CONTENT ANALYSIS OF DOCTORAL THESES ON BOTANY SUBMITTED TO THE UNIVERSITIES OF WEST BENGAL (2000 - 2020)

Thesis Submitted for the Degree of
Doctor of Philosophy (Arts)
at
Jadavpur University

by
Sayantani Majumder

Under the Supervision of
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2025

Certified that the Thesis entitled

Content Analysis of Doctoral Theses on Botany Submitted to the Universities of West Bengal (2000 - 2020)

submitted by me for the award of the degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out Under the Supervision of **Prof. (Dr.) Subarna Kumar Das**

and that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere/ elsewhere.

Sayantani Majumder

Countersigned by the
Supervisor: Subarna Das
Dated: 03/07/2025

Candidate:
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DECLARATION

The Thesis entitled "**Content Analysis of Doctoral Theses on Botany Submitted to the Universities of West Bengal (2000 – 2020)**", is submitted to Jadavpur University for fulfilment of the requirements for award of the degree of Doctor of Philosophy in Library and Information Science. I hereby declare that this thesis is original record of my research work under the supervision of **Prof. (Dr.) Subarna Kumar Das**, Department of Library and Information Science, Jadavpur University.

I further declare that it has not been previously submitted either in part or full to this or any other University or Institution for any degree. Every time something has been taken from another source or cited; the appropriate acknowledgement has been made.

Date: **Sayantani Majumder**

Dedicated

to

my beloved Parents

Mrs.Mousumi Majumder

and Mr. Goutam Majumder

Preface

Doctoral research in the botanical sciences has gained substantial prominence over the years, not only driving forward knowledge but also nurturing the next generation of scholars. This study seeks to examine the development of doctoral theses submitted to six leading universities in West Bengal, with a particular focus on the Department of Botany. The University of Calcutta, University of Kalyani, University of North Bengal, University of Burdwan, Vidyasagar University, and Visva Bharati University have played a crucial role in shaping the academic field of Botany in the region.

Covering the period from 2000 to 2020, this research delves into key trends in doctoral thesis submissions, analyzing the growth of academic output, evolving research themes, and shifts in the academic environments within these institutions. Through a detailed examination of year-wise submission trends, faculty supervision patterns, gender distribution, and research subjects, this study offers a comprehensive look at the changing dynamics of doctoral education in West Bengal. Its primary goal is to provide an in-depth analysis of the factors influencing research productivity and to facilitate a comparative assessment of doctoral research outputs across the six universities.

Beyond its contribution to academic scholarship, this research holds potential for informing future strategic decisions at these institutions. By uncovering trends in research topics, supervisory practices, and gender inclusivity, the study highlights areas where improvements can be made and offers suggestions for enhancing the overall quality of doctoral education. As the academic research landscape continues to evolve, understanding these trends will be critical in shaping the future direction of research in the field of Botany.

It is my sincere hope that the insights gleaned from this research will assist administrators, researchers, and policymakers in strengthening doctoral research in Botany and related fields.

Date: **Sayantani Majumder**

Acknowledgement

As a prelude to my thanks giving, at first, I wish to thank the Almighty for giving me the strength to complete my entire course and research program.

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Last but not least, I take this opportunity to express my heartfelt gratitude to my Father, Mr. Goutam Majumder and my Mother, Mrs. Mousumi Majumder for their unconditional support and motivation throughout the journey.

