



RESEARCH ARTICLE

## Pharmacological and Preliminary Phytochemical Studies in *Solanum torvum* Swartz.

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### ABSTRACT

*Solanum torvum* Swartz. is one of most important ethnomedicinal plant used by the Korku of Melghat. Plant powder or ash given with honey to cure asthma and cough by Korku tribe but elsewhere it is used for other health elements by few researchers. The present paper deals with detailed morphological, anatomical and phytochemical screening of *Solanum torvum* Swartz. with pharmacognostical approach. In this paper, macro- & micro- morphological and anatomical studies are presented along with illustrations which give better picture of anatomical peculiarities of *Solanum torvum* Swartz.

**Keywords:** Pharmacology, Phytochemistry, *Solanum torvum* Swartz.



## INTRODUCTION

In India, various traditional medicinal systems such as Ayurveda, Siddha and Unani are being practiced in addition to ethnomedicine. In all over more than 8000 plants are in medicinal use. Across the country, which constitutes 45% of 17,500 known flowering plant species of India (Ved *et al.*, 2000) India is a mega-biodiversity country with high level of endemism of its flora and fauna. Methanolic extracts of roots of *S. torvum* exhibited promising antibacterial and antifungal effects on all organisms tested in comparison with that observed in the leaves, stems and inflorescence extracts. (Bari *et al.*, 2010). Highly significant antifungal activity was observed in methanolic and ethanolic extract. The percentage inhibition of the test pathogenic fungi in Methanolic extract was 100% (*P. oryzae*), 74.42% (*A. alternata*), 65.68% (*B. oryzae*), 87.62% (*C. lunata*), 100% (*T. padwickii*), 63.33% (*D. halodes*), 60.31% (*D. tetramera*), 76.01% (*F. moniliformae*), 59.21% (*F. oxysporum*), 43.91% (*F. solani*) and zone of inhibition of *Xanthomonas campestris pv oryzae* was 18 and 30mm in Methanol and ethanol extract (Lalitha *et al.*, 2010).

Leaf and root of *Solanum torvum* is used to cure Asthma, diabetes, hypertension. A combination of leaf and root juice is used against asthma, diabetes and hypertension (Ramamatullah *et al.*, 2009) Kamraj *et al.* (2009) has reported highest larval mortality was found in leaf petroleum ether, flower methanol extracts of *C. auriculata*, flower methanol extracts of *L. aspera* and *R. nasutus*, leaf and seed methanol extracts of *S. torvum*. An antiviral isoflavonoid sulfate, torvanol was isolated from the MeOH extract of the fruits of *Solanum torvum* (Arthan *et al.*, 2002). These studies also reveal the importance and need of the conservation and propagation.

## STUDY AREA

The study area Melghat stretches from south to north between latitudes 21°-11' and 21°-46' north and from west to east between longitude 78°-38' and 77°-34' east. It turns to southwest and widens into Chikhaldara and Vairat plateau with. Vairat is highest point being 1,177.75 meters above sea level (Anonymous, 1968). The Melghat area is situated on the branch of Satpuda range to the south of Tapti River. The prominent feature is the main ridge of Gawilgarh hills. Reserve forest of Melghat division is divided into East Melghat and West Melghat division. The striking feature of Melghat ridge is its almost flat-topped plateau descending in a series of precipitous scarps on either side, one below the other, separated by narrow steps of lesser gradients and finally sloping down to the narrow step valleys known as *Khoras* (Devarkar, 2001). Dhakna-Kolkaz wildlife Sanctuary

was established in 1963 covering 381.58 sq. km. of forest area situated in the heart of Melghat. About 80% populations are of tribals (Indurkar, 1992).

## MATERIALS AND METHODS

This survey was conducted to know about medicinal plants used by the people residing in the Melghat area. During this ethnomedicinal survey of the Melghat data was collected medicinal uses of the plants by Korku tribe people, the varied uses of the plants were also documented. Informal discussions, interviews and village walk with informants, medicine-men (Bhumka) were held to enhance understanding and gather information. Field visits were made with the informants for collection of specimens. Identification of the collected specimens was made with the help of Flora of Melghat (Hooker, 1872-1897). and other Standard Floras (Patel, 1968; Dhore & Joshi, 1998; Naik, 1998; Bhogaonkar & Devarkar, 1999). Herbarium specimens were deposited in the Govt. Institute of Science and Humanities, Amravati [Maharashtra] in Department of Botany. Botanical Survey of India, Pune was also consulted for identification and confirmation of identification of the specimens.

