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NA-200

**SRI LANKAN MEDICINAL PLANT**

**MONOGRAPHS AND ANALYSIS**

**VOL - 2**

***SOLANUM XANTHOCARPUM***



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**LAKSHMI ARAMBEWELA & RUVINA SILVA**

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**1999 VOL - 2**

***SOLANUM XANTHOCARPUM***

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# ***SOLANUM XANTHOCARPUM***

- Synonyms<sup>1</sup> - *SOLANUM VIRGINIANUM*,  
*SOLANUM JACQUINI*,  
*SOLANUM SURATTENSE*
- Other Names<sup>2</sup> - Tamil<sup>2</sup> - Kandangattari, Sutturam, Udaravani, Udavani; Hindi – Katai, Kataikkudda, Kateli, Ringni, Satyanasi; Sans - Anakranta, Bahukanta, Bahukantaka, Bahuphala, Bhantaki, Brihati, Chitraphala, Dhavani, Dhavanika, Dushpradharshini, Dusparsha, Kantakai, Kantakarika, Kantakini, Kantalika, Kantashreni, Kasaghni, Kshudra, Kshetraja, Kshudra-kantika, Kshudraphala, Kshuriko, Kuli, Nidigdihika, Pitatandula, prachodini, Putrapada, Rashtrika, Sarpatanu, Sinhi, Sprihi, Vyaghri.
- Sinhalese Name - Katu-wel-batu
- Family - Solanaceae
- Part used - Entire plant
- Pharmacopoeia - Ayurveda Pharmacopoeia, Volume 1, Part 2, Published by the Department of Ayurveda, 1979, Colombo, Sri Lanka. Page 44-45
- Official Drugs<sup>3</sup> - Paste, Concentrated decoction , Linctus, Powder
- Uses in Traditional Medicine - In Sri Lanka the root of this plant is valued <sup>2</sup>as an expectorant and is used in the treatment of coughs, asthma, colic fever, loss of appetite and pains in the chest.  
In Bengal, this plant is used <sup>2</sup>as a diuretic in dropsy, while in Panjab a decoction of the plant is given for gonorrhoea.
- Comments - *S. xanthocarpum* has a commercial value due to the presence of solasodine and the ease with which it is converted to intermediates for the preparation of corticosteroidal hormones. Therefore solasodine has

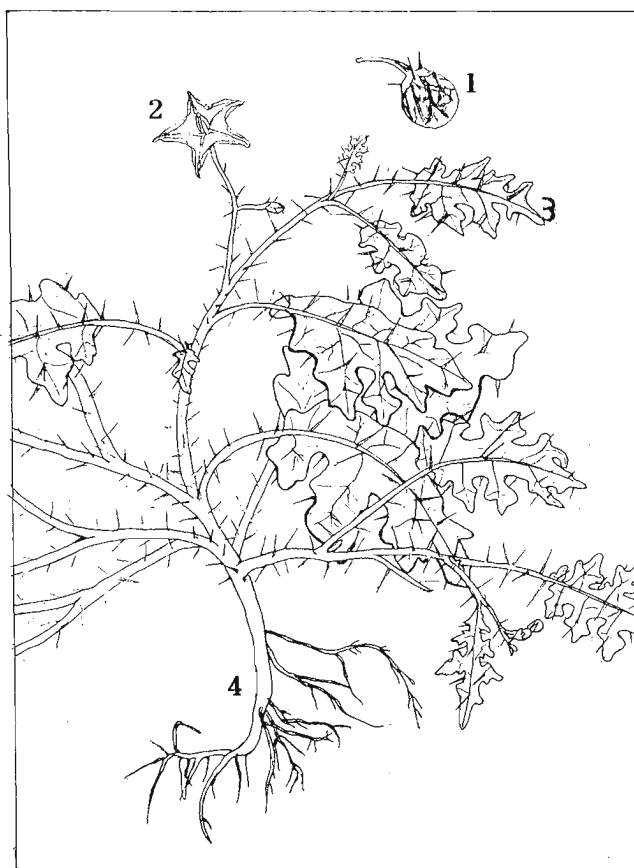
been receiving increased interest and significance as a starting material for the commercial manufacture of steroidal alkaloids.

