3. THE PRESENT STUDY

The marine biosphere is one of the earth’s richest innumerable habitats. The oceans are highly complex environments and a diverse assemblage with extreme variations in pressure, salinity and temperature. Marine microorganisms encompass a complex and diverse grouping of microscopic life forms of which it is estimated that, only one per cent has been cultured or identified. Considering the fact that marine environment is saline in nature and it could provide rare and unique microbial products, particularly enzymes which could be safely used for human therapeutic purpose. Among the microorganisms, marine actinomycetes have attracted great attention since they have developed unique metabolic and physiological capabilities that not only ensure survival in extreme habitats, but also differ the potential to produce bioactive compounds with antitumor and other interesting pharmacological activities that would not be observed in terrestrial microorganisms. Marine actinomycetes are emerged as a promising group for biotechnological applications, especially in medical and industrial fields. It plays an important role in bioremediation, biodegradation of complex aromatic polymers, such as pesticides, polycyclic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and biosorption of various heavy metals.

Fifty six actinomycetes were isolated from the ten marine sediments of South Indian Coastal region, India and identified by morphological, physiological, biochemical and microscopic characterisation. The reference actinomycete *Streptomyces aureofaciens* - 325 was obtained from Microbial Type Culture Collection (MTCC), Chandigarh, India. They were screened for L-asparaginase, keratinase and lipase activity. Among the fifty six isolates screened, three isolates (1, 2 and 18) were selected for further studies. The isolates 1, 2 and 18 were identified as *Streptomyces acrimumcini* NGP 1 (JX843532), *Streptomyces albogriseolus* NGP 2 (JX843531) and *Streptomyces variabilis* NGP 3 (JX843530) respectively by 16S rRNA gene sequencing technique.

Effect of culture conditions (incubation period, pH, temperature, agitation speed, carbon and nitrogen source) of actinomycetes growth and enzyme production were studied. The enzymes studied were L-asparaginase, keratinase and lipase. The enzymes were purified from
the culture filtrates by column chromatography and their properties (optimum pH, temperature, $V_{\text{max}}$, $K_m$, $pI$ and molecular weight) were determined.

The actinomycetes and their enzymes were tried for various biotechnological applications like antagonistic activity of bioactive compound, anticancer activity of L-asparaginase, feather meal production for fish, plant growth stimulation, waste water treatment (automobile and slaughter house), biosynthesis of fragrance esters, additives in detergent formulations, biodegradation of xenobiotic compound and biosorption of heavy metals.

Marine actinomycetes are indigenous in the marine ecosystem which exists in high salinity and pressure leads to exhibit novel enzymes and bioactive compound that are distinct from terrestrial strains. In this study, the bioactive compound from the test actinomycetes exhibited admirable antagonistic activity against human pathogens which are resistant to the antibiotics tested. The enzyme L-asparaginase showed anti-cancer activity against stomach adenocarcinoma (AGS) cell line which was proved in invitro studies. Very few researches were carried out with L-aspraginase from bacteria against AGS cell line. Keratinase is the important industrial enzymes, involved in the conversion of feather keratin to valuable feed for fish and played a significant role in the plant growth stimulation as well as revealed anti-microbial activity. Similarly, lipase producing actinomycetes are the great interest in the treatment of fat/oil containing waste water in a short incubation period at low costs. Synthesis of fragrance ester from brewery industry effluent is the novel approach to produce the fragrance intensity on fabrics by exhaustion and microencapsulation method. In the detergent formulation, lipase played a vital role in the lipid stain removal and resistance against abrasion and perspiration test which indicated the longitvity of the fabric shelf-life. In an environmental application studies, actinomycetes proved as a valuable and ecofriendly isolate in the degradation of xenobiotic compound carbaryl and absorption of heavy metals (Copper and Zinc) from electroplating industry effluent.