

# **The Importance of Research in Academia Beyond Just a Degree**

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
FOR THE DEGREE OF**

**DOCTOR OF PHILOSOPHY  
IN  
BIOTECHNOLOGY**

**To**



**THE ASSAM**

---

**ROYAL GLOBAL UNIVERSITY**

**By**

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**Registration No:**

**August 2022**



## DECLARATION

I hereby declare that the content embodied in the PhD thesis entitled "**The Importance of Research in Academia Beyond Just a Degree**" is the result of research work carried out by me in the Department of Biotechnology, The Assam Royal Global University, Guwahati, India, under the supervision of Dr. Name Surname.

In keeping with the general practice of reporting research observations, due acknowledgments have been made wherever the work described is based on the findings of other researchers.

Further, I declare that this thesis as a whole or any part thereof has not been submitted to any university (or institute) for the award of any degree/ diploma.

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## **CERTIFICATE FROM THE SUPERVISORS**

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## **ACKNOWLEDGEMENTS**

Please use this section to acknowledge all the people whose help was invaluable in completing this study.

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## **ABSTRACT**

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# Abbreviations

ACP	Acyl carrier protein
ANOVA	Analysis of variance
ATR	Attenuated total reflectance
CaCl <sub>2</sub>	Calcium chloride
CMC	Critical micelle concentration
CMD	Critical micelle dilution
CoA	Coenzyme A
Cu	Copper
CuSO <sub>4</sub> · 5 H <sub>2</sub> O	Copper (II) sulfate pentahydrate
DNA	Deoxyribonucleic acid
Dpi	Days post inoculation
Dps	Days post sowing
EC	Enzyme commission number
EDX	Energy dispersive X-ray spectroscopy

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# 1

## Introduction

*This chapter should ideally begin with an introduction to the overall scope of the presented research lucidly and understandably. Any statement or data directly adopted from previously published sources must be cited within the text and in references numbered in the citation order. The citations should be continued without any break throughout the thesis so that a single final list would contain all the references from chapters 1, 2, 3, and so on.*

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### **Aim and scope of the present study**

*This section should clearly and concisely describe the aim and scope of the study in light of the information provided in the preceding paragraphs of the chapter, justifying the topic and importance of the proposed research. The section should lead to the formulation of the research objectives.*

### **Research objectives**

*The research objectives of the proposed study are –*

- 1. The first objective*
- 2. The second objective*
- 3. The third objective and so on.*

# 2

## Chapter 2

*This chapter can be titled as per the researcher, e.g., Literature Review, Materials and Methods, or any other specific title. Sections, subsections, and sub-subsections should be used to enhance clarity if required.*

### **2.1 Reasonably long and suitable section title (Bold, non-italicized, 14-point font size)**

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# 3

## Chapter 3

*This chapter can be titled as per the researcher, e.g., Materials and Methods, Results, Results and Discussions, or any other specific title. Sections, subsections, and sub-subsections should be used to enhance clarity if required. In this template, this chapter outlines the key features to note while presenting research findings in Tables and Figures.*

### **3.1 The layout of formal Tables**

*The following rules are to be adhered to while preparing Tables –*

- 1. Do **NOT** use **vertical lines**.*
- 2. Do **NOT** use **double lines**.*
- 3. Mention the units in the column heading instead of placing them adjacent to the values in the body.*
- 4. Decimal values should always be preceded by a digit, i.e., 0.1, not .1*
- 5. Do **NOT** use 'ditto' signs or any other convention to repeat a previous value. Typically, a blank space serves the purpose. If not, then repeat the value.*
- 6. Do **NOT** place Tables in between text. Place them either at the beginning or end of a page, preferably with central alignment.*
- 7. Large Tables with multiple columns should be presented in landscape orientation.*
- 8. The Table legend should always be placed **above** the Table.*

**Table 3.1** A poorly formatted Table

Bacterial isolate	Mean mycelial growth in Fungus 1	Mean mycelial growth in Fungus 2	Inhibition against Fungus 1	Inhibition against Fungus 2
Isolate 1	1.27 ± .06 cm	3.18 ± .28 cm	85.89 ± .67 %	64.67 ± 3.11 %
Isolate 2	0.90 ± .17 cm	2.95 ± .17 cm	90.00 ± 1.89 %	67.22 ± 1.89 %
Isolate 3	0.09 ± .01 cm	2.64 ± .15 cm	99.00 ± .02 %	70.67 ± 1.67 %
Isolate 4	1.27 ± .12 cm	3.26 ± .30 cm	85.89 ± 1.33 %	63.78 ± 3.34 %

