



Available through Online

www.ijptonline.com

SOLANUM XANTHOCARPUM (WHITE VARIETY): A PHYTO-PHARMACOLOGICAL REVIEW

Pathan Aslam R*, Dr. Vadnere Gautam P¹

Department of Pharmacognosy, Smt. S. S Patil College of Pharmacy, Chopda- (MS) - 425 107,

Dist-Jalgaon, Maharashtra, India.

Email: aslamkhan_14@rediffmail.com

Received on 04-11-2012

Accepted on 16-11-2012

Abstract

Medicinal herbs are significant sources for treating various diseases. This plant formed one of the important plants in Hindu medicine. It was one of the ten roots, the Dhasomoola. *Solanum xanthocarpum* is traditionally used as Pungent, bitter, digestive, diuretic, alternative, astringent and anthelmintic. It was also used in fever, cough, flatulence and heart diseases. Several phytoconstituents have been isolated and identified from different parts of the plant belonging to the category glycosides, glycobases, steroids and coumarins. Many studies have been conducted to prove its potential as antibacterial, antiviral, Antifertility, apoptosis inducing effect, antihyperlipidemic, Hepatoprotective effect. The present review aims toward forming a bridge between traditional use and modern therapeutics of *Solanum xanthocarpum*.

Key Words: *Solanum xanthocarpum*, Solasodine, Phytochemistry, Pharmacotherapeutics.

Introduction

Solanum xanthocarpum (white variety) (Figure 1) occur in the dry and sandy places in Shri Lanka and throughout in India. an annual prostrate herb, stems somewhat zigzag, leaves simple, alternate, oblong-oval, rounded or unequal sided at base, obtuse or subacute, pinnately deeply lobed, nearly glabrous with very numerous long sharp bright yellow prickles, petioles prickly.^[1-2] flowers regular bisexual, bright mauve white, cymes usually one flowered, sepals five, fused into a prickly calyx, petals five, fused into rotate corolla about 2.5 cm diameter, lobes very broad, acute; stamens five, inserted into corolla throat, filaments very short, anthers large, fruit (Figure 2) a glabrous yellow berry with numerous seeds (Figure 3). Flower occurs throughout the year.^[1-2] In Shri Lanka the Root of this plant is valued as an expectorant and used in treatment of coughs, asthma, colic fever, loss of appetite and pains in the chest. In Bengal this

plant is used as Diuretics in dropsy, while in Punjab decoction of plant is given for gonorrhoea. In practice the drug was combined with other expectorants, demulcents and aromatics. Fumigation with vapour of the burning seeds of this plant was in high repute to cure toothache. When smoked like tobacco, the native believed that the smoke killed the insects. The root paste was utilized by the Mukundara tribals of Rajasthan for the treatment of hernia.^[1]



Figure-1: *Solanum xanthocarpum* Leaves and Flower



Figure-2: *Solanum xanthocarpum* Fruits



Figure-3: *Solanum xanthocarpum* Seeds

Phytochemistry

The fresh unripe, undried berries of *Solanum xanthocarpum* contains glycoalkaloids, Solasodine (Figure 4), Solasonine (Figure 5), solamargine (Figure 6), solasurine, solanocarpine, solanocarpidine.^[3] The steroidal constituents of whole plants are cycloartanol, cycloartenol, sitosterol, stigmasterol, campesterol (Figure 7), cholesterol, sitosterol glycoside, stigmasterol glycoside.^[4] The leaves, fruits and root of the plant have yielded three coumarins, scopoletin, esculetin and esculetin. The active principle of the plant is solasodine.^[5]

