ACKNOWLEDGMENTS

The time has arrived when I really want to pay my sincere thanks to everyone who has helped me in completing my work; In fact words are often a weak mode of revealing one’s feelings. As the intensity of sentiments deepens one fumbles for words and fail to express. In every step of achieving anything concrete, there is a need of guidance, inspiration and help. I am grateful to express my sincere and heartiest gratitude to those who helped me in reaching to the destination of obtaining the degree. These people deserve much than mere written acknowledgement of their exemplary help.

With stupendous ecstasy and profundity of compliancy, I express my deep sense of indebtedness and gratitude to my Supervisor Dr. Ashok Aggarwal, Professor, Department of Botany, Kurukshetra University, Kurukshetra for the opportunity to partake in the Ph.D. programme. His all time helping attitude, understanding heart, aesthetic suggestion, benevolent supervision, insurmountable enthusiasm and faith in me kept me going.

I would like to express deep appreciation to my Co-supervisor, Dr. M.S. Saharan, Principal Scientist, Crop Protection Division, Indian Institute of Wheat and Barley Research (IIWBR), Karnal for accepting me in his lab and for giving me the opportunity to develop myself intellectually, academically, and spiritually. Thank you for your trust, help, support, guidance and encouragement. Your passion and hard work as a scientist have truly changed my perspective of science and my life. I was privileged, because few people have the opportunity of working with persons as you, with the highest quality as researcher, as human being, and as a person.

I also pay my deep-hearted gratitude to Dr. Narender Singh Professor and Chairman, Department of Botany, Kurukshetra University, Kurukshetra for providing me a golden opportunity to carry out my research in botany department.

I would like to thank all the respected faculty members of the botany department, Kurukshetra University, Kurukshetra and my colleagues for their valuable guidance, cooperative attitude, moral help and helpful suggestions.

I express my great pleasure and deep sense of indebtedness towards the invaluable help of Dr. Sudheer Kumar, Pr. Scientist, Plant Pathology, IIWBR, Karnal. His incisive comments, cooperation, sagacious advice and fruitful discussions, abiding interest throughout the period of my research work helped me a lot to reach my goal.
I am also thankful to Dr. Indu Sharma, Director, IIWBR, Karnal for her support and guidance.

It gives me immense pleasure to record my sincere thanks to Dr. M.K. Meghavansi, Scientist “D” Defence Research and Development Organization (DRDO), Tezpur, Assam for his valuable suggestions and generous help in carrying out my work. I would like paying special thanks to Dr. Gyanendara Singh, Principal Scientist, Crop improvement, IIWBR, Karnal. I thank my lab mates, Mr. Jitender Kumar, Mrs. Shefali, Mr. Pankaj Kumar and Mr. Palvinder Singh who made lab a convivial place to work and helped me in understanding the meaning of keeping faith and belief in myself. I really feel dearth of words in expressing my sincere thanks to my friend and colleagues, Saurabh Yadav, Girish Pandey and Mrs. Anju Tanwar who shared their knowledge and encourage me during entire course of this work.

I am indebted to the facilities extended by the Indian Council of Agricultural Research through its one of the esteemed institutions i.e. Indian Institute of Wheat and barley Research where I performed most of my research work. My special thanks are due to the research community of IIWBR, Karnal for their cooperation and timely help. Thanks to God for providing me the inner strength in my life during all ups and downs in the past few years.

I feel deep sense of gratitude for my mother and father for their prayers, inspiration, supports, encouragements, and sacrifices throughout my study. My family members, my grandparents, my uncle and aunt and my younger brothers and sisters were always with me in all sorts of circumstances. I do not know how I would have made it possible without my wife Renuka Panwar, their patience, support and unflagging love who always encouraged me to continue with this study. I am also thankful to my son Aayushman and nephew Utsav for their limitless love for me.

Vipin Panwar