Distribution

- Plants occur in the dry and sandy places in Sri Lanka and through out India. It is cultivated for medicinal purposes.

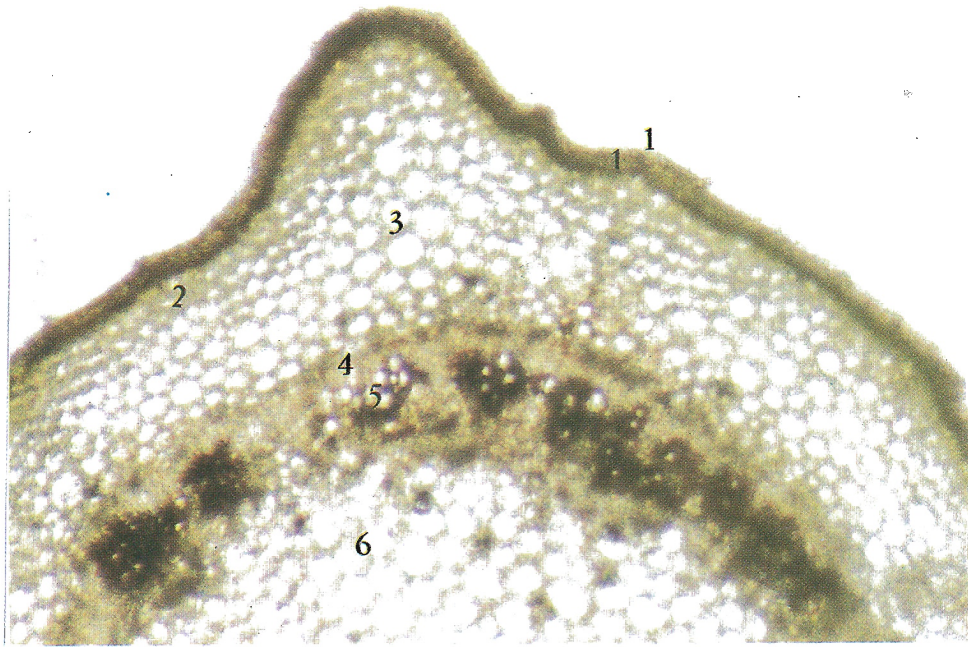
Morphology

- An annual prostrate herb<sup>2</sup>, 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 and long sharp bright yellow prickles, petioles prickly; flowers regular bisexual, bright mauve purple, cymes usually 1-flowered, sepals five, fused into a prickly calyx, petals five, fused into a rotate corolla about 2.5 cm diameter, lobes very broad, acute; stamens five, inserted into corolla throat, filaments very short, anthers large; fruit a glabrous yellow berry with numerous seeds. Flowers through out the year.



