Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 12, pp.24767-24772, December, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

PHARMACOGNOSTICAL & PHYSICOCHEMICAL STANDARDIZATION OF *SOLANUM XANTHOCARPUM (ARIEAL PARTS & ROOTS)*

Kaushal Kishore Chandrul and *Bhuwanendra Singh

School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, NH – 24, Rajabpur, Distt, Amroha (U. P), India

ARTICLE INFO

Article History:
Received 18th September, 2015
Received in revised form
20th October, 2015
Accepted 15th November, 2015
Published online 30th December, 2015

Key words:

Standardization,
Pharmacological Activity,
Orgenoleptic,
Solanum Xanthocapum,
Phytochemica.

ABSTRACT

Aim of the study is to explore the biological as well as chemical potentials of the *solanum xanthocapum* and to focus that drug still needed some more attention for identifying its new chemical constituents and medicinal values. In this research drug is studied more extensively regarding their macroscopic and microscopic characters (organoleptic & histological evaluation), as well as phytochemical and physicochemical examination to standardize the drug, and its concluded that drug contain different chemical compounds such Alkaloid, carbohydrates, amino acids, flavanoid, etc.

Citation: **Kaushal Kishore Chandrul and Bhuwanendra Singh, 2015.** "Pharmacognostical & physicochemical standardization of *solanum xanthocarpum (arieal parts & roots)*", *International Journal of Current Research,* 7, (12), 24767-24772.

INTRODUCTION

Traditional medicines rely on the basis of knowledge and clinical experience of the practitioners for indigenous systems of medicine. According to our history, many infectious diseases have been treated with the help of herbals. The traditional medicine is increasingly solicited through the traditional practitioners and herbalists in the treatment of infectious diseases. Among the remedies used, plant drugs constitute an important part. Current status on scientific investigations (database search: PubMed, SciFinder, SCOPUS, Medicinal and Aromatic Plants Abstracts (MAPAs), Indian and Chinese Pharmacopoeias) have highlighted the importance and the contribution of many plant families i.e. Asteraceae, Liliaceae, Apocynaceae, Solanaceae, Caesalpinaceae, Rutaceae, Piperaceae, Sapotaceae etc. Description and Distribution of *Solanum xanthocarpum.* Solanum is the genus that belongs the family *Solanaceae,* is abundant source of steroidal glycoalkloids, which is an important secondary metabolites obtained from the plant drugs. These compounds are used as precursors for the synthesis of steroidal drugs. In majority of solanaceous plants, solasodine occurs as aglycone part of glycosides (Kanika Patel *et al*., 2013).

Corresponding author: Bhuwanendra Singh,
School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, NH – 24, Rajabpur, Distt, Amroha (U. P), India.

Solanum xanthocarpum is commonly known as the Indian night shade or Yellow berried night shade. It is a prickly diffuse, bright green perennial herb, woody at the base, 2–3 m height, found throughout India, mostly in dry places as a weed along roadsides and waste lands. *Solanum xanthocarpum* is also called from different name in various different languages in India viz, Kantkari (Sanskrit), Kateri (Hindi), Bhoringni (Gujarati), Kantankattiri (Tamil), Kantkariccunta (Malayalam), Vakudu (Telugu), Nelagulle (Kannad) (Reddy *et al*., 2014; Sachin Parmar *et al*., 2010) It is naturally propagated by seed in waste lands. It is mainly distributed in Ceylon, Malaya, and Asian regions (Sheth, 2005) *Solanum xanthocarpum* is an important medicinal plant and in recent history this plant is reported for various medicinal properties. Such as Solasodine, an alkaloid of *Solanum xanthocarpum* possesses antispermatogenic activity (Reddy *et al*., 2014; Dixit and Gupta, 1986) Jigrine is a polypharmaceutical herbal formulation containing aqueous extracts of 14 medicinal plants including *Solanum xanthocarpum* and used for liver ailments[3,7]. The experimental results indicated that it exhibited a potent blood glucose lowering property both in normal and streptozotocin induced diabetic rats (Reddy and Rajasekhar Reddy, 2014; Gupta *et al*., 2005) The fruit extracts of Solanum xanthocarpum revealed larvicidal activity against An. stephensi and.Quinquefasciatus and one culicine species. Aegypti. Volatile oil obtained from Solanum xanthocarpum exhibited

