Acknowledgement

The Ph.D is a journey which takes many years to complete. During this exciting and stimulating, but at times exhausting and difficult journey, I was accompanied by an awesome group of people who supported me in multiple ways. First of all, I express deep sense of gratitude to the Almighty for giving me a chance into the wonderful world of science, curiosity and discovery. I will be failing in my duty if I do not make known my unspeakable gratitude to GOD, without whom I would not have attained this level of achievement.

The first group of people I would like to express my deepest appreciation and gratitude to my parents for their never ending love, blessings, unceasing encouragement, and patience and for everything. It is my pleasure to acknowledge the affection from my nephew Nehan, elder brother Shashi and elder sister Dr. Suman lata who helped me to achieve my goals.

Words are finite for the infinite help and support of my family !!

I owe a deep depth to my supervisors who supported me through the Ph.D process. I would like to thank to my PhD advisors, Dr. J.S.Laura and Dr. V.S.Beniwal for supporting me during these past four years.

I feel greatly invigorated and privileged to express my highest degree of regards, gratitude and deep indebtedness to my esteemed mentor Dr. J.S. Laura, under whose noble guidance and supervision, I had the opportunity to carry out this work. His generosity, valuable insight, guidance, optimism and consistent encouragement throughout the period of study induced self confidence in me. The present study would have not been possible without his excellent guidance and support.
I am heartfelt thanks to my research guide Dr. V.S. Beniwal for his wise and concrete suggestions, careful and reasoned criticism and meticulous attention to every detail. His contribution to this thesis, however, does not only encompass his role as an academic supervisor, but include his care and support on a personal level without which this journey may never have been completed. His truly scientist intuition has made him as a constant oasis of ideas and passions in science, which exceptionally inspire and enrich my growth as a student, a researcher and a scientist want to be. I am indebted to him more than he knows.

Special thanks to Prof. Rajesh Dhankhar, Head of Department, M. D. University, Rohtak for providing the necessary facilities and support during this journey. I express my sincere thanks to Dr. Meenakshi, Mr. Sunil Yadav, Mrs.Rachna Bhateria, Dr. Geeta Dhaniya and Dr. Babita Khosla for their valuable advice.

I would also like to express my appreciation to technical and non-technical staff, Santro and Tizo aunty at the Plant Tissue Culture Lab, HAU, Hisar; for their technical support, a friendly lab atmosphere and hospitality.

I express my deep-felt thanks to my lab-mates, Ramanjeet Kaur, Anju, Ajit, Harinder, Sakshi, prabha, Raman and Surender for their immense support and ever ready help.

Finally, I would like to thank everybody who was important to the successful realization of thesis, as well as expressing my apology that I could not mention personally one by one.

TO GOD BE THE GLORY

(Sarina)