

Preface

This Ph.D. thesis is a culmination of the research undertaken by me at Molecular Genetics Laboratory, Department of Botany, University of North Bengal over a period of almost five years (2008-2012). These five years have been a challenging trip, with both ups and downs. It would not have been possible for me to write this thesis without the help and support of the kind people around me. I am grateful to numerous local and global “peers” who have contributed towards shaping this thesis.

At the outset, I would like to express my appreciation to Dr. Arnab Sen, Associate Professor, Department of Botany, University of North Bengal for his valuable advice, scholarly inputs and consistent encouragement during my entire research endeavor. This feat was possible only because of the unconditional support and the invaluable time provided by him despite of his many other academic and professional commitments. As my supervisor, he has constantly forced me to remain focused on achieving my

goal. Thank you Sir, for all your help and support.

I would like to express my sincere thanks to Dr. Asim Kumar Bothra, Associate Professor, Department of Chemistry, Raiganj (University) College, Raiganj for his valuable suggestions during the entire phase of the thesis work.

I express my gratitude to all the teachers: Prof. A. P. Das, Prof. P. K. Sarkar, Prof. B. N. Chakraborty, Prof. U. Chakraborty, Dr. A. Saha, Dr. S. C. Roy and Shri. P. Mandal and the office staffs of the Botany Department, University of North Bengal for offering me necessary help at various phases of my research.

I am grateful and express my thanks to Department of Biotechnology, Government of India and University Grants Commission, Government of India for providing me the fellowship to carry out my research work.

I thank Shri. Ajay Kumar Dubey and Shri. YT Aden, Divisional Forest Officer and Shri. Prasanth Kumar Ghosh, Range Officer, Directorate of

Forests, Government of West Bengal, Kurseong Research Range, Silviculture (Hills) Division, Sukna, Darjeeling for providing the necessary help, support and information during the field study.

My field study was made less obstacle ridden because of the presence of a few individuals like Shri. DT Sherpa, Shri. Ratna Kumar Lama, Shri. Arup Sarkar, Shri. Ranjan Rai and Shri. PN Burman and I am thankful to them for all the help they rendered to me as and when required.

My special thanks to Dr. Punya P. Poudyal, Consultant, Bamboo Mission Sikkim for the identification and authentication of the bamboo species. I am also thankful to Smt. Saumyasree Pathak, SRF, Botanical Survey of India, Kolkata for authentication of the author citation of the identified species. I greatly thank Dr. T. L. Santha, Director and Dr. M. B. Nagaveni, Head of the Department of Biotechnology, Maharani Lakshmi Ammanni College for Women, Bangalore for allowing me to work in their laboratory.

I am indebted to Shri. Sushil Kumar Middha and Ms. Usha Talembedu Middha of the Department of Biotechnology, Maharani Lakshmi Ammanni College for Women, Bangalore for sharing their knowledge

that influenced the work and resulted in joint publications. I would like to express my special thanks to them for being great soul and always ready to help with a smile.

I would like to express my sincere thanks to my fellow friend Shri. Sushen Pradhan, Sikkim State Council of Science and Technology, Gangtok for helping me to carry out my tissue culture work and always welcome me with a smile whenever I visited Gangtok despite of his busy schedule and personal work.

I acknowledge my lab mates Dr. Saubashya Sur, Dr. Bharat Chandra Basistha, Shri. Debadin Bose, Shri. Malay Bhattacharya, Ms. Tanmayee Mishra, Ms. Ritu Rai, Ms. Subarna Thakur, Shri. Ayan Roy, Ms. Sanghati Bhattacharya, Shri. Pallab Kar and Shri. Manas Ranjan Saha for extending their support in a very special way. I gained a lot from them, through their personal, scholarly interactions and their suggestions at various points of my research. I will remiss if I don't acknowledge my fellow friend Shri. Anurag Chowdhury, Shri. Krishanu Ghosh, Data Entry Operator, Bioinformatics Facility, Md. Khurshid Alam my friend and lab attendant and Shri. Basudev Singha our lab boy.

I would like to thank Dr. Soumen Bhattacharjee, Associate Professor, Department of Zoology, University of North Bengal for allowing me to use his laboratory as and when required.

I thank Shri. Sajjan Agarwal, Smt. Bhagwati Devi Agarwal, Shri. Naresh Garg, Smt. Maneka Garg, Shri. Dinesh Garg, Shri. Rakesh Garg, Sneha and Barun for their wonderful hospitality and care when I visited Gangtok for my tissue culture work.

I owe a lot to my parents, my father Shri. Pawan Kumar Agarwal and mother Smt. Sumitra Devi Agarwal who encouraged and helped me at every stage of my personal and academic life and longed to see this achievement come true.

I am very much indebted to my Grandmother, Smt. Bhagwati Devi Agarwal, my uncle Shri. Sushil Kumar Agarwal, my brother Shri. Anand

Goyal, his wife Smt. Harshita Goyal and my nephew Master Vedank Goyal for their love, support, patience, understanding and allowing me to spend most of the time on this thesis. I also thank my grandfather Lt. Ayodhya Prasad Agarwal for the blessings bestowed upon me and miss him at this critical juncture of life to share my happiness with him.

Above all, I owe it all to Almighty God for granting me the wisdom, health and strength to undertake this research task and enabling me to its completion.

Finally, I thank each and everyone who were directly and indirectly important in successfully completion of my thesis, as well as I express my apology to all whose name could not be mentioned personally one by one.

For any errors or inadequacies that may remain in this work, of course, the responsibility is entirely my own.



[Arvind Kumar Goyal]