List of Figures

Figure No.	Description	Page No.
2.1	Summary of important transport process and drugs absorbed through them	11
2.2	Schematic describing barriers to drug targeting and the role of nanosystems in overcoming these barriers (Labhasetwar)	13
2.3	Schematic diagram of Nano Lipid Carriers	19
2.4	(A) NLC with Lipid Matrix (B) NLC with Lipid Matrix Imperfections	20
2.5	Diagrammatic presentation of drug release from NLC type I/II	21
2.6	Storage and Application condition of SLN and NLC	22
2.7	Line diagram of NLC Preparations	23
2.8	Clinical Presentation of Skin Tuberculosis	27
2.9	Structure of Rifabutin	29
2.10	Chemical Structure of Precirol ATO 5	32
2.11	Basic chemical structure of Poloxamer	33
4.1	Diagrammatic presentation of NLC Method for formulation Preparation	43
4.2	Box-Behnken design for three factors shows the geometric representation	45
5.2	λ max of Rifabutin	59
5.3	Linearity Curve of Rifabutin	60
5.4	Chromatogram of Rifabutin	60
5.5	Fourier Transform Infrared (FTIR) of Rifabutin	62
5.6	Graphical Presentation of solubility of Rifabutin in Liquid Lipid where Values are mean ±SD; n=3	64

5.7	Graphical Presentation of solubility of Rifabutin in Solid Lipid where Values are mean ±SD; n=3	65
5.8	Microscopic evaluation of oil and solid lipid mix smear where Fig A. Precirol ATO-5 with Capmul MCM C-8 and B. Precirole ATO-5 with Capmul MCM EP	66
5.9	Selection of Solid Lipid Ratio for Capmul MCM C-8 and Capmul MCM EP with Precirol ATO-5	67
5.10	Selection of Surfactant on Percentage Transmittance	68
5.11	Diagrammatic presentation of NLC Method for formulation Preparation	69
5.12	Showing response on Particle size of significant factors through Pareto chart	72
5.13	Showing significant factors response on Entrapment Efficiency through Pareto chart	72
5.14	Showing optimisation of entrapment efficiency and Particle size on the value of Poloxamer 188 and Homogenization time	75
5.15	Showing optimisation of entrapment efficiency and Particle size on the value of Ratio of Solid Lipid & liquid Lipid and Organic Phase & Aqueous Phase	75
5.16	Showing the effect of Particle size vs Poloxamar 188, Homogenization time	76
5.17	Showing the effect of Entrapment Efficiency vs Solid Lipid: Liquid Lipid and the Ratio of Organic Phase & Aqueous Phase	76
5.18	Showing the effect of Entrapment Efficiency vs Solid Lipid: Liquid Lipid and the Ratio of Organic Phase & Aqueous Phase through contour Plot	76
5.19	Showing the effect of Particle size vs Poloxamar 188, Homogenization time through Contour Plot	77
5.20	Showing the effect of factors on response through response optimizer	77
5.21	Showing optimisation of entrapment efficiency and Particle size with the value of Poloxamer 188 and Homogenization time for Formulation Two	79

5.22	Showing optimisation of entrapment efficiency and Particle size with the value of Solid Liquid Lipid Ratio for Formulation Two	79
5.23	Surface Plot of Particle size vs Poloxamer 188, Homogenization Time	80
5.24	Surface Plot of Entrapment Efficiency vs Solid, Liquid Lipid Ratio and Organic Aqueous Phase	80
5.25	Showing the effect of Entrapment Efficiency vs Solid Lipid: Liquid Lipid and the Ratio of Organic Phase & Aqueous Phase through contour Plot	81
5.26	Showing the effect of Particle size vs Poloxamar 188, Homogenization time through Contour Plot	81
5.27	Showing the effect of factors on response through response optimizer	131
5.28	the Scanning Electron Microscopy (SEM) Image of NLC containing Rifabutin	132
5.29	Transmission Electron Microscopy (TEM) Image of NLC containing Rifabutin	83
5.30	Graphical presentation of In-vitro release Profile	84
5.31	Graphical presentation of zero order reaction	84
5.32	Florescence Image of Capmul MCM C-8 With Calcein- I	87
5.33	Florescence Image of Capmul MCM C-8 With Calcein- II	88
5.34	Graphical presentation of stability studies at different temperature	89
5.35	DSC Image of Rifabutin drug	90
5.36	DSC Image of Precirol ATO 5 and binary physical mixture at different Temp.	90
5.37	DSC Image of Ternary Physical with Drug Loaded NLC	91
5.38	% Cumulative Release of plain drug with other formulations	93