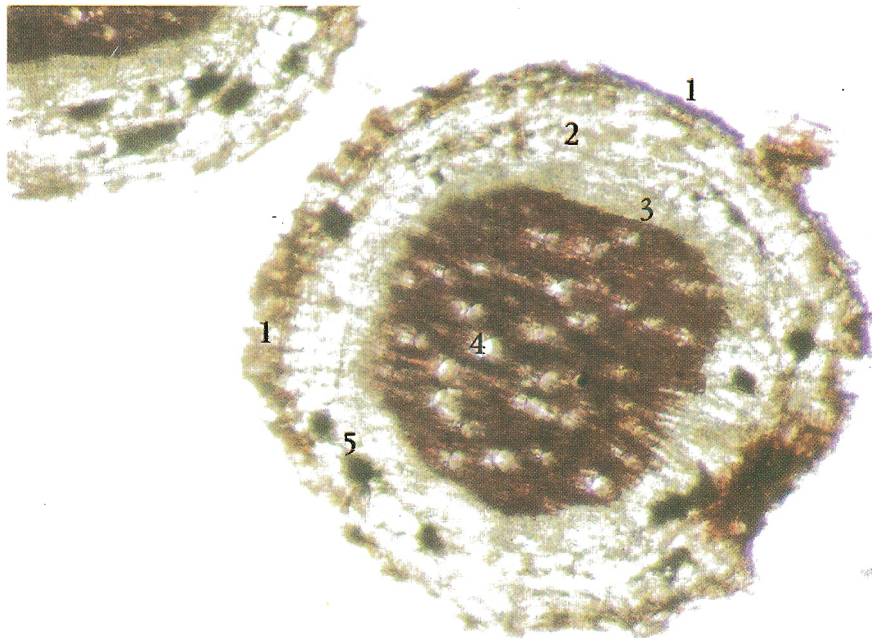
**Fig - 1** *Solanum xanthocarpum* plant

1. Fruit      2. Flower      3. Leaf      4. Root



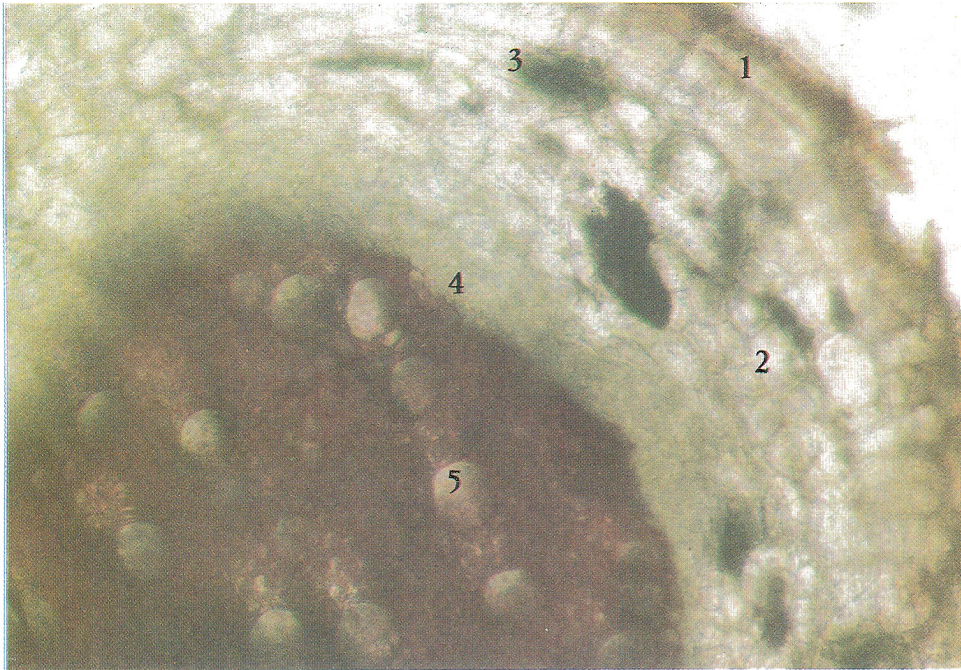
**Fig – 2**  
Cross section of *S. xanthocarpum* stem

