Mybo Webinar
on

THESIS WRITING:
for B.Pharm and M.Pharm Projects

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Andhra Pradesh, India

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Writing a thesis

- Last and most important stage of your project work.
- Culmination of your efforts
- Good, scientific, systematic and proper presentation
- Appropriate professional language and correct grammar
- Logical order in presentation

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First pages

i. **Title page** highlighting the title, name of the candidate, reg. no., guide's name, college's name and month and year of submission.
ii. **Inner title page** containing the same details on white background.
iii. **Certificate from the Head of the institution** and industry (if)
iv. **Certificate from the Research Director / Guide**
v. **Certificate from the ethics committees** for approval of study (if there is work on animals or on human volunteers)
vi. **Declaration** by the student
vii. **Acknowledgements**

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Indices

viii. **Index for chapter titles and sections titles**
ix. **Index for tables, figures and photos**, if any
x. **Abbreviations and symbols**
xi. **Materials** used in the investigation with their procurement details like name of the company, batch number etc.
xii. **Equipment** used in the study with the model number and other details

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Thesis

1. Aim and objectives of the investigation
2. Introduction and literature survey
3. Description: Methods and Materials, etc.
4. Experimental work
5. Results and discussion
6. Summary and conclusions
7. References

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Let's start…

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Title Page

- Face of the thesis
- Brief, representative of the work, technical words
- No question marks or exclamations
- Details of the author/candidate and college

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Certificates

- Certificate from the Head of the Institution
- Certificate from the Research Director / Guide
- Certificate from the Ethics Committee (where necessary)

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Bonafide work

- Scientific integrity
- Bonafide work
- Original work, submitted first time, carried out in certified, laboratories on calibrated, validated equipment, supplied by reliable, authentic manufacturers
- Give reference when describing other people's work

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Declaration by the student

Student affirms that it is his/her bonafide work

↓

Having Confidence in the student, having monitored the student through out the project period, research director certifies the work

↓

Having confidence in the Research Director, Head of Institution Certifies the work

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Acknowledgements

- Expressions of gratitude of the author

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Chapters in the thesis

- Aim and Objectives of the Investigation
- Introduction and Literature Survey
- Materials and Methods
- Experimental Work
- Results and Discussion
- Summary and Conclusions
- References (end of each chapter or end of thesis)

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Aim and objectives

- Background, current level of the field of work
- Need for the study
- Importance of the drug/ technique/ model/ procedure/ treatment
- Benefits of the new/ modified/ system proposed
- Brief statement on proposed work
- Specific objectives

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Aim and objectives

- Aim is the general, overall goal of the work,
- ex: To formulate and evaluate a gastro-retentive system of xxx drug
- Objectives are sub-parts of the aim, and in their totality they help in achieving the aim.
- This part should be crisp, sharp and to the point.
- Objectives should flow from the aim and follow a logical order

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Objectives

Example for Pharmaceutical Technology Students:

- Suppose aim is to develop and evaluate a novel formulation
- **Objectives:**
- To carry out Formulation Development (to identify the excipients to be used in the formulation and prepare a formula and identify the technique to be used for the novel formulation)
- To carry out drug-excipient incompatibility studies
- To prepare the formulation
- To identify the best formulation by optimisation
- To carry out comparative *In-vivo* studies and stability studies

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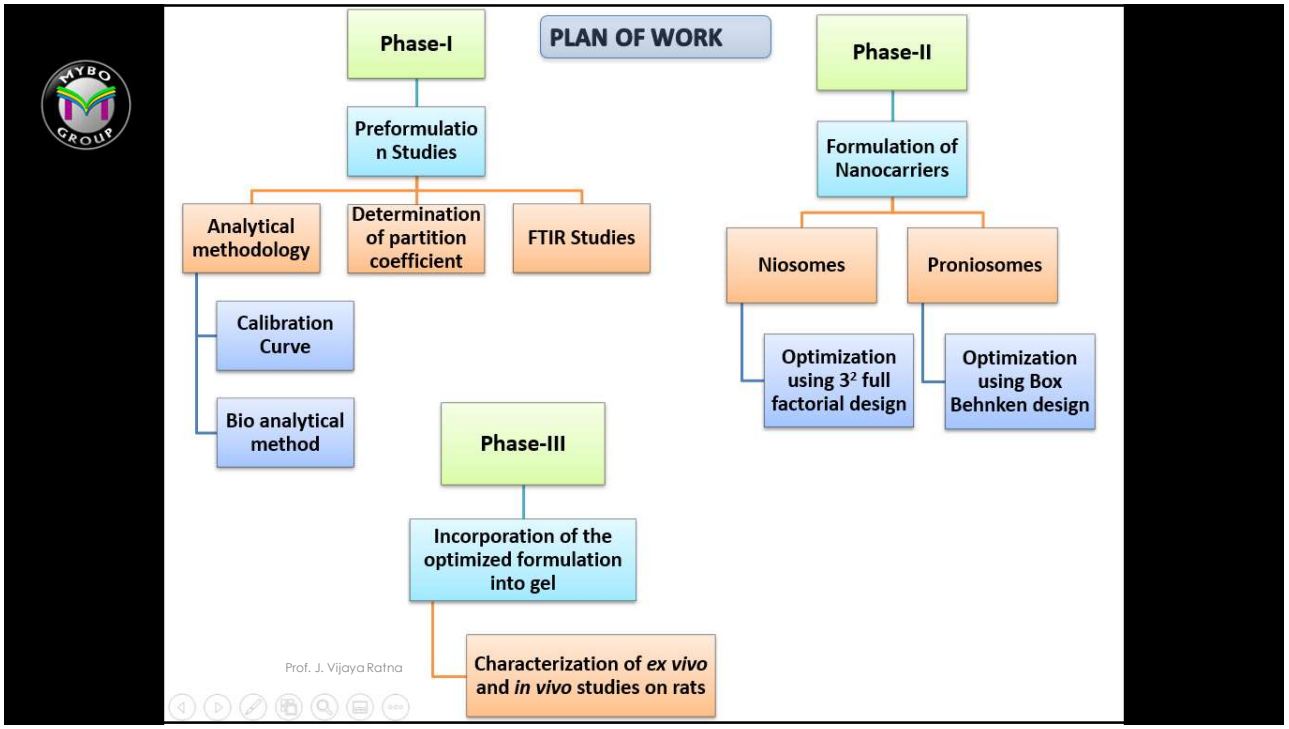

