite promising for the use of SX as a multi-purpose medicinal agent, several limitations currently exist in the current literature.

While SX has been used successfully in Ayurvedic medicine for centuries, more clinical trials should be conducted to support its therapeutic use.

Moreover, the therapeutic potential of the plant should also be checked when used in combination with other herbal drug.

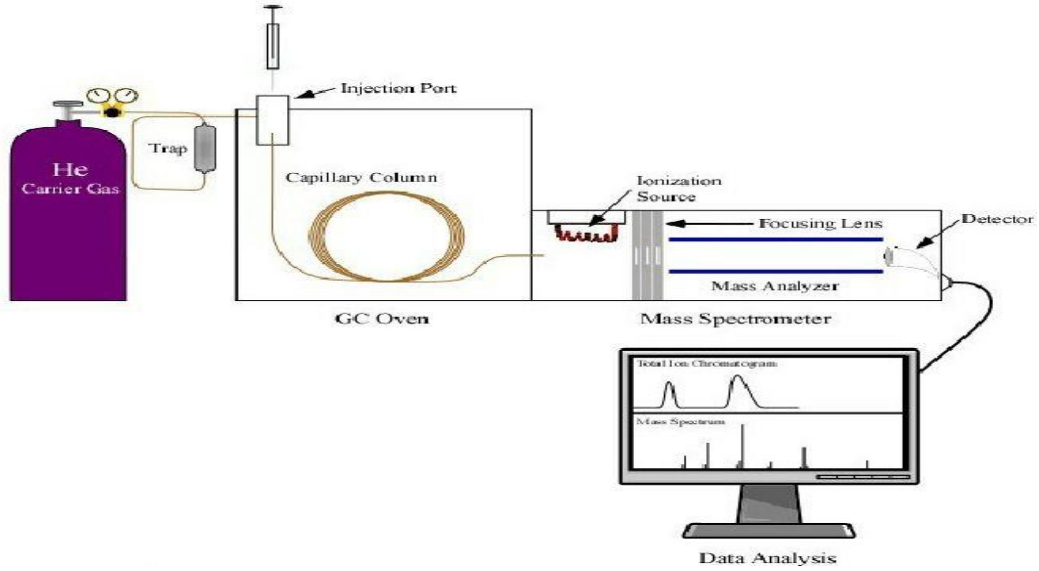
Figure 3 flower of solanum xanthocarpum

Ways Of Extraction

A variety of chemicals have been isolated from z officinale and studied for their chemical structure by advanced analytical techniques as-

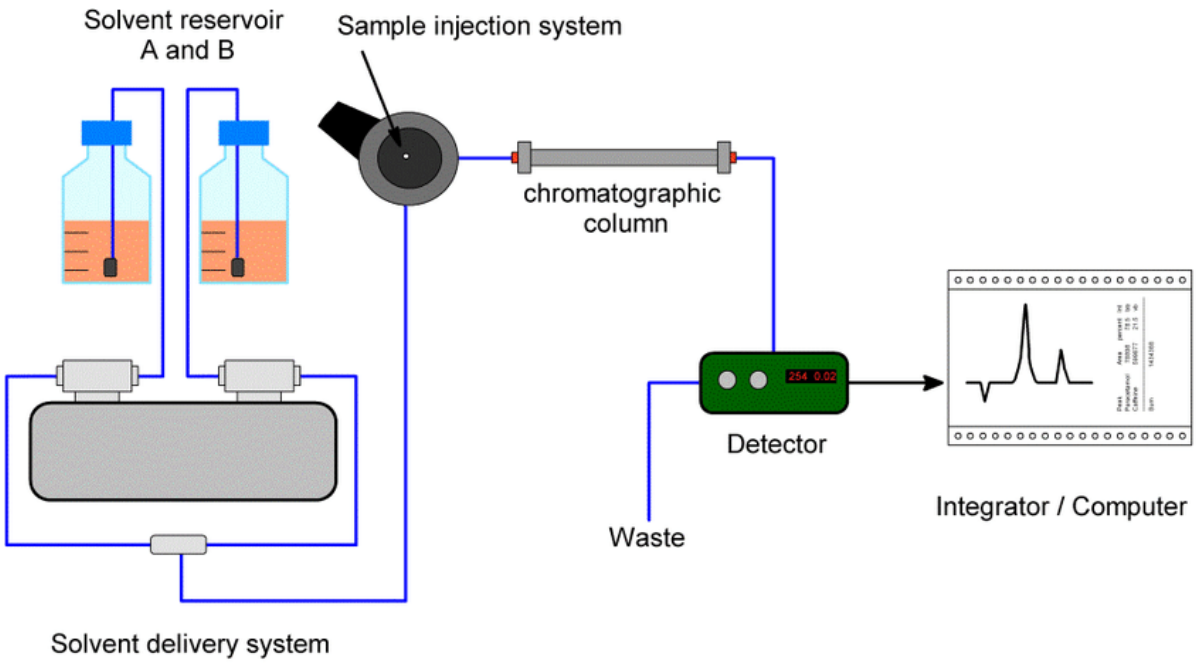
Gas Chromatography-Mass Spectroscopy (GC-MS)