1. Epidermis 2. Chloranchyma 3. Cortex 4. Phloem 5. Xylem 6. Pith



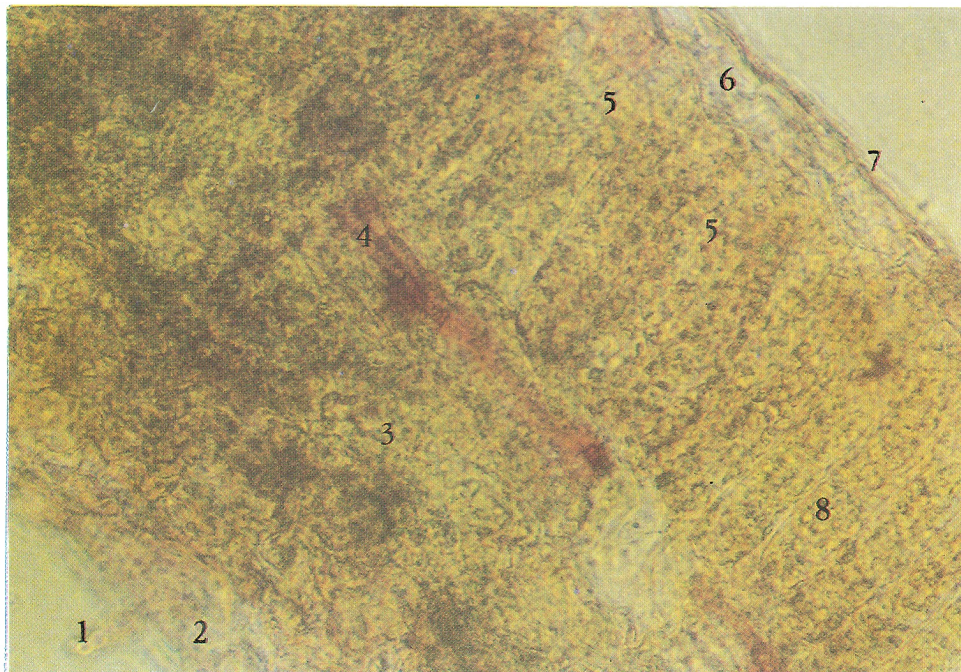
**Fig – 3**  
Cross section of *S. xanthocarpum* root

1. Cork 2. Cortex 3. Phloem 4. Xylem 5. Inter cellular air space



**Fig - 4**  
Cross section of *S. xanthocarpum* root

1. Cork    2. Cortex    3. Inter cellular air space    4. Phloem    5. Xylem



**Fig - 5**  
Cross section of *S. xanthocarpum* leaf

1. Hair    2. Lower epidermis    3. Spongy cells    4. Vein  
5. Palisade cells    6. Upper epidermis    7. Cuticle    8. Chloroplast

