

## Acknowledgement

### **“Jai Shree Ram”**

With a deepest gratitude, I offer my heartfelt praises to **The Bhagwan Hanuman**, whose benevolent blessings have endowed me with a sound mind and a healthy body. It is with his divine grace that I was able to navigate through the intricate complexities of my research and bring it to fruition. Words cannot express the depth of my gratitude towards the almighty for his unwavering support throughout this journey.

I am utmost grateful to my guide, **Prof. Pushpa Robin** for giving me an opportunity to work under her able guidance. Her perseverance and love for perfection is truly contagious and inspiring. Without your support this journey was not possible. Thank you, Ma'am!!

I thank to The Maharaja Sayajirao University of Baroda, Vadodara, for providing me a university scholarship for three years.

I would like to express my sincere gratitude to our esteemed **Vice-Chancellor, Prof. V.K. Srivastava** for his unwavering dedication to the development of our university community, which has been instrumental in creating a nurturing and inclusive environment where researchers can thrive and reach their full potential.

I'd also like to use this chance to express my gratitude to **Prof. Parimal Vyas**, former vice chancellor at the Maharaja Sayajirao University of Baroda in Vadodara, for his unwavering support during a difficult period in my PhD path. He went above and beyond to support everyone who had difficulties, demonstrating his commitment to ensuring that every student receives the assistance they require to succeed.

It gives me a great pleasure to acknowledge my indebtedness and profound sense of gratitude to **Prof. Haribhai Kataria**, Dean, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara for his kindness, hospitality and understanding. I thank him for all the help and advice which made my Ph.D. journey smooth. Without you this wasn't possible sir.

I take this opportunity to thank **Prof. Ratna Prabha Chivukula**, Head, Department of Biochemistry for her constant support and valuable suggestions. I would like to thank The Department of Biochemistry for providing me with the necessary infrastructure for my work. I would like to extend my gratitude to **Dr. Jose M. Vinardell Gonzalez** from the University of Sevilla, Spain, for his kind gift of the *Sinorhizobium fredii* NGR 234 bacteria, which made

my research work possible. Special thanks to **Prof. G. Naresh Kumar** for being highly supportive and co-operative during my initial phase of Ph.D., his love and passion for quality work always inspire me. I would thank **Dr. Shashikant Acharya** for always guiding me in the matter of life as well as Ph.D. by sharing his practical and honest views. Also, a heartfelt thanks to **Prof. Rashidunissa Begum** for always giving me honest suggestions and also providing me an access to electroporator instrument of her lab. I would also like to thank the members of my research advisory committee, **Prof. Sunil Singh** and **Dr. Ravi Vijayvargiya** for giving me valuable inputs for my research work. A special thanks to other teaching staff for giving me some very valuable life lessons. I am very fortunate to have been acquainted with them.

I would like to express my heartfelt gratitude to **N.K. Ojha Sir**, our former Registrar, for his invaluable support and guidance during my academic journey. I am deeply grateful to Mr. Ojha for his tireless efforts to streamline administrative processes. I thank him for his invaluable contributions to our university and for being a source of inspiration to me and countless other students.

PhD is a life changing experience both personally and professionally. This thesis was not possible without the support of my beloved parents, **Ashok Dave and Jayshree Dave**. I am very grateful to them for their unwavering support and guidance throughout my life, and especially during my PhD journey. Their selflessness and unconditional love have been a constant source of strength. They have always been there for me, sacrificing their own needs and desires to ensure my well-being and success. Their support has been instrumental in helping me pursue my dreams. I will forever be indebted to them for their love, support, and the sacrifices they have made for me. You always believed in me when I was occupied with self-doubt. Thank you for reminding me that success belongs to those who never quit!!