Although *Solanum xanthocarpum* is of some medicinal value there has been no previous chemical examination of the flowers. In the present work, apigenin was identified in the petals and a new flavonol diglycoside and sitosterol were

isolated from the stamens. The Identity of apigenin and sitosterol was confirmed by standard procedures. [5] Only glucose could be identified in the aqueous hydrolysate obtained after acid hydrolysis, indicating that glucose occupies the terminal position. The position of the disaccharide molecule at position - 3 was confirmed by the ready H_2O_2 oxidation of the glycoside in dilute NH_4OH and was further confirmed by acid hydrolysis of the methylated glycoside. The methylated aglycone hydrolysate, mp $192^\circ-93^\circ$ was identified as 5, 7, 3', 4'-tetra-O-methylquercetin by co-chromatography with an authentic compound obtained similarly from quercetin-3-glycoside. Since the glycoside failed to reduce Fehling's solution and also did not give a test with aniline hydrogen phthalate, the glucose molecule must be linked to mannose through its reducing group. [5] Hydrolysis of the glycoside with emulsin gave glucose and mannose, indicating a β -linkage between the two sugar units in the disaccharide as well as between the aglycone and mannose. Thus, the original glycoside is quercetin-3-O- β -D glucopyranosyl-O- β -D-mannopyranoside. [5]

