CHAPTER VII

RESULT AND DISCUSSION

Fungal infections comprise an important faction of diseases occurring not only in plants and animals but also in human beings. Moulds and yeasts are so widely distributed in human environment that human beings are instantly exposed to them. Fortunately, because of the relative resistance of human beings and comparatively non pathogenic nature of fungi, most of these exposures do not lead to over infection. However, fungi are gaining importance with respect to increased incidence of chronic, often fatal, mycoses in immunocompromised patients (De Hoog et al. 2000).
Infact, fungal vitality and human defense are more or less in balance, but when innate cellular immunity becomes impaired the balance shifts towards fungal advantage and development of fungal diseases may take place. Such fungal agents are referred to as opportunity.

A number of microbes amongst the normal microbial flora, including Canadida and related yeasts are endogenous opportunists. The fungi present in soil, water and air constitute exogenous fungal opportunists. The roster of opportunistic fungal species continues to increase. However, some of the common ones include *Candida albicans*, *Torulopsis glabrata*, *Cryptococcus neoformis*, *Aspergillus fumigates*, *A. niger*, *A. terreus*, *A. flavus*, *Rhizomucor*, *Rhizopus*, *Absidia*, *Cunningharmella* and *Mucor* (Singh, 1976)

To find suitable drug for the management of fungal diseases is difficult because fungi, like human beings, are eukaryotes. Many of the cellular and molecular processes are similar, and still a number of chemicals are reported to have antifungal activity. These include the derivatives of quinazolinone (Farghaly and Moharram, 2000), coumarin (Hankare et al., 2002), thiazolidinone (Datta et al., 2002); thiadiazole (Yu et al., 2001), Thiazole (Jag, 2000), Pyridine (Bhatt et al., 2001) and Sydnone (Bekhit et al., 2002).
However, increasing roster of opportunistic fungi and increasing resistance developing in the fungal strains against prevailing antifungal agents, as well as increasing recognition of the adverse side effects of chemicals has induced the scientists to search for better alternatives. Though the healing power of plants are well known since ancient times, the use of plant derivatives as antimicrobials was less popular since the advent of antibiotics in 1950’s, but due to several side effects and limitations of antibiotics, the use of plant extracts is gaining greater popularity since late 1990’s (Cowan, 1999). In 1996, the sales of botanical medicinal increased by 37% over 1995 (Ktink, 1997).

Plants are known to contain several classes of Secondary metabolites with diverse biological activity. Flavonoid constitute a group of important plant secondary metabolites. After the discovery of phytolexin properties of Flavanoids and so flavonoids several investigations have been carried out to evaluate the antimicrobial potential of these compounds (Ramachandraiah and Reddy, 1991).

Subramani et al. (2004) studied antifungal activity of six flavonol glycosides and two phenolic acids isolated from Canthium sp. of Rubiaceae. They took three species of Canthium viz. Canthium diococcum, Canthium parvisorum, Canthium rheedii. They concluded that phenolic acids are more toxic than the flavonoids. Among the various flavoroids flavonol diglycosiders are more toxic than flavamol monogly.
germination found in 100 μg/ml concentration of Canthium extract.

Herbal medicine, some time referred as Herbalism or Botanical medicine, is the use of herbs for their therapeutic or medicinal value. An herb is a plant or plant part valued for its medicinal aromatic or savory qualities. Herb plants produce and contain a variety of chemical substances that act upon the body to cure fungal and bacterial diseases.

Medicinal plants are the oldest form of health care known to mankind. Herbs had been used by an people in remote past. It was an integral part of the development of modern civilization. Primitive man observed and used large number of medicinal plants available to him. Much of the medicinal plants use seems to have been developed through observations of wild animals and by trial and error method. As time went on, each tribe added the medicinal power of plants. They methodically collected information on herbs and developed well defined herbal pharmacopoeias. Indeed well into the 20th century much of the pharmacopoeia as scientific medicine was derived from the herbals of local area. Many drugs commonly used are as plant origin.

In fact about 25 per cent of the prescription drug used all over the world contains at least one active ingredient derived from medicinal plants. Some are made from plant extracts, others are
synthesized to mimic a natural plant compound (Parihar and Bohra, 2004).

Plants have been a valuable source of natural products for maintaining human health. According to world Health Organization medicinal plants would be source to obtain a variety of drugs.

The medicinal value of plant drug is due to the presence of some chemical compounds in them, such as alcoloids, glycosides, essential oil, resin, gums and mucilage etc. The indigenous system of medicine namely Ayurvedic, Siddha and Unani have been in existence for several centuries. This system of medicine fulfills needs to nearly 70 per cent of our population in the village. Various Govt. and non govt. organization and individuals take up their cultivation and conservation, in view of their pharmaceutical and economic potential (Srivastava and Bohra, 2005).

Infact, plants have unlimited ability to synthesize aromatic substances, which can help in the treatment of diseases. A long list of more important plants with established antimicrobial activity has been given by Cowan (1999). The antimicrobial phytochemicals include phenolics and polyphenols, terpenoids and essential oils, alkaloids, lactanes and other compounds.

