INTRODUCTION
Biological nitrogen fixation is an interesting prospect for biotechnology, especially in agriculture for providing nitrogen to higher plants. Cyanobacteria are unique prokaryotes coupling the characteristics of gram negative bacteria in cellular architecture and chemistry and the eukaryotic algae in pigmentation and oxygenic photosynthesis. In addition, many species of cyanobacteria are able to carry out N₂ fixation, the reduction of atmospheric N₂ to a biologically active form such as ammonia under aerobic, microaerophillic or anaerobic conditions. This combination of abilities makes these organisms potentially valuable systems for the bioutilization of solar energy.

Over the past few years, much attention has been drawn by cyanobacteria not only because of their value in agriculture, food and feed but also because of their capacity to produce a variety of chemicals. Aminoacids, flocculants, pharmaceutically useful anticancer, anti-AIDS virus and antibacterial substances, growth promoters, vitamins, potent toxins and fuels like H₂ and NH₃ are some of the many known products (Subramanian and Shanmugasundaram, 1986a; Kerby et al., 1987).

In the recent past, the use of immobilized microbial and plant cells as biocatalysts has become a rapidly advancing area of biotechnology. Cyanobacterial cell immobilization offers the possibility of designing a "bioreactor" to convert solar energy, water and nitrogen in the air into ammonium as a fertilizer or producing H₂ as a fuel.

Cyanobacteria appear to be the ideal systems for biotechnological manipulations since the exploitation of those cyanobacteria that have the capacity to fix both carbon and nitrogen from the atmosphere will prove to be the least expensive compared to the exploitation of all known living systems.
Thus, the spin off from biotechnology will be strains with high $N_2$ fixing ability and high tolerance to environmental stress and also would yield valuable metabolites.

Immobilization refers to the "imprisonment" of a biocatalyst or cells or microbes in a distinct phase which is water insoluble and is made of a high molecular weight polymer which allows only the exchanges of raw materials and products but does not allow the immobilized agent to escape into the mobile phase.

Enzymes are nature's catalysts and their ability to catalyze biochemical reactions under mild conditions in a highly specific and efficient manner has led to the interest in their exploitation as industrial catalysts. Enzyme processing traditionally has been accomplished using soluble cell-free enzyme preparations. These batch processes are not very economical, because these biocatalysts are used for single operation and conventional recovery methods are either expensive or cause denaturation and loss of catalytic activity. Also, enzymes are relatively unstable. If enzymes are to be reused effectively, their stability must be improved and some inexpensive non-destructive recovery methods must be developed. One of the major activities in the field of biotechnology over the past 2 decades has been the immobilization of enzymes as a means of achieving both these objectives. Several reviews and books describe the characteristics, the preparation and application of immobilized biocatalysts (Brodelius and Mosbach, 1987; Brouers et al., 1988; D'Souza, 1989.).

A number of studies have been done in recent years on the immobilization of photosynthetic organisms for the production of
pharmaceuticals, chemicals and fuels. Immobilization appears to offer several advantages such as increased biocatalytic capacity due to increased cell densities, stabilization of enzyme activities, the possibility of avoiding washout of cells at high dilution rates, the possibility for continuous operation and lower cost of isolation of products (Brouers and Hall, 1986).

Many methods are available for the immobilization of cells, but several conditions must be fulfilled if the development of an industrial process is envisaged. The method must be safe and the chemically inert matrices should present no hazard to operators or cells; it must be simple and must lead to a long-lived process. This implies resistance to abrasion of the matrix, long-term maintenance of cell activity and avoiding extremes of heat and pH; it must be cheap in order to compete successfully with the alternative processes.

A special requirement for photosynthetic systems, where light is one of the substrates, is that the material should be translucent or transparent. Entrapment in porous gels and foams has become the most popular technique for the immobilization of whole cells as they generally do not use toxic reagents. The most commonly used matrices for photosynthetic cells are agar and alginate gels and polyurethane and polyvinyl foams. Polyurethane and polyvinyl foams offer better mechanical properties than agar and alginate gels (Brouers et al., 1989).

Having recognized the potential of cyanobacteria to catalyse the light-driven production of a variety of chemicals and fuels, it is a logical step to employ the technique of immobilization in order to exploit these organisms.

A few laboratories have worked on H2 and ammonia production by free and immobilized cyanobacteria (Muallem et al., 1983; Brouers et al., 1989; and
Musgrave et al., 1982.). Till now, very little is known about the mechanisms which induce changes in photosynthetic cell function and structure that occur when cells are immobilized. Hence, a detailed long-term study has been made on the effects of foam immobilization on morphological, physiological and biochemical parameters of *Anabaena variabilis* (a free-living form) and *Anabaena azollae* MS101 (a symbiotic form from *Azolla mexicana*) with 3 different nitrogen sources.

This work was aimed at understanding certain physiological and metabolic changes within the cells in response to immobilization.