CHAPTER 1

AN INTRODUCTION TO THE THESIS

"The most important discoveries of the laws, methods, and progress of Nature have nearly always sprung from the examination of the smallest objects which she contains." (J. B. Lamarck—1809).

Algae, the cute little creatures would therefore, give us important clue to understand the intricacy of metabolism.

This thesis is a small effort to understand how algae manage their amino acid metabolism.
Algae have been used as an experimental material to understand many complex metabolic pathways. We owe our present knowledge on photosynthesis largely due to results obtained through experiments on Chlorella, Scenedesmus and Anacystis. Their minute size, rapid rate of growth, plasticity, and ease with which they can be handled in experiments contribute towards their qualifications to be used for physiological investigation.

There is not a single group of organisms such as algae in the entire living kingdom where one would get varieties of pigment systems, varieties of ways to obtain nutrition, varieties of habitats and with great variations in stages of life cycles. Taxonomic heterogeneity of algae is also unique in plant kingdom.

Blue green algae the procaryotes and green algae the eucaryotes show great similarity in their thallus organizations and habitats and yet their cell organizations are fundamentally different. It is the cell organization which has ultimate say in the metabolism. It is therefore, that we choose to study aminoacid metabolism in a few members of blue green algae and green algae.
Algae involved in this investigation are species of Oscillatoria, Microcystis, and Anabaena (all blue greens) Chlamydomonas, Chlorella, Pithophora, Ulva and Enteromorpha (all greens). They belong to different taxonomic orders.

Scope of the present investigation:

After about one year of rigorous experimentations and study of references in literature we were able to grow many cultures of these algae. As mentioned in the beginning of this chapter, to grow and maintain algal culture in pure form is rather a laborious task. After trial and error we were able to standardize methods of cultivating algae in batch cultures. These methods are described in Chapter II.

Chapter III includes the account of methods adopted for estimation of amino acids. Paper chromatography is the easiest tool to estimate amino acids in plant tissues. But the standardization of chromatographic technique and to obtain separation of amino acids for the purpose of quantitative estimation is again a time consuming work. Chromatographic work was repeatedly carried out until constant and satisfactory results were obtained. Account in Chapter III is a final theme of many
preparatory experiments. As soon as the chromatograms were ready the spots on them were marked out and they were photographed at earliest opportunity. Many a time it was not possible to photograph chromatograms immediately and hence spots can be represented by pencil marks only. Chromatograms of algae are depicted in plates 1-8.

Chapter IV embodies the account of uptake of $^{14}$C glycine (UL) by algae and its conversion into other amino acids. Glycine is the simplest amino acid. Moreover it is optically inert and it participates in many metabolic activities. We therefore, used glycine in this experimentation. With the available facilities to work with labelled compounds it was not possible to conduct pulse type of experiments. We had a limitation to measure the exact radio activity in various compounds formed from labelled glycine and hence our experiments only give an over all picture of glycine metabolism in algae.

Results obtained by window type GM counters and simple technique of autoradiography are described and discussed in Chapter IV.

**Format of the thesis:**

The thesis as described above is divided into four Chapters. Each chapter is further divided into sections
like (1) Review of the subject, (2) Material and Methods, (3) Experimental findings or Results, (4) Discussion. At the end of each chapter references of literature referred are listed. Many of them are referred in original while some of them are quoted from other standard work. Most of the experimental findings are documented and are shown in 29 plates.

The work submitted in this thesis was completed in period of three and half years at Botany Department, University School of Sciences, Gujarat University, Ahmedabad.