Structure of Isolated Phytoconstituents-

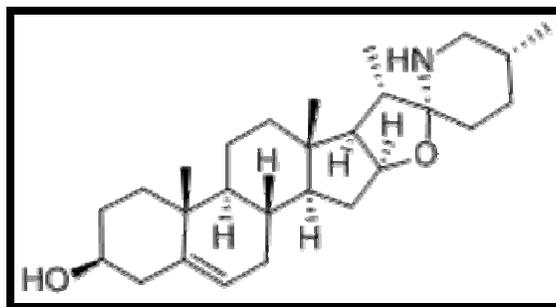


Figure-4: Solasodine

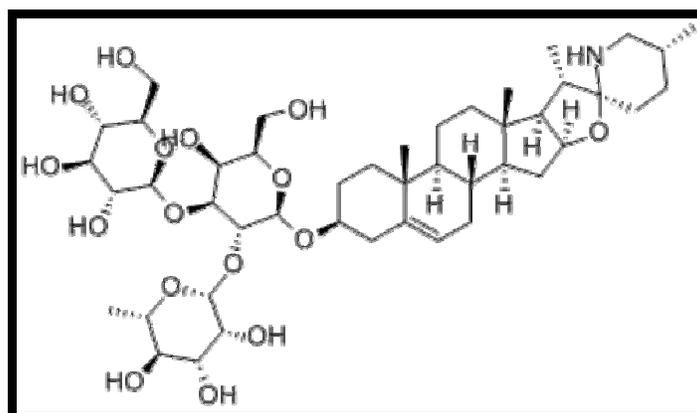


Figure-5: Solasonine

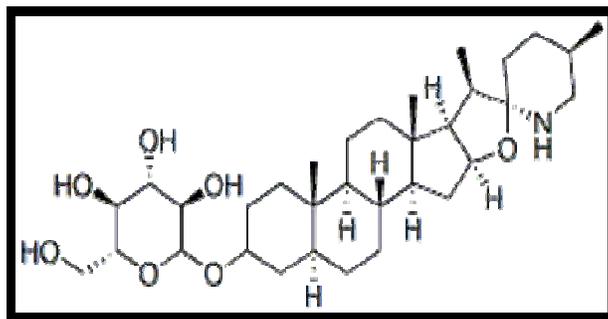


Figure-6: Solamargine

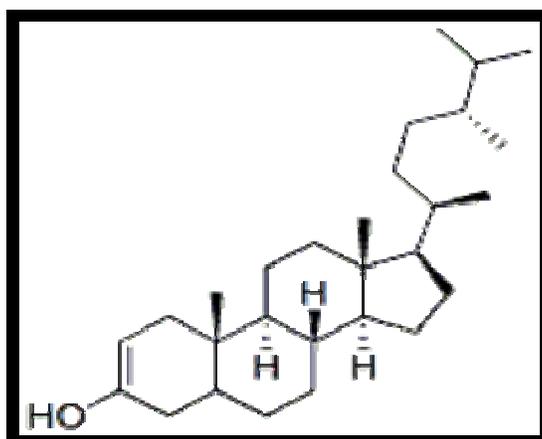


Figure-7: Campesterol

Pharmacology

The pharmacological activity of *Solanum xanthocarpum* is due to presence of glycoalkaloids and presence of phenolic substances. The crude aqueous and alcoholic extracts caused fall in blood pressure. ^[6] The beneficial effect of *Solanum xanthocarpum* on bronchial asthma attributed due to depletion of Histamine from bronchial and lung tissue. ^[7] Extracts of whole plant have shown anti-viral activity against Ranikhet disease virus and also against sarcoma 180 in the mice. Extracts of shoot and fruits exhibited antibacterial activity against *S. aureus* and *E. coli*. ^[8] Alcoholic extract caused increased amplitude of contraction of the auricle ventricle in the intact dog. The inorganic potassium nitrate content of the drug as well as anticholinesterase effects may be helpful in its expectorant action. ^[9]

Anti-Fertility effect

In one 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) non-esterified 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. ^[10]

Antihyperlipidemic effect

The Antihyperglycemic activity was associated with increase in plasma insulin. Though the exact mechanism of action is not known, it could be due to increased pancreatic secretion of insulin from existing β -cells. It is known that certain alkaloids and flavonoids present in *Solanum xanthocarpum* exhibit hypoglycemic activity and is also known for their ability of beta cell regeneration of pancreas. ^[11]

Hepatoprotective effect

In one investigation, *Solanum xanthocarpum* extracts was evaluated for hepatoprotective activity using CCl₄ induced hepatotoxicity in rats. The hepatotoxicity induced by CCl₄ is due its metabolites CCl₃. Rats administered with CCl₄ but treated with *Solanum xanthocarpum* extracts showed significant increased in the level of enzyme which indicates the antioxidant activity of *Solanum xanthocarpum*. ^[12]

Apoptosis Inducing effect

The one study shows that steroidal constituents from *Solanum xanthocarpum* and *Asparagus racemosus* clearly have the capacity to tumor cell death and these natural products represent interesting lead compounds for the development of potential cancer therapeutics. This is the first report on apoptosis inducing activity of immunoside, which was found to be the most active inducer of apoptosis amongst all the compounds tested in the study in HCT 116 human colon carcinoma cell line. Our data suggest that the presence of sugar moieties in *Solanum* compounds is associated with induction of necrotic cell death. ^[13]

Acknowledgements

The financial support to Mr. Pathan Aslam R. as Maulana Azad National Fellowship from University Grant Commission, New Delhi, is gratefully acknowledged.

References

1. Jayaweera, D.M.A. National Science Council of Sri Lanka, Part-V. NSC: Sri Lanka; 1982
2. Ayurvedic Pharmacopoeia. Department of Ayurveda, Colombo, Sri Lanka. 1979; Volume 1, (2):779-787
3. Saiyed IZ, Kanga DD. Proc Ind Acad Sci 1956 Jul; 7(4A): 225-8
4. Verbist JF, Monnet R. Plant Med Phytother. 1974 Feb; 8(4): 262
5. Dubey P, Gupta PC. A new flavanol glycoside from the flowers of *Solanum xanthocarpum*. Phytochemistry. 1978 April 14; 17 (1): 2138
6. Gutpa SS, Verma SCL, Singh C, Khandelwal P. Ind J Med Res. 1967 March; 55(7): 723
7. Dhar. Ind J Exp Biol. 1968 Feb; 6(1): 232
8. Magar J. J Sci Indust Res. 1952 Oct; 11(b): 261
9. Gupta SS, Verma SCL, Singh C, Khandelwal P, Gupta NK. Ind J Med Res. 1967 March; 21(1): 795
10. 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
11. 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 June 28; 4 (2): 276-280.
12. 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 Dec 20; 14 (3): 964-968.
13. Bhutani KK, Paul AT. Apoptosis inducing activity of steroidal constituents from *Solanum xanthocarpum* and *Asparagus racemosus*. Phytomedicine. 2010 Jan 17; 17 (5): 789-793.

Corresponding Author:

Pathan Aslam R*,

Email: aslamkhan_14@rediffmail.com