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Introduction

- Gives elaborate background of the work
- Gives a sketch of how historically the work developed, briefly
- Put stress on recent developments
- Reinforces on need for the study and what is the level at which the work stands now.
- One must try not to just copy material from standard text books, attempt must be made to go into review articles, understand their import, and express in one's own words

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Introduction

- Must be a total review of the recent developments in the work
- Much material should be written on the importance of formulation proposed/ analytical technique proposed/treatment proposed/ study proposed

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Literature Review

- Must contain a brief review of standard, recent literature from peer reviewed scientific journals
- Paragraphs on important, relevant work
- If there is a lot of work in recent times, may be presented in the form of a Table
- Ratna et al. reported the application of HPMC in preparation of nanoparticles .....

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Plagiarism

- Plagiarism is usually found in this chapter (introduction and literature review), because authors tend to copy and paste from standard text books or recent scientific papers or review articles.
- Plagiarism is a very negative practice- to be avoided at all costs.
- Read a number of research papers, write down your understanding in your note book, represent it in your own words in literature review, give credit to the original author by giving reference at the end of the chapter/ thesis

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Images, flow charts, models and photos

- Plagiarism includes copying images or flow charts or models or photos
- Create your own diagrams or photos or models

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Literature survey

- Survey of the most recent literature must be included.
- This should include reviews articles from peer reviewed journals.
- literature that is most relevant to the work.
- chronological order
- past to the recent times.
- Author must carefully read a paper, understand it and write the results in his/her own words from the paper.

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Literature review

- There are 2 ways of putting up your literature.
- writing in small paragraphs.
- Writing in tables.
- You can write the name of the first author and give the year in brackets at the end of the sentence.
- Then at the end of the chapter, you give all the references in alphabetical order.
- If multiple works of the same author are being discussed they are listed in chronological order.

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Literature review

- Another way is to give numbers to the references, and the numbers go in ascending order as the discussion unfolds.
- References are given at the end of the chapter in numerical order.
- Sometimes the same reference is used multiple times. Then, the same number is allotted to it, whenever it is used.

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Materials and methods

The specifications and details of sources of all the materials used.

- the methods used are described in clear technical and procedural detail
- for standard procedures, one may write "this test was conducted by the method given in IP…….".
- Photographs of the tests or procedures being carried out may be given.

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Experimental work

In this chapter the work carried out is written in developing order.

ex: formulation development, drug- excipient incompatibility studies, Preparations of formulation, *in-vitro* studies, optimization

In-vivo is usually given as a separate chapter.

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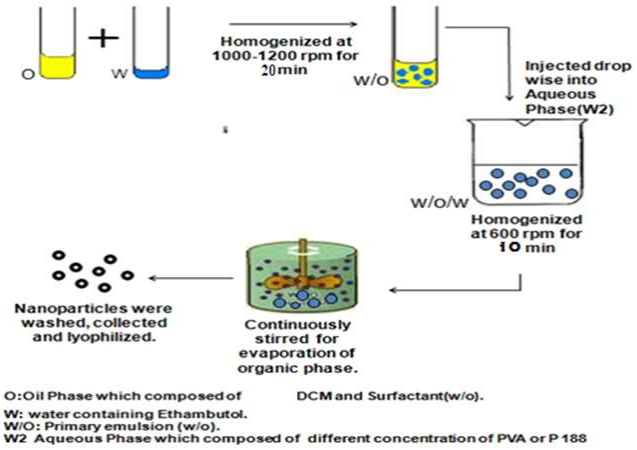

Fig. 1: Preparation of PYZ loaded nanoparticles by double/multiple emulsion method (solvent diffusion-displacement technology)

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Results

All the results of the experiment are given in this chapter.

- The tables include raw data tables, graphs, diagrams, photos and tables involving results of analysis of raw data.
- standard formats for writing tables and presenting graphs and giving numbers to them.
- In Research Papers, we present data, either by table or by a graph.
- in thesis books, we give data and then present it by different types of analysis, by tables as well as graphs.

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Data presentation

- Plots (2D and 3D), histograms, pie charts, probability charts, tables of numbers
- For comparison plot, more than one data set on the same graph, using the same scale
- Images and flow charts
- Interpolation and extrapolation
- Curve fitting
- Contour plots

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Plotting and analysis tools

- MS Excel
- Matlab

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Qualitative data

- Nominal scale
- Ordinal scale
- Interval scale
- Ratio scale
- Qualitative data must be transformed into quantitative data, as much as possible, by adopting gradation scales.