repellency against mosquito. quinquefasciatus at a very lower concentration than those of the plants studied earlier (Reddy and Rajasekhar Reddy, 2014; Mohan *et al*., 2005) Stigmasterol, carpesterol and diosgenin showed Antiinflammation effect (Reddy and Rajasekhar Reddy, 2014; Gabay *et al*., 2010; Bhattacharya and Ghosh, 1980). Leaves are applied locally to relieve pain (Intellectual Property Rights, 2002)

MATERIALS AND METHODS

Collection of Plant Material

The plant material used in this study, aerial parts and roots of *Solanum xanthocarpum* were collected locally from university campus situated at *Gajraula, NH 24, Rajabpur, Distt, Amroha (U. P), India*.

Processing of Plant Material

The plant materials were properly dried in shade for 5-6 days then dried in hot air oven at 40^0C after drying, the plant materials were milled to powder and passed through the sieve (mesh size 40), this material were used for the identification of plant metabolite.

Macro & Microscopic Identification of Plant

Thin section were made with the help of blade, stained and mounted following the usual plant micro-techniques (Kay, 1938; Johansen, 1940). For the study of isolated cells and tissues, small pieces of leaves, roots, stem, were taken. Washed and mounted in glycerine. The anatomical sketches were made with digital camera. The sections were stained with safranine and fast green for general studies of root and stem only.

Physico-chemical parameters for standardization of Solanum Xanthocarpum

Measurements were taken using micrometer scale in the microscope and the data were subjected to statistical analysis.

Determination of foreign matter

5.0 g of drug sample examined was weighed and spread out a thin layer. The foreign matter was detected by inspection with the unaided eye. Separated and weighed it and calculated the percent present. Drug undertaken for further study were free from moulds, insects, animal faecal matter and other contamination such as soil, stones and extraneous material (WHO, 1998).

Determination of moisture content (Hot Air Oven Method)

To determine the amount of moisture (water drying off from the drug) for substance appearing to contain water as the only volatile constituent, the procedure given below, was used. 5.78 g of drug (without preliminary drying) after accurately weighing was placed in a tare evaporating dish. After placing the above said amount of the drugs in the tared evaporating dish, dried at 105^oC for 5 hrs, and weighed, percentage was calculated with reference to initial weight (British Pharmacopoeia, 1980).

Determination of Total Ash

About 2.0 g of powder drug was incinerated in a redtop silica dish at a temperature not exceeding 450^0 C. until free carbon was left, cooled and final weight was taken. The percentage of ash calculated with reference to the air-dried drug (PSAF, 1987)

Determination of Acid Insoluble Ash

The ash obtained as above method was boiled for 5 minutes with 25 ml of dilute hydrochloric acid and collected the insoluble matter on the ash-less filter paper, washed with hot water and ignited to constant weight. The percentage of acid insoluble ash with reference to the air dried drug was calculated (PSAF, 1987)

Determination of Extractable Matter

Method II. Cold Maceration

About 5.0 g of coarsely powdered air dried material, was accurately weighed in a glass stoppered conical flask and macerated with 100 ml of solvent for 6 hrs shaking frequently, then allowed to stand for 18 hrs, filtered rapidly taking care not to lose solvent. The extracted matter was dried at 105^0C for 6 hrs, cooled in desiccators for 30 minutes and then weighed. The percentage extractable matter was calculated (WHO, 1998). Solvent used are water and methnol.