Date: **Sayantani Majumder**

CONTENTS

Abstract

This study presents a comprehensive bibliometric analysis of 663 doctoral theses in Botany submitted between 2000 and 2020 across six prominent universities in West Bengal: University of Calcutta, University of Kalyani, University of North Bengal, University of Burdwan, Vidyasagar University, and Visva Bharati University. Through a critical review of local, national, and international literature, key research gaps were identified, leading to objectives that encompass year-wise trends, supervisory contributions, gender representation, subject-wise focus areas, and citation patterns. Employing a hybrid content-analysis and bibliometric approach, data were sourced from the Shodhganga digital repository and university libraries, with OCR tools converting scanned theses into analysable text. Quantitative methods—descriptive statistics and bibliometric techniques—were applied using Microsoft Excel for visualizations like bar graphs and line charts, ensuring ethical compliance and researcher confidentiality. Findings reveal a gradual rise in doctoral outputs: modest submissions in 2000–2005, steadier growth in 2006–2011, and a pronounced surge from 2012 to 2019, peaking at 60 theses in 2016, followed by a sharp drop in 2020 due to the COVID-19 disruptions. Supervisory analysis shows a clear preference for single-supervisor mentorship—62–69% of theses—while joint supervision accounted for 31–38% . Notably, Anita Mukherjee (16 theses) at CU and Animesh Kumar Datta (19 theses) at KU emerged as leading mentors. Subject-wise distribution underscores Cytology as the dominant field (21.27%), followed by Genetics (12.82%), Plant Ecology (12.22%), Microbiology (10.11%), and Environmental Botany (9.95%). Citation analysis highlights robust engagement with scholarly literature: average references per thesis at CU ranged from 139.78 to 188.25, with journal articles comprising over 50% of all citations—reflecting strong reliance on peer-reviewed sources. Overall, this study illuminates the evolving contours of botanical doctoral research in West Bengal, spotlighting institutional strengths, mentorship models, disciplinary trends, and citation practices. The insights gained can guide policy-makers and academic leaders in enhancing doctoral training curricula, fostering interdisciplinary collaborations, and strengthening research infrastructure to support future botanical scholarship.

Keywords: West Bengal, Cytology, Botany, Genetics, Plant Science.

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List of Abbreviations

CU – University of Calcutta

KU – University of Kalyani

NBU – University of North Bengal

BU – University of Burdwan

VU – Visva Bharati University

VBU – Visva Bharati University

Ph.D. – Doctor of Philosophy

M.Sc. – Master of Science

UGC – University Grants Commission

DST-FIST – Department of Science and Technology - Fund for Improvement of S&T Infrastructure

HPLC – High-Performance Liquid Chromatography

HPTLC – High-Performance Thin Layer Chromatography

DBT – Department of Biotechnology

BOOST – Biotechnology Overseas Training Scheme

NAAC – National Assessment and Accreditation Council

CHAPTER I

INTRODUCTION

1 Introduction

This study explores the analysis and interpretation of doctoral theses across six prominent universities in West Bengal: University of Calcutta, University of Kalyani, University of North Bengal, University of Burdwan, Vidyasagar University, and Visva Bharati University. These institutions have long played a key role in advancing research in the field of Botany and related disciplines. Each of these universities represents a unique academic culture and historical context, but they all share a common goal of contributing significantly to knowledge in the botanical sciences.

1.1 Background of Study

The Department of Botany at each of the aforementioned universities has witnessed various stages of growth, reflecting broader trends in academic and research landscapes. These universities have transitioned from modest academic beginnings to advanced research hubs. Over time, they have built upon their foundational strengths, achieving international recognition through faculty contributions, student achievements, and an expanding body of research. The trend in the submission of doctoral theses serves as a critical indicator of these universities' growing academic and research capacities.

As the importance of research intensifies globally, academic institutions must continually adapt to address changing educational landscapes and technological advances. The doctoral programs at these universities not only foster critical thinking and academic excellence but also help shape future leaders in the field of Botany. Understanding the patterns in thesis submissions, supervision, gender distribution, and research trends can provide invaluable insights into the current state and future trajectory of doctoral research in Botany.

1.2 Social Implications of the Study

This study provides essential insights into the growth and trends of doctoral research within the Botany departments across six prominent universities. Understanding the dynamics of thesis submissions, supervisory contributions, gender representation, and subject-specific research areas offers substantial implications for academic communities, library and information science (LIS), and societal growth. These insights hold significant value for various stakeholders:

- **Library and Information Science (LIS)**: The findings enable librarians to better understand the nature of academic research, helping them design more effective

collection development policies and information services tailored to the needs of doctoral researchers. With an increased focus on specific research areas, the study supports targeted acquisitions and resource allocation, thus improving the quality and relevance of academic libraries' collections.

