Chapter - I

Introduction
1. INTRODUCTION

Hydrophilous plants possess unique morphological and anatomical features. These features include thin and/or dissected waxy leaves, poorly developed mechanical tissue, presence of large air cavities etc. But information on the occurrence of unique features, if any, in reproductive structures is very scanty. This situation is largely because researchers are fond of investigating developmental aspects of reproductive structures only in a few families of angiosperms, specially in Liliaceae, Poaceae and Fabaceae. The negligence towards other families, specially hydrophilous plants, is also because of the attitudes of researchers that the developmental aspects of reproductive structures are same in all angiosperm plants.

Most of the literature on hydrophilous plants is concerned about floral construction, with special reference to stylar conditions and pollination (Barrett, 1980; Barrett and Harder, 1992). Another aspect well studied in hydrophilous plants is structure of pollen exine and its relation to pollination (Pettitt and Jermy, 1975; Takahashi, 1994).
Study of reproductive structures is now in its heyday due to the general progress in natural science. The current investigation is encompassing complicated morphogenetic processes and abnormalities involved in the development of reproductive structures. Instead of remaining a purely morphological branch of science, reproductive biology is nowadays acquiring the features of morphophysiological and ecomorphological science. Morphogenetic and morphophysiological correlations determining normal development of the reproductive structures cannot be established without investigating plant-environment interactions which change during ontogenesis.

Elaboration of theoretic foundations of sexual reproduction is one of the objectives of reproductive biology. Reproductive biology involves studies of various interrelated stages of ontogenesis. The development of reproductive biology is especially important for the introduction and repatriation of rare and endangered plants, as well as of plants of agricultural importance. Although Potamogeton richardsonii and Eichhornia crassipes does not belong to the category of above, they are chosen for present study because detailed work on reproductive biology has not been performed on these, especially
application of modern methods, such as histochemistry. All the foregoing prompted preparation of this thesis on "Microsporogenesis and Gametogenesis in some members of Hydrophytes - a Histochemical study."

AIM AND SCOPE OF THE PRESENT WORK

The development of anther is controlled by coordinated expression of genes in space and time. Different developmental stimuli and positional information also play role in the determination of cell fate and tissue formation. At cellular level also cells and tissues reflect their functional potential through their cytoplasmic contents. In situ localization of histochemical substances in developing anther tissues helps to understand the changes in their dynamism which result in their reorganization and modification of functions. Histochemistry also helps in understanding the dynamics of the relationship between diploid sporophytic and haploid gametophytic tissues.

The focus of this study is to characterize the anther tissues histochemically during their ontogeny. This enables to gauge the functional status of different anther tissues. The author is aware of
the limitations of histochemical techniques. The important limitation is availability of staining procedures for some vital biochemical components that play significant role in growth and development. In this regard, biochemical techniques have an edge over histochemical techniques. By employing biochemical procedure many more soluble and insoluble components, that cannot be assessed by histochemical techniques, can be analyzed. But, by biochemical technique it is not possible to study in situ localization of substances. Therefore, histochemical techniques, despite their limitations mentioned earlier, provide better understanding of the physiological changes that occur in tissues.

For the present study *Potamogeton richardsonii* and *Eichhornia crassipes* are chosen for the following reasons.

1. By and large, studies on microsporogenesis have been neglected in hydrophilous plants.

2. Till this date, histochemical studies on developing anthers in these plants are not made.

3. To ascertain unique features during microsporogenesis and gametogenesis, if any, in these plants.
The main objective of the present study is to provide a comprehensive account on microsporogenesis by using the result of present study in the background of hypotheses and conceptions advanced by other workers. In this way it is an attempt to bring information on microsporogenesis studied from different perspectives.

In the present qualitative histochemical study, in situ localization of insoluble polysaccharides, callose, ascorbic acid, RNA and total proteins are carried out for two reasons. The first and foremost reason is these histochemical substances are vital for growth and development (Sawhney and Rastogi., 1990; Kaul and Sudha, 1990). Deficiency in these substances is known to cause a deleterious effect on normal growth and development of the anther. The second reason is the procedures for the localization of these histochemical substances are well established and dependable. The terminologies used in the text, such as ‘rich’ ‘weak’ etc do not indicate the absolute quantity of the histochemical substance. These terminologies reflect the staining intensity, which is directly proportional to the quantity of the substance present in sections. Therefore, uniformity is maintained in the thickness of sections in all preparations so that the differences in staining intensity reflect quantitative differences.