Determination of Swelling Index

About 1.0 g fine powder accurately weighed, was taken into 25 ml of glass stoppered measuring cylinder. The internal diameter of the cylinder was about 16 mm, the length of the graduate portion about 125 mm, marked in 0.2 ml in division from 0 to 25 ml in upward direction. 25 ml, of water was taken and the mixture thoroughly shaken every 10 minutes for 1 hrs. kept for 3 hrs at room temperature and the volume in ml occupied by the plant material, including any sticky mucilage was measured. The mean value of the individual determination, related to 1.0g of plant material was calculated (WHO, 1998).

Determination of Foaming Index

About 1.0 g a coarse powder of drug was placed into a 500 ml conical flask containing 100 ml of boiling water. The moderate boiling was maintained for 30 minutes. Cooled and filtered into a 100 ml volumetric flask and volume was made up to the mark with distill water. The decoction was poured into 10 stoppered test-tubes (height 16cm, diameter 16 mm) in successive portion of 1ml, 2ml, 3ml, etc. Up to 10ml, and adjusted the volume of the liquid in each tube with water to 10ml. The tubes were stopper and shaken them in length wise motion for 15 seconds, two shake per second. After 15 minutes and height of the foam was measured (WHO, 1998). The results are assessed as follows

- If the height of the foam in every tube is less than 1 cm, the foaming index is less than 100 &
- If the height of the foam 1 cm is measured in any tube, the volume of the plant material decoction in this tube (a) is used to determine the index. If this tube is the first or second tube in a series, prepare an intermediate dilution in a similar manner to obtain a more precise result.
- If the height of the foam is more than 1 cm in every tube, the foaming index is over 1000. In this case repeat the determination using a new series of dilution of the decoction in order to obtain a result.

Calculate the foaming index using the following formula:

=1000\a

Where a = the volume in ml of the decoction used for preparing dilution in the tube where foaming to a height of 1cm is observed.

Preliminary Screening of Phytochemicals (Kokate *et al*., 2006)

The preliminary phytochemical studies were performed for testing the different chemical groups present the drugs 10% (w/v) solution of extract was taken unless otherwise mentioned in the respective individual test. The chemical group test were performed and the result are shown in tables General screening of various extracts of the plant material was carried out for qualitative determination of the groups of organic compounds present in them (Evans, 2002)

Alkaliods

Dragendroff's test: Dissolve a few mg of alcoholic extract of the in 5 ml of distilled water, add 2 M hydrochloric acid until an acid reaction occurs, then add 1 ml of Dragendroff's reagents, *orange or orange-red ppt is produced immediately. Hager's test:* to 1 ml of alcoholic extract of the drug taken in test tube, add a few drops of Hager's reagent. Formation of yellow ppt confirms the presence of alkaloids. *Wagner's test:* Acidify 1 ml of alcoholic extract of the drug with1.5% v/v of hydrochloric acid and add a few drops of Wagner's reagent. A yellow or brown ppt is formed. *Mayer's reagent:* Add a few drops of mayer's reagent to 1 ml of alcoholic extracts of the drug. White or pale yellow ppt. is formed.

Crbohydrates

Anthrone test: To 2 ml of anthrone test solution, add 0.5 ml of alcoholic extracts of the drug. A green or blue color indicates the presence of carbohydrates. Benedict's test*:* To 0.5 ml of alcoholic extracts of the drug add 5 ml of Benedict's solution and boil for 5 mins. Formation of a brick red coloured ppt is due to presence of carbohydrates.

Fehling's test: To 2 ml of alcoholic extracts of the drug add 1 ml of the mixture of equal parts of fehling's solution 'A' and 'B' then boil the contents of the test tube for few mins. A red or brick red ppt is formed.

Molisch's test: In test tube containing 2 ml of alcoholic extracts of the drug add 2 drops of a freshly prepared 20% alcoholic solution of β napthol mix poured 2 ml of conc sulphuric acid so as to form a layer below the mixture. Carbohydrates, if present, produce a red- violet ring, which disappears on the addition of an excess of alkali solution.