- **University Administrations and Research Policy Makers**: By revealing the subject areas of growing interest, the study helps universities identify emerging trends in research, fostering strategic planning for course offerings, faculty recruitment, and research collaborations. Furthermore, it provides a roadmap for creating policies that encourage diversity in research interests and equal participation among gender groups.
- **Researchers and Faculty Members**: The study serves as a reference for understanding the research priorities within the field of Botany and highlights the role of faculty members in shaping academic research. By identifying supervisors who have guided numerous theses, it emphasizes the importance of mentorship in research productivity and quality, encouraging more faculty involvement in guiding students.
- **Gender Inclusivity and Equality**: The significant participation of both male and female researchers points to an encouraging shift toward gender inclusivity. However, the study also identifies areas for improvement in balancing gender representation in higher academic research, with some institutions showing greater gender disparity. This prompts further investigation into institutional policies, offering potential for developing strategies to encourage more female participation in doctoral studies and enhance their representation in key research areas.
- **Broader Societal Impact**: The growing body of research in fields like plant pathology, genetics, and environmental botany can directly contribute to societal well-being. Research in these areas plays a crucial role in addressing real-world challenges such as climate change, agricultural sustainability, and health. The study's findings underscore the importance of fostering research that directly aligns with global and local environmental needs, thereby shaping the future of ecological conservation and public health initiatives.

In conclusion, the social implications of this study extend far beyond academic circles, influencing policies, practices, and collaborations that will shape the future of botanical research and its applications in society.

1.3 Conspectus

This study provides a thorough analysis of doctoral research across six major universities in India, specifically focusing on the Department of Botany. The research aims to explore patterns in submission, supervision, gender representation, and subject specialization, all of which are key to understanding the evolving research environment in Indian academic institutions. The present study has been organized into the following 10 chapters:

Chapter I: Introduction

This chapter introduces the study, focusing on the analysis and interpretation of doctoral theses across six universities in West Bengal. It discusses the background, objectives, scope, and research methodology. The study examines trends in doctoral submissions, gender distribution, and research topics in Botany.

Chapter II: Review of Literature

This chapter reviews relevant literature on the research topic, focusing on previous studies and their findings in related fields. It categorizes the review into local, national, and international levels, providing insights into existing research and identifying gaps.

Chapter III: Analysis of Interpretation of Data of University of Calcutta

This chapter analyzes data from the University of Calcutta's Botany Department, looking at trends in doctoral thesis submissions, supervisor contributions, and research topics over two decades. It highlights a significant increase in thesis submissions, particularly between 2012 and 2019.

Chapter IV: Analysis of Interpretation of Data of University of Kalyani

Here, the data from the University of Kalyani's Botany Department is analyzed, with a focus on year-wise submissions, supervisor-wise distribution, and research trends. The study reveals fluctuations in submissions, with notable increases in specific years, such as 2013 and 2015.

Chapter V: Analysis of Interpretation of Data of University of North Bengal

This chapter provides an analysis of the University of North Bengal's Botany Department's doctoral thesis submissions. It covers the year-wise distribution, supervisor-wise contributions, and supervising patterns. The chapter shows a growing trend in research activity, particularly after 2010.

Chapter VI: Analysis of Interpretation of Data of University of Burdwan

The analysis in this chapter focuses on the doctoral thesis submissions at the University of Burdwan's Botany Department, exploring trends in research output and supervisor contributions. The chapter reveals an intermittent pattern of submissions with notable peaks in certain years.

Chapter VII: Analysis of Interpretation of Data of Vidyasagar University

This chapter examines the doctoral research output at Vidyasagar University's Botany Department. It provides a breakdown of submissions, supervisory patterns, and gender representation among researchers, highlighting the concentration of theses under a few key supervisors.

Chapter VIII: Analysis of Interpretation of Data of Visva Bharati

The data from Visva Bharati's Botany Department is analyzed in this chapter. It discusses year-wise submissions, the role of individual supervisors, and the supervisory model used. The chapter also presents a breakdown of gender-wise thesis distribution.

Chapter IX: Comparative Study of Six Universities

This final chapter offers a comparative analysis of doctoral research across the six universities, focusing on year-wise submissions, supervisor contributions, research topics, and gender representation. It presents a comparative overview of research trends and highlights the academic strengths and challenges of each institution.

Chapter X: Findings and Conclusion

The final chapter summarizes the findings from the study, including the year-wise and supervisor-wise distribution of theses, gender representation, and subject areas of research. It concludes with insights into the doctoral education landscape in these six universities, highlighting the evolving research priorities and trends.

