CHAPTER 1

Introduction

Ammi majus L.  Psoralea corylifolia L.
1. INTRODUCTION

"Eat leeks in March and wild garlic in May,
And all the year after the physicians may play."
Traditional Welsh rhyme

"An apple a day keeps the doctor away."
Traditional American rhyme

Medicinal plants, since time immemorial, have been used in virtually all human cultures as a source of medicine. The widespread use of herbal remedies and healthcare preparations obtained is described in the ancient text such as the Vedas and the Bible. Hippocrates, in the late fifth century B.C., mentioned 300 to 400 medicinal plants (Schultes, 1978). In the first century A.D., Dioscorides wrote De Materia Medica, a medicinal plant catalog, which became the prototype for modern pharmacopoeias. The Bible offers descriptions of approximately 30 healing plants. The fall of ancient civilizations forestalled Western advances in the understanding of medicinal plants, with much of the documentation of plant pharmaceuticals being destroyed or lost (Stockwell, 1988). During the Dark Ages, the Arab world continued to excavate their own older works and to build upon them. Of course, Asian cultures were also busy compiling their own pharmacopoeia. In the West, the Renaissance years saw a revival of ancient medicine, which was built largely on medicinal plants. The use of plant extracts, as well as other alternative forms of medical treatments, is enjoying great popularity in the late 1990s. Earlier in this decade, approximately one-third of people surveyed in the United States used at least one "unconventional" therapy during the previous year (Eisenberg, 1993).

Some plants that induce photosensitization of human skin have been used for the treatment of vitiligo for a long time. Vitiligo is more commonly known as leucoderma, which simply means white (leuco) skin (derma) i.e. a skin disorder where skin loses its normal colouration. It is also medically known as achromia, which means loss of colour. Basically vitiligo can hardly be called a disease, but a skin disorder that has more social than medical significance, especially amongst the dark skin people. Due to retorted melanin formation, there is loss of pigmentation. The vitiligo sufferers are observed all over the world including the white skin communities. However, epidemiologically most cases (8.8%) are recorded in India and Mexico. Males and females are affected equally inclusive of children age group. It may begin at any age. Childhood vitiligo is, however,
not in common. Vitiligo affects all races. Its incidence in the world population varies from 0.14 to 3.2%. It is about 1% in Egypt, 1.64% in Japan, about 3% in India, 0.14% in Russia, while 0.39% in Switzerland and about 1% in the USA. References to this disease are also found in Bible. Vitiligo has also been referred in Quran (3:49, 5:113) as 'Bohak' and 'Baras'. Common terms for vitiligo are 'white spot' or white patches, "sufed dagh", Phuleri, Pandra Vorh etc. Ancient Chinese literature mentions about the use pu-ku-c (Psoralea corylifolia). In the thirteenth century Ibn El Batar in Egypt treated vitiligo with the extract from the plant known as *Ammi majus.* As early as 2000 B.C. in Egypt, the juice of *Ammi majus* (Umbelliferae), false Bishop's Weed, which grows throughout the Nile River valley as a weed, was rubbed on patches of vitiligo after which patients were encouraged to lie in the sun. Even today, Egyptian herbalists sell Atrial, a yellowish-brown powder made from *Ammi majus* seeds for the treatment of leucoderma. The boiled extract of leaves, seeds and roots of *Psoralea corylifolia* are used in Indian medicine to treat this disease. Both the plants produce furocoumarins that are used in the treatment of vitiligo.

Furocoumarins, which naturally occur in plants, have been shown to be responsible for their photoreactive properties (Lagey *et al.*, 1995). They are well known for their ability to induce the production of photodermatitis (Zobel and Brown, 1990), and are used to treat psoriasis and vitiligo by photochemotherapy plus ultraviolet A radiation (PUVA therapy) (Roelandts, 1984; Hoenigsmann *et al.*, 1987; Bruneton, 1993). Furocoumarins have been mainly described in four plant families, the Rutaceae, Moraceae, Apiaceae and Fabaceae (Bourgaud *et al.*, 1989). In plants, these molecules are produced as phytoalexins against herbivores (Diwara *et al.*, 1993) or pathogen (Fowls *et al.*, 1958, Towers *et al.*, 1987). Furocoumarins also have other biological activities that may lead to development of treatments for certain cutaneous lymphomas and multiple sclerosis (Bohushaviski *et al.*, 1994; Wulff *et al.*, 1998).

*Ammi majus* L. (Atrial) of family Apiaceae contains four main linear furocoumarins: xanthotoxin (8-MOP), bergapten (5-MOP), isopimpinelin and imperatorin. *Psoralea corylifolia* L. (Babchi) of family Fabaceae contains psoralen and isopsoralen. Xanthotoxin and Psoralen appears to be most promising molecule from the pharmacological point of view (Wall *et al.*, 1988; Hamerski *et al.*, 1990; Rangari *et al.*, 1992; Miura *et al.*, 1996; Singab, 1998; Hurauchi *et al.*, 2000; Pande *et al.*, 2002). It has been reported in other furocoumarins containing plants like *Ruta graveolens* that the content and nature of furocoumarins depends upon phenology and phytonutrients (Nitrogen, Potassium, Phosphorous and Sulfur) (Zobel *et al.*, 1991a, 1991b, 1994a, 1994b;
Chapters 1

INTRODUCTION

Ekiert and Gomolka, 1998; Eilert, 1989; Hahlbrock and Scheel, 1989; Bourgault et al., 1992). It has been reported by several researchers that the plant natural products vary in different parts of plant at various phenological stages (Bos et al., 1998; Palomino et al., 1997; Menkovic et al., 2000; Liu et al., 1998; Wallart et al., 2000; Ferreira et al., 1995). Hence concentration and yield of these compounds can be enhanced by using suitable combination and appropriate doses of phytonutrients and harvesting the plant at appropriate phenological stage at which these compounds accumulate maximum. The information related with the cultivation and harvesting of both *Ammi majus* and *Psoralea corylifolia* plants for the optimal production of furocoumarins is meagre. Taking this fact into consideration, the present study was, therefore, aimed to assess the response of *Ammi majus* and *Psoralea corylifolia* to phenology and phytonutrients (N, P, K and S) with respect to their medicinal quality and economic yield.

The following were the major objectives:

(i) To study the organ-specificity (stem, leaf, seed and straw after harvest) of the active ingredients of *Ammi majus* and *Psoralea corylifolia* at various phenological stages (Vegetative, Pre-flowering, Flowering and Post-flowering).

(ii) To study the impact of phytonutrients on the concentration of active ingredients and yield in these herbs.