## ANALYTICAL SPECIFICATION

### Powder Analysis

#### Macroscopic characters

Colour	-	Brownish green
Odour	-	No special smell
Taste	-	No special taste

#### Microscopic character

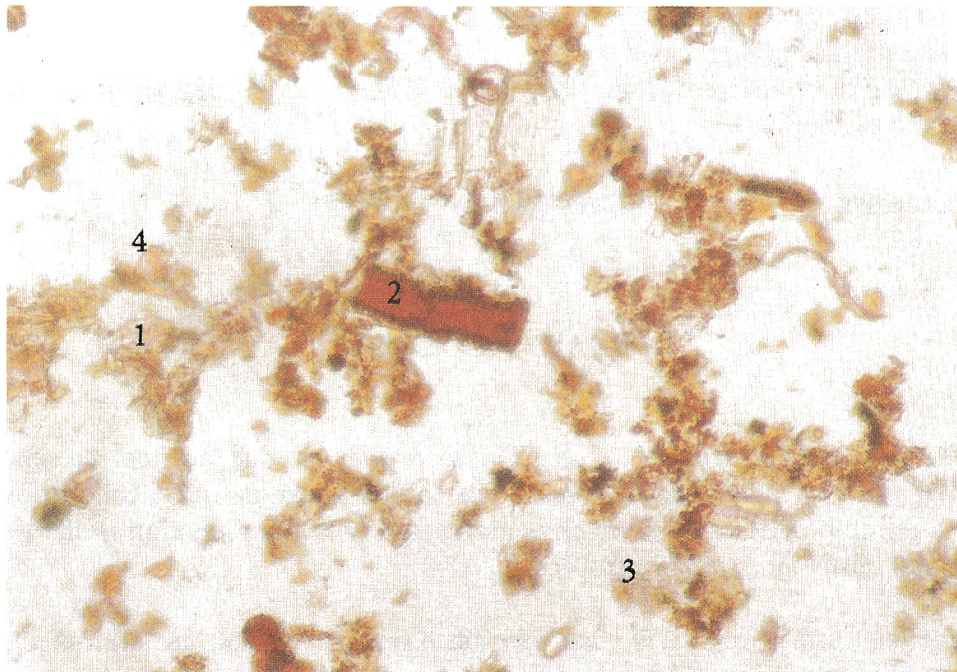
The powder is characterised by -

Thin walled parenchyma cells.

Fragments of thick walls of tracheids and part of tracheids,

Wilted irregular shape parenchyma cells and their parts.

Tiny droplets like structures that have come out of cell contents ( plastisides and granules).



**Fig - 6**

Powdered plant material under the microscope

1. Parenchyma cell    2. Tracheid    3. Cell content    4. Part of cell

**Table 1                      Physico-Chemical Analysis**

Test	Limits
Ethanollic extract	20.8 % w/w
Ash content	22.0 % w/w
Acid insoluble ash	4.3 % w/w

### **PHYTOCHEMISTRY**

The fresh, undried, unripe berries of *S. xanthocarpum* contain<sup>5</sup> glycobases, solasonine, solamargine, solasurine, solanocarpine and solanocarpidine.

The steroid constituents<sup>6</sup> of whole plant of *S. xanthocarpum* are cycloartanol, cycloartenol, sitosterol, stigmasterol, campesterol, cholesterol, sitosteryl glycoside, stigmasteryl glycoside.

The leaves, roots and fruits of plant have yielded<sup>7</sup> three coumarins, scopoletin, esculin and esculetin.

Active principle                      -                      Solasodine (on hydrolysis)

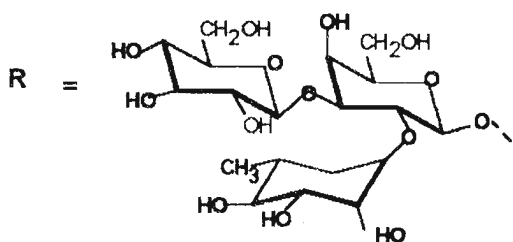
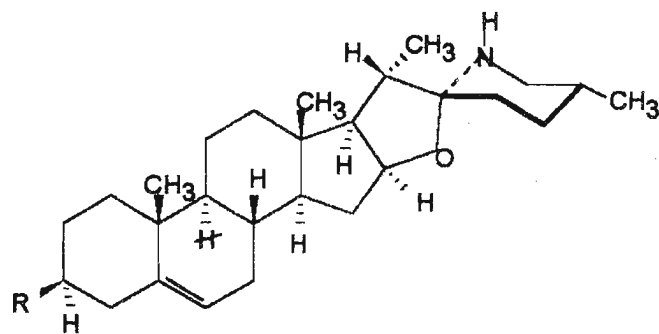
### **PHARMACOLOGY**

The pharmacological activity of *S. xanthocarpum* is due to the presence<sup>8</sup> of glycoalkaloids and phenolic substances. The crude aqueous and alcoholic extracts caused a fall in blood pressure which is associated with the reduction in the tidal air volume and this is inhibited by atropine.

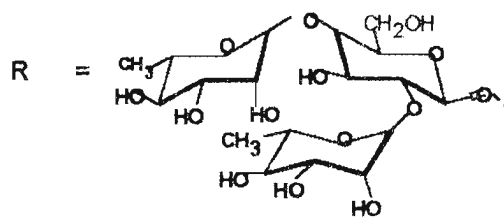
The beneficial effect<sup>9</sup> of *S. xanthocarpum* on bronchial asthma are attributed to the depletion of histamine from bronchial and lung tissue.

