Acknowledgement

I would like to thank all those people who made this thesis possible and an unforgettable experience for me. At the end of my thesis, it is a pleasant task to express my thanks to all those who contributed in many ways to the success of this project and made it an unforgettable experience for me.

It is a moment of great pleasure for me to express my deep sense of gratitude and sincere appreciation to my esteemed mentor, Dr. (Mrs.) Shishu, Professor, University Institute of Pharmaceutical sciences, Panjab University, Chandigarh, who is the pre-eminent personality behind the successful completion of my research work. It has been a rare privilege and honor to be her doctoral student and I would always be indebted for all her contributions of time, ideas and finding to make my Ph.D. experience productive and stimulating. Being from non-pharmaceutics background the doctoral research initially looked like an uphill task to me. Only due to her untiring efforts, constant support and inspirational guidance, I was able to accomplish this difficult assignment. This whole piece of work is only because of her and I owe this to her. I have learnt not only a lot of pharmaceutics but also some important lessons of life from her. "Dear Madam! Thanks a lot for showing trust in me. Wherever I may go in my life, I will always remember that I have a lifelong mentor in the form of you..."

Truly admitting, I have no words in my dictionary to express my inner feelings of ineffable in combine towards my revered supervisor Dr. Gulshan Bansal, Associate Professor, Department of Pharmaceutical Sciences and Drug Research, Punjabi University Patiala. His patience, motivation and enthusiasm have added an extra feather to this work, I feel short of words to express my gratitude towards him. He has been an impelling force in me throughout by giving full research freedom and support.

My sincere thanks to Prof. V. R. Sinha (Chairperson) and Prof. Karan Vasisht (former Chairperson), University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh for providing all the necessary infrastructure facilities and resources required to carry out the project work.

I wish to express my profound sense of gratefulness Prof. B. S. Bhoop, Professor, University Institute of Pharmaceutical sciences, Panjab University, Chandigarh, for guiding me regarding the valuable aspects of systematic optimization and quality by design approach. He has played a vital role
via his direct guidance as well as his pioneer research publications in enabling me to understand and recognize the exhilarating concepts of 'formulation by design'.

My sincere thanks to Prof. O. P. Katare, University Institute of Pharmaceutical sciences, Panjab University, Chandigarh for providing me the lab facility to perform texture analysis of developed formulations.

I also owe my thankfulness to the faculty of U.I.P.S, Panjab University Prof. V. R. Sinha, Prof. O. P. Katare and Prof. I. P. Kaur for their valuable suggestions and guidance during course of the project work.

I would also like to thank, Prof. Renu Chadha, University Institute of Pharmaceutical sciences, Panjab University, Chandigarh for providing necessary facilities whenever needed.

I also owe my gratitude to other faculty members of University Institute of Pharmaceutical Sciences, Panjab University especially Prof. Anil Kumar, Prof. Manoj Kumar, Prof. Ranju Bansal, Prof. Renu Chadha, Prof. Kanwaljeet Chopra, Dr. Maninder Karan and Dr. Neelima Dingra for their valuable suggestions, help and guidance during the course of work.

Special thanks are extended to Mr. Sanjeev Kataria and Dr. A. K. Jana (Head, Department of Biotechnology, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar) for their expert guidance and unstinted help in carrying out microbiology studies.

I would like to thank Mr. Balraj Saini and Rohit Bansal, PhD Scholars working at Department of Pharmaceutical Sciences and Drug research, Punjabi University Patiala, for sparing their valuable time while carrying out the HPLC studies required for my project work.

I also wish to acknowledge the technical support and co-operation extended to me particularly by the staff of Pharmaceutics division especially Mr. Chaman Lal, Mr. Boota Singh, Mr. Swaroop Singh and Pandit Ji. The support provided by Mr. (Late) Shadi Lal Sir for maintaining the glass apparatus is sincerely acknowledged.

My sincere and special thanks goes to Maninder Mam at CDPES, Ranjeet Kaur Mam, Devi Lal, and Pardeep of DST-FIST lab for helping me to carry out my research work and being so co-operative.

I also thank Mr. PD Chaudhary, former Librarian and Mr. Dayal for their help rendered in providing easy access to literature required to carry out the research work.
Special thanks to Mr. Ravi Chandra from Nain Graphics, who sacrificed his sleep for completing the printing of the thesis.

Very special words of thanks to my colleagues Mr. Varun, Ms. Vipul, Mrs. Amanpreet Kaur, Mrs. Poornam Negi, Mr. Honey Goyal, Mr. Basant and Mr. Aashuman for their invaluable support and constant encouragement. I am also grateful to my juniors Anupama, Gautam, Barveeta, Ankita, Prabhleen, Manleen, Ashana, Jayati, Ramanpreet, Ramneek, Prabha and Divya for their help. I gratefully acknowledge the help of seniors: Amit Bhatia, Shantanu, Rohit Bhandari, Manoj Verma, Kaisar Raza, Saurabh Aggarwal, Ruchita V Kumar, Rajiv and Swati Bhandari.

I would like to extend my gratitude towards my dearest friends Mr. Varun, Ravinder, Jitendra, Shantanu, Chhanda, Ashish Jena, Rajesh, Pratap, Mahavir, Mandeep, Satyakam Pratul, Darpan Khurana, Sarvar, Ranjeet, Pradeep Jadhwani, Sandeep Kasley, Abhishek Kaler, Pradeep Chopra, Ravi Bhatia, Amit Gautam, Anil Kalia, V. S. Negi and all others who always stood by my side when I needed them the most.

I am deeply indebted to all those innocent animals, which were sacrificed/used by me directly or indirectly for my project work.

I am also thankful to Nosch Labs Pvt. Ltd., Hyderabad for providing gift sample of itraconazole. Abtec Corp., West Indies for providing the gift samples. Gattefossé SAS, France; Colorcon Asia Pvt. Ltd., Goa, India; Phospholipon GmbH, Germany; BASF SE and Ludwigshafen, Germany, India are also duly acknowledged for generous gift samples of lipids, oils, and other excipients used in the study.

I am also thankful to my cousin brothers Amandeep, Amit, Rajeet, Sanjeev, Deepak, Gaurav, Surjit, Mandeep, Rajnish & Karni and sisters Indu, Richa, Anju, Mona, Poornam, Lata, Shalini & Naini for always cheering me up their positive and motivating me to do my best. The innocent smiles and giggles of my cute nephews and nieces: Samarth, Saksham, Aryan, Asha, Pehlu, Puneet, Soham, Akshit and Mannat have been great stress busters during the course of my PhD.

Words fail me to express my appreciation for my wife Kanchan, whose dedication, moral support, inspiration, encouragement and help has taken the load off my shoulder. My special thanks to my parents-in-law for their constant love and support.

I thank my dear brother Sumeet with all my heart for his constant love, care and financial support, which enabled me accomplish my work without any difficulty.
Last, but surely not the least, the most obvious, significant and undeniable contribution has been made by my mom and dad. My parents have always been an inspiration for me. They always supported my dreams and aspirations. I am grateful to my father for giving me the life I ever dreamed. I can’t express my gratitude for my mother in words, whose unconditional love has been my greatest strength.

I acknowledge the Almighty, who extended his helping hand whenever I was in need, who has led me miraculously, giving me strength, courage, spirit, wisdom and resilience to work and to bring this endeavor to completion.

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

Date: Aug 13, 2014

Neeraj Kumar