Mass Spectrometry (GC-MS) is a hyphenated analytical technique that combines the separation properties of gas-liquid chromatography with the detection feature of mass spectrometry to identify different substances within a test sample.



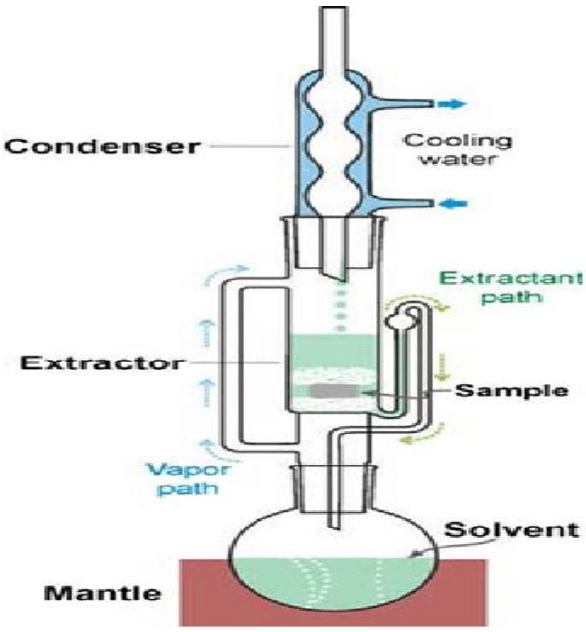
High performance liquid chromatography (HPLC)

High-performance liquid chromatography or high-pressure liquid chromatography (HPLC) is a chromatographic method that is used to separate a mixture of compounds in analytical chemistry and biochemistry so as to identify, quantify or purify the individual components of the mixture.



By Soxhlet Extraction

The concentrations of *solanum xanthocarpum* bioactive compounds extract with time by Soxhlet extraction using Hexane as a solvent.; Soxhlet extraction is a percolation method in which fresh solvent flows through the solid matrix. It can be observed that during the first 2h, the concentrations of bioactive were relatively low. This is attributed to the diffusion of the solvent which saturate the *solanum xanthocarpum* matrix.



ginger, whilst the taste of ginger is mainly affected by various monoterpenes. Shogaols, contained in semidried ginger, are more pungent than gingerols [20], are a major degradation product of the thermally labile gingerols, and are rarely found in fresh ginger [21]. Another minor component, zingerone, is a degradation product which indicates low quality plant material. A number of other coactive constituents could also contribute to the treatment of various diseases.

Oleoresins Extraction of Solanum Xanthocarpum by Soxhlet Extractor;

- Oleoresins are resin like viscous materials obtained when a spice is extracted with a hydrocarbon solvent. The solvent is removed by vacuum distillation and reused. Oleoresins are 5–20 times stronger in flavor than their corresponding spices and are weaker than the corresponding essential oils.
- Oleoresins' advantages over their corresponding spices are similar to those of essential oils. During extraction of oleoresins, fewer low flavor notes are destroyed than during steam distillation of the essential oils. In addition, the heavy oils of the oleoresins contain some important flavor notes that are absent in volatile oils. For example, oil of black pepper contains only the top black pepper notes.