Extracts of the whole plant have shown<sup>10</sup> antiviral activity against Ranikhet disease virus and also against sarcoma 180 in the mice. Extracts of the shoot and fruits exhibited antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*.

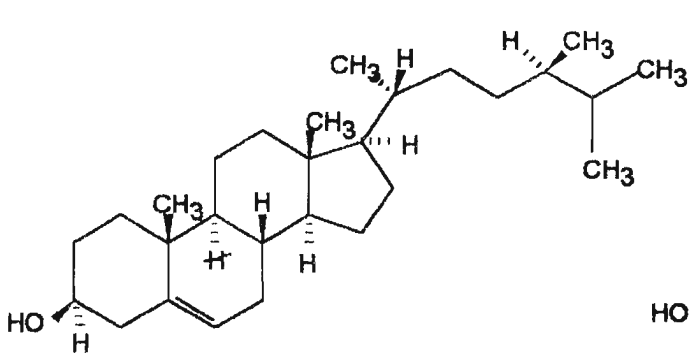
Alcoholic extract caused<sup>11</sup> increased amplitude of contraction of the auricle and ventricle in the intact dog. The stimulatory effect was independent of the heart rate. The inorganic potassium nitrate content of the drug as well as anticholinesterase effect may be helpful in its expectorant action.



