

ACKNOWLEDGEMENTS

First of all, I wish to convey my sincere thanks to my supervisor Prof. Bhavanath Jha for giving me an opportunity to pursue this work under his illuminating guidance. He has introduced me to this interesting scientific world and inculcated scientific temper in me. I am indebted to him for his dedicated spirit towards research, great support, unlimited encouragement, constructive suggestions and sorting out my difficulties throughout the research period which led me to complete my research work successfully. I find deficiency of words to express my gratitude for his educative supervision.

I am very thankful to Dr. P. K. Ghosh, Director, CSIR-CSMCRI, for providing infrastructure facilities during my thesis work.

My sincere thanks are due to Dr. (Mrs.) K. H. Mody and Dr. C. R. K. Reddy for their support and encouragement during the course of this study.

I express my heartfelt thanks to Dr. Avinash Mishra whose association with my research work, urge to solve difficult problems, invaluable help and consistent encouragement was very important for me in successful completion of my work. I would like to thank Dr. P. K. Agarwal and Dr. Asish Kumar Parida for his helpful suggestions and constant support during my research period. I warmly thank Dr. D.R. Chaudhary and Dr. Mangal Singh Rathod for their support and encouragement.

I am thankful to Dr. Siddharth Tiwari, Scientist, National Agri-Food Biotechnology Institute, Mohali for his valuable suggestions during my research.

I would like to thank our staff members Mr. Santlal Jaiswar, Mr. Vishal Gohel, Mr. Manish Vasava and Ms. Afsana Makwa (ex-member) for their friendly behaviours, help and assistance in research and administrative work. I am thankful to Mr. Hirendra R. Vyas, Mr. Yuvrajsinh Parmar, Mr. Manish Dave and Mrs. Geeta Pandey for their timely help in lab work.

I am grateful to my seniors Dr. Jitendra Keshri, Dr. Mukul Joshi, Dr. Narendra Singh Yadav, Dr. Rakesh Jain, Dr. Puja, Dr. Kapil Gupta and Dr. Kumar Harshvardhan for their generous support and suggestions.

I would like to thank my friends, labmates and ex-labmates Kumari Kavita, Ashish Kumar Dubey, Dr. Mudassar A. Kazi, Dr. Basit Y. Dar, Dr. Jaya Sharma, Sonika Pandey, Vijay Kumar Singh, Raaj Kumar, Pushpika Udawat, Sushma Rani Tirky, Shristi Ram, Poorva Dubey, Ranjeet Kumar, Sweta, Sonam Yadav, Anupam Kumari, Aditya Kumar Rathore, Shilpi Anand, Nikunj Balar, Intesaf-UI-Haq, Jayant Kulkarni, Ankita Alexander, Deepika, Priyanka, Payal Sanadhya, Pushpsheel Shukla, , Rathis P., Teena A. Mathew, HariKishor CM and S. Boopathi for their supportive nature, positive attitude and making a friendly atmosphere for research work.

My special thanks are due to my friends/colleagues/juniors Amit Chaturvedi, Sweta Kumari Yadav, Manish Kumar Patel, Raghawendra Kumar and Dinkar who were with me in every good and difficult situation since my beginning in this institute. Spending a great time with them and their support will always be memorable for me.

Finally, I would like to express the deep gratitude to my parents Rama Shankar Tiwari and Manju Devi and my uncle Dr. Girija Shankar Tiwari for their blessings, consistent encouragement, understanding and firm support throughout my life which made me believe in myself. Boundless love and motivation from my elder and younger brothers and my wife Puja always encouraged me during my research. I remember the words of motivation from my grandfather Late Mr. Jagannath Tiwari, whose blessings are always with me. Last but not the least; I deeply appreciate and thank to almighty God who always provide me strength to face difficult situations and create a way for me to come out of it.

Financial assistance to carry out my research work received from CSIR, Govt. of India is duly acknowledged.