- whereas black pepper oleoresin contains the pungent crystalline material known as piperine and other low flavor notes as well as the top flavor notes. Therefore, the closest liquid extractive of any spice is its oleoresin. Oleoresins are used at 0.1–0.5% in the finished product.
- Oleoresin represents the complete flavour and non-volatile resinous fraction present in the spices. The resinous fraction comprises heat components, fixative, natural antioxidant and pigments. Hence, oleoresin is designated as the true essence of the coriander.
- Oleoresin in coriander seeds is obtained by solvent extraction of the ground seed and is a brownish-yellow liquid with a fruity, aromatic, slightly balsamic flavour. Oleoresin from roasted seeds has a more rounded and slightly caramellic flavour. Volatile oil in the oleoresin ranges from 2 to 12 ml per 100 g.
- In coriander the volatile oil is found only in very small quantities, therefore the volatile oil content and oleoresin make less of a contribution as a value addition than the others.

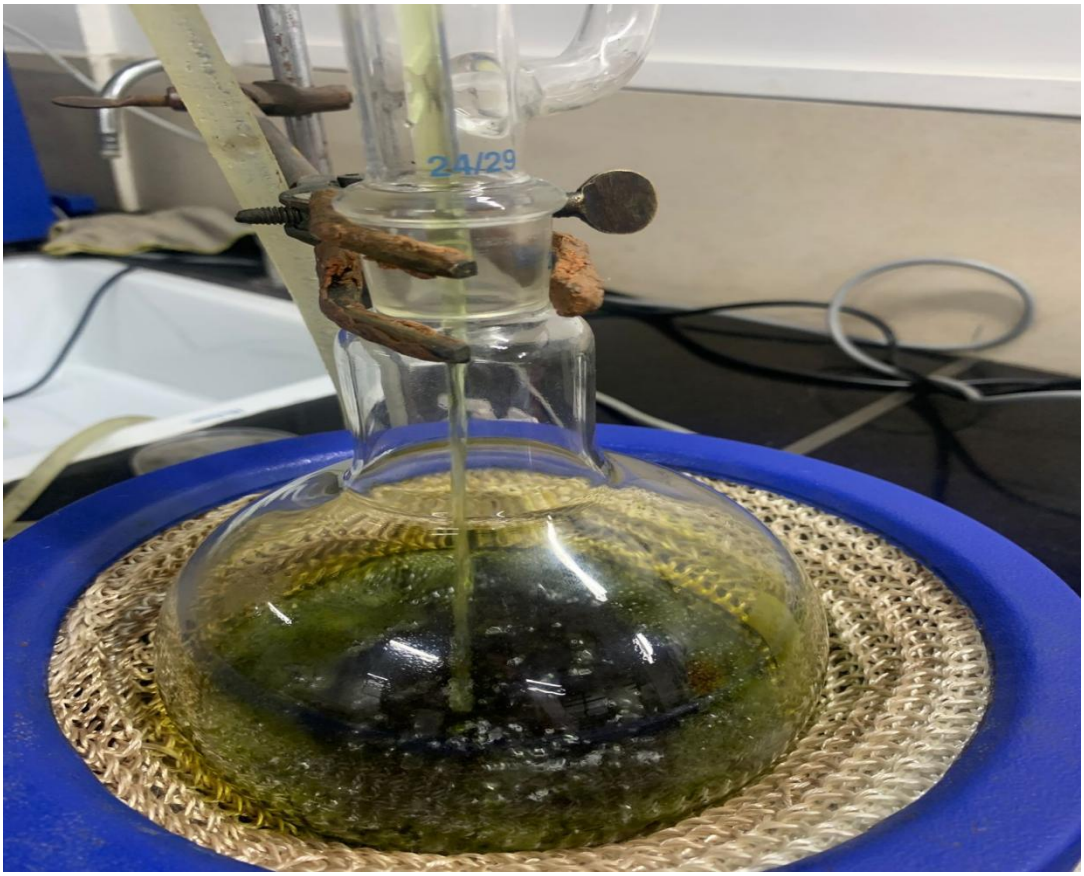


Figure 4 oleo resin in round bottom flask

- Soxhlet Extractor was operated for atleast 6h and 20 cycles were repeatedly done.and time taken for each cycle was around 10 mins.

