Chapter - I

INTRODUCTION
CHAPTER - I

INTRODUCTION

The success of the drug discovery process is often a function of the diversity of chemotypes examined. Natural products screening represents a potential source of organic chemicals of unparallel diversity. The screening of natural products is one of the earliest steps in drug discovery—Lead identification. A lead compound, also frequently referred to as a chemical template, is a compound with many of the characteristics of a desired new drug which will be used as a model for chemical modification, but which lacks either the potency or specificity expected of a product candidate. Historically, medicinal plants and microorganisms have been extraordinarily rich sources of medicinally and agriculturally useful compounds. Interest in these sources of new bioactive molecules continues to present time.

Medicinal plants comprise a group of large number of plant species that produce raw material for pharmaceuticals and phyto-chemicals for manufacturing drugs. In the commercial market, medicinal herbs are used as raw drugs, extracts or tinctures. The World Health Organization (WHO) estimates that up to 80% of the world population rely on plants for their primary health care. The international medicinal plants market is worth US $60 billion per year, and growing at the rate of 7% per annum (Bhojvaid, 2003). Plants have contributed more than 7,000 different compounds in use as heart drugs, laxatives, diuretics, antibiotics, decongestants, analgesics, anesthetics, ulcer treatments anti-parasitic compounds and so on (Ved et al., 1998). For the last few decades, phytochemistry (study of plants) has been making rapid progress and herbal products are
becoming popular. A complete understanding of medicinal plants involves a number of disciplines including commerce, botany, horticulture, chemistry, enzymology, genetics, quality control and pharmacology. The number of medicinal plants in India, both indigenous and introduced, has been variously put at between 3,000 to 3,500 species of higher plants (Asolkar et. al. 1992; Chopra et. al., 1956, 1974). Sixteen medicinal plants of exotic origin, introduced in India from time to time, are under cultivation and are now considered a part of the Indian medicinal plant resources (Sarin, 2003).

Exploitation of already existing variability in available germplasm is very important to identify superior genotype for local condition. Studies on the extent of variation in yield and quality characters of medicinal plants are important for selection of genotype with higher yield and better quality. Though wide genetic variability exist with regard to the growth, yield and quality, not much work seems to have been done on crop improvement through the selection of superior types with high yield and better quality. The present investigation was undertaken to evaluate the performance of different turmeric (Curcuma) and musli (Chlorophytum) genotypes with regard to their growth, yield and quality with a view to identify the superior types with high yield and high metabolite content.

Cultivars are generally distinguished on the basis of morphological features only. Such features are not very distinct and some times quite variable, but have to be used by farmers for basic identification of the planted material. In order to clarify the numerous ambiguities of cultivars identification and classification researchers tried to characterize cultivars on the basis of DNA profile. Recently developed DNA based marker system offers a more reliable and environmentally neutral alternative to detect genetic
polymorphism useful for cultivars identification. Among the various DNA marker techniques currently available RAPD (Random Amplified Polymorphic DNA) technique is most popular because of its speed, low cost and necessity of only minute amount of plant material (Asemota et al, 1996). In the present study we used the RAPD approach to detect genetic variability and relatedness among the different accessions of turmeric and musli.

A medicinal herb can be compared with a chemical factory due to presence of number of chemical constituents like alkaloids, glycosides, saponins, resins, oleoresins, sesquiterpene lactones and oils (essential and fixed). With introduction of sophisticated techniques, the scientists started exploring the plant flora for active constituents. The concept of standardization has great impact on quality of herbal products. Standardization helps in adjusting the herbal drug formulation to a defined content of a constituent or constituents with therapeutic activity. In the present study we analyzed and quantified the curcuminoids and saponin from turmeric (Curcuma) and musli (Chlorophyllum) respectively for identification of best quality genotype.

The biotechnological research is multidisciplinary and acquires expertise of different areas. Research consists of characterization and testing of different proveniences and genotypes, development of suitable multiplication methods for plants, plant cells or tissues, either in the field, in micro propagation conditions or in bioreactors. The techniques of plant tissue culture offers means for mass multiplication, for biomass energy production as well as for the conservation of important, elite and rare species that are threatened in nature with danger of extinction (Jang et al., 2003). Plant tissue culture techniques are now being used also for monitoring of their secondary metabolites. The
production of secondary metabolites by tissue culture has commercial potential as well as being useful in studying the biosynthesis and regulation of secondary products. The potential of plant tissue culture both source of high value chemicals and as a system for studying secondary metabolism has not yet been exploited (Holden et al., 1987). *Curcuma* (Haldi) and *Chlorophtum* (Safed musli) are two endangered and rare medicinal plants of this state have been selected for in-vitro regeneration.

Turmeric is used as traditional medicine in many countries because of the antibiotic and antiseptic effects of curcumin, an important constituent of turmeric. A yellow-pigmented fraction isolated from the rhizomes of *Curcuma* contains curcuminoids belonging to the dicinnamoyl methane group. Curcuminoids are present to the extent of 3 - 5% (http://www.Curcuminoid.com). It is an important active ingredient responsible for the biological activity of *Curcuma*. Though the major activity is anti inflammatory, it has also been reported to possess antioxidant, anti allergic, wound healing, anti bacterial, anti fungal and anti tumor activity (Chattopadhyay et al., 2004).

Safed Musli (*Chlorophytum*) is a medicinal plant that grows in dense forests. It belongs to Liliaceae, a family of 175 species distributed all over the world. Among the 13 species found in India, Safed Musli (*Chlorophytum bioviriilium*) has market potential (Borodia et al., 1995). Safed Musli is a medicinal plant used to overcome general and sexual weakness. It is a well-known ayurvedic medicine rich in alkaloids, vitamins, minerals, protein, carbohydrate, steroids and polysaccharides. Owing to its enormous uses, its worldwide demand is estimated to be 35000 tones annually as compared to current annual production of 5000 ton (Udhyamita samachar patra, 1998). Dried roots of *Chlorophytum* contain 42% carbohydrate, 8-9% protein, 3-4% fiber and 2-17% saponin
Research studies on Chlorophytum conducted in India and elsewhere indicate that saponins are responsible for medicinal properties (Arora et al., 1999). The plant yields a flavonone glycoside, which is a powerful uterine stimulant. Mainly, Saponins are natural surfactants, or detergents, found in many plants.

With the increasing population, coupled with the shrinking of genetic diversity in traditional farming systems and reduction in the area of prime land available for agri-horticultural crops, there is emergent need for better utilization of plant genetic resources including lesser known or underutilized plant species like Curcuma and Chlorophytum through critical characterization and evaluation of existing biodiversity. Considering above facts, the present investigation was designed with the following major objectives:

- Evaluation and characterization of Curcuma and Chlorophytum germplasm for morpho-agronomic attributes.
- Molecular characterization and assessment of molecular diversity.
- Biochemical characterization, evaluation and value addition.
- Use of biotechnological techniques for enhancement of medicinal property of these species.