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Data analysis

- Calculating percentages, averages, ranges, confidential limits, kinetics, mechanism of drug release,
- Calculating odds ratio
- Statistical analysis – t test, chi square test, analysis of variance, linear regression, multiple regression, correlation

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S.No.	Objective	Result	Conclusion
1	Excepient Compatibility	1.Visual-No color change. 2. DSC-Identical thermogram as pure drug. 3. FT-IR-Similar to pure drug.	Excepients are compatible with the drug.
2	Optimised formulation	Total weight of tablet-300mg Carvedilol-80mg, PEO301-50mg, HPβ CD-80mg, Avicel 102mg. Stearate, Talc	Better CD release was observed.
3	Correlation with theoritical results	Similarity factor was found to be 64.40	Indicates good similarity.
4	Stability study	Studied for 6 months for tablet stored at 40° C and 75%RH	No significant change after 6 months.
5	*In vivo* performance	Drug traced for 36 hours, C_{max} 53.6±1.02 ng/ml well below MSC, MRT-16.35±1.01 hours	Indicates extended release,lack of dose dumping,it concludes 16 hrs formulation can be prepared.
6	Applicability	Tested with carbamazepine	Hence applicable for BCS CLASS II DRUGS

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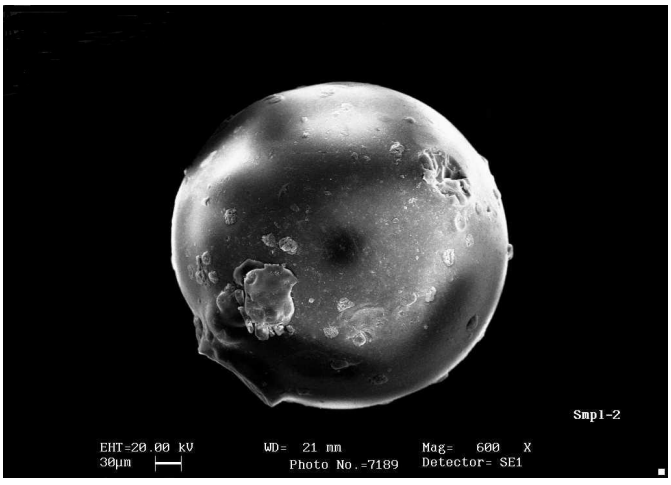

Fig. 2: Chitosan-alginate microspheres containing rifampicin before lectin coating

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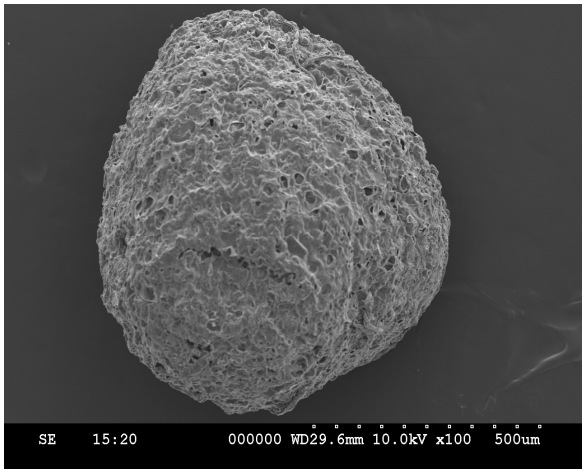

Fig. 3: Lectin coated rifampicin microcapsule

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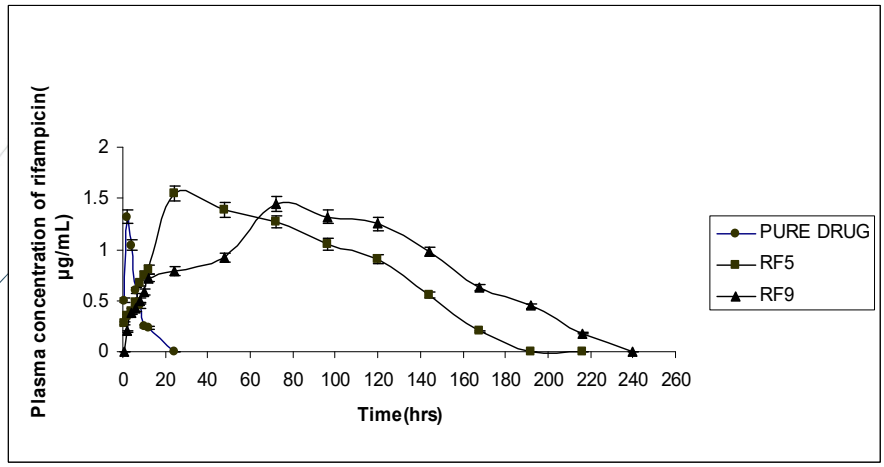

Fig. 4: Plasma concentration of rifampicin following the oral administration of pure drug, lectin uncoated and lectin coated microcapsules containing rifampicin