- The Oleo Resin Extract was collected in a vial and which was sent for GCMS.

- The above picture depicts the Oleo Resin Extract.

3 OBJECTIVE

- To estimate the content of oil present in plant sample of solanum xanthocarpum.
- Extraction of Oleo Resin from Solanum Xanthocarpum,using hexane as a solvent.
- GCMS of oleo resin extract.

4 METHODOLOGY

1. Collection of raw plant material.
2. Washing of plant material.
3. Identification of plant material
4. Preparation of Extracts by different methods.
5. Extraction of Oil.
6. Phytochemical Analysis.
7. Oleo Resin Extraction.
8. Determination of Phenolic and Flavonoid content of the extract.
9. Antimicrobial and Anticancer activity.
10. GCMS of the sample.

Procedure Followed:

- **First step:** The Plant sample of Solanum xanthocarpum was collected from nearby area near Kathgodam
- **Second step**: The plant material collected, was first washed with distilled water and was kept for drying for atleast 1 day.
- **Third step:** The leaves were seperated and ground to fine powder.
- **Fourth step:** The powdered form of leaves was used for the extraction of oil present in leaves via Clevenger apparatus (steam distillation method).
- **Fifth step:** Clevenger type apparatus was operated for min. 12 h and for max 3 days, but the yeild of oil was poor.
- **Sixth step**: since the yeild of oil was very poor, so at the next step we will go for Oleoresin extraction by soxhlet apparatus.
- **Seventh step:** now the resin obtained by soxhlet extraction can undergo for GC-MS.
- **Eighth step**: by GC-MS of resin obtained, we would get information phytochemical constituents present in the resin.
- **Ninth Step**: Now we would find the Antibacterial and Antifungal activity of the plant extract.

Isolation Of Essential Oil

Experimental Work Plant material:

Solanum xanthocarpum was collected from the city of Uttarakhand Haldwani. The plant was identified as kantkari of family solanaceae and a voucher specimen has been deposited in the herbarium of the Botanical Survey Of India Dehradun. The dry leaf, fruit, stem and root samples (each 100 g) were crushed and hydrodistilled using a Clevenger type apparatus for 12h and the temperature of heating mantle was set at 60 degree celcius to give 0.04, 0.02, 0.01, and 0.03 g of clear, pale yellow essential oils, which were stored at 4ºC until analysis. But the yield of oil collected by Clevenger was very poor.