Micromorphological and anatomical studies were carried out by taking hand sections of fresh material collected from the field and/ or preserved in 4% Formalin. Macromorphological sketches were drawn with visual observations and micro morphological and anatomical sketches with the help of camera lucida. Preliminary phytochemical screening for bioactive compounds, amino acid composition by two dimensional paper chromatography, and qualitative ash analysis for the presence of inorganic compounds was done by standard methods given in reference books by Gangulee *et al.* (1959), Evans (1996), Gibbs (1974), Harborne (1973), Johansen (1940), Peach & Tracey (1979) and Rastogi & Mehrotra (1999).

## OSERVATIONS & RESULTS

*Solanum torvum* Swartz. (Family: Solanaceae) Hook f. Fl. Brit. India. 4:234. 1883; Bhogaonkar & Devarkar. Add. Fl. Melghat. 41.1999. (Ver.- Pulum ringani, Safed ringani)

**Macromorphology** : Large shrubs, 8-12 ft. high, densely covered with stellate hairs; stem and petioles prickly, few may be present on midrib on the underside of leaf. Leaves ovate-lanceolate, 20 x 10 cm. base oblique - cordate; Inflorescence adnate, cymes helecooid, arranged in corymbose fashion. Flowers white, 1.5 - 2 cm. Calyx 5 - lobed, green. Corolla rotate; tube very short; petals 5, white. Stamens 5 in the corolla throat; filaments short, 0.1

cm; anthers oblong, connivent in a short cone, dehiscence terminal, by pores. Ovary 2-celled but at maturity becoming 4-celled, covered by gland tipped hairs, stigma capitate, Berry globose, glabrous, yellow when ripe (Figs A-F). Occurrence - Rare, on Chikhaldara plateau especially on Gavilgarh and around. Flrs. & Frt. - September - January

**Micromorphology : Root** (Fig. 1). - Tetrarch; pith few celled, becomes sclerotic. Cork superficial, many layered. Cork cambium produces secondary cortex to the inner side. Cells of secondary cortex horizontally stretched and compactly placed. Several lysigenous cavities produced in secondary cortex. Secondary growth normal. Cells of cortex, lysigenous cavities, cells of phloem and even the conjunctive tissue of xylem shows a dark black content. Rays uniseriate; cells of rays and some cells of conjunctive tissue show secondary thickening like water storage tracheids.

**Stem** (Figs. 2 & 3). - Epidermis cuticularized, followed by single layer of parenchymatous hypodermis. Cells of epidermis and that of hypodermis containing chloroplasts; however, chloroplasts are more abundant in hypodermis, followed by broad zone of collenchymatous outer cortex. Inner cortex parenchymatous, few layered, some of the cells of inner cortex full of starch grains. Endodermis and pericycle not distinct. Vascular bundles conjoint, bicollateral, open, arranged in a ring. Pith large; cells contains starch grains. Secondary growth normal. Peripheral cells of inner and outer phloem lateron get converted into stone cells.

**Leaf** (Figs. 4-12). - Petiole cylindrical, dorsal side somewhat flattened. Epidermis with numerous stellate hairs and few short stalked glands; followed by single layered chlorenchyma. Ground tissue differentiated into outer collenchymatous and inner parenchymatous zone. Many cells of parenchymatous zone filled with starch grains. Vasculature in the form of shallow and two small vascular bundles on dorsal side below the outer cortex. Vascular strand bicollateral. Many cells of phloem contain starch.

Lamina hypostomatous, cells of upper epidermis polygonal, those of lower epidermis, shallowly sinuate or bluntly angled. Stomata anomocytic, numerous in lower epidermis, occasionally one or the other stoma may be seen on the upper epidermis. In v. s. guard cells show outer and inner ledges forming front and back cavity leading to the substomatal chamber. Mesophyll differentiated into single layered palisade; cells of palisade narrow, long, almost occupying half the thickness of lamina. Spongy tissue 4-5 layered; cells loosely arranged, enclosing large intercellular spaces. Midrib with single layered chlorenchymatous

hypodermis followed by few layers of thick-walled cells. Ground tissue parenchymatous. Vasculature in the form of a bicollateral crescent shaped arc. Trichomes - Stellate hairs with long multicellular stalk form a dense tomentum. Few glandular hairs interspersed between stellate hairs. Glands shortly stalked with multicellular head.

