

Pharmacognostic, Phytochemical and Anti-microbial studies of *Solanum indicum* leaves

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Abstract: The leaves of *Solanum indicum* showed the presence of stellate trichome. Ethanolic extract of leaves of *Solanum indicum* showed antibacterial activity against *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli* where as chloroform extract, acetone extract and ethanol extract showed anti bacterial activity against *Pseudomonas*. The aqueous extract did not show any anti microbial activity towards the tested organism. None of the extract showed anti fungal activity.

Introduction

Solanum indicum Linn belongs to the family Solanaceae is distributed throughout tropical countries like India, Ceylon, Malaya, china, Philippines. In Tamil it is known as "Karimulli" and in English it known as "Poison berry".

Materials and Methods

Fresh leaves of *Solanum indicum* were collected from Aryankavu in Kerala and their morphological (Macroscopy)^{1,2} and microscopic studies^{3,4,5,6} were carried out in addition to various analytical parameters⁷, phytochemical constituents studies⁷, anti microbial studies⁸.

Extraction:

100 gms of drug was weighed and packed in Soxhlet apparatus. The drug was extracted with various solvents such as chloroform, Acetone, Ethyl alcohol and water for 72 hours until the drug gets exhausted. The extracts were concentrated by distillation process and dried. The phytochemical constituents were analyzed with various extracts.

Results and Discussions

Macroscopy

Leaves 5-15 cm length and 2.5-7.5 cm in width, ovate in outline, acute sub entire or with a few large triangular ovate sub acute lobes, sparsely prickly on both sides, clothed above with simple hairs from bulbous bases inter mixed with small stellate ones, covered below with small stellate hairs.

Analytical parameters

Extractive values like alcohol soluble extractive - 1.78 % w/w; water soluble extractive- 2.72 % w/w; Physical constant like, total ash 14.8 % w/w; water soluble ash - 7.6 % w/w; Acid soluble ash 11.8 % w/w ; and

sulphated ash 14.4 % w/w were calculated as per standard procedures.

Phyto chemical tests

Chloroform, acetone, alcohol and aqueous extract of the leaves of *Solanum indicum* were subjected to qualitative chemical tests. Chloroform and alcohol extracts showed the presence of carbohydrates and sterols. Acetone extract showed the presence of sterols. Aqueous extract did not show the presence of any constituents.

Microscopy

Midrib.

The midrib is quite prominent and projects as short wide adaxial hump and wide hemispherical adaxial body. It is 570 µm wide in vertical plane; and the adaxial hump is 250 µm wide and the adaxial body 600 µm wide. The epidermal layer is thin and distinct comprising of small squarish, then walled size. Stalked stellate trichomes are often seen on the epidermis of the midrib. The ground tissue of the midrib is homogenous, parenchymatous, thin walled, angular and compact. The vascular bundle is single, widely bowl shaped with short radial multiples of xylem elements and phloem elements (fig.2.1)

Lamina

The lamina is dorsiventral, mesomorphic and hypostomatic. Both adaxial and abaxial epidermal layers have dense mat of stellate trichomes.

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The trichomes arise from a group of projecting epidermal cells; the arms of the trichomes spread horizontally parallel to the surface of the lamina; the arms are thick walled and lignified.

The adaxial epidermal layers are slightly thicker than abaxial layer; the cells are circular to rectangular. The adaxial epidermis is thin and consists of narrow tubular cells.

The mesophyll is differentiated into adaxial wide zone of palisade cells and abaxial zone of small, loosely arranged spongy mesophyll cells. The palisade cells are wide, compact and are up to 90µm in height. The vascular strands of the lateral veins are situated along the medium part of the lamina (fig2.2). The vascular strands have a thin vertical strand of xylem elements and a small cluster of phloem elements surrounded by a thin layer of bundle sheath cells. The lamina is

uniformly thick measuring 150µm in vertical plane. These dense stellate trichomes arise from a group specialized thick walled, lignified epidermal cells, especially arising from the adaxial side (fig 2.2)

Stellate trichomes

The trichomes consist of a group of short thick walled cells forming the **Stalk**. From the stalk arises varying number of arms spreading horizontally in the form of a star (fig 3.1, 2). The arms are thick walled with smooth surface and pointed ends. The arms are 100-240µm long and 15µm thick.

Venation Pattern

The lateral veins and venulets are thick and prominent. They form definite vein-islets of various shape and size each islet has distinct **Vein termination** which are mostly single short and unbranched.

Table 1: Data Showing the Preliminary Phytochemical Screening of *Solanum indicum*

Extracts	Alkaloids	Carbohydrate	Glycoside	Gums & mucilage	Steroids sterols	Tannins	Flavanoids
Chloroform	-	+	-	-	+	-	-
Acetone	-	-	-	-	+	-	-
Alcohol	-	+	-	-	+	-	-
Aqueous	-	-	-	-	-	-	-

Table 2: Antimicrobial Activity of *Solanum indicum*

Type of Micro organism	Name of Micro Organism	Zone of Inhibition				
		Standard (Ampicillain, Fluconazole)	Chloroform Extract	Acetone Extract	Ethanol Extract	Aqueous Extract
Gram Positive Bacteria	<i>Staphylococcus aureus</i>	25 mm	-	-	20mm	-
	<i>Bacillus cereus</i>	25mm	-	-	25mm	-
Gram Negative Bacteria	<i>Escherichia coli</i>	22mm	-	-	24mm	-
	<i>Pseudomonas aerogenosa</i>	24mm	24mm	24mm	22mm	-
Fungi	<i>Candida albicans</i>	-	-	-	-	-

Forked vein terminations are also seen in some of the islets. (Fig 4.1)

Crystal

Calcium oxalate crystals are fairly abundant in mesophyll. The crystals type is microcrystal or sand crystals. They occur in the spongy mesophyll tissue. Minute crystal bodies are densely aggregated and packed in the cells

Stomata

Stomata occur only on abaxial epidermis or anisocytic. In the anisocytic type, three unequal subsidiary cells surround each stoma; in the anisocytic type, no distinct subsidiaries can be seen around the stomata. The epidermal cells are small, rectangular or commonly polyhedral. Their antilinear cells are thick and straight. (Fig 5.1, 2)

Antimicrobial studies

Only ethanolic extract showed antibacterial activity against *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli* whereas chloroform extract, acetone extract and ethanol extract showed anti bacterial activity against *Pseudomonas*. The aqueous extract did not show any anti microbial activity towards the tested organism. None of the extract showed anti fungal activity.

Conclusion

Chloroform extract, acetone extract and ethanol extract showed anti bacterial activity against *Pseudomonas*. The aqueous extract did not show any anti microbial

activity towards the tested organism. The antimicrobial activity of leaf of *Solanum indicum* may be due to sterols.

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