I would like to express my deep gratitude to my dearest wife **Tanvi Khanna Dave**, who provided unwavering support during my PhD journey, while also pursuing her own PhD. She stood by my side through all the challenges and obstacles, offering encouragement and providing a source of strength when I needed it the most. Despite the demands of her own research, she never hesitated to provide a listening ear or a helping hand whenever I needed it. Her unwavering support and understanding have been instrumental in my success, and I am truly grateful for her presence in my life. I am deeply grateful to my **parents-in-law**, who have been a constant source of support and motivation throughout my PhD journey. I would like to

extend my appreciation to **Tejus, Priyanka, Parul** and their families, who have always been there for us. I am grateful for their love and support.

I would like to express my heartfelt appreciation to **Mrs. Shakuntala Mehta**, my beloved aunt, who has been a pillar of support throughout my PhD journey, especially during the challenging times. Her unwavering support, love and guidance have been a source of inspiration for me. I am grateful for her presence in my life.

I would like to express my gratitude to my Late friend **Dr. Mukesh Chaubey** who generously provided me with a plasmid that was crucial for my project. His assistance was instrumental in the success of my research. Although he is no longer with us, his support and generosity will always be remembered and deeply appreciated.

Special thanks to my M.Sc. classmates and dear friends, **Dr. Nakshi Desai, Mr. Gaurav Kansagara, and Mr. Harsh Shah**, for their unwavering support during my challenging times. Their intellectual contributions and provision of necessary chemicals were invaluable in helping me navigate through difficult situations.

I would like to express my sincere gratitude to **Dr. Tabassum Mansuri and Dr. Suresh Antony**, my seniors in the lab, for their invaluable guidance and support throughout my Ph.D. journey. **Dr. Brinda Panchamia and Dr. Poonam Singh** also deserve my thanks for instilling a positive outlook towards life and research in me and providing me with valuable technical suggestions. I am deeply indebted to my friend and colleague, **Ms. Jinal Thakkar**, for her unwavering assistance and timely help, which made my Ph.D. journey much smoother. I would also like to thank my Ph.D. colleagues from the department, **Mr. Raju Dabhi, Mr. Sandeep Kumar, Mrs. Dhruti Aman Shah, Mrs. Sushmita Singh, Ms. Dhruvi Kakadiya, Mr. Nishant Parmar, Mr. Jayvadan Vaishnav, Ms. Minal Mane, Mr. Dhruv Gohil, Mrs. Vaidehi Chatupale, Ms. Megha Chaudhari, and Ms. Krishna Bhutia**, for their constant support in providing me with necessary consumables and chemicals. Special thanks to my colleague from The Department of Chemistry, **Ms. Dhruvi Pithadia** for helping me with chemistry related doubts and technical inputs.

I would like to express my sincere gratitude to the M.Sc. dissertation students, **Ms. Priyanka Bhawrani, Ms. Himanshi Joshi, Ms. Lipi Sheth, Ms. Nidhi Patel, Mr. Parth Modi, Ms. Sheetal Sindha, and Ms. Trupti Solanki**, as well as the B.Sc. dissertation students **Tamanna, Zishan, Khushi, and Mervin** for their hard work and dedication during their research projects.

Their presence during my PhD journey has made it a joyous and fulfilling experience. I am grateful for their friendship and support.

I would like to express my heartfelt appreciation to the non-teaching staff who have played an integral role in my PhD journey. **Mr. Ramesh Nare's and Mr. Manish Chauhan's** help with issuing chemicals and consumables was invaluable and greatly facilitated my research. **Mr. Balwant Gohil's** diligent work in the office helped ensure a smooth working environment. **Mrs. Axita Thapa's and Mr. Ramesh Kamle's** assistance with paperwork related to my PhD and access to the Xerox machine was always appreciated. **Mr. Sandeep Bandal's** company over a cup of tea provided a refreshing break from the rigors of research. Finally, **Mr. Shailesh Raval's** thorough knowledge of the necessary paperwork required for a PhD student was invaluable, and his timely advice was always appreciated. I am grateful for their tireless efforts and support, which have made my PhD journey a much smoother and enjoyable experience. Lastly, thanks to each and every person of the university who helped me in some or other way which has made my journey successful.

**No funding was available or received for this research.**

**Akash Ashok Dave.**