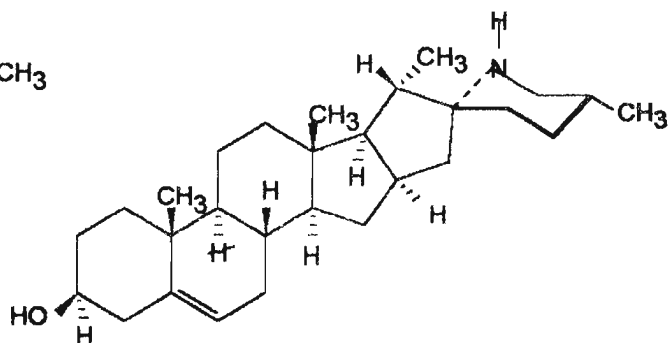
**Solasonine**



**Solamargine**

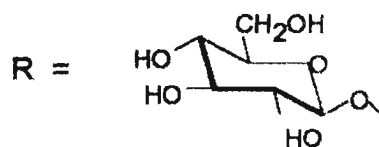
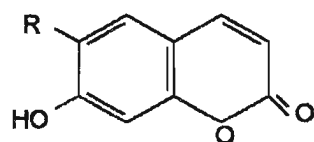
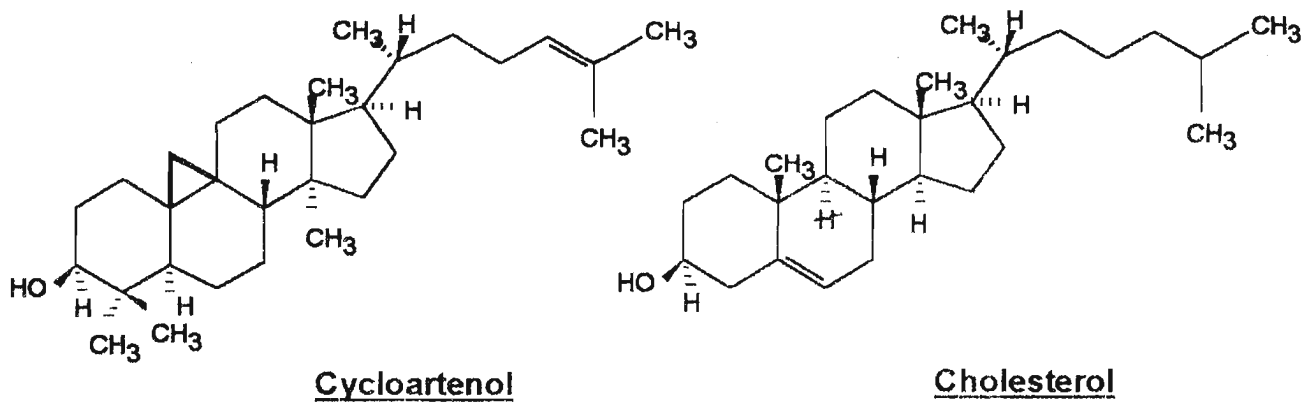
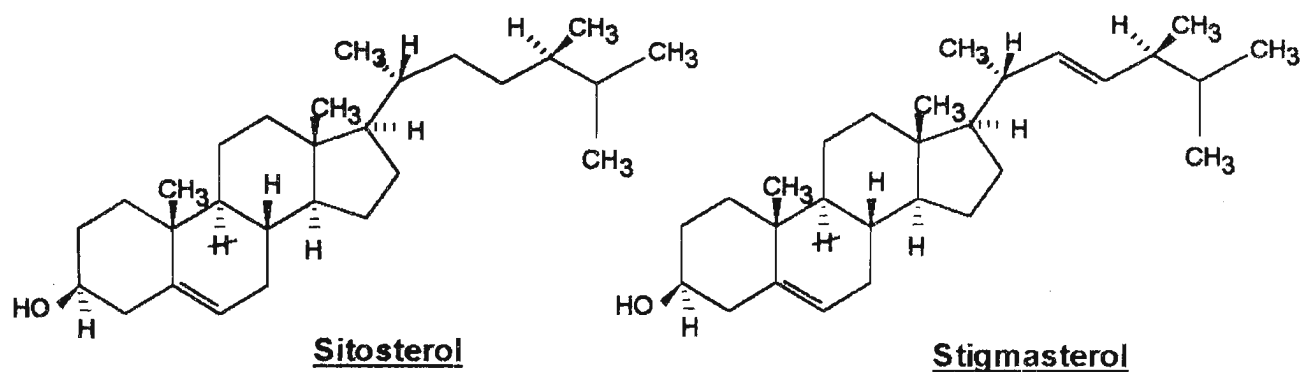