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S.No.	Study	Results and Discussion		
1	SEM	Almost spherical, discrete and covered completely with chitosan coated material		
2	Size analysis	Uniform in size with a mean size of 795.76±1.154µ with increase coat:core ratio the size of the microcapsules was increased		
3	Drug content and encapsulation efficiency	Each 50 mg of various microcapsules was found to be in the range of 4.95-5.94 mg in methanol % encapsulation efficiency achieved were, for 1:1 microcapsules 41%, 1:2 microcapsules 62.8% and 1:3 microcapsules 98.62%		
4	FT-IR studies	Spectra of micro capsule with nits peak in the same region as that of individual components suggesting no interaction or degradation		
5	Swelling studies	Swelling ratio of chitosan microcapsules were higher at pH 1.2 than, at pH 7.4		
6	*In-vitro* Mucoadhesion test	Formulation	% Adhering to tissue in pH 7.4 medium	%Adhering to tissue in pH 1.2 medium
		1:1	56	60
		1:2	42	52
		1:3	38	42
7	*In-vitro* Dissolution studies	The percentage drug release from microcapsules 1:1,1:2,1:3 were found to be 60.20%,43.25% and 39.63% respectively after 12hrs		

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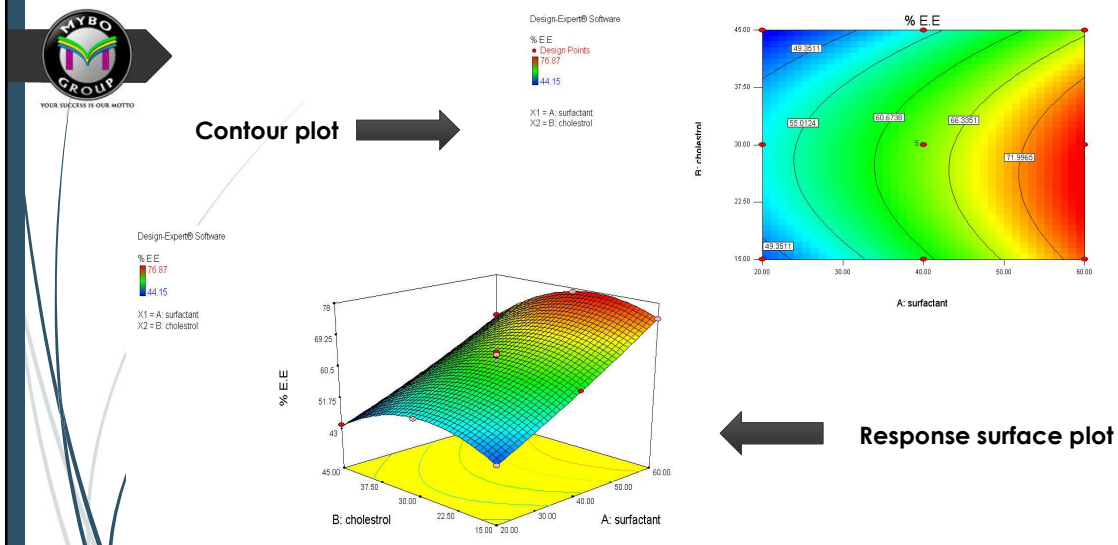

Plots showing the effect of surfactant and cholesterol on entrapment efficiency of tamsulosin hydrochloride loaded niosomes

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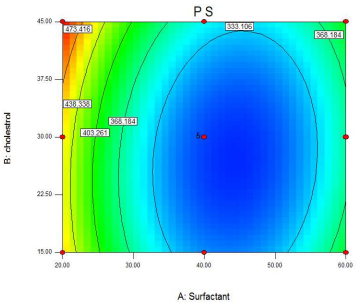
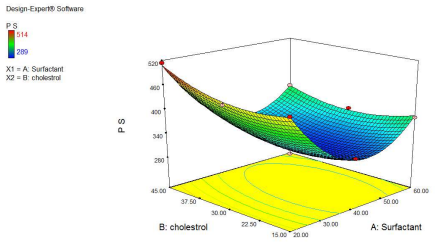
Contour plot



Response surface plot



Plots showing the effect of surfactant and cholesterol on <u>particle size (nm)</u> of tamsulosin hydrochloride loaded niosomes

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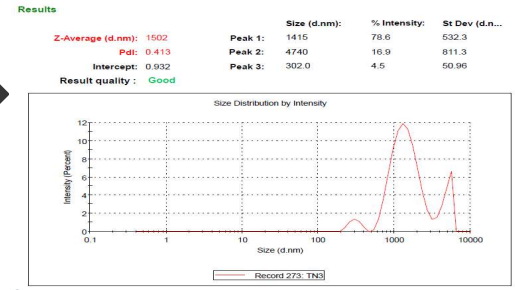
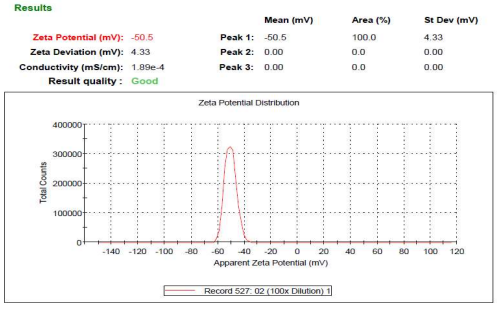


Particle size and PdI of optimized formulation of proniosomes (PNF O3)

Zeta potential of optimized formulation of Proniosomes (PNF O3)