The medicinal importance of plant products is well known to man from the ancient times. Many plants possess substances of fungistatic or fungicidal nature. There are 50,000 valid species of
Fungi but only 50 to 100 are generally recognized as known to cause pathogenic diseases to human beings. Dermatophytes are known to cause superficial skin infections like ring worm. Tinea capitis tiner corporis etc in man, animal and birds.

Hippocrates in the alter fifth century mentioned 300-400 medicinal plants (Schultes, 1978). However, the fall of ancient civilization led to the loss of documentation of plant pharmaceuticals (Stockwell, 1988). However, renewed interest in science led to the establishment of more and more plants as resources of medicinal value. There are innumerable reports with respect to the antimicrobial activity of plants and it is not possible to site all these in a single cover.

India is blessed with enormous vegetation wealth. A great variety of climate and soils are found in our country. The natural plant wealth in addition to being the immense sources of food, fibers and shelter might become invaluable source of medicinal plants including that effective against the micro organisms causing a number of diseases in human beings. As already discussed, a number of these plants and their parts have been worked out for their antimicrobial potential. However, there is enough scope for further investigations in this direction. Therefore, it is proposed.

Considering the rich diversity of Indian medicinal plants it is expected that screening and scientific evaluation of certain medicinal plant extracts of Meerut and Himalaya for their
antifungal substances may be worked out in order to benefit human beings.

The present investigations are being carried out to evaluate the antifungal medicinal properties of some higher plant and some lower plants against the pathogenic fungi viz. Aspergillus niger, Candida albicans and Torulopsis globerata.

Thus, based on above light present investigation were done to control opportunistic fungi with the help of selected 4 Medicinal plant extract.

Therefore, in the present thesis following plan of work done:

1. A large number of angiospermic plants and one fern Cheilanthes albomarginata. Collected from different places of Meerut as well as from hills of Garhwal Himalaya. A list of plant family wise given in the present work.

2. Review of literature surveyed till date related to antimicrobial property and antifungal property.

3. Effect of alcoholic extract of 4 Medicinal plants selected from plains as well as hills have been used to control the radial growth of 3 opportunistic fungi attacking human beings.

4. Effect of aqueous extracts of 4 Medicinal plants collected from plains as well as hills are also observed on the radial growth of three opportunistic fungi popular as human pathogen.
In our present study four selected Medicinal plants are –

1. Calatropis procera of Asclepiadaceae
2. Dhatura metel of Solanaceae
3. Ocimum basilicum of Lamiaceae

Likewise, the effect of alcoholic and aquous extracts of various parts of above 4 plants studied to control the radial growth of three opportunistic fungi acting as human pathogen.

1. Aspergillus niger
2. Candida albicans
3. Torulopsis globerata

Results of our above study are discussed in the light of following lines.

Our above studies can be correlated with the following work done in the field of plant sciences.

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
<th>REFERENCE(S)</th>
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<tbody>
<tr>
<td>Apple</td>
<td>Malus sylvestris</td>
<td>Hunter &amp; Hull (1993)</td>
</tr>
<tr>
<td>Bael tree</td>
<td>Aegle marmelos</td>
<td>Rana et al. (1997)</td>
</tr>
<tr>
<td>Black pepper</td>
<td>Piper nigrum</td>
<td>Ghoshal et al. (1996)</td>
</tr>
<tr>
<td>Caraway</td>
<td>Carum carvi</td>
<td>Hamburger &amp; Hostettmann (1996)</td>
</tr>
<tr>
<td>Cashew</td>
<td>Anacardium pulsatilla</td>
<td>HIJMEJMA &amp; Kubo (1991)</td>
</tr>
<tr>
<td>Garlic</td>
<td>Allium sativum</td>
<td>Naganawa et al. (1996)</td>
</tr>
<tr>
<td>Grapefruit peel</td>
<td>Citrus paradise</td>
<td>Stange et al. (1993)</td>
</tr>
<tr>
<td>Olive Oil</td>
<td>Olea europaea</td>
<td>Kubo et al. (1995)</td>
</tr>
<tr>
<td>Orange peel</td>
<td>Citrus sinensis</td>
<td>Stange et al. (1993)</td>
</tr>
<tr>
<td>Papaya</td>
<td>Carica papaya</td>
<td>Satrija et al. (1995)</td>
</tr>
<tr>
<td>Savory</td>
<td>Satureja Montana</td>
<td>Ali Shtayeh et al. (1997)</td>
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Thus, our review of literature in the field of human pathogens matches with the plant pathogen studies.

Our results with alcoholic extract concentration of above plant shows that alcoholic extract of all the selected plant is inhibitory for the radial growth of opportunistic fungi. Our these observation matches with the work done by Sandhu and Arora (2000), Pariher and Buhra (2003); Singh and Walia (2003).


Thus, the present study clearly shows that antifungal properties present in plant part extracts.