List of Tables

Table No.	Description	Page No.
2.1	Drug Targeting Approaches	09
2.2	Components of Targeting and Its Descriptions	10
2.3	Recommended treatment regimens for each diagnostic category by WHO	15
2.4	Physiochemical properties of Rifabutin	30
2.5	Market Preparation of Rifabutin	31
2.6	Uses of glyceryl palmitostearate	32
2.7	Physiochemical Properties of Glyceryl palmitostearate	33
2.8	Representation of a and b blocks with its values	33
4.1	List of Chemicals used	37
4.2	List of Instruments used	38
4.3	Randomized Design Table of selected factors from Minitab-17	44
4.4	Box-Behnken design for three factors shows the design by Minitab-17	46
5.1	Solubility profile of Rifabutin in different solvent	58
5.2	Recovery Study of Rifabutin	61
5.3	Precision Study of Rifabutin	61
5.4	Repeatability Study	61
5.5	Robustness Study	62
5.6	Identified Compounds of Rifabutin	63
5.7	Solubility of Rifabutin in Liquid Lipid	64
5.8	Solubility of Rifabutin in Lipid	66
5.9	Percentage Transmittance of Surfactant	68
5.10	Randomized Design Table of selected factors with its Response	71

5.11	Process of Optimisation through Box-Behnken Design	73
5.12	Process of Optimisation through Box-Behnken Design	78
5.13	Release Kinetic of Optimised batch	85
5.14	Cytotoxicty of NLCs in J744.1 Macrophage Cells by MTT Assay	86
5.15	Cell uptake of NLC Capmul MCM EP and NLC Capmul MCM C-8 formulations	86
5.16	Different Variable of Pharmacokinetic studies	92
5.17	Results of Pharmacokinetic studies	92

List of Abbreviations and Symbols

Rifabutin	- RIF
Macrophage Phagocytic System	- MPS
Area under the curve	- AUC
Minimum inhibitory concentration	- MIC
Potassium bromide	- KBr
Differential scanning calorimetry	- DSC
Scanning elecron microscopy	- SEM
Fourier transform infrared spectroscopy	- FTIR
Correlation coefficient	- R^2
Absorbance unit	- AU
Percentage relative Error	- %RE
Relative Standard Deviation	- RSD
Standard Deviation	- SD
Limit of detection	- LOD
Limit of quantification	- LOQ
Clearance	- CL
Mean Residence Time	- MRT
Retention Time	- RT
Peak Plasma Concentration	- C_{max}
Time for Peak Concentration	- T_{max}
Half life	- $T_{1/2}$
Trichloroacetic Acid	- TCA
Acetonitride	- ACN
Bovine Serum Albumin	- BSA
Fetal Calf Serum	- FCS
Heat Inactivated Fetal Calf Serum	- HIFCS
Acid dissociation Constant	- pKa
Hour	- hr

Percentage	- %
Microgram	- µg
Nanogram	- ng
Milliliter	- ml
Degree	- ^{0}
Celsius	- C
Centimeter	- cm
Millimetr	- mm
Kilo Dalton	- kDa
Cytotoxic concentration required to kill 50% of the cells	- CC_{50}
Phosphate buffer saline	- PBS
Intravenous	- i.v.
High performance liquid chromatography	- HPLC
Effective dose of drug that inhibits 50% of the parasites	- ED_{50}