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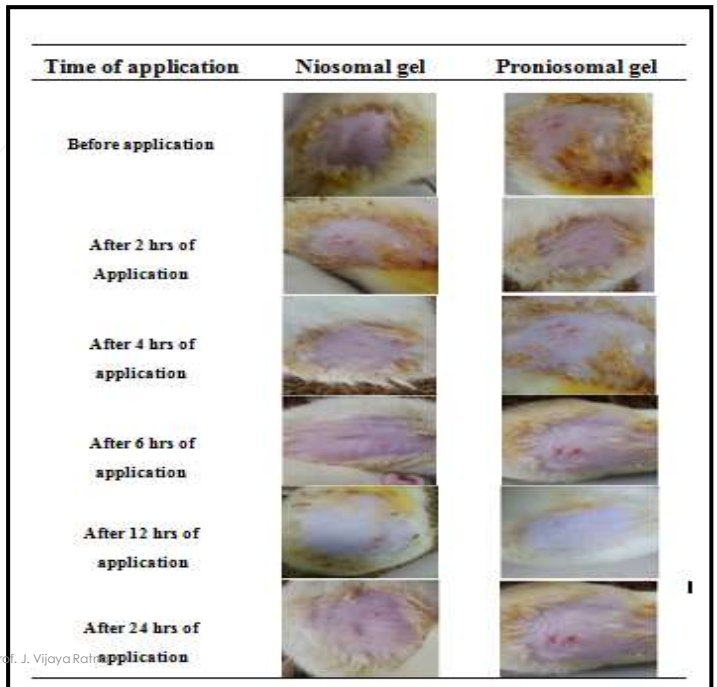

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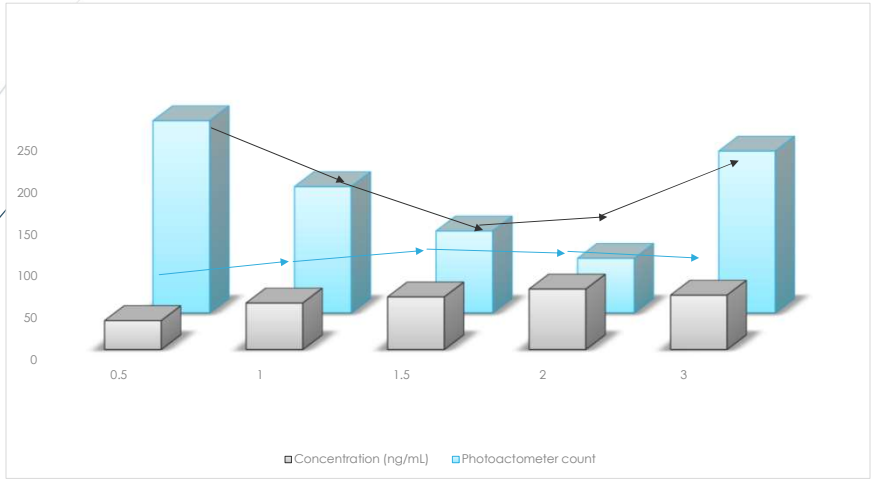
Concentration of drug and Photoactometer score with respect to time for PC



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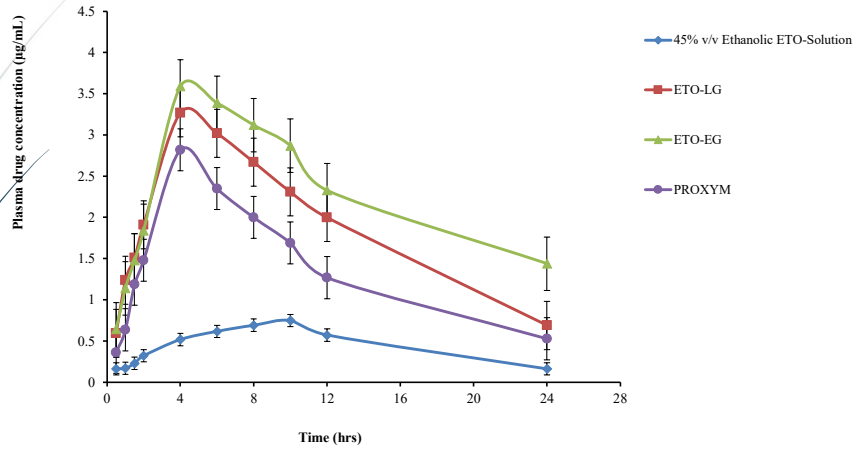
Time vs plasma drug concentration



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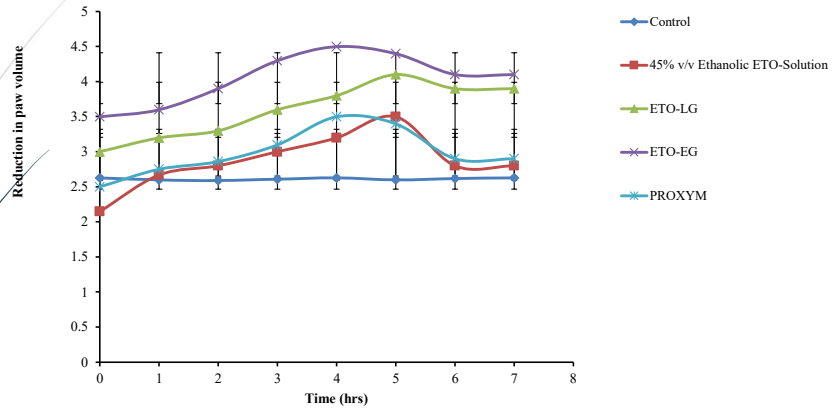
Reduction in paw volume



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Discussion

- Discussion should include each and every data point in each and every table and graph presented.
- Explain in clear sentences the meaning of the results and their analysis.
- In the tables and graphs, units and legends must be properly written.
- Trends in the data must be observed.
- Discussion must include the inferences that can be drawn. Interpretation must be done.