CHAPTER II

OBJECTIVES AND SCOPE

2 Introduction

Doctoral research represents the highest level of academic scholarship and is fundamental to the creation, dissemination, and advancement of knowledge. In the field of botanical sciences, doctoral theses embody the intellectual efforts of researchers who explore complex biological phenomena, investigate plant diversity, and develop sustainable solutions to ecological and agricultural challenges. The doctoral process is guided by a formal academic framework, typically supervised by faculty members with expertise in specific areas. The productivity, patterns, and distribution of such research outputs offer significant insights into the academic health and research priorities of universities. In West Bengal, a state rich in biodiversity, ecological diversity, and academic tradition, universities play a considerable role in shaping research in Botany. The present study seeks to understand the overall trends, gender distribution, supervisory practices, thematic orientations, and institutional variations in doctoral research in Botany across six major universities over a span of two decades (2000–2020). This time frame is long enough to observe transformations in academic culture, policy implementations, research interests, and societal demands that may have influenced doctoral research. Given the scope and purpose of this study, the primary goal is not merely to quantify the research outputs but to undertake a systematic and interpretive analysis of how these outputs have evolved across universities, individuals, and themes. The study aims to map the growth of botanical research in a regional academic context while also identifying strengths, disparities, and potential areas for development. To address these research imperatives, the study is guided by a set of well-defined objectives. These objectives form the backbone of the research process, helping to maintain clarity, structure, and focus. Each objective serves a distinct purpose, and collectively they allow a holistic understanding of the doctoral research landscape in Botany.

2.1 Objectives of the Study

2.1.1 To Analyse Year-wise Trends in Doctoral Thesis Submissions at the Six Universities

Each year's number of obtain theses submitted is a good sign of how much study is being done in a field. Analysing the year-wise trends of thesis submissions allows us to identify periods of academic growth or stagnation. These trends can be influenced by various factors including changes in government funding, shifts in academic policy, faculty recruitment, availability of research infrastructure, or even broader socio-economic conditions. In this study, a longitudinal approach is employed to examine the fluctuations and patterns of doctoral submissions in

Botany from 2000 to 2020 across six prominent universities in West Bengal. This two-decade period provides ample scope to identify whether the number of theses has increased, remained stable, or declined, and to interpret these patterns in light of institutional and systemic changes.

Through this objective, the study intends to:

- Trace the growth trajectory of doctoral research in Botany.
- Understand how external policy shifts might correlate with changes in submission numbers.
- Offer temporal insights that can help in future academic planning and policy making.

2.1.2 To Examine the Distribution of Doctoral Theses Among Various Supervisors and Their Contributions to Research Output

Supervisors play an essential role in guiding doctoral research. Their expertise, availability, and mentorship style significantly influence the quality and quantity of research produced under their supervision. Some supervisors may supervise numerous candidates over the years, while others may engage more selectively. This creates variability in supervisory distribution which can reflect individual academic productivity, departmental workload distribution, and institutional policies on Ph.D. supervision. By studying the distribution of theses among supervisors, the research aims to uncover patterns such as:

- The number of theses supervised by individual faculty members.
- The concentration of research output around a few supervisors .
- Identification of supervisors with specialized thematic interests or institutional roles.

This also indirectly reflects on departmental leadership, the distribution of academic mentorship, and how certain faculty may serve as pillars of research within their institutions.

This objective will help to:

- Identify the most prolific supervisors and their research domains.
- Understand mentoring dynamics within departments.
- Reveal potential issues such as over-dependence on a few supervisors or underutilization of others.
- Assist in future workload distribution and mentoring capacity-building strategies.

2.1.3 To Identify Gender-wise Distribution Patterns of Researchers in Doctoral Programs

Gender equality in academia has become a central concern in recent decades. While higher education institutions in India have increasingly opened doors to women, the representation of female scholars at the doctoral level—especially in the sciences—still varies significantly. An analysis of gender-wise participation offers valuable insights into inclusivity, empowerment, and equity in research.

This objective seeks to examine the proportion of male and female candidates pursuing Ph.D. degrees in Botany. It will look at whether there has been an increasing trend in female participation over the two decades and whether gender representation varies by institution.

Further, gender distribution patterns may also reveal:

- Institutional efforts towards gender diversity.
- Potential systemic biases or socio-cultural barriers.
- Correlations between gender and thematic research areas.

