Acknowledgement

“A journey of thousand miles begins with single step”.

The long journey of my educational phase seems to have passed with the blink of an eye. I thank the Almighty who has generously bestowed such esteemed education on my destiny. This thesis is the result of constant hard work whereby I have been accompanied and supported by many people. It is a moment of immense pleasure for me to express my regards and gratitude for all of them.

I feel exceptionally privileged and a deep sense of gratitude from the core of my heart towards my supervisor Prof. V.K. Gupta for his advice, constant encouragement over years, insightful guidance, “tireless editing” and most importantly for always being willing to listen. I am especially indebted for his patience in handling my shortcomings which have helped me immensely towards developing my research skills. His generosity, affection and understanding will always remain engrained in my memory. I am really blessed to get an opportunity to work under his guidance. I value his concern and support at all times. Patience, hardworking nature and optimistic attitude are few of his qualities, which will continue to inspire me in all spheres of my life. I owe him lots of gratitude for having me shown this way of research. I am again thankful to almighty God, who provided me supervisor like you.

Truly admitting, I have no words to express my inner feelings towards my Co-supervisor Dr. Rajinder Parshad (Scientist-G) Department of Biotechnology, Indian Institute of Integrative medicine (IIIM), Jammu, under whose joint supervision research for the present thesis was carried out. And I am also indebted to him for his valuable suggestions, moral boost-up and his dynamic role played during my thesis.

I express my sincere thanks to Dr. N. N. Dogra, Chairperson and all others teachers of Department of Biochemistry, Kurukshetra University, Kurukshetra for their help extended during the entire period of Ph.D. Program.

I humbly owe my sincere thanks to Dr. Hari Singh, Prof. Emeritus, Department of Biochemistry, Kurukshetra University, Kurukshetra for his valuable suggestions and support during the entire period of Ph.D. Program.

I express my whole hearted thanks to Dr. Jitender Sharma and Dr. Ritu Mahajan from Department of Biotechnology, Kurukshetra University, Kurukshetra for invaluable help rendered to me during the time of need. They always helped me to get the best out of the most difficult moments of my doctoral work.

I express my thanks to Dr. Neelam Garg, Chairperson, Department of Microbiology, Kurukshetra University, Kurukshetra for her extended help during the entire period of Ph.D. program.
I am extremely thankful to Dr. Anita Dua and Dr. Ashwani Mittal, University College, Kurukshetra University, Kurukshetra for their guidance and invaluable help during the time of need.

I express my special thanks to entire non teaching staff of the Department of Biochemistry, Microbiology and Biotechnology for their full co-operation during research.

Financial assistance provided by Kurukshetra University, Kurukshetra in the form of University Research Scholarship is greatly acknowledged.

My most sincere and special thanks would go to my friends Bhim Singh, Dr. Pushpa Bogra, Dr. Shrina Bhandari, Dr. Ashwani Sanghi, Dr. Kalika Kuhar, Dr. Shalini Dhirman, Sushil Nagar, Lalit, Kanika, Anuradha, Deepak Aneja, Mahipal Yadav, Chand Raina, Gaurav Kumar, Simranjot Kaur, Farnaz, Rajinder Khajuria and Asha Chaubey for their contribution at various levels of my research work was beyond words of recognition. I thank all my colleagues in our research group for the good and motivating work atmosphere. The time spent with them will always remain as a wonderful memory in my mind.

The lack of vocabulary utterly to express gratitude to my friends Gaurav Garg, Gulab Singh, Shiv Kumar Giri, Sachin Gulati, Kapil Dev Chauhan, Anil Kumar and many more for their valuable assistance, motivation and kind of co operation during entire period of my investigation.

Finally, I take this opportunity to take one and all who have directly or indirectly helped me in completing this task. Though many have not been mentioned, none are forgotten.

Lastly, I would like to express my deep sense of regard to my father Sh. Rajpal Sharma and my mother Smt. Nirmala Devi who formed part of my vision and taught me the good things that really matter in my life. They raised me with a love of science and supported me in all pursuits of my life. They have been extremely supportive and caring towards me.

I would like to express my gratitude to my loving elder brother Virender Kumar, Bhabhi Meenakshi Sharma, Sisters Savita, Geeta and Anu and Jijaji Parveen Kaushik for their cherished support in every way and constant encouragement over the years.

I express my heartful thanks to my loving nieces Akshita, Sania, Vanishka and nephew Akshat for their sweet presence during the course of this work.

January 2013

(Davender Kumar)