Flavonoids

Shinoda's test: In a test tube containing 0.5 ml of alcoholic extract of the drug, add 5-10 drops of dilute hydrochloric acid followed by a small piece of magnesium. In the presence of flavonoids a pink, reddish pink or brown colour is produced.\

Triterpenoids

Liebermann-Burchard's test: Add 2 ml of acetic anhydride soloution to 1 ml of alcoholic extracts drug in chloroform followed by 1 ml of con sulphuric acid. A violet color coloured ring is formed indicating the presence of triterpenoids.

Saponins

In a test tube containing about 5 ml of an alcoholic extracts of the drug add a drop of sodium bicarbonate solution, shake the mixture vigorously and leave for 3 mins. Honeycomb like froth is formed.

Steroids

Liebermann-Burchard's test: Add 2 ml of acetic anhydride soloution to 1 ml of alcoholic extracts of the drug in chloroform followed by 1 ml of con sulphuric acid. A greenish colour is developed which turns to blue.

Salkowaski reaction: Add 1ml of conc. Sulphuric acid to 2 ml of alcoholic extracts of the drug carefully, from the side of the test tube. A red colour is produced in the chloroform layer.

Tannins

To 1-2 ml of plant alcoholic extracts extract, add a few drops of 5% $FeCl_3$ solution was added. A green colour indicates the presence of gallotannins while brown colour tannins.

Starch

Dissolve 0.015g of iodine and 0.075g of potassium Iodide in 5 ml of distilled water and add 2-3 ml of an alcoholic extracts of drug. A blue colour is produced. **Proteins**

Biuret's test: To 1 ml of alcoholic extracts extract of the drug add 5-8 drops of 10% w/v sodium hydroxide solution followed by 1or 2 drops of 3% w/v copper sulphate solution. A red or violet colour is obtained.

Millon's test: Dissolve a small quantity of alcoholic extracts extract of the drug in 1 ml of distilled water and add 5-6 drops of millon's reagent. A white ppt is formed which turns red on heating

A. Whole Plant

B. Root C. Stem D. Leaf

Fig. 1. Morphology of the Plant *Solanum Xanthocarpum (Whole (Plant, Root, Stem, Leaf)*

RESULTS AND DISCUSSION

Macroscopic Characters of Solanum Xanthocarpum

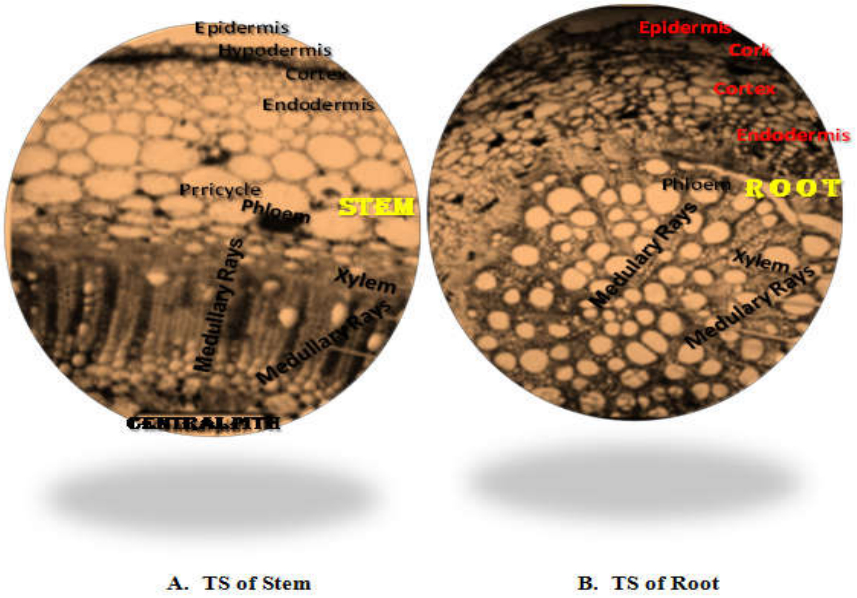
The plant is very prickly diffused bright green perennial herb somewhat woody at the base (Fig 1. A).