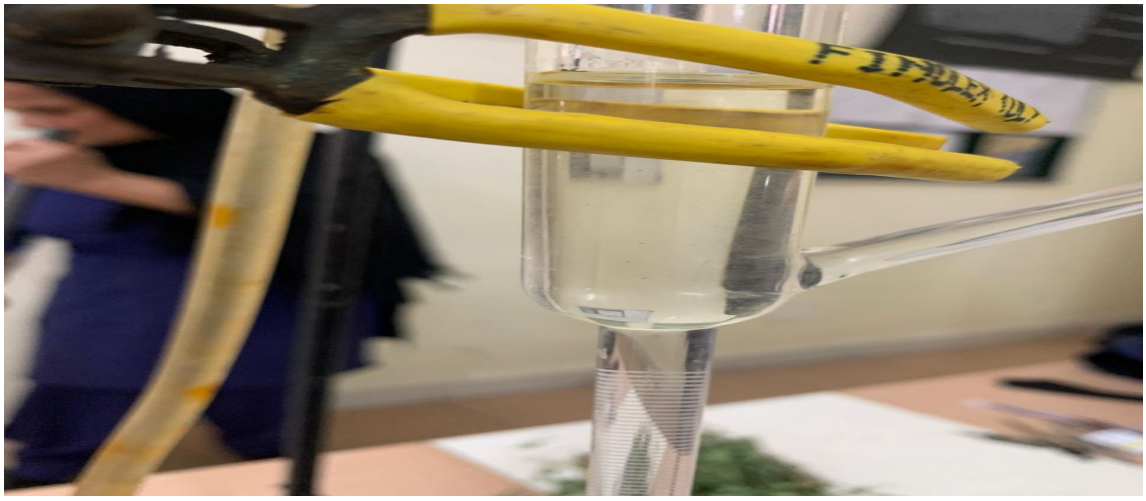


Figure 5: Oil Extract in Clevenger Apparatus

Gas chromatographic – mass spectral analysis of oleo resin

The essential oils of S. xanthocarpum were analyzed by GC-MS using an Agilent 6890 GC with Agilent 5973 mass selective detector, as previously described. Identification of the oil components was based on their retention indices determined by reference to a homologous series of n-alkanes on an HP-5ms column, and by comparison of their mass spectral fragmentation patterns with those reported in the literature, and stored on the MS library [NIST database (G1036A, revision D.01.00)/ChemStation data system (G1701CA, version C.00.01.080)]. The percentages of each component are reported as raw percentages based on total ion current without standardization.