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Result-Observation

- Suppose results say:
  The drug release rate for microcapsules having 30% polymer show that release is fastest from Methyl Cellulose, release is slower from Ethyl Cellulose and release is slowest from Cellulose Acetate.
- observation from the result
  Slowest release from Cellulose Acetate is because it is giving thick solid coat to the MCs.
  Ethyl Cellulose is giving a porous coat.
  MC is giving an irregular coat.

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Correlation of all the results- interpretation

- These results must be correlated with results of the SEM photographs.
Researcher must carefully observe whether the results of all the experiments are in harmony or in agreement with each other or not.
Thus, interpretation is the heart of the discussion.

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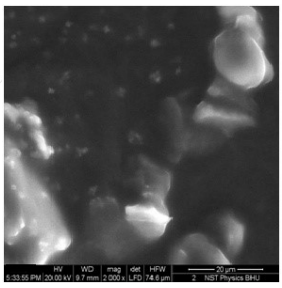
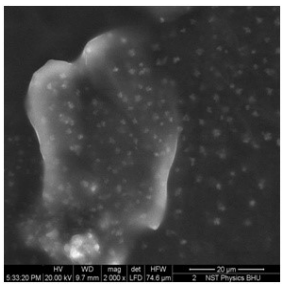
Scanning electron microscopy





The external morphology study using SEM revealed that all nanoparticles are somewhat **spherical in shape** and are of nano size range, but with substantial agglomeration. The degree of nanoparticles fusion was notable in the above Figure.

A reason for this behaviour was that during the lyophilisation process solvent was removed from nano formulation.

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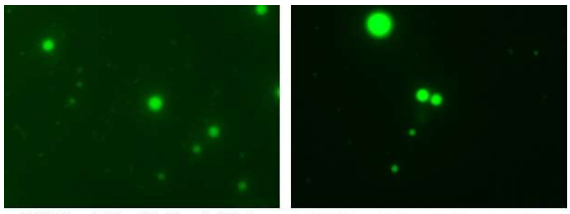
Uptake studies on broncho-alveolar macrophages



(A) CLSM image of AMs containing Fluorescein labelled Nanoparticles (Ex vivo)

(B) CLSM image of AMs containing Fluorescein labelled Nanoparticles (In vivo)

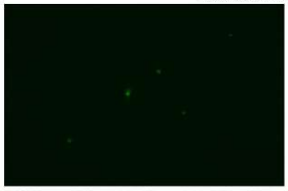


Figure 7 (C) CLSM image of AMs containing Fluorescein labelled Drug Solution (In vivo)

FCLSM images of alveolar macrophages (a) containing fluorescein-labelled nanoparticles *ex vivo* (b) containing fluorescein-labelled nanoparticles *in vivo* (c) containing fluorescein-labelled drug solution *in vivo*

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Images of patients with *Psoriasis vulgaris*

Figure 1-C. A male patient with scaly psoriatic lesions on the palms of both hands and

Figure 1-D. A female patient showing typical psoriatic skin lesions on her Right elbow

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Table- 5.1.5: Size distribution analysis of Eudragit L100 and Eudragit S100 microcapsules of XYZ drug

Size range (µm)	Mid point (d)	Frequency (n) (MC3)			nxd		
		Batch 1	Batch 2	Batch 3	Batch 1	Batch 2	**Batch 3**
100-200	150	6	5	4	900	750	**600**
200-300	250	12	13	12	3000	3250	**3000**
300-400	350	26	27	26	9100	9450	**9100**
400-500	450	3	3	6	1350	1350	**2700**
500-600	550	2	2	1	1100	1100	**550**
600-700	650	1	1	1	650	650	**650**
					Davg=329 µm		

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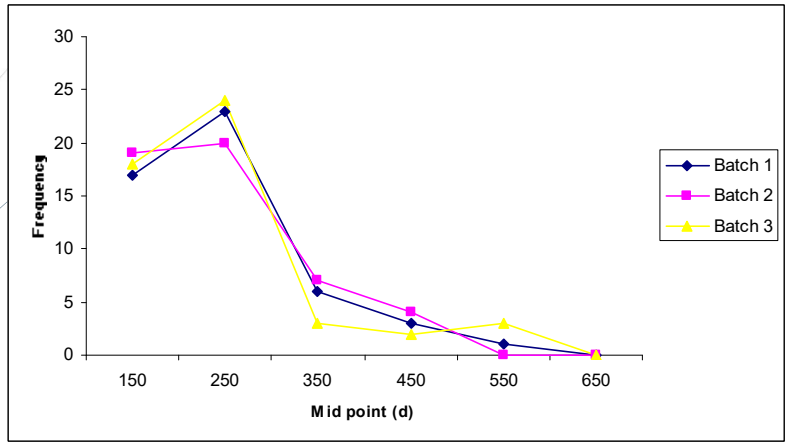

Figure- 5.2.2: Size distribution of microcapsules of XYZ drug in three batches prepared under similar conditions

