

## **Background**

*Exacum lawii* C.B. Clarke, species of genus *Exacum* is small herb commonly distributed in the Western peninsula, Western coast region of India, Mysore and Coimbatore, Southern part India. It is endemic to Jarandeshwar hill from Satara district, Maharashtra and Western ghat of Karnataka. The common English name is Law's Persian violet. It is locally known as Lahan chirayata in Maharashtra, Manali in Malayalam, Marukozhunthu in Tamil. The whole plants of *Exacum lawii* possess the medicinal property and have been used as folk remedy for the treatment of kidney disorders and eye diseases (Hooker, 1885; Gamble, 1923; Kirtikar, 1935; Chopra, 1956). Indigenous practitioners in Satara district of Maharashtra and bababudan hills of Mysore, Karnataka uses *Exacum lawii* to treat kidney problems. The literature survey on this species results in no information in field of quality control standardization, phytochemistry and pharmacology.

## **Objective**

- Quality control standardization of *Exacum lawii*.
- To evaluate the nephroprotective effect of *Exacum lawii* and its isolated compound swertiamerin against cisplatin- induced nephrotoxicity in experimental rats and human embryonic kidney cell line (HEK-293). To evaluate antibacterial activity and antifungal activity against strains causing ocular infection to scientifically validate its traditional uses.

## **Work done and outcome of the study**

### *Plant authentication and Quality control standardization*

The *Exacum lawii* herbs were authenticated by Dr. N M Dongarwar, Assistant Professor, Department of Botany, Rashtrasant Tukadoji Maharaj Nagpur University, India. Random

amplified polymorphic DNA (RAPD) fingerprinting profile of *Exacum lawii* was performed. The 6 primers pairs were successfully used for amplification of matK and rbcL gene. Morphological, histological and powder evaluation was done according to standard procedure. Nutritional content and physicochemical analysis were done as per the official methods of AOAC and WHO guidelines. The phytochemical screening of ethanolic extract of *Exacum lawii* (ELE) and its fraction was performed. ELE was standardized with chemotaxonomic marker swertiamarin (secoiridoid glycoside) using HPLC and isolated by using standard protocol.

*To evaluate protective effect of Exacum lawii and its isolated compound swertiamerin on cisplatin-induced nephrotoxicity in rats*

Acute oral toxicity study (OECD guidelines 420) and Repeated dose 28-days oral toxicity study (OECD test guideline 407) were performed to evaluate the toxicity of ELE in rats. Nephroprotective potential at different doses of extract was evaluated against cisplatin (6 mg/kg, i.p.) in experimental rats and validated by measuring changes in serum renal toxicity markers, renal tissue oxidative stress biomarkers, and proinflammatory cytokines level were measured. To estimate the change in oxidative status of renal tissues, DNA and single viable cells were isolated from treated rat kidney, DNA fragmentation assay and flow cytometric analysis of reactive oxygen species (ROS) were performed. Histopathology of renal tissues was also examined.

*In-vitro study of Exacum lawii and its isolated compound swertiamerin on cisplatin in human embryonic kidney cells (HEK-293)*

Human Embryonic Kidney cell line, HEK-293 obtained from the National Centre for Cell Sciences (Pune), Maharashtra, India. MTT cytotoxicity assay was done to estimate the dose of drug causing toxicity to HEK-293 cells. Cytoprotective action of ELE and swertiamerin

was evaluated by measuring iNOS expression by western blot analysis, proinflammatory cytokine level, ROS estimation, cell cycle analysis using flow cytometry, DNA fragmentation assay was done by gel electrophoresis and morphology of cells were observed.

*Antibacterial and antifungal activity of Exacum lawii extracts and volatile oil against ocular infection*

The antimicrobial susceptibility was performed by agar disc diffusion assay method. The minimum bactericidal concentration and minimum fungicidal concentration were determined for each extract and volatile oil by sub-culturing the samples. The study showed that *Exacum lawii* has a broad spectrum antimicrobial activity against pathogenic bacteria and fungi causing ocular infection.

**Conclusion**

Quality control standardization of *Exacum lawii* has been documented for the first time to develop the scientific standardization monograph.

Ethnopharmacological use of *Exacum lawii* as nephroprotective and in ocular infection has been scientifically validated for the first time.