The prickles are compressed, straight, yellow, glabrous and shining, often exceeding 1.3 cm. Roots of *Solanum Xanthocarpum* (Fig1. B) are thick slightly tortuous, cylindrical, outer surface reddish brown in colour, smooth and with lenticels, tap root and its branches are with many wiry root lets. The stem is somewhat zigzag (Fig1. C) hard woody and short about 3.5-4.5cm in length but contains spines those are very sharp in nature & branches are numerous. Leaves (Fig1. D) are usually 10-15 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; armed on the midrib and often on the nerves with long sharp prickles; base usually rounded and unequal-sided; petiole 1.3-2.5 cm long and stellately hairy.

Microscopic Characters of Solanum Xanthocarpum

Stem: While in transverse section of Kantakari stem (*Solanum Xanthocarpum*.) - Epidermis, hypodermis, cortex, Endodermis, pericycle, phloem, xylem, Medullary rays, central pith etc. were found (Fig 2.A) Shows a thin layer of cortex consisting of 3-4 layers of rectangular, brownish cells; cork cambium not distinct;; plenty of simple starch granules present; endodermis single layered; stelar region composed of five wedge-shaped vascular bundles alternating with wide medullary rays; phloem lies towards outer side and composed of sieve elements, parenchyma and phloem fibres occurring singly or in groups; xylem lies towards centre and composed of vessels, tracheid, fibres and xylem parenchyma; medullary rays multi seriate, cells thin walled, filled with simple, round to oval, central pith shown in the microscopy.

Root: In the transverse section of *Kantakari* root *(Solanum Xanthocarpum*.) - epidermis, cork, cortex, endodermis, phloem, xylem, Medullary rays etc. were observed. **(**Fig 2.B). It shows the outer most thin yellowish brown cork consisting of 7-10 rows of tangentially elongated thin walled cells. Walls of the outermost layers are slightly brownish in color. Inner to the cork is the cortex which is comparative a wide zone. Cortical cells are tangentially elongated, narrow and thick walled.



A. TS of Stem B. TS of Root

Fig. 2. Microscopy of the Plant *Solanum Xanthocarpum (Diagrametic)*

Table 1. Physico-chemical parameters of *Solanum Xanthocarpum*

S.No.	Parameters	Observations
1.	Foreign Organic matter	No adulterants
2.	Physicochemical	
	Ash Values (% w/w)	
	(a) Total Ash Value	6.078
	(b) Acid Insoluble Ash	1.78
	Extractive Values (% w/w)	
	Cold percolation method (Maceration)	
	Water soluble	13.456
	Alcohol soluble extractive value	22.34
	Moisture content (%)	25.03
3.	Pharmacological	
	Swelling Index	0.85 ± 0.15
	Foaming index	126.32

Table 2 Qualitative analysis of plant metabolites (primary and secondary both) of aerial parts of *Solanum Xanthocarpum* (Alcohalic extract)

S.NO	Phytochemicals	Observations
1.	Alkaloid	+ve
2.	Cabohydrate	+ve
3.	Flavonoid	+ve
4.	Protein	+ve
5.	Resin	-ve
6.	Saponin	+ve
7.	Starch	+ve
8.	Steroids	+ve
9.	Tannins	-ve
10.	Triterpenoid	-ve

Qualitative Test For Phyto-Chemicals of *Solanum xanthocarpum*

All most all the cells are fully packed with starch grains. The cortex is narrow and composed of cubical to polygonal thin walled cells. Groups of fibres are seen in this region. Some of the cells of this region also contain the sandy crystals. Inner to the phloem is the cambium composed of 1 or 2 rows of cells. Medullary rays are many uni or biseriate, extend up to the cortex and the cells at the distal end of the medullary rays are tangentially elongated. The phloem tissue followed by the cortex is narrow and composed of cubical to polygonal thin walled cells. Xylem occupies the major portion of the root and occurs just beneath the 1-2 layered cambium. Xylem is composed of vessels, fibres and a few parenchyma cells. Vessels are rounded solitary and in tangial or rarely radial groups of 2-3. Xylem rays are uni- bi seriate and composed of radially elongated cells. Starch grains are seen in all the medullary ray cells and xylem parenchyma.