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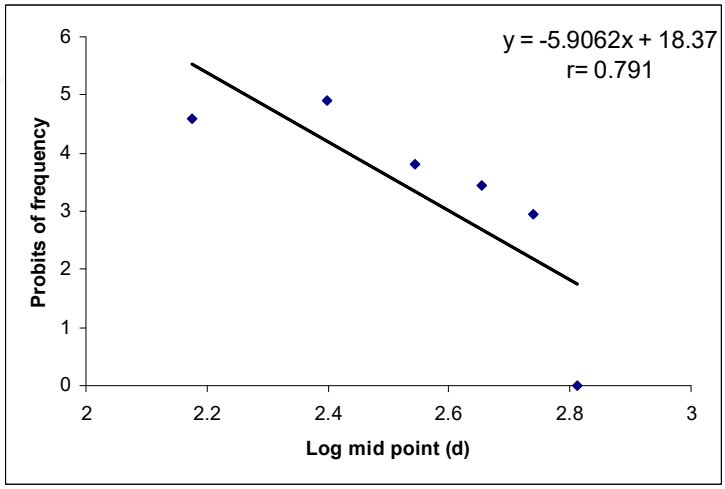

Figure-5.2.4: Log Probability Plots of Microcapsules (MC1)

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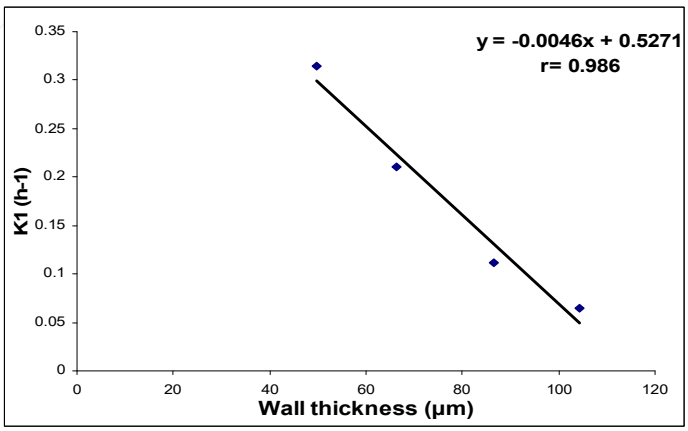

Figure-5.3.9: Relationship between wall thickness and release rate (K_1) of Eudragit microcapsules of XYZ

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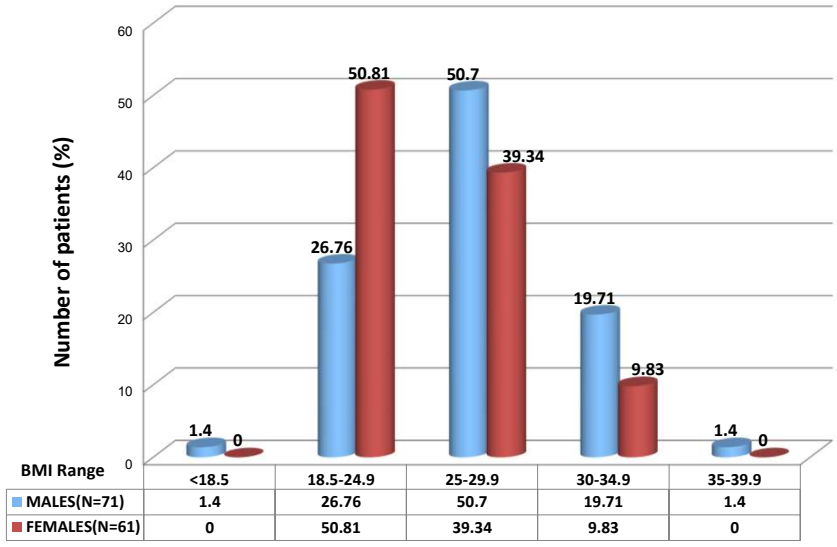

Figure 3.1: Gender-wise distribution of BMI in psoriasis group

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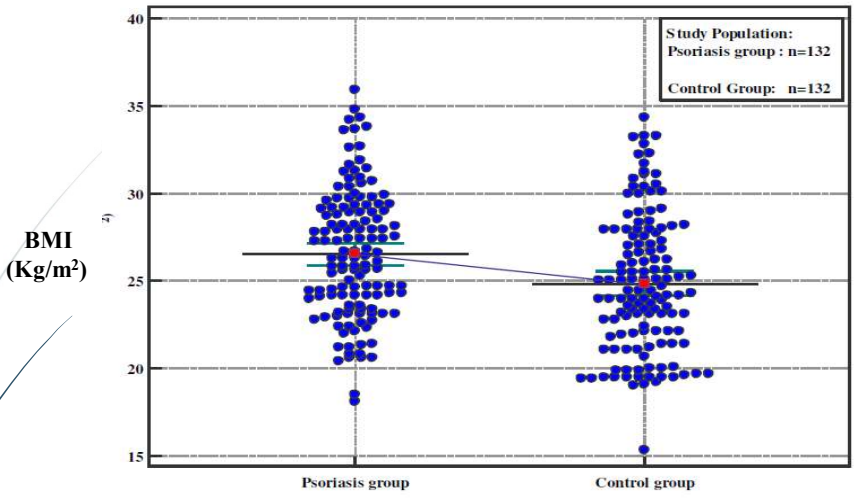

Figure 3.4: Data Comparison graph. Dots plot for Body mass Index (BMI) in psoriasis and control groups.