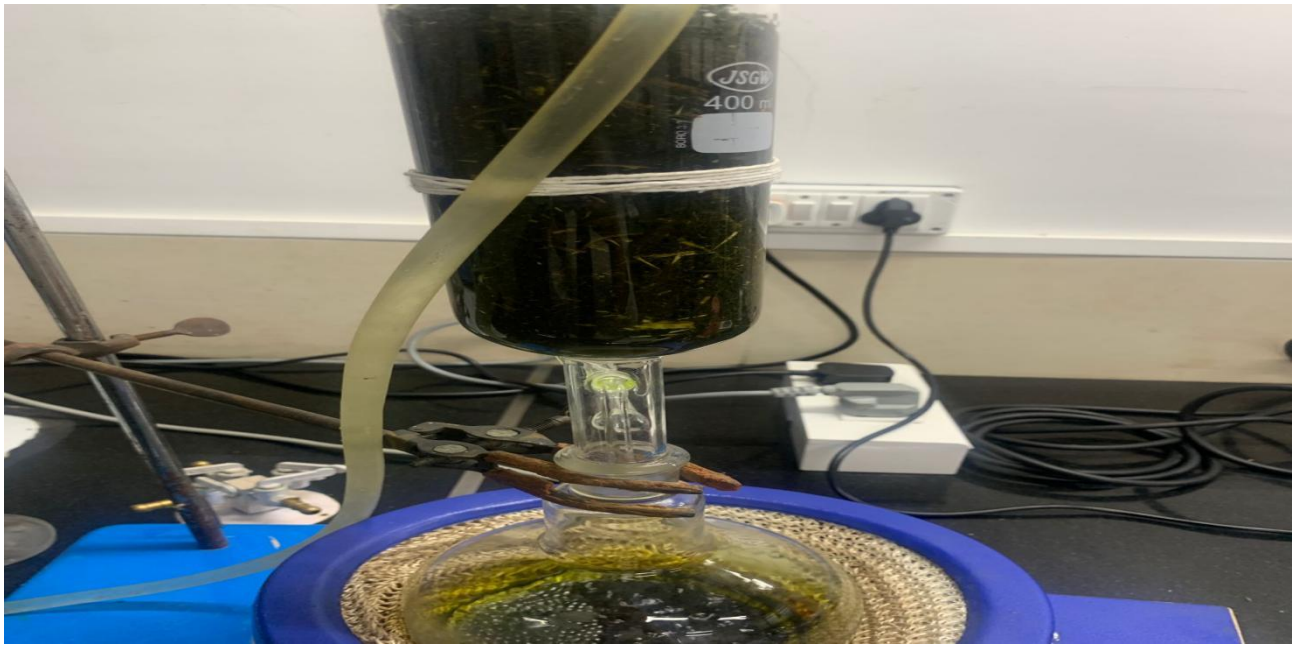


Figure 6: oleo resin in soxhlet

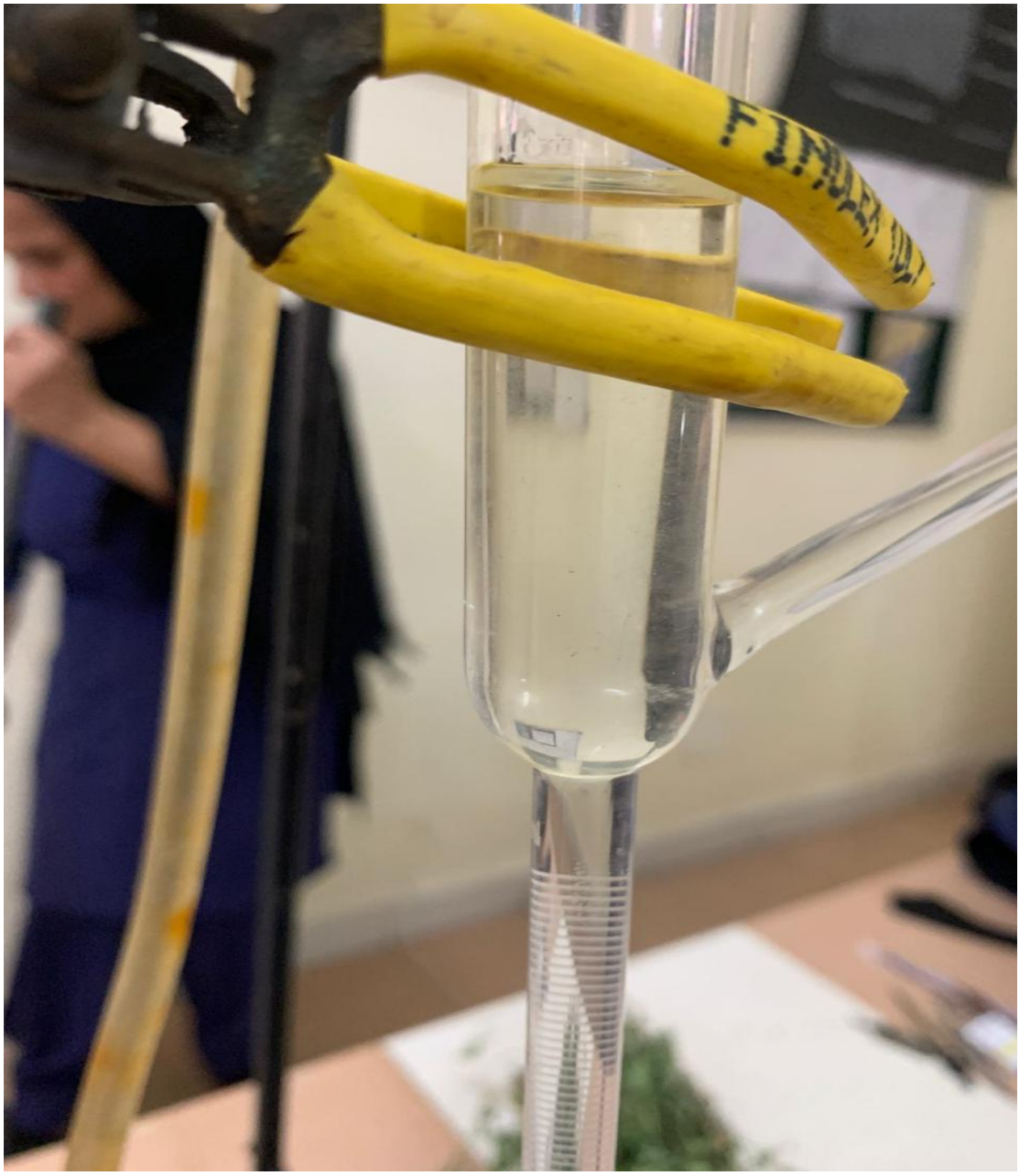


Figure 7 oil from solanum xanthocarpum

5 RESULT

The Oleo Resin Extract of Plant sample of was collected from Soxhlet apparatus in a Vial. where hexane was used as a solvent as it is volatile in nature and has low melting point.The oleo resin sample collected was sent for GCMS in Petroleum University (UPES) UTTARAKHAND DEHRADUN.

