ACKNOWLEDGEMENTS

In the name of Allah, the most gracious, the most merciful, who is the primary resource in helping me complete this thesis. I would like to express my appreciation and gratitude to my advisor Prof. Nafees Ahmad Khan, Department of Botany, Aligarh Muslim University, Aligarh (India), who has been an incredible mentor for me. Without his guidance and constant feedback this Ph.D. would not have been achieved. I would like to thank him for encouraging my research and for allowing me to grow as a researcher. His suggestions on both research as well as on my career have been priceless. He has been supportive since the days I began working. This feat was possible only because of the unconditional support provided by him. He is a person with an amicable and positive disposition. He has always made himself available to clarify my doubts despite his busy schedules and I consider it as a great opportunity to do my doctoral programme under his guidance and to learn from his research expertise.

I am immensely thankful to Prof. M. Yunus Khalil Ansari, Chairperson, Department of Botany, Aligarh Muslim University, Aligarh (India), who gave me access to all possible research facilities to conduct this research.

This Ph.D. study would not have been possible without the support and guidance extended by Dr. Asim Masood, Assistant Professor, Department of Botany, Aligarh Muslim University, Aligarh (India). He is someone you will instantly love and never forget once you meet him. He has been very kind to extend his help at various phases of this research, whenever I approached him, and I do hereby acknowledge him for supporting me for everything.

A good support system is important to stay consistent in the field of research. I was lucky to have seniors like Dr. Shabina Syeed, Dr. Md. Iqbal Raja Khan, Dr. Mehar Fatma, Dr. Mohd. Asgher and Dr. Sugandha Varshney, they have all been so friendly and personable to me. Special thanks for their encouragement and assistance whenever I needed.

A special thanks to my senior labmates, Dr. Md. Iqbal Raja Khan, Dr. Mehar Fatma, Dr. Mohd. Asgher who have been an inspiration on how to make things ‘perfect’. I also thank my fellow labmates Faisal Rasheed, Sofi Javed and Zebus Sehar for the stimulating discussions, and for giving me cheerful years.
I deem it a privilege to express my gratitude to all the teachers who taught me from school days till now.

The most basic source of my life energy resides: my family. I have an amazing family, unique in many ways, and the stereotype of a perfect family in many others. Their prayer for me was what sustained me thus far. Their support has been unconditional all these years. Words cannot express how grateful I am to my family. 

Ammi and Abbu have been a source of love and energy ever since. I love them so much, and I would not have made it this far without them. I know I always have my family to count on when times are rough. My brothers (Mubassir and Tahir) and sisters (Rehana, Shafia and Rida) have been my best friend all my life and I love them dearly and I would like to say a heartfelt thank to them for all their advice, support, unconditional love, care and longed to see this achievement come true. I also thank my all uncles, aunts, cousins, brothers-in-law and their families, sisters-in-laws and their families for their good wishes.

To my beloved nephews and nieces Aqeel, Ahrar, Muhammad, Adiba, Aiza, Aqsa and Mugaddas, I would like to express my thanks for being such a good always cheering me up.

I am fortunate enough to have Hassan Jaleel and Shahnawaz Khursheed as my friends. These two friends formed the core of my research time. They have been a true and great supporter and have unconditionally supported me during my good and bad times. They have been non-judgmental of me and instrumental in instilling confidence.

I also thank my friends (too many to list here) for providing support and friendship that I needed. The thesis would not have come to a successful completion without the care and help I received from Dr. Arif, Dr. Mudasir, Dr. Bilal, Dr. Ashraf, Dr. Tanveer, Dr. Tariq, Dr. Jamsheed, Arjumand, Taiba, Vikas, Adnan, Arshiya, Anamica, Urooj, Iqbal, Ashiq, Irfan, Bilal, Amir, Manzoor, Altaf, Abu Zaid, Imran, Latif, Ishtiaq and Basit. They are all a fun bunch with lots of enthusiasm and optimism. I am indebted to all my friends. Special thanks to all of them.

I truly thank Uzma Latief for her concern and good wishes and for being supportive and providing help in numerous ways during various stages of my PhD. I admire her positive outlook.
I am also thankful to the Officer Incharge of UCIF, AMU, Aligarh and AIRF, JNU, New Delhi for providing assistance regarding scanning and transmission electron microscopy studies.

I would like to say thank you to all non-teaching staff and Research Scholars of the Department of Botany for extending full cooperation and encouragement during my research studies.

I am also grateful to the funding received from Department of Biotechnology, Government of India, New Delhi through the DBT-BUILDER programme in the form of JRF and SRF fellowships. I am also highly thankful to Aligarh Muslim University for giving me the opportunity and financial assistance to attend and present my research work in International conference held at Granada, SPAIN.

People here are genuinely nice and want to help and I am glad to have interacted with many. If I have forgotten anyone, I apologize.

Finally I thank again Allah, for letting me through all the difficulties.

Date:

Place: Tasir Sharief Per