

**MUSTARD OIL EMULSION FOR THE
TREATMENT OF VITILIGO**



A

Dissertation

Submitted for the partial fulfillment of the requirement for

The award of a degree of

MASTER OF PHARMACY

(PHARMACEUTICS)

Session 2021-2022

SUPERVISOR

**Dr. Manoj Kumar
M.Pharm., Ph.D.
Assistant Professor
(Pharmaceutics)**

SUBMITTED BY

**Ms. Priyanjna Bhagat
M. Pharm IV Semester
(Pharmaceutics)
Enroll. No: GGV/20/06333
Roll No: 20704006**

DEPARTMENT OF PHARMACY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

**MUSTARD OIL EMULSION FOR THE
TREATMENT OF VITILIGO**



A

Dissertation

Submitted for the partial fulfillment of the requirement for

The award of a degree of

MASTER OF PHARMACY

(PHARMACEUTICS)

Session 2021-2022

SUPERVISOR

Dr. Manoj Kumar

M.Pharm., Ph.D.

Assistant Professor

(Pharmaceutics)

SUBMITTED BY

Ms. Priyanjna Bhagat

M. Pharm IV Semester

(Pharmaceutics)

Enroll. No: GGV/20/06333

Roll No: 20704006

DEPARTMENT OF PHARMACY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)



DEPARTMENT OF PHARMACY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

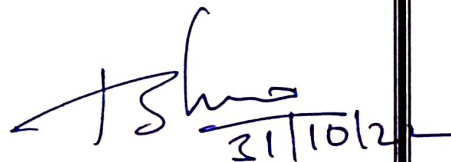
(C.G.)

(A Central University Established by the Central University Act-
2009 No-25 of 2009) Tel.No.07752-260027; FaxNo.07752-260148.

FORWORDING CERTIFICATE

This is to certify that **Ms. Priyanjna Bhagat** M. Pharm IV semester (Pharmaceutics) in the Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) has submitted her dissertation work entitled “**MUSTARD OIL EMULSION FOR THE TREATMENT OF VITILIGO**” for the partial fulfillment of the requirement for the award of the Degree of Master of Pharmacy (Pharmaceutics) with her truly and honestly observed inference during her research work under the supervision of **Dr. Manoj Kumar, Assistant Professor (Pharmaceutics)**.

I hereby forward her thesis for the award of a degree of Master of Pharmacy (Pharmaceutics) during the academic session 2021-2022.


31/10/22

**HEAD
Head**

**Department of Pharmacy
Guru Ghasidas Vishwavidyalaya
(A Central University)
Bilaspur (C.G.)**

Dr. Manoj Kumar
M.Pharm PhD.
Assistant Professor
(Pharmaceutics)
mrmanojkumar1@yahoo.co.in



Department of Pharmacy
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495009, India
Phone No.: +91-7752-260027

CERTIFICATE

This is to certify that **Ms. Priyanjna Bhagat D/O Mr. Bharat Bhagat**, M. Pharm IV Semester (Pharmaceutics) of Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) has submitted her dissertation work entitled **“MUSTARD OIL EMULSION FOR THE TREATMENT OF VITILIGO”** for the partial fulfillment of the requirement for the Award of Degree of Master of Pharmacy (Pharmaceutics) under my supervision and guidance with her truly & honestly observed inference during her research work. Her work is original, and satisfactory and is not submitted anywhere else for any degree.

I hereby forward her thesis for the award of Master of Pharmacy (Pharmaceutics) during the academic session 2021-2022.

Manoj
(31/10/22)

Dr. MANOJ KUMAR
SUPERVISOR

PRIYANJNA BHAGAT
M.PHARM. IV SEMESTER
(Pharmaceutics)
Enroll. NO: GGV/20/06333
Roll No: 20704006
bhagatpriyanka054@gamil.com
Contact No: 9617545446



DEPARTMENT OF PHARMACY
GURU GHASIDAS VISHWAVIDYALAYA
BILASPUR (C.G.)

(A Central University Established by
the Central University Act-2009 No-
25 of 2009) Tel. No.07752-260027;
FaxNo.07752-260148.