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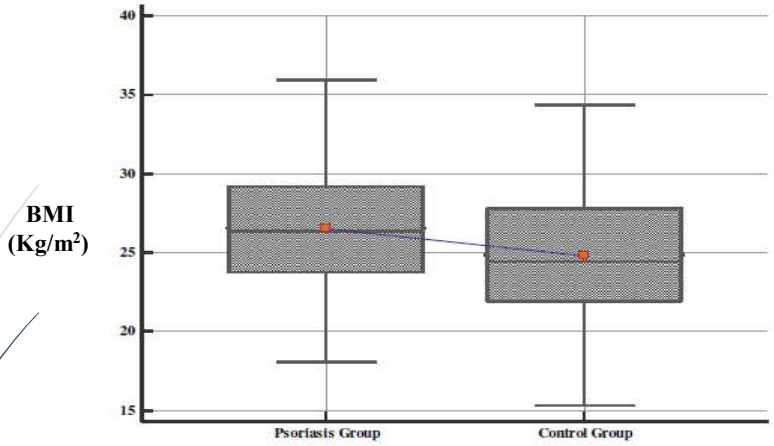

Figure 3.5: Box and Whisker plot of Body Mass Index (BMI) scores in psoriasis and control groups

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Table 7.1: Descriptive statistics of Body Mass Index (BMI) in cases group

BMI (Cases)	Statistic
MEAN	26.53
95% Confidence Interval for Mean	Lower bound 25.90 Upper bound 27.16
Median	26.35
Variance	13.37
Std. Deviation	3.65
Minimum	18.10
Maximum	35.90
Range	17.80
Interquartile Range	5.47

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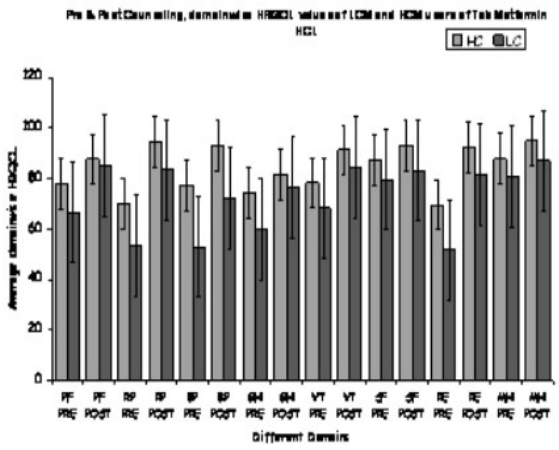
Comparative analysis



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Discussion

- Raw data/experimental data
- Tabulated data
- Analysis through calculations, diagrams, graphs
- Observations
- Interpretations
- Understanding the interpretations from various experiments in their totality
- Looking for harmony/consistency
- Conclusions

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Discussion

- Give only those conclusions for which you have solid evidence/proof.
- Conclusions of our own work must be compared with the work of previous authors, whose work we referred to, in literature review.

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Summary and conclusions

- This chapter should summarize the work from Aim to Discussion.
- Duplication is to be avoided.
- Briefly we need to write our aim, need for the study, experiments conducted, important results and all the conclusions.
- One must highlight the contributions from the work.
- Future scope for the work may also be written.

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References

- References must be written in Vancouver style.
- You must carefully study how a reference is to be written in the body of the thesis and how it is to be written at the end of a chapter.

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Vancouver style

- In-text citation: when a researcher is cited, the source is given a number, 1,2,3-----
- We put the number in brackets, after the full stop, or write it as a superscript.
- Ex: results …..clearly proved this point.[3]
- Ex : results --- clearly proved this point. (3)
- Usually, colleges have a conventional format.
- The same format must be consistently followed throughout the thesis.
- Try to always give primary references.

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Vancouver style

- Sometimes, you attribute one statement to a number of workers; example: This argument is advocated by a number of authors. (1-3,6-8)

Or

- This argument is advocated by a number of authors. [1-3,6-8]

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Reference from a journal

Format:

- Author AA, Author BB, Author CC, Author DD. Title of article. Abbreviated title of journal. Date of publication YYYY Mon DD;volume number(issue number):page numbers.
- Example:
- 192. Boudad H, Legrand P, Lebas G, Cheron M, Duchêne D, Ponchel G. Combined hydroxypropyl-β-cyclodextrin and poly(alkylcyanoacrylate) nanoparticles intended for oral administration of saquinavir. **Int J Pharm**. (2001); 218:113-24.

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Thesis

- Author AA. Title of thesis [dissertation]. Place of publication: Publisher; Year of publication. Page numbers.

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Text book

- Author AA. Title of book. Edition [if not first]. Place of publication: Publisher; Year of publication. Pagination.

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Web site

- Author / organization name. Title of the page [Internet]. Place of publication: Publisher; Date or year of publication [updated YYYY Mon DD; cited YYYY Mon DD]. Available from: URL
- Write the date on which you accessed the web site.

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Important

- Your observation notebook is a very important document. Keep it safely.
- The original graphs or documents of IR spectra, SEM photographs, DSC thermographs, HPLC prints must be maintained safely.
- You must start gathering hard copies of important literature, as soon as you start work. Good understanding of the theoretical framework/principle/ background of your problem is important.

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Important

- Research must have significant contribution to the pharmaceutical field and to the society.
- Overall plan of the work must be there in the beginning of the research.
- Taking measurable parameters as dependent variables is important.

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A good thesis, well written brings out the significance of the work and get laurels to the author.

That is what all of you should aim for.

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Thank You

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