Introduction

Ayurveda, the ultimate road to absolute health upholds the doctrine “A sound mind in a sound body,” and works for restoring the equilibrium of the natural bodily fluids to make the body healthy. The source of ayurveda is certainly the deep-rooted Vedic tradition of India, where the sages processed the herbal wealth of nature to answer many enigmas of human ailments. Along with ayurveda, other codified systems such as Sidha, Unani, Amchi etc. make use of the diverse and rich bounty of plants in their pharmaceutical preparations. WHO estimates that 65-85% of the world population are still opting traditional medicines as their primary form of health care due to their high efficacy, wide spread acceptability and easy availability. Besides the codified systems, the non-codified folklore tradition also makes use of plants as their main source of medicine.

Medicinal plants in India have diverse consumers. They include domestic users, traditional physicians, folk healers, ayurvedic drug manufacturing units, pharmacists etc. More than 8000 species of Indian plants belonging to different botanical families are reported to posses medicinal properties (Ved. et al., 2000). This represents more than $1/4^{th}$ of the world's known medicinal plants. In India, about 5000 units with a total annual turn over of about Rs. 2000 crores are engaged in the manufacture of herbal medicine. In Kerala alone, about 500 plants species are commercially used in ayurvedic formulations.

It is interesting to note that 95% of these crude drugs come from the forest source. Almost three-fourth of the extraction of these materials from the forests is done by destructive collection in the form of whole plant, root, reproductive parts
and even bark. Destructive and non-sustainable collection of plant materials coupled with low regeneration and habitat destruction creates a serious threat to very survival of medicinal plants.

Around 200 medicinal plants are estimated to be threatened with extinction either regionally or globally (Nayar and Sastry, 1987-1990). This resulted in banning of trade of about 150 plants by the Ministry of Commerce, Govt. of India.

The crude drugs scenario in India is very unorganised, unsystematic and non sustainable. Majority of the crude drugs are supplied by drug suppliers who procure the material from collectors who in turn collect the plants from wild. Very few plants are commercially cultivated for medicinal use. Regional source variation and lack of efficient transport force the traders to select regional plant substitutes. Besides, lack of knowledge on post harvest technology also creates a lot of problems in drug marketing. The present day commercial harvesters too are not trained traditional practitioners but are the rural folk collecting plants for their livelihood. Above all the collectors as well as the crude drug sellers are generally ignorant about the botanical identity of the medicinal plants, often resulting in unintentional adulteration. Multilingual identity of the plants and its several vernacular synonyms further add to the confusion. In India there are about 100,000 vernacular names, corresponding to around 35,000 botanical names. In both the oral and written medical traditions, plant names do not have a one to one correspondence to a single or unique species. The ancient treatises of the traditional systems are written in Sanskrit. The parameters selected for the nomenclature of Sanskrit names are habitat, habit, properties etc, and plants having
identical parameters among these have named accordingly. As a result there are several Sanskrit synonyms for one plant E.g. *Plumbago indica* is known by the Sanskrit name *Chitraka, Dahanah, Agni*, etc and more than one medicinal plant is equated to the same name of the drug. E.g. *Pashanabheda* refer to *Berginia ciliata, Didymocarpus pedicellatus, Coleus ambonicus, Aerva lanata, Aerva javanica, Ammania baccifera, Bryophyllum calycinum, Homonia riparia, and Rotula aquatica*.

As far as the drug manufacturing in the state of Kerala is concerned, most of the raw drug suppliers are from northern states of the country. Out of the 500 drugs used in ayurvedic formulations, less than 200 only are procured from the state. The materials brought from northern states fetch a higher price. This often results in the supply of substandard materials. Certain plants are available only in the northern parts of the country and hence cannot be collected from the state. But their substitute may be found in the state. For example, *Swertia chiretta*, the genuine source of *bhumimba* is a north Indian drug. But its equally effective substitute *Andrographis paniculata* is prevalent in central Kerala. But ayurvedic pharmaceutical companies and physicians still continue to use *Swertia chiretta* in formulations.

The global demand for natural products in health care and cosmetic preparation is increasing day by day. Kerala has tremendous potential for commercial cultivation of medicinal plants because of the natural advantage of varying agro climatic zones, biodiversity and the availability of developed agronomic practices. A preliminary analysis has shown that out of the 627 plant drugs, which are being traded in India, only 70 species are at present purely under
cultivation (Anjana and Oommen 1998). These include plants like *Coriandrum sativum* Linn., *Allium sativum* Linn, *Curcuma longa* Linn, *Zingiber officinale* Rosc., etc which are otherwise used as spices or condiments in our daily use. The remaining 557 odd species are found in

1) Partially cultivated or wild state
2) Purely wild state or
3) Purely exotic in origin

Agro technology is available for only 20% of the plants referred in the first category. Of these, very few are under large-scale cultivation and that too in certain pockets of our country. E.g.

