SUMMARY AND CONCLUSION
Chapter V

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Herbal medicines are promising choice over modern synthetic drugs. They show minimum/no side effects and are considered to be safe. Generally herbal formulations involve the use of fresh or dried plant parts. Right knowledge of such crude drugs is a very important aspect in preparation, safety and efficacy of the herbal product. Pharmacognosy is a simple and reliable tool, by which complete information of a crude drug can be obtained. There is a need for documentation of research work carried out on traditional medicines. With this backdrop, it becomes extremely important to make an effort towards standardization of the plant material to be used as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies. These studies help in identification and authentication of the plant material. Correct identification and quality assurance of the starting materials is an essential pre-requisite to ensure reproducible quality of herbal medicine which will contribute to its safety and efficacy. Simple pharmacognostic techniques used in standardization of plant material include its morphological, anatomical and biochemical characteristics. These standards are of utmost importance not only in finding out genuity, but also in detection of adulterants in marketed drugs.

- The present study includes a systematic Pharmacognostical analysis of some selected species of Fabaceae. Many plants of this family are used in traditional systems of medicine. The present study reports on the pharmacognostical, preliminary phytochemical, Gas Chromatographic screening and antibacterial potentials of Indigofera aspalathoides, Indigofera viscosa, Tephrosia spinosa and Tephrosia villosa. The present study has also developed a suitable protocol for in-
vitro regeneration of *Indigofera aspalathoides*, *Indigofera viscosa*, *Tephrosia spinosa* and *Tephrosia villosa*.

Pharmacognosy

* The morphological description of these four taxa helps in the identification of the plants in the field.

* Microscopical study has highlighted the parameters and helps to resolve botanical identity of the chosen plant specimens. The anatomical study of the four species shows great variation.

* The study of powder microscopy, crystals, starch grains and lignified cells are of indispensible value in the identification of the pure powdered drug.

* The quantitative determinations of some pharmacognostic parameters are useful for setting standards for crude drugs. The physical constant evaluation is an important parameter in detecting adulteration or improper handling of the drug. Various ash values are important to determine the purity of the drug i.e the presence or absence of foreign inorganic matter. The physico – chemical parameters like total ash, acid insoluble ash, water soluble ash, moisture content, extractive values have also been carried out and results are recorded.

* Powdered drug under UV and visible light when treated with different reagents emitted various colour radiations which help in identifying the drug in powder form. In the present study different extracts showed a marked intensity and characteristic colour under UV and visible light.
Phytochemistry

* Preliminary phytochemical analysis of the various extracts of stem, leaf and root powder of all four different plants were performed and the results obtained are presented. Tannins, alkaloids and sugars are dominantly reported in all the chosen plants.

* Biochemical and physiological studies were carried out for carbohydrates, proteins, phenols, tannins, amino acids, lipids and starch using standard methods of analysis. The amount of phytoconstituents are calculated and tabulated.

* Gas Chromatography-Mass Spectrum Analysis was used in this study to identify the compounds present in the plant extract. 38 constituents were identified in *Indigofera aspalathoides* and 23 compounds were identified from the whole plant of *I. viscosa*. A total of 13 compounds and 36 compounds were identified in *Tephrosia spinosa* and *Tephrosia villosa*. Stigmasterol was found in all the chosen species.

Antibacterial studies

* The antibacterial activities of the plant extracts obtained in petroleum ether, benzene, chloroform, methanol and water are studied against ten human pathogenic bacteria. The results are reported on the basis of diameter of the zone of inhibition around each disc (in mm). In the present study, generally all the selected plant extracts show good to moderate antimicrobial activity. Methanol extracts are proven to be most effective against selected bacteria. *Indigofera aspalathodes* exhibits very effective *in-vitro* inhibition than other selected species. Each solvent extract of the plants had its own choice of inhibiting the microbial growth.
The results of the present investigation may inspire further phytochemical probes to isolate the constituents of these species may replace synthetic compound which has therapeutically value.

In-vitro studies

* In-vitro plant regeneration was achieved in *Indigofera aspalathoides, Indigofera viscosa, Tephrosia spinosa* and *Tephrosia villosa* from nodal and shoot tip explants. The explants were cultured on MS medium supplemented with BAP and NAA exhibits maximum regeneration in *Indigofera aspalathoides I. viscosa* and *Tephrosia villosa*. In *Tephrosia spinosa* NAA and Kinetin combination proved to be the most effective treatment for promoting shoot multiplication.

* The nodal explants exhibited a greater number of healthy multiple shoots in *Indigofera viscosa, Tephrosia spinosa* and *Tephrosia villosa*. In *Indigofera aspalathoides* shoot tip explants showed maximum response. The plantlets showed high survival rate in the soil.

* The present study would be beneficial for sustainable utilization of these medicinal plants for their bioactive ingredients, providing an alternate method rather than destroying whole plants, which are not under cultivation.

This study presents a set of diagnostic characters of *Indigofera aspalathoides, Indigofera viscosa, Tephrosia spinosa* and *Tephrosia villosa* that will help to identify the drug in fragmentary condition as well as in whole form. The results of parameters for preliminary phytochemical screening, UV analysis and GC/MS studies can act as biomarkers for identification and authentification of raw drug samples and play an important role in quality control and prevention of adulteration.
Authentication of Indigenous medicinal material is important for ensuring safe and appropriate use of Indian systems of medicines, ensuring therapeutic effectiveness, minimizing unfair trade and raising consumers' confidence towards indigenous medicines. It also plays an important role in the modernization, industrialization and globalization of Indian systems of medicine. For future development, it is necessary to compile a reference library of Indian systems of Medicines with genetic information, especially for endangered species and those with high market value and/or with possible adulterants.

The plants chosen for the present study can be employed as a potential source of useful drugs. Further, ongoing investigations on these plants would provide protocols in order to isolate, identify, characterize and elucidate the structure of the bio active compounds. Bio activity guided chemical studies may yield the relation between the pure compounds and defined biological activities. This will lead to the utilization of these plants in different commercial pharmaceutical products.