

**Title of Research Project:** Identification of bioactive metabolites, alkaloids in *Lavatera cashmiriana* Cambess and study of their biological activity

**Keywords:** *Lavatera cashmiriana* Cambess (LCC), Pyrrolizidines Alkaloids (PA), LC-MS, analytical techniques

**Research Areas:** Secondary metabolites, phytomedicine

**General Presentation of Project and state of art:**

*Lavatera cashmiriana* Cambess (LCC) is commonly called Hollyhock (English), Sozposh and Wansochal (Kashmiri). *Lavatera cashmiriana* is a traditional medicinal plant found at the foothills of the Himalayas and Kashmir regions. Traditionally, LCC has been used for many diseases and disorders, such as respiratory disorders, rheumatism, kidney pain, and as a diuretic. Various parts of the plant have been in use medicinally since ancient times. The seeds of the plant are have been used as an antiseptic and the whole plant is utilized as an analgesic, particularly to control painful urination. Flowers of the plant have been used to cure mumps in children and are mashed/ mixed with milk and applied on the skin to treat the epidermal disease. Upon extensive literature survey, it was revealed that very little data is available for the plant as far as its chemical characterization is concerned.

However, LCC has not fully explored for its chemical arsenal. Furthermore, minimal literature is available in context with its pharmacological properties, especially the anti-bacterial and antiproliferative activity, therefore, demanding a more robust study into the chemical and therapeutic potential of LCC and its bioactive metabolites. Studies had revealed that pharmacological properties exhibited by medicinal plants are mostly due to their secondary metabolites viz. alkaloids, tannins, phenolic compounds, glycosides, saponins, carbohydrates, flavonoids, anthraquinones, triterpenoids, etc. These secondary plant metabolites present in various parts of a plant are considered responsible for free radical scavenging activity, out of which phenolic compounds are the most promising constituents which can be employed for therapeutic use in those disorders involving free radical formation. The preliminary studies done on the root extract of LCC have provided very promising results and it can be explored more for the identification of bioactive and pharmacologically active compounds.

The family Malvaceae comprising of 4225 species, belonging to 243 genera are described to contain many pharmacologically active compounds as; phenolic acids, flavonoids, and polysaccharides. The plant species belonging to this family are distributed worldwide and have been used as a folk remedy for the treatment of skin diseases, as an antifertility agent, anti-inflammatory, antimalarial, antiviral, and antiseptic.

PA and PA N-oxides are toxic plant secondary metabolites present in various plant species and drive off their natural enemies. They are infamous for serious hepatotoxicity, neurotoxicity, neurological damage and usually contaminate the normally consumed foods. They are eminent for their anti-bacterial, anti-microbial activities and also possess beneficial pharmaceutical properties. The medicinal properties of alkaloids like morphine, codeine to quinidine and ergonovine are diverse. Morphine, a potent narcotic is used as a pain-reliever, though its addictive properties bound its usefulness. Codeine, found in the opium poppy, is the methyl ether derivative of morphine and acts as an excellent analgesic that is comparatively non-addictive. Many other alkaloids act as cardiac or respiratory stimulants. Quinidine, which is obtained from plants of the genus *Cinchona*, is used to treat arrhythmias

or irregular rhythms of the heartbeat. Ergonovine is used to reduce uterine haemorrhage after childbirth, and ephedrine is used to relieve the discomfort of common colds, sinusitis, hay fever, and bronchial asthma.

### **Research Objectives:**

The main objective of the research study will be to understand the chemical composition and investigate the presence and isolation of secondary metabolites, PA and other alkaloids in the extracts of LCC. Pyrrolizidines and other alkaloids are well-known for their presence in many medicinal plants which have been traditionally used to cure different ailments ranging from treatment of arthritis, sprains and remedy for coughs. Upon isolation of the bioactive compounds, the study of their biological activity and usage in medicines can be explored. The idea of the research is to identify the secondary metabolites like terpenes, terpenoids, flavonoids, sesqui-terpenes which can be studied for the potential outcome for anti-microbial, anti-oxidant studies so that the plant can be used commercially for pharmaceutical purposes.