*Gloriosa superba* Linn. in Tamilnadu, *Mucuna pruriens* (Linn) DC in Maharashtra, and *Plantago ovata* Forsk, in Gujarat. Cultivation practices of most of these plants are often incomplete. Even propagation methods are not available for majority of the plants mentioned in this category.

All these aspects clearly show that the need of the hour is supply oriented research studies together with promotion, conservation and cultivation of endangered plants. This is absolutely necessary to ensure uninterrupted supply of genuine raw materials at a reasonable price to the pharmaceutical industry. Above all, this will surely keep alive the hopes of millions of people of our country, who depend on this safe alternative system of medicine.

Non-availability of some of these cultivatable herbals prompted to undertake the present project. The details of study on survey, collection,
conservation and standardization of agro techniques carried out during the last 5½ years are presented in this thesis in the following four chapters.
PART-I

Survey, collection and conservation of important medicinal plants in South India.

The plant source of various drugs in the wild is diminishing day-by-day. Surveys were conducted during the project period to locate and collect such plants. Collected plants were duly identified and conserved as dry specimens in herbarium as well as living specimens in the herbal garden of Kerala Ayurveda Pharmacy Ltd. Nedumbassery (KAPL). This herbal garden is regularly consulted by students and research scholars. More than that it gives awareness to the public regarding the domestic as well as commercial use of this herbal wealth.

PART-II

Performance appraisal of selected medicinal plants under Kerala conditions.

Selected medicinal plants which are not commercially cultivated in Kerala, but used in large quantities by most of the ayurvedic drug-manufacturing units were introduced to the herbal farm of KAPL at Nedumbassery. Their adaptability, growth pattern and yield were regularly monitored to find out the feasibility of commercial cultivation of these plants under the climatic conditions of Kerala. Studies of the following 9 plants were carried out during the project period.

a) Aloe barbedensis Mill
b) Anisomeles malabarica (Linn) R.Br.
c) Alpinia calcarata Rosc.
d) Bacopa monnieri (L.) Pennel,
**turpethum** is a recently introduced plant to Kerala. *Holostemma adakodien* is a high value medicinal plant and there is great threat to the seasonal availability of genuine raw material. Besides its therapeutic value, *Indigofera tinctoria* is the major colour-imparting ingredient of the classical preparation, *Neelabhringadi thailam* where the fresh leaf juice is used. So its timely availability is crucial.

*Adhatoda sp., Acorus calamus, Piper longum* Linn., *P.chaba* Hunt. and *Wedelia chinensis* are a few important medicinal plants which are to be cultivated in Kerala successfully. The three exotic plants - *Mentha arvensis, Ruta chalepensis* and *Pogostemon patchouli* are recently introduced to Kerala but offer wide scope for large scale cultivation in the state.

**PART-IV**

**Phytochemical studies on rasna**

*Rasna* is a highly controversial drug having wide therapeutic application as an anti rheumatic and anti arthritic drug. The selection of *rasna* in different formulations is purely governed by commercial consideration rather than efficacy. An attempt is made in this chapter to rank 5 different *rasna* drugs on the basis of the content of methyl cinnamate, a compound which shows marked therapeutic properties.

Studies in these lines are presented in the thesis under the following headings.

a) Introduction

b) Review of literature

c) Materials and methods

d) Result and discussion
PART-III

Standardisation of Agrotechnique of selected medicinal plants

This chapter deals with studies on standardization of agrotechniques for the following.

a) Adhatoda zeylanica Medicus, A. beddomei C.B.Clark and Manjapra eco-type
b) Acorus calamus Linn.
c) Holostemma adakodien Schultes
d) Indigofera tinctoria Linn.
e) Mentha arvensis Linn.
f) Operculina turpethum Silva Manso
g) Piper longum Linn. & P.chaba Hunt.
h) Pogostemon patchouli Pellet
i) Ruta chalepensis Linn.
j) Wedelia chinensis (Osbeck) Merrill

Of the 9 plants whose performance under Kerala conditions was studied in the first chapter, Aloe barbedensis and Anisomeles malabarica are found in wild in the state of Tamilnadu. Alpinia calcarata, Bacopa monnieri and Kaempferia rotunda are indigenous to Kerala, and are abundant in the wild. Operculina
e) Summary and Conclusion

f) References

REVIEW OF LITERATURE