**Chemistry** - Total eight amino acids present. They are L-Tyrosine, Threonine, DL-Alanine, Proline, Valine, Isoleucine; up 3 and unp 5. Alkaloids, Flavonoids (Flavonols & Flavanones), Phenolics (Catechol) and Steroids present. Ash contains Sulphur, Calcium, Magnesium, Iron, Chlorine, Phosphorus and Sodium.

**Korku uses** - Plant powder or ash given with honey to cure asthma and cough.

**Recorded uses** - Plants are digestive, diuretic, sedative, and tonic. Root decoction useful in postnatal blood discharge; root paste useful in rhagades. Leaf paste applied on snakebite, haemostatic, dog-bites. Fruit decoction in spleen enlargement, cough, liver enlargement and boils (Banerjee & Pal, 1996; Chatterjee & Pakrashi, 1991-1995; Chopra *et al*, 1956; Chopra *et al*, 1969; Jain, 1992; Nath *et al*, 1988; Sur *et al*, 1987; Yoganarsimhan *et al* 1984)

## CONCLUSION

*Solanum torvum* Swartz is characteristic in not having peltate hairs, so characteristic for *Solanum*. Stellate hairs present; however, they are different from both the peltate and stellate hairs already noted in the presence of central cell. Calcium oxalate crystals or crystal sand widely distributed in family is absent from the present species. Instead, several cells contain some black substance easily diffusing in the preservative medium; whose nature is not known. *S. torvum* is an established herbal medicine. Chemistry of plant is known to much extent. However no information about the ash contents and free amino acids is available.