This component of the study aims to:

- Assess the gender parity among doctoral candidates.
- Provide empirical evidence on the role of women in botanical research.
- Contribute to the discourse on gender in science and academia in India.

2.1.4 To Analyse the Supervising Patterns of Doctoral Research, Focusing on the Prevalence of Single versus Joint Supervision

The supervision model adopted in doctoral research greatly influences the direction and quality of the work. Traditionally, single supervision has been the norm, where one faculty member guides a research scholar throughout the doctoral journey. However, with increasing complexity and interdisciplinary approaches, joint or co-supervision has gained prominence.

Joint supervision facilitates diverse perspectives, broader expertise, and shared responsibility. It may also serve as a mentoring mechanism for younger faculty members working alongside senior academics. In some cases, joint supervision may be mandated for interdisciplinary topics or collaborative projects between departments or institutions.

By analysing the pattern of supervision—single vs. joint—this study aims to understand:

- The evolving nature of mentorship models in Botany.
- Institutional practices and policies encouraging or discouraging joint supervision.
- Correlation between supervisory models and thesis output or quality.

This objective will help to:

- Quantify the proportion of single vs. joint-supervised theses.
- Highlight the advantages and challenges of each model.
- Offer recommendations for promoting effective supervision strategies.
- Reflect institutional openness to collaborative mentoring practices.

2.1.5 To Explore the Distribution of Research Topics, Thereby Identifying Emerging Trends and Areas of Focus in Botanical Sciences

The subject of a doctoral thesis reflects not only the candidate's interests but also broader disciplinary trends, funding priorities, and societal needs. In a diverse and evolving field like Botany, the thematic areas of doctoral research provide a mirror to changing academic and scientific priorities.

The analysis of research topics serves several purposes:

- It helps to map the landscape of research interests across institutions.
- Identifies dominant themes such as plant physiology, ecology, genetics, taxonomy, or biotechnology.
- Detects emerging or under-researched areas.
- Demonstrates the response of academic institutions to global scientific challenges such as climate change, biodiversity loss, or sustainable agriculture.

By categorizing and analyzing research topics, the study aims to track the intellectual trajectory of botanical sciences in the region and reveal institutional or thematic specializations.

Through this objective, the study intends to:

- Classify the research areas represented in the doctoral theses.
- Highlight dominant and emerging research domains.

- Offer insights for curriculum revision, funding allocation, and future research planning.
- Assist scholars and institutions in identifying gaps or duplication in research efforts.

2.1.6 To Compare and Contrast the Research Output Across These Six Universities, Offering Insights into Institutional Strengths and Challenges

Each university has a unique academic culture, infrastructure, faculty strength, and administrative policies. These variables influence the nature and volume of doctoral research undertaken. A comparative analysis of the six universities included in the study enables a deeper understanding of institutional dynamics, allowing benchmarking and identification of best practices.

The comparison will be made on multiple parameters:

- Total number of theses submitted.
- Year-wise growth patterns.
- Gender distribution.
- Supervisor involvement.
- Supervisory models.
- Thematic diversity.

Such a comparative approach helps highlight disparities in performance, capacity, or strategic focus. It can also inform policy recommendations for state and institutional leadership to foster more balanced and productive research environments.

This final objective aims to:

- Provide a comparative academic profile of the selected universities.
- Identify institutions with strong or weak doctoral research frameworks.
- Explore reasons behind disparities and offer possible remedies.
- Serve as a foundation for inter-university collaborations, faculty development, and strategic academic planning.

2.2 Significance of the Objectives in the Context of the Study

The chosen objectives are interrelated and collectively form a robust framework to understand the doctoral research ecosystem in Botany within West Bengal. By addressing these objectives, the study will:

- Establish a data-driven narrative on the state of botanical research.
- Identify systemic strengths, weaknesses, opportunities, and threats (SWOT analysis) in doctoral education.
- Provide a scholarly basis for academic reforms and research policy formulation.
- Contribute to the academic historiography of botanical sciences in Eastern India.

By achieving these objectives, the study hopes to generate meaningful insights that will not only contribute to the academic understanding of research in Botany but will also help strengthen doctoral education in the region. These objectives provide a clear roadmap for the subsequent methodology, data analysis, interpretation, and recommendations that follow in the later chapters of the research work.