Physico-Chemical Standardization of *Solanum xanthocarpum*

The physiochemical quality evaluation of crude herb powder was performed following the WHO procedures. The results are summarized in Table 1. It can be observed that plant have very low value of swelling index with moderate value of foaming index which implies towards the presence of tannins with little amount of mucilage, pectin or hemicelluloses. It contain very low ash values that reveals less amount of inorganic salts in the plant. Preliminary phytochemical screening was carried out by using standard procedur (Kokate et al., 2006).

The phytochemical screening of the plant revealed the presence of carbohydrate, starch, steroid, glycosides and and flavonoids . While on other hand tannins & terpenoids are not present in the drug. This serves as an important tool for the quality assurance of plant for future studies.

Conclusion

Solanum Xanthocarpum is non-toxic wildly grown plant and safe for preparation of herbal medicines as well as synthetic drugs for the treatment of various diseases. Several chemical constituents proved their own pharmacological activity such as solasodine abundantly used for antifertillity agent, Lupeol, apigenin and solamargine posses anticancer activity, Main advantage of the plant is its availability & economic status, *Viz* not a costly drug. But still this herb in needed more focus of researches to explore its biological potential in the benefits of humans, by developing some new formulations containing the *Solanum Xanthocarpum* as a main drug.

Acknowledgement

The author is grateful to School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, for providing support to carry out the research work. I am thankful to Dr Kaushal Kishore Chandrul, Principal School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, for his valuable guidance.

REFERENCES

Kokate, C.K, Purohit, A.P and Gokhale, S.B. 2006. *Pharmacognosy* 30th ed Nirali Prakashan Pune, India.

Kanika Patel, Ravi B. Singh, Dinesh K. Patel. 2013. *Medicinal significance, pharmacological activities, and analytical aspects of solasodine: A concise report of current scientific literature Journal of Acute Disease.* 92-98.

Reddy, N.M. and Rajasekhar Reddy, N. 2014. *Solanum xanthocarpum* Chemical Constituents and Medicinal Properties: A Review, *Scholars Academic Journal of Pharmacy,* 3(2): 146-149.

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

Sheth, A.K. 2005. The Herbs of Ayurveda. Vol.IV, A.K.Sheth Publisher, pp1044.

Dixit, V.P. and Gupta, R.S. 1986. Antisperatogenic/antiandrogenic properties of solasodine (C27H43O2N) obtained from *Solanum xanthocarpum* berries on the male rats and dogs. *Journal of Steroid Biochem.,* 25: 27s.

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

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

Mohan, L., Sharma, P., Srivastava, C.N. 2005. Evaluation of *Solanum xanthocarpum* extracts as mosquito larvicides. *Journal of Environ Biol*., 26(2): 399- 401.

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

Bhattacharya, T.K., Ghosh, M.N. and Subramanian, S.S. 1980 A note on anti inflammatory activity of carpesterol Fitoterapia,; 51: 265-268.

Intellectual Property Rights (Ipr) Vol 8 No. 11 November, 2002.

Kay, A. L. 1938. Microscpically studies on drugs. Balliere Tindall and Cox. London. Pp18.

Johansen, D. A. 1940. *Plant Micro-Technique.* Mc-Hill Book Co.Inc. New York, pp.182-203.

WHO. 1998. Quality control methods for medicinal plant material, World Health Organization Geneva.

BP, British Pharmacopoeia. 1980. Her Majesty's Stationery Office (HMSO), London, Great Britain.

PSAF, Pharmacopoeial Standards for Ayurvedic Formulations., 1987. Central council for Research in Ayurveda and Siddha (CCRAS). Ministry of Health and Family Welfare, Govt of India, New Delhi.

Evans, W.C. 2002. Trease and Evans Pharmacognosy, *Elsevier* Publication, 15th eds. Reprint. W.B. Sounders & Co., London,

******