6 CONCLUSION

Solanum xanthocarpum is an important source of many pharmacologically and medicinally important chemicals, particularly steroidal hormone solasodine and other chemicals like solasonine, campestrol, campeferol, diosgenin and various useful alkaloids. Solanum xanthocarpum safe for human use and is regarded as a valuable plant in both Ayurvedic and modern drug development areas for its versatile medicinal uses. The plant is widely studied for the various pharmacological activities like antiasthmatic, hepatoprotective, cardiovascular, hypoglycemic and mosquito repellent properties. Most of the pharmacological studies were preliminary, carried out in animals and are not sufficient for the development of a pharmaceutical product. Further studies of other phytochemical compounds will possibly lead to exploration of new method for therapeutic and industrial application.

7 REFERENCES

1. Pandey MM, Rastogi S, Rawat AK; Indian herbal drug for general healthcare: An overview. Internet J Altern Med., 2008; 6:1.

2. Sachin Parmar, Amit Gangwal, Navin Shet; Solanum xanthocarpum (Yellow Berried Night Shade): A review. Der Pharmacia Lettre, 2010; 2(4): 373-383.

3. Ghani A; Medicinal plants of Bangladesh - chemical constituents and uses. Asiatic Society of Bangladesh, Dhaka, 1998.

4. Dixit VP, Gupta RS; Antisperatogenic/antiandrogenic properties of solasodine (C27H43O2N) obtained from Solanum xanthocarpum berries on the male rats and dogs. J Steroid Biochem., 1986; 25: 27s.

5. Dixit VP; Antifertility effects of Solasodine obtained from Solanum xanthocarpum berries in male rats and dogs. Department of Zoology, University of Rajasthan, Jaipur: India, 1980.

6. Sridevi M, Kalaiarasi P, Pugalendi KV; Antihyperlipidemic activity of alcoholic leaf extract of Solanum surattense in streptozotocin diabetic rats. Asian Pacific Journal of Tropical Biomedicine, 2011; 4(2): 276-280.

7. Chandana VR, Gupta RK, Talib Hussain; Hepatoprotective effects of Solanum xanthocarpum fruit extract against CCl4 induced acute liver toxicity in experimental animals. Asian Pacific Journal of Tropical Biomedicine. 2011; 14(3): 964- 968.

8. Najmi AK, Pillai KK, Pal SN, Aqil M; Free radical scavenging and hepatoprotective activity of jigrine against D-GalN induced hepatopathy in rats. J Ethnopharmacol., 2005; 97: 521-525.

9. Chaturvedi PK, B hui K, Shukla T; Lupeol: Connotations for chemoprevention. Cancer Lett., 2008; 263:1-13.

10. Siddiqui TH, Beg T and Afzal M; A ntigenotoxic effect of apigenin against anti cancererous drugs. Toxicology in Vitro, 2008; 22: 625-631.

11. Kuok W, Hsu SH, Li YP, Lin WL, Liu LF, Chang LC et al.; Anticancer activity evaluation of the solanum glycoalkaloid solamargine: Triggering apoptosis in human hepatoma cells. Biochem Pharmacol, 2000; 60:1865-1873.

12. Bhutani KK, Paul AT; Apoptosis inducing activity of steroidal constituents from Solanum xanthocarpum and Asparagus racemosus. Phytomedicine, 2010; 17 (5): 789-793.

13. Mohan L, Sharma P, Srivastava CN; Comparative efficacy of Solanum xanthocarpum extracts alone and in combination with a synthetic pyrethroid, cypermethrin, against malaria vector, Anopheles Stephensi. Southeast Asian Journal of Tropical Medicine and Public Health, 2007; 38(2):256–260.

14. Vadnere GP, Gaud RS, Singhai AK; Evaluation of Anti-Asthmatic Property of Solanum Xanthocarpum Flower Extracts. Pharmacology online, 2008; 1: 513-522.

15. Gupta S, Mal M, Bhattacharya P; Evaluation of hypoglycemia potential of Solanum xanthocarpum (Solanaceae) fruits in normal and streptozotocin induced diabetic rats. Eur Bull Drug Res., 2005; 13:51–55.

16. Mohan L, Sharma P, Srivastava CN; Evaluation of Solanum xanthocarpum extract as a synergist for cypermethrin against larvae of the filarial vector Culex quinquefasciatus(Say). Entomol Res., 2006; 36(4): 220–225.