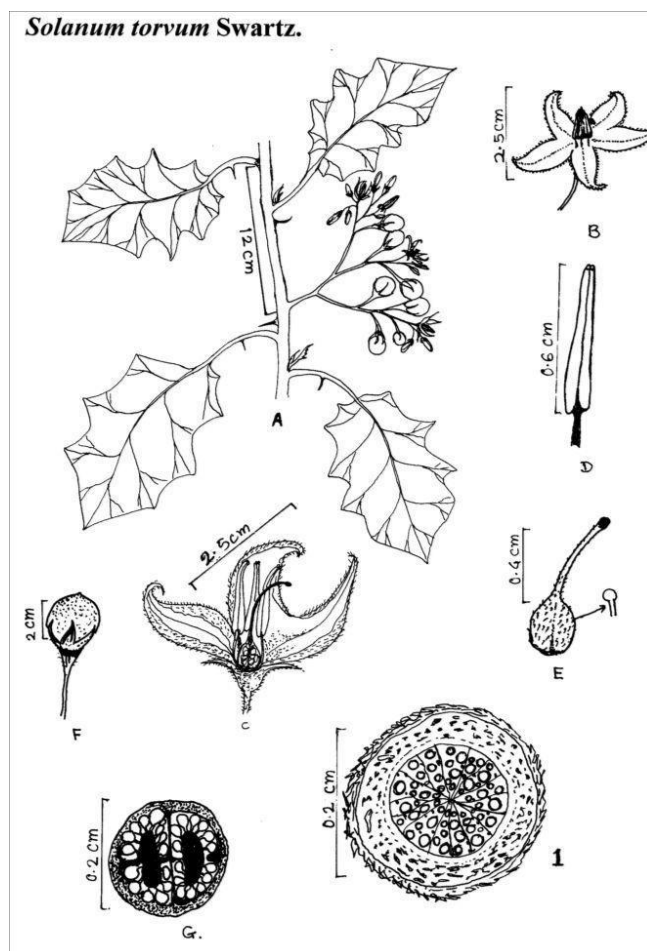
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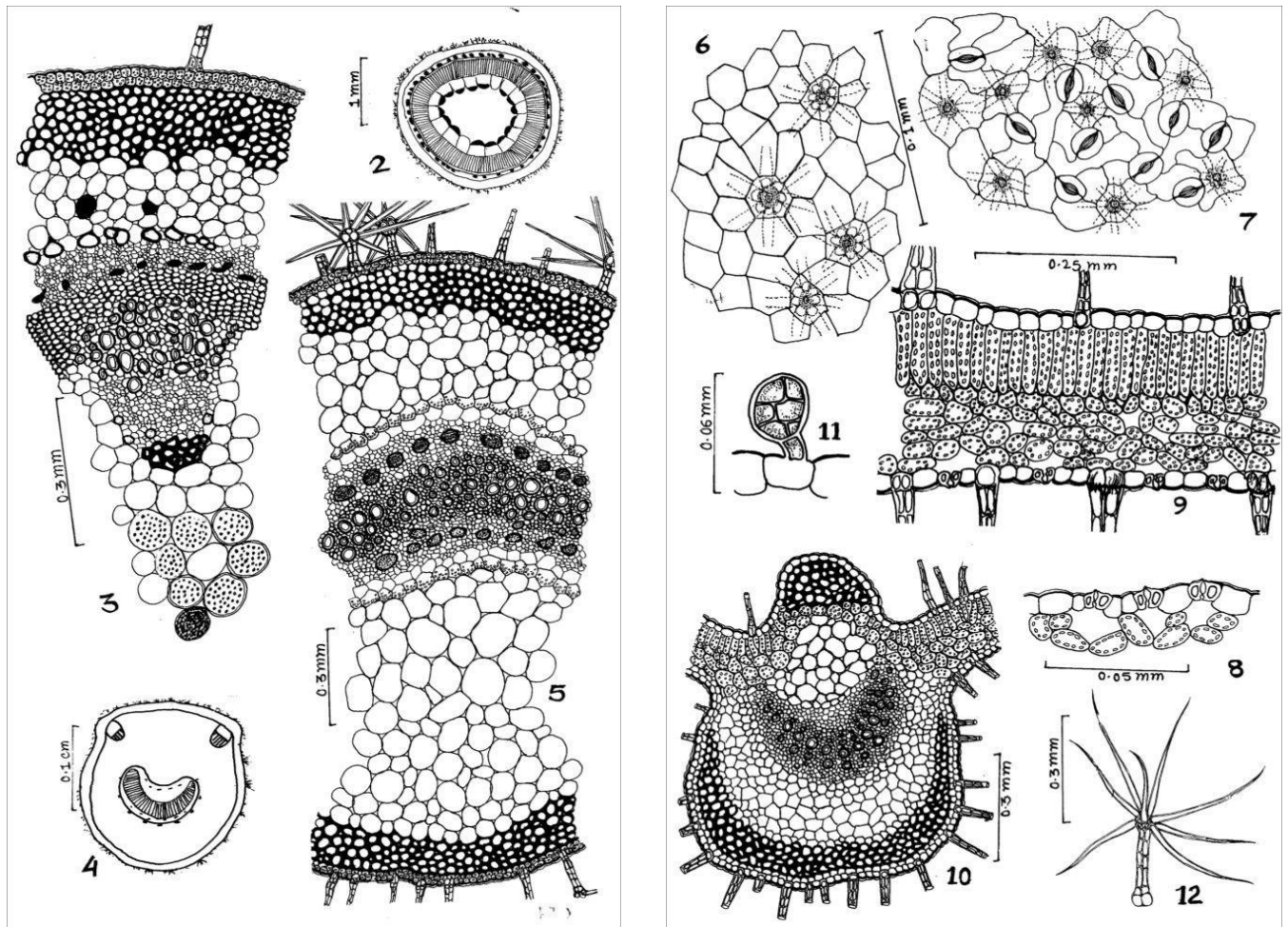
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## PLATE I



*Solanum torvum* Swartz. : Fig. A-Flowering twig; Fig. B- Single flower; Fig. C- L. S. Flower; Fig. D- Single Stamen; Fig. E- Ovary; Fig. F- Fruit; Fig. G- T. S. Ovary



*Solanum torvum* Swartz. : Fig. 1-T. S. Root (Diagrammatic); Fig. 2- T. S. Stem (Diagrammatic); Fig. 3- T. S. Stem (Sector magnified, cellular); Fig. 4- T. S. Petiole (Diagrammatic); Fig. 5- T. S. Lamina (Sector magnified, cellular); Fig. 6- Leaf Surface showing Trichome base; Fig. 7- Stomata (Surface View); Fig. 8- Stomata (T.S. View); Fig. 9- T. S. Lamina ;Fig. 10- T. S. Midrib; Fig. 11- Glandular hair; Fig. 12- Single Trichome