8. CONCLUSION AND FUTURE PERSPECTIVES

Polyhydroxyalkanoates (PHA) are bioplastics with properties similar to synthetic plastics which makes them important as an alternate for replacing plastics. They can be used in all fields, where plastics are used, especially in medical and pharmaceutical industry. Therefore, due to the complications related with disposal of plastics, bioplastics enlarged its prominence. PHAs are accumulated by microorganisms and rise in response to stress. While a large number of microbes are known to accumulate PHAs as a product of their metabolism, yet not many microbes are acknowledged and exploited for the commercial production of this important biopolymer.

Since the production of bio-plastic is expensive, many techniques have been adopted for large scale production. But, all working on this field should concentrate on the selection of proper strains of bacteria, capable of producing or accumulating PHB in large scale. Many reports are found on the use of terrestrial bacteria having the potential of producing bioplastics. However, marine environments are the least explored compared to their terrestrial counterparts said by Dash et al. (2013). It is one of the largest ecosystems on earth and still required to be explored. So in this present study, the production of PHA from marine bacteria has been done to find out its potency to accumulate more PHA and also, their potentiality how could be influenced by the climatic condition and soil physiochemical parameters were also studied.

The constraints in the progress of commercially sustainable technology for PHA production are the lack of cost effective production methods. Thus a lot of efforts are still being made for the process extension for the production of this biopolymer in large amounts in a cost effective mode. This will enable its commercialization and will exactly defend its versatile applications as replacement for plastics. Realizing all this, the present investigation was commenced to yoke the potential of microorganism for the production of PHAs. In this regards, initially an extensive screening programme was undertaken to isolate and identify the potential PHA producers. Successively attempts were made to optimize the processes for maximum production of PHA. Else its production would endure a dream and the
gradually increasing pollution will rescind the environment. The feed stock required in fermentation is very much costly. Hence the waste materials have been employed as biomass required for culture of microbes for PHA production. Feed stocks including industrial or agricultural wastes, which mainly contain simple sugars, starches or other organic chemicals, need to be explored. Study on their physicochemical properties and their compositions should be estimated to caliber their potentiality in case of PHA accumulation as energy sources.

In the present investigation, description of KSN1 Brochothrix sp. and KSN2 Edwardsiella sp. are of extremely new in the field of PHA production and also they were examined to produce more like other predominant bacterial species mentioned in reviews. Production of PHA by using basic simple PYM media used in this study yielded high PHA when compared with other complex media that are being used commonly. The production of PHA from agro industrial wastes by above said bacterial species significantly reduced the cost of PHA. It may enhance the economic feasibility of commercial applications of bioplastics and also influence the biodegradation of agro industrial wastes.

In conclusion, whatever the subsequent research area, one important thing to be considered is to build a comprehensive economic analysis model for the production of PHA from renewable biomass sources. A balance between operating cost, product yield and quality is imminent to make this conversion more economically and functionally feasible. So, continued research and development in bioplastics is creating high quality products for a wide variety of industries. Biocompatibility, biodegradability and bioaccessibility nature are the three drivers of growth, will provide the spur for continued growth in bioplastics across the world.

**Future blueprint**

However, key barriers to be overcome for PHA production include low PHA content, more complex product recovery and downstream processing. As discussed earlier, the main challenge of industrialized PHA production focuses on the expense of raw materials which amounts to around 40% of the total cost. Therefore, looking for cheaper feedstocks should be the first research direction towards the
commercialization of PHA production using biomass. Defined techniques should be established to extract PHA without any impurity so that the cost of production can be lowered. To rectify above said hindrances involved in economical production of PHA, the following efforts need to be performed in future.

- Consuming cost effective organic wastes instead of Himedia to produce PHA and to examine the efficacy of bacteria to utilize it.
- Optimization of growth and PHA production under various stress induction processes.
- Studying the physico-chemical properties of PHA and its degradability
- Preparation of PHA polymer sheets for commercialization.