DECLARATION

I hereby declare that my M. Pharm dissertation work entitled “**MUSTARD OIL EMULSION FOR THE TREATMENT OF VITILIGO**” is my own work conducted under the supervision of **Dr. Manoj Kumar, Assistant Professor (Pharmaceutics)**. The same is submitted to the Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for the partial fulfillment of the requirement for the Award of Degree of Master of Pharmacy in Pharmaceutics during the academic session 2021-2022.

I further declare that to the best of my knowledge the thesis does not contain any part of work, which has been submitted for the award of any degree either in the University or in any other University/ Deemed University without proper citation.

DATE: 31/10/2022

PLACE: BILASPUR

A handwritten signature in blue ink, appearing to read 'Priyanjna Bhagat', is written over a blue oval background.

PRIYANJNA BHAGAT

M. PHARM IV SEMESTER

(PHARMACEUTICS)

ACKNOWLEDGMENT

First and foremost, praises and thanks to God, the Almighty, for his showers of blessings throughout my research work to complete the research successfully.

I am using the opportunity to express my gratitude to everyone who supported me throughout the course of the thesis work. I am thankful for their aspiring guidance, invaluable constructive criticism, and friendly advice during the project work. I am sincerely grateful to them for sharing their truthful and illuminating views on a number of issues related to the project.

I would like to express my deep and sincere gratitude to my mentor and research supervisor, **Dr. Manoj Kumar, M. Pharm., Ph.D., Assistant Professor, Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Bilaspur C.G.**, for giving me the opportunity to do research and providing invaluable guidance throughout this research. Her dynamism, vision, sincerity, and motivation have deeply inspired me. He has taught me the methodology to carry out the research and to present the research works as clearly as possible. It was a great privilege and honor to work and study under his guidance. I am extremely grateful for what he has offered me. I would also like to thank him for his empathy, and great

sense of humor. I am extending my heartfelt thanks for his acceptance and patience during the discussion I had with him on research work and thesis preparation.

I take pride in acknowledging the insightful guidance of **Dr. Bharti Ahirwar** Head of Department of Pharmacy, **Guru Ghasidas Vishwavidyalaya, Bilaspur C.G.** for sparing her valuable time whenever I approached her and showing me the way ahead despite her busy schedule.

I would also like to convey my deep sense of gratitude to **Dr. Ravishankar Pandey, Assistant Professor (Pharmaceutics), Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Bilaspur C.G.** for providing me with valuable suggestions needed in connection with my dissertation work. His deep involvement and logical and analytical thinking have made a big difference in the research. Without his able assistance, my project would not have been completed authentically.

I am immensely thankful to my teachers **Dr. Alpana Ram, Dr. Shivani Ray Paliwal, Dr. Kedar Meena, Dr. K. Kesavan, Dr. S.H. Bodakhe,** and Non-Teaching staff especially **Mr. Nityanand Singh, Mr. Murlidhar Gupta, Mr. Dharendra Sahu, Mrs. Veena Vaishnav, Mr. Virendra Kumar Verma, Mr. Miri** for organizing required resources and for the assistance.

I am deeply indebted to **Dr. Nishant Gupta, Senior Scientific Officer, Arjuna Natural Pvt Ltd, Kerala 683101, India** for providing me gift

sample of Curcumin.

I am extremely grateful to my parents for their love, prayers, caring and sacrifices for educating and preparing me for my future. I express thanks to my **mother, father, sisters, and brothers** for their support and valuable prayers. I shall remain devoted my all life to them for their affection, good wishes and blessings conferred upon me.

I would like to say thanks to my senior, Miss. Rashmi Madhariya, Mrs. Taruni Patel, Mrs. Khushboo Kanwar, Mr. Gajendra Singh, Mr. Ravi Parashar, Mr. Ravishankar Yadav, Miss Ekta, and Miss Vibhuti Dubey. My Special thanks goes to my friends Neha Singh Rathore, Jyoti Chandraker, A Bharti Reddy, Shikha Pandey, Reena Kaushik, Tripti Karri, Vagesh Verma, Balram Kaushik, Nirdesh Kumar, Akhilesh Patel who helped me to complete this thesis successfully.