2.3 Scope of the Study

In total Six Hundred Sixty-Three PhD theses are available in the Botany departments of six universities of West Bengal under study i.e University of Calcutta, University of Kalyani, University of North Bengal, The University of Burdwan, Vidyasagar University, and Visva Bharati University over the past two decades. The data spans from 2000 to 2020, providing a comprehensive overview of trends in academic output, supervision, and research areas. It is to mention that statistical data from Vidyasagar University and Visva Bharati University between 2000 and 2010 was not retrieved and processed in this study due to the unavailability of theses during that period. The scope of the study includes detailed analysis of submission rates, supervisor contributions, research topics, gender representation, and the overall development of each department's doctoral program.

CHAPTER III

REVIEW OF LITERATURE

3 Introduction

The term Review of Literature may be denoted as a deliberate attempt on the part of the researcher to examine and review all types of available relevant information for finding out what has already been done or not done so far on the topic of his research study. Building upon previous findings and using relevant references as a framework, efforts were made to determine how the completed research connects with the current study. In this section, an attempt is made to explore various print and electronic resources related to the study's topic. This part highlights the potential and strengths of conducting this research. It allows the researcher to gain insight into what has already been explored in a particular field, which in turn guides them toward meaningful conclusions. The process of reviewing literature paints a comprehensive picture of previous studies in the area the researcher intends to focus on. Moreover, being familiar with the literature helps the researcher carve out new avenues for investigation, while also laying a solid foundation for the design of their own study. Reviewing related studies not only prevents redundancy by ensuring that the same work isn't repeated, but it also provides the researcher with a deeper understanding of various dimensions of the problem at hand. It offers a valuable opportunity to identify gaps in the existing research, highlighting unexplored areas that could pave the way for new and original investigations.

The literature review serves several key purposes for the researcher. It also helps the researcher identify major findings, emerging trends, areas of debate or controversy, and gaps that have been overlooked, while offering suggestions for further investigation. Additionally, reviewing existing studies helps avoid unnecessary duplication of efforts, allowing the researcher to learn from past mistakes and ensure the originality of their own research topic.

The present review of literatures deals has been done under the following categories:

3.1 Local Level Analysis

Das (2000) conducted a bibliometric analysis of 2,324 citations from journal articles in the field of Plasma Science, spanning the years 1989 to 1998. The research primarily focused on various aspects such as publication growth, the characteristics of the articles, distribution across journals, subject classifications, citation frequency, and authorship

patterns. One notable finding from the research is that 71% of the publications were published in scholarly journals.

Dutta and Sen (2001) analyzed 427 citations from 30 articles published between January and March 2000, involving a total of 622 authors. Number of authors, document type, journal or document source, and self-reference status were among the other data points collected in the research. Notably, 51.4% of all citations were written by a single author.

Kanungo (2007) reviewed articles from volumes 59–63 of the Journal of Asian Studies and found 9,111 citations. Books, journals, newspapers, and conference proceedings were the most frequently cited sources in the study. Notably, a far lower percentage of researchers used electronic materials as references.

Mukherjee (2009) presented the trend of India's research scholars from 2000-2007. For this study prolific institutes, subject-wise literature distribution, quality of contributions etc. were taken into consideration. This research also identified top twenty-five most productive institutions of India.

Shahab (2009) studied 414 doctoral dissertations of Jamia Hamdard, a "Deemed to be University" from 1992 to 2007. According to the report, the majority of research has been conducted in the fields of biotechnology, pharmaceutical science, toxicology, Islamic studies, and federal studies. Other topics of consideration for that study included department-wise contributions, teacher-wise contribution, doctoral research trends and research funding.

Biswas (2010) stated in this study PhD theses awarded by different Indian universities, language of theses, productivities of research guides, subject-wise distribution etc. were taken into consideration. University Library was mostly used sub-field of research with 47 doctoral theses. Karnataka University acquired the first position for contributing 52 PhD theses in LIS field.

Kaur and Aggarwal (2010) showed the research papers published between 2002 and 2006 in his university. A total of 269 research publications from 84 different journals were examined, for which 33% of the publications were in collaboration with foreign institutes. Almost 85.7% journals distributed over organic, inorganic and physical chemistry.