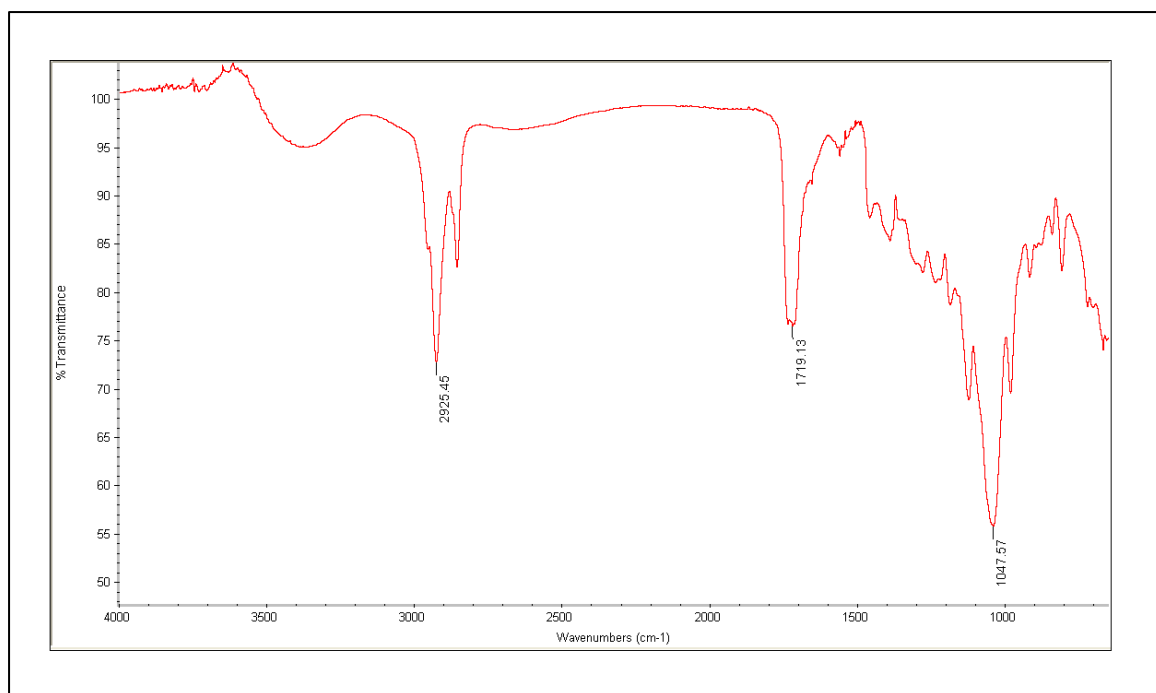
**Table 3.2** A properly formatted Table

Bacterial isolate	Mean mycelial growth (cm)		Percentage of inhibition (%)	
	Fungus 1	Fungus 2	Fungus 1	Fungus 2
1	1.27 ± 0.06	3.18 ± 0.28	85.89 ± 0.67	64.67 ± 3.11
2	0.90 ± 0.17	2.95 ± 0.17	90.00 ± 1.89	67.22 ± 1.89
3	0.09 ± 0.01	2.64 ± 0.15	99.00 ± 0.02	70.67 ± 1.67
4	1.27 ± 0.12	3.26 ± 0.30	85.89 ± 1.33	63.78 ± 3.34