17. Mohan L, Sharma P, Srivastava CN; Evaluation of Solanum xanthocarpum extracts as mosquito larvicides. J Environ Biol., 2005; 26(2): 399-401.

18. Gabay O, Sanchez C, Salvat C, Chevy F, Breton M, Nourissat G et al.; a phytosterol with potential anti-osteoarthitic properties. Osteoarthritis Cartilage, 2010; 18:106-116.

19. Bhattacharya TK, Ghosh MN, Subramanian SS; A note on anti inflammatory activity of carpesterol. Fitoterapia, 1980; 51: 265-268.

20. Saleem M, Lupeol; a novel anti inflammatory and anti cancer dietary triterpene. Cancer Lett, 2009; 285:109-115.

21.Goldberg. Alternative medicine: The definitive guide. Future Medicine Publishers, Puyallup, Washington, 1994, 257.

22. S.T. Ghule, D.K. Patil. Kisan World, 2001,28 (10), 33-34.

23. T.N. Khosoo. India’s biodiversity: Tasks ahead. Curr Sci, 1994, 67(8), 577-582.

24. Vishnukanta, A.C. Rana. Melia azedarach: Pharmacognosy reviews, 2008, 2(3), 173-179.

25. Anonymous. TheWealth of India—Raw materials, Council of Scientific and Industrial Research, New Delhi, 1989, 393–394.

26. S. Siddiqui, S. Faizi, B. Siddiqui. J Chem Soc pak, 1983, 5(2), 14-21.

27. L. Mohan, P. Sharma, C.N. Srivastava. Southeast Asian J Trop Med Public Health, 2007, 38(2), 256-260.

28. A.K. Sheth. The Herbs of Ayurveda. A.K.Sheth Publisher,Vol.IV, 2005, 1044.

25. K.G. Heal, N.A. Sheikh, M.R. Hollingdale, W.J. Morrow, M.W. Vaccine, 2001, 19, 4153-4161.

26. M. Friedman, P.R. Henika, B.E. Mackey. Food Chem Toxicol, 2003, 41, 61-71.

27. P. Josekutty. S Afr J Bot, 1998, 64, 238–243.

28. M.R. Heble, S. Narayanaswami, M.S. Chadha. Diosgenin and β-Sitosterol: Isolation from Solanum Xanthocarpum Tissue Cultures. American Association for the Advancement of Science Stable, 1968, 161(13), 1145.

29. N.P. Bector, A.S. Puri. J Assoc Physicians India, 1971, 19, 741- 744.

30. L.V. Asolkar, Y.R. Chadha. Diosgenin and other steroid drug precursors. CSIR, New Delhi, 1979, 115.

31. M. Weissenberg, A. Levy, I. Svoboda, I. Ishaaya. Phytochemistry, 1998, 47, 203.

32. P.G. Kadkade, C. Rolz. Phytochemistry, 1977, 16, 1128.

33. J. Laurila, I. Laakso, T. Vaananen, P. Kuronen, R. Huopalahti. J Agric Food Chem, 1999, 47, 2738–2744.

34. P. Trivedi, K. Pundarikakshudu. Chromatographia, 2007, 65, 239-243.

35. S. Emmanuel, S. Ignacimuthu, R. Perumalsamy, T. Amalraj. Fitoterapia, 2006, 77: 611–612.

36. J.I. Chungath, P.B. Nair. Indian Drugs. 26: 295-297 (1989).

37. R. Djukanovic, W.R. Roche, J.W. Wilson. Am J Respir Crit Care Med, 1990, 142, 434–457.

38. F. Phillip Mol Ther, 2003, 7, 148–152.

39. R.J. Davies, Asthma in clinical Medicine. In: P.J. Kumar, M.L. Clark Eds. A Text Book for Medical Students and Doctors, Bailliere Tindall, London, 2nd ed, 1990, 664–668.

40. S. Gupta, M. Mal, P. Bhattacharya. Eur Bull Drug Res, 2005, 13, 51-55. [41] A.K. Najmi, K.K. Pillai, S.N. Pal, M. Aqil. J Ethnopharmacol, 2005, 97, 521–525.

THANK YOU