“Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world. Science is the highest personification of the nation because that nation will remain the first which carries the furthest the works of thought and intelligence.”

*Louis Pasteur*

The emergence of biotechnology over the last two decades as a major discipline has opened up new vistas for increased productivity on all fronts—agriculture, medicine, and industry, particularly in relevance to developing countries confronted with an ever-increasing population, food shortage, and scarcity of economic resources. It caters to the welfare of the humanity. Harnessing of solar energy to improve photosynthetic efficiency of plants, algae and photosynthetic bacteria as well as utilization of agriculture and organic wastes to produce methane using biogas plants are the current aspects of biotechnology. It has now become an important and integral part of any of the today’s life science. In early days, biotechnologists used living organisms for the manufacture of a variety of useful materials. The most prominent amongst these are bread making, wine making, cheese making and leather processing. These processes were a vital part of economic developments and trade. Today, the mechanisms underlying these processes have been elucidated and intensive researches have been carried out for further improvements. These processes have slowly been developed as technologies which are more or less dependent on enzymes used in vitro or invivo.

In this context, tannases are hydrolases which under natural conditions catalyze the hydrolysis of tannins into gallic acid and glucose. They occur ubiquitously in plants, animals and in various groups of microorganisms. However, the production of these enzymes from plants and animals is difficult and expensive. Therefore, in the present scenario, microbial tannases were found to be superior with respect to ease in handling as it requires minimal space for its cultivation, high supply due to rapid growth and its easy accessibility to genetic manipulations. Owing to their ability to carry out both hydrolytic and synthetic reactions under aqueous and non-aqueous conditions, these enzymes have an upper hand in the
areas of pharmaceuticals, food, leather industries, detergent formulation and in the
treatment of tannery effluent.

Realizing the significance of tannases, the present investigation was
undertaken. Here, a series of experiments were planned and executed for
screening of potential tannase producers, optimization of production, scale upto a
300 L fermentor, purification, immobilization, characterization and industrial
applications.

The detailed results of this investigation are presented in Chapter IV,
‘Observations and Results’ of this thesis, which has been divided into eight
sections. Section I deals with the comprehensive account of the screening and
selection of the potent tannase producers. Section II throws light on identification
and characterization of the selected isolate. This section is followed by Section III
which is devoted to process engineering of various physical and nutritional
parameters using ‘one at a time’ method and ‘Response Surface Methodology’ for
enhancement of tannase production from the organism under both submerged and
solid state fermentation systems. The results of the scale up and optimization for
tannase production upto a 300L bioreactor is presented in Section IV. Section V
explores various strategies for the purification of tannase from fermentation broth.
Section VI deals with immobilization studies for tannase production. Section VII
gives in detail the properties and kinetics of this tannase. The last Section VIII
deals with the evaluation of various potentials and industrial applications of this
tannase produced with special emphasis on industries like food, pharmaceutical,
beverages and feed.

In Chapter V, ‘Discussion’, all the results have been discussed in light of
the existing status of research. This chapter is followed by Chapter VI, ‘Summary
and Conclusions’ which summarizes and highlights the major achievements in a
precise manner. Chapter VII, ‘Future Prospects’ discusses the possible prospects
and direction of research for this hydrolytic enzyme.

The chapter on ‘Observations and Results’ is preceded by Chapter III
‘Materials and Methods’ which describes in detail the procedures used for
carrying out the present investigation. Chapter I, ‘Introduction and Chapter II
‘Review of literature’ reviews all aspects of tannase research. Last but not the
least Chapter VIII – ‘Bibliography’, is in itself indicative of the pace at which the
tannase research is accelerating and the importance given to it by the scientific community.

In the last of thesis, Appendix I is appended which gives the details of the lists of research papers published on Tannase and on other aspects along with the work presented in the National and International conferences and awards received.

Shailendra Raghuwanshi