**Campesterol**



**Solasodine**

**Fig. 7 Main compounds in Solanum xanthocarpum**



R = OH    **Esculetin**

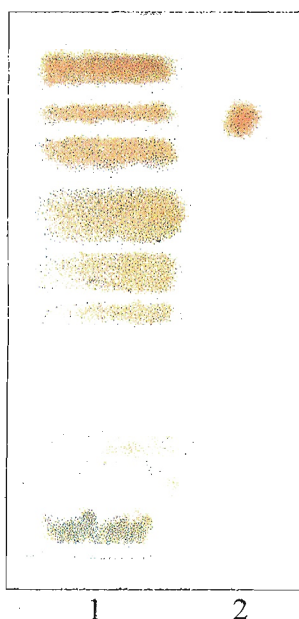
R = OCH<sub>3</sub>    **Scopoletin**

**Esculin**

Fig 8    Main compounds in *Solanum xanthocarpum*

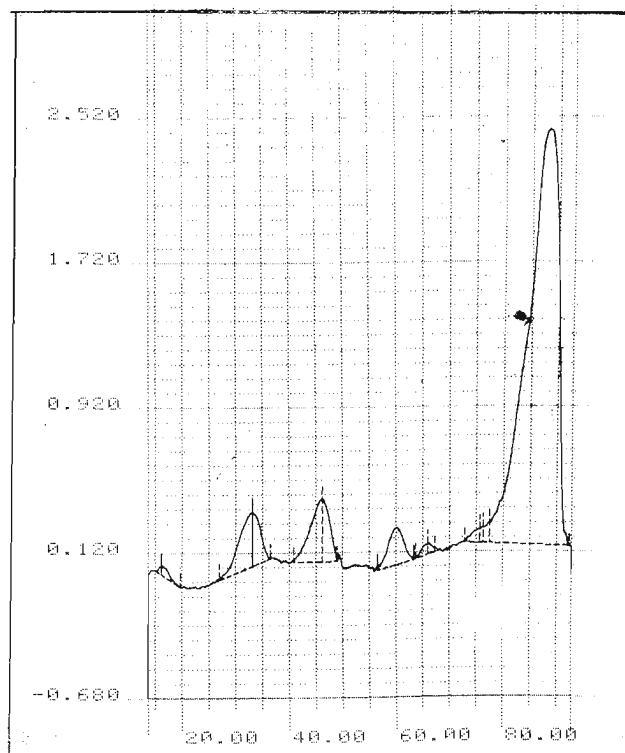
## TLC PROFILE

- Sample detail - *Solanum xanthocarpum* entire plant
- Sample preparation - *S. xanthocarpum* plant (5.0g) was successively extracted with ethanol and concentrated (48.5mg/10ml). 20µl extract and 5µl of solanine standard (2g/10ml ) were applied to TLC plate.
- Adsorbent - Silica gel G F<sub>254</sub>
- Solvent system - ethylacetate : formic acid : glacial acetic acid : water  
100 : 11 : 11 : 27
- Detection
- Direct evaluation - UV<sub>254nm</sub> and UV<sub>366nm</sub>  
Rf values UV<sub>254</sub> = 0.95, 0.82, 0.72, 0.63, 0.52, 0.43, 0.32, 0.23, 0.16, 0.12  
Rf values UV<sub>366</sub> = 0.73, 0.42, 0.18
- Scanning - Densitometer
- Spray reagent - Dragendorff 's reagent and 5% ethanolic sulphuric acid.



**Fig - 9**

- TLC chromatogram
1. *S. xanthocarpum* ext
  2. Solanine



**Fig - 10**

TLC Densitometer finger print

## HPLC PROFILE

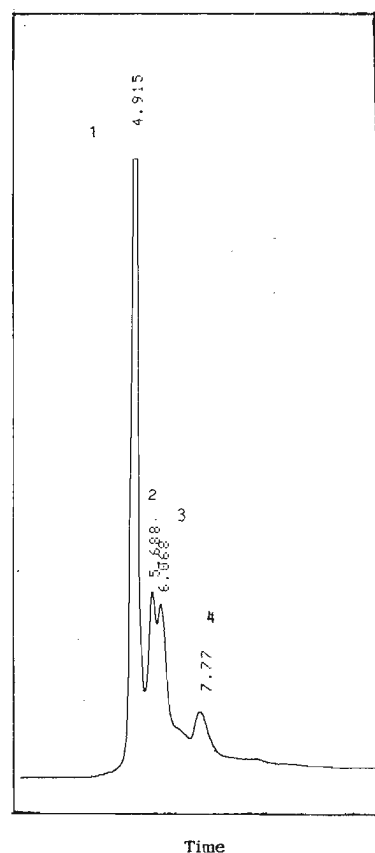
- Sample preparation - Dried *S. xanthocarpum* plant (5.0g) was successively extracted with ethanol (19.5mg/10ml) and purified using Sep – Pak C18 cartridge.
- Injection volume - 20 $\mu$ l
- Apparatus - Waters 501 HPLC pump.  
SPD 10AV Shimadzu uv-vis detector.
- Column -  $\mu$  Bondapak<sup>TM</sup> RP18
- Solvent system - Methanol : water ( 1:4 )
- Flow rate - 5ml/min
- Detection - 254nm

Description of the HPLC – Chromatogram

Peak no	Rt (min)
1	4.9
2	5.6
3	6.0
4	7.8

**Table 2**

Retention time of main peaks



**Fig – 11**

HPLC Finger print

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