Finally, my thanks go to all the people who have supported me to complete the research work directly or indirectly.


PRIYANJNA BHAGAT

**M. PHARM IV SEMESTER
(PHARMACEUTICS)**

INDEX

CONTENTS		
CHAPTER 1: INTRODUCTION		
S.NO.	TITLE	PAGE NO.
1.	INTRODUCTION	1-17
1.1.	Symptoms of vitiligo	1-2
1.2.	Types of vitiligo	2
1.2.1.	Segmental vitiligo	2-3
1.2.2.	Non-segmental vitiligo	3-4
1.2.2.1.	Generalized vitiligo	3
1.2.2.2.	Acrofacial	3
1.2.2.3.	Mucosal	3
1.2.2.4.	Universal	4
1.2.2.5.	Focal vitiligo	4
1.3.	Cause of vitiligo	4
1.4.	Complications of vitiligo	4
1.5.	Epidemiology and prevalence	4
1.6.	Pathogenesis	5
1.6.1.	Autoimmune responses	5
1.6.2.	Genetics hypothesis	6
1.6.3.	Oxidative stress	6
1.6.4.	Neural hypothesis	7
1.6.5.	Melanocyte growth and development	8
1.7.	Available treatments for vitiligo	8
1.8.	Vitiligo diagnosis	10
1.8.1.	Tissue culture test	10
1.8.2.	Blood test	10
1.8.3.	Eye test	10
1.9.	Research envisaged	10
1.9.1.	Drug selected: curcumin	10

1.9.2.	Formulation selected: Nanoemulsion	10-11
1.10.	Objectives	11
1.11.	Literature survey	12-15
1.12.	Plan of work	15
	References	16-17
CHAPTER 2: DRUG AND EXCIPIENT PROFILE		
2.	DRUG AND EXCIPIENT PROFILE	18-24
2.1.	Characteristic drug profile: curcumin	18
2.1.1.	Taxonomical classification of curcumin	19
2.1.2.	Biological activities	19
2.1.3.	Pharmacokinetics of curcumin	20
2.1.4.	Pharmacology	20
2.1.5.	Safety	20
2.2.	Characteristic profile of span 80	21
2.3.	Characteristic profile of tween 80	22
2.4.	Characteristic profile of mustard oil	22-23
	References	24
CHAPTER 3: PREFORMULATION STUDY		
3.	PREFORMULATION STUDY	25-50
3.1.	Materials	25
3.2.	Methods	
3.2.1.	Physical inspection	25
3.2.2.	Identification by UV spectroscopy	26-30
3.2.3.	Identification by FTIR spectroscopy	31-45
3.2.4.	Determination of solubility	45-46
3.2.5.	Determination of partition coefficient	46-47
3.2.6.	Melting point determination	47
3.2.7.	Result and discussion	48-49
3.2.8.	Conclusion	49
	References	50
CHAPTER 4: FORMULATION DEVELOPMENT		
4.	FORMULATION DEVELOPMENT	51-54

4.1.	Preparation method of nanoemulsion	52-53
	Reference	54
CHAPTER 5: CHARACTERIZATION OF FORMULATION		
5.	CHARACTERIZATION OF OPTIMIZED FORMULATION	55-65
5.1.	Visual inspection	55
5.2.	Surface morphology	55
5.3.	Viscosity	56
5.4.	pH measurement	57
5.5.	Particle size and zeta potential distribution	57-58
5.6.	In-vitro study	58-63
5.6.1.	In vitro drug release studies	58
5.4.2.	Mathematical modeling	60-63
A.	Zero order model	60
B.	First-order model	60
C.	Higuchi matrix model	61
D.	Korsmeyer- peppas model	61
5.7.	Results and conclusion	64
	References	65
CHAPTER 6: STABILITY STUDY		
6.	Stability study	66-68
6.1.	Stability study of formulation	66
6.2.	Effect on storage of formulations: short-term stability studies	66-67
6.3.	Result and discussion	67
	References	68
CHAPTER 7: SUMMARY AND DISCUSSION		
7.	Summary and discussion	69-71