### **Methodology and expected results:**

Foremost, the part of the plant will be identified for the study and preparation of different plant extracts. These plant extracts will be analysed for their chemical compositions using the analytical techniques of GC-MS and LC-MS. The data will help in the quantification of the different organic compounds. Later, isolation of the quantified compounds with the help of column chromatography can be carried out. The isolated compounds will then be subjected to NMR studies to understand the molecular structures leading to further characterisation using chromatographic techniques. Once the above procedure is complete, the biological activity can be studied like anti-oxidant activity can be determined using the DHHP radical scavenging activity and nitric oxide scavenging. The anti-microbial activity can be determined using the agar well diffusion method.

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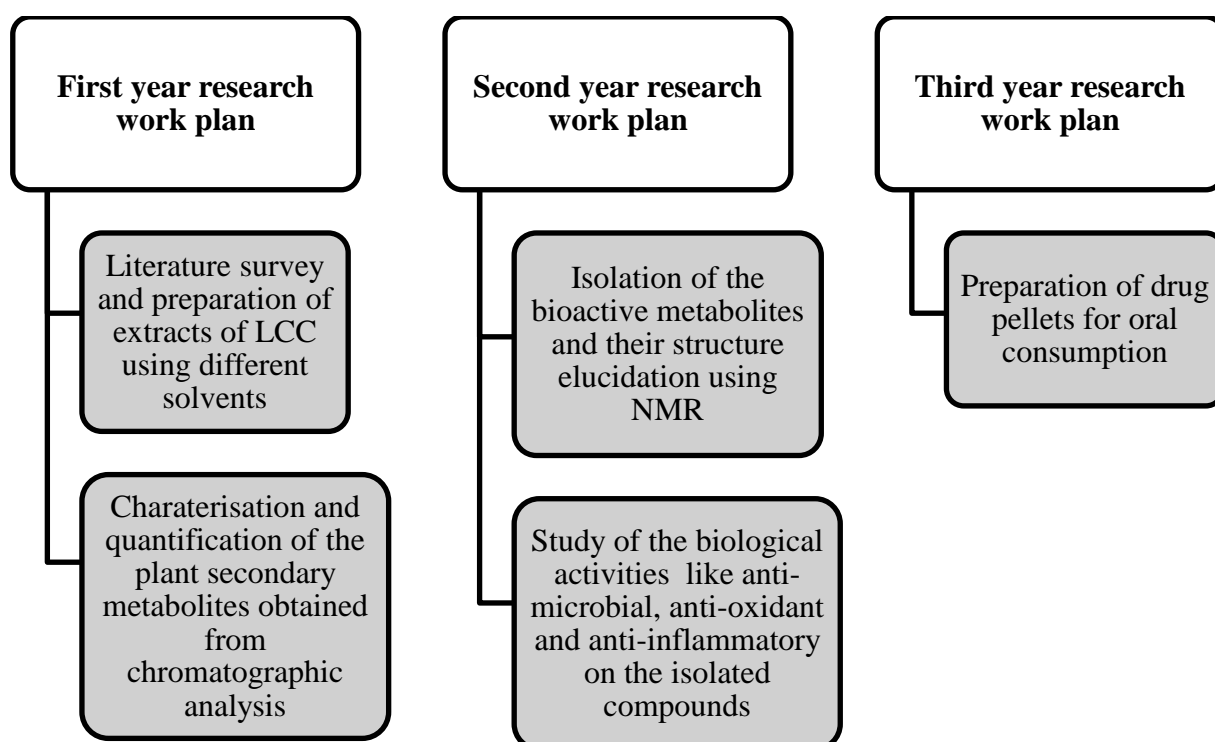
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### **Description of research in 3 year period:**



First year research will involve literature survey, preparation and characterisation of different extracts of LCC. Later, on the quantification of data from different chromatographic techniques e.g. LC and GC-MS we can proceed with the isolation of the secondary plant metabolites and alkaloids. Second year research will involve the characterisation of the isolated compounds through the techniques involving NMR to confirm the isolated compounds and the structure interpretation. It can further lead to the study of biological activities like anti-microbial, anti-inflammatory and their use in medicines. Third year research work will involve preparation of drug pellets for oral consumption.