### 3.2 The layout of formal Figures

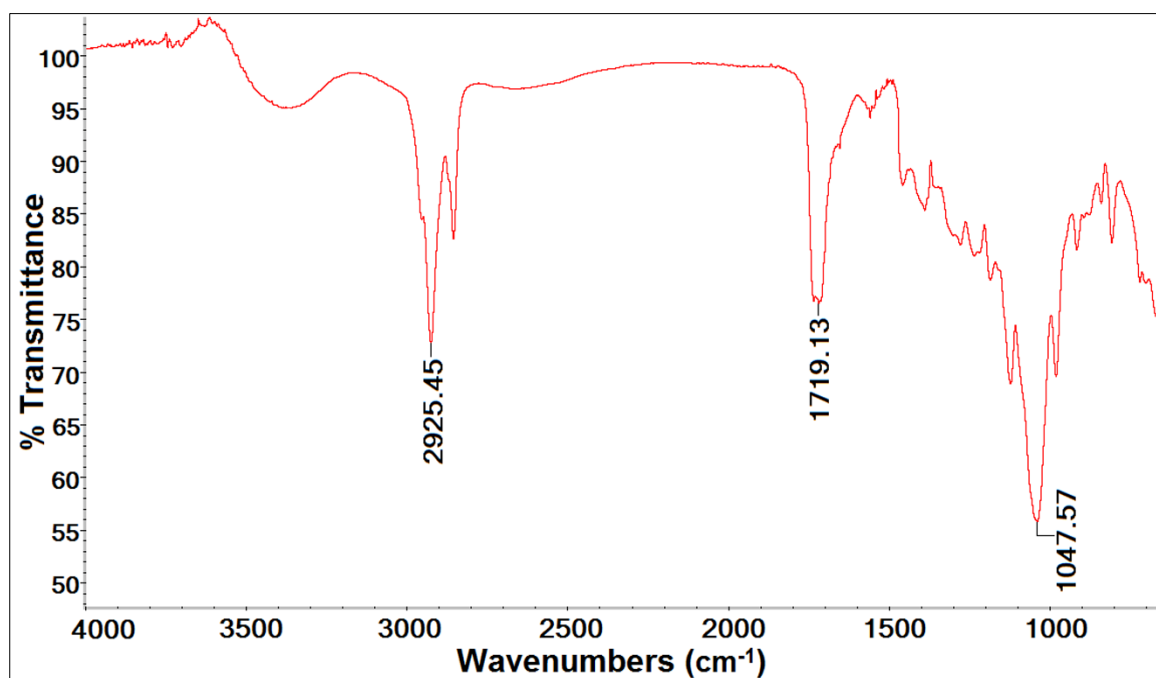
*A figure used in the thesis may be a photographic image and sometimes a representative schematic or scientific graph, depending on the field of study. However, the following general rules should be adhered to, except for minimal essential variations –*

- 1. A Figure should be of high enough resolution to be legible without zooming.*
- 2. The extra white space around a Figure should be cropped to maximize the space available for the data.*
- 3. In the case of graphs, text used within should **NOT** have a font size or type radically different than the thesis text.*
- 4. If a scientific graph is generated in other statistical software, do **NOT** insert that directly into the word processor file. First, save the graph as an image and then insert it as a picture.*
- 5. Do **NOT** place Figures in between text. Place them either at the beginning or end of a page, preferably with central alignment.*
- 6. The Figure legend should always be placed **below** the Figure.*



**Fig. 3.1** A poorly formatted FTIR spectrum

Although factually accurate, the Figure above (**Fig. 3.1**) is not formatted well. Notice the extra white space, illegible text, and double border around the graph. The same Figure after proper formatting can be represented as shown in **Fig. 3.2**



**Fig. 3.2** A properly formatted FTIR spectrum

*Chapter 3 ended on an odd-numbered page; however, the next chapter should not be started on this page. Start Chapter 4 from the next odd-numbered page and leave this page blank with the following statement –*

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# 4

## Chapter 4

*This chapter can be titled as per the researcher, e.g., Results and Discussions, Discussions, Conclusions and Future Perspectives, or any other specific title. Sections, subsections, and sub-subsections should be used to enhance clarity if required.*

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## References

*This component should be named either as **References** – if **only in-text citations** are listed, or **References and Bibliography** – if (in addition to in-text citations) additional **sources consulted during the study** are also listed **but not cited in-text**.*

- [1] Rayman, M. P. Selenium and human health. *The Lancet*, **379**, 1256-1268 (2012)
- [2] Andersson, M., Karumbunathan, V., and Zimmermann, M. B. Global iodine status in 2011 and trends over the past decade. *The Journal of nutrition*, **142**, 744-750 (2012)
- [3] Borah, S. N., Goswami, L., Sen, S., et al. Selenite bioreduction and biosynthesis of selenium nanoparticles by *Bacillus paramycoides* SP3 isolated from coal mine overburden leachate. *Environmental Pollution*, **285**, 117519 (2021). <https://doi.org/10.1016/j.envpol.2021.117519>.
- [4] Borah, S. N., Sen, S., and Pakshirajan, K., Biosurfactants for Enhanced Bioavailability of Micronutrients in Soil. In: H. Sarma, and M. N. V. Prasad (Eds.), *Biosurfactants for a Sustainable Future*, (2021), pp. 159-181. <https://doi.org/10.1002/9781119671022.ch8>.
- [5] Combs Jr, G. F., and McClung, J. P. *The vitamins: fundamental aspects in nutrition and health*, 5<sup>th</sup> Ed, Academic Press, 2017.

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# Appendices

*Appendices, if any, should be incorporated here after the References/ References and Bibliography section.*

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## List of Publications

*The list of publications from work presented in the thesis should be given here as a list in reverse chronology (latest publication first). Following this, the first pages of each publication should be attached in the same order.*