Shukla, Goswami and Sharma (2010) analyses 50 PhD theses of Botany of Vikram University for the period of 1991 to 2006. In order to analyse and interpret the data, various illustrations, authorship patterns, bibliographical forms of references, journal rankings, and year-wise and subject-wise distributions were employed. The subject Air Pollution was ranked first for the choice of researchers. Books was the most preferred choice of references followed by journals.

Verma and Thakur (2010) highlighted 35 theses of the subject Botany of Pt. Ravishankar Shukla University during the period of 1966 to 2004 to determine the use pattern of literature in this area. Altogether 7916 references were described for choosing bibliographic forms, pattern, ranking, geographical parameters cited in the journals. 72.54% of the total citations covered by journal articles.

Nandi and Bandyopadhyay (2011) emphasized the historical distribution of theses, the authorship pattern, and the citations obtained by the writers of various published publications of mathematics. This study also investigated ranked list of most preferred journals on Mathematics and their country-wise distribution

Prasad and Reddy (2012) studied 1180 articles on mental retardation from the period of 1950 to 2005. According to the analysis, the two journals with the most papers were Indian Journals of Paediatrics and Indian Paediatrics. Most of the researches undertaken in the sub-fields like Medical Research, Psychological and Special Educational Aspects.

Chattopadhyay and Das (2013) focused on publication of journal 'Librarian' covers thirteen volumes i.e. from Vol. 1(1984) to Vol.13(2006). The data analyses on the parameters of volume-wise distribution, authorship pattern, gender-wise distribution, citation pattern, subject field etc.

Mishra and Ralte (2013)3719 citations were analysed from 77 MLIS dissertations approved in between 2004 and 2010. According to the report, students have restricted access to e-journals.The students were mostly favored journal articles than other sources of information. ILA Bulletin ranked first among the all the cited journals.

Rahman and Bhattacharya (2013) Zoology theses were assessed and submitted to North Bengal University in Darjeeling.The study analyses doctoral dissertations for the period of 1987-2007. Journals published from USA, UK prime position. The most

frequently mentioned journal titles were Journal of Immunology, Journal of Experimental Biology, and Advance Immunology.

Bag (2014)analyses 266 articles of 16 issues of the Indian Journals of Fisheries from 2004 to 2007. Content analysis was conducted to determine volume distribution, average number of contributions per volume, authorship pattern, state distribution, institution distribution, and so on.

Basak and Das (2014) carried undertaken the study of 167 theses in Earth Science in between 1960 and 2009. This research focused on the chronological distribution of theses, supervisory patterns, subject-related distributions, and gender-based production. It also determined the citation distribution by decade. The survey revealed the greatest research trend in petrology and geology. Between 2000 and 2009, the greatest number of theses were accepted for the granting of a PhD in Earth Science.

Nural and Shukla (2014) determined the 306 journal articles were collected and analyses from LISA database. The research showed that no study was conducted in the field and sub-fields of Space Science. So, this gap indicated a need for an investigation on the structure of the Space Sciences, its evolution, growth pattern and current status etc.

Reddy and Reddy (2014) conducted a citation analysis of 15380 citations attached to 138 PhD in Mathematics. The research covered between 1965 to 2011. The bibliographic form of distribution, authorship pattern and degree of cooperation, and a ranking of mathematical journals. The survey shows periodicals (83.19%) as popular sources of information utilized by the scholars, followed by general books (9.49% citations). The predominance of collaborative research was discovered in this study.

Mishra and Lalrempuii (2015) took bibliometric analysis and performed it on 1116 citations attached to 15 M. Phil dissertations submitted to Mizoram University in between 2007 & 2011. It was also discovered that most citations were from journal articles. Citations from books, seminar sessions, theses and dissertations, reports, and other sources also played an important role. The prevalence of international journals was also found. The journal IASLIC Bulletin occupied the leading position among all cited journals followed by the journal Library Herald.

Dutta and Bandyopadhyay (2016) sought to evaluate the citations related to PhD dissertations in Agriculture Economics at the University of Burdwan from 1979 to 2009. According to the survey, journals (52.50%) were the most popular sources of knowledge among researchers, followed by books (30.06%) and reports (7.61%). Furthermore, the research found that the half-life span of the references utilized in Agriculture Economics was 18 years.

Salim and Babu (2017) carried out a study on 3945 references of 37 theses on Civil Engineering. Journal of Irrigation and Drainage Engineering attained the first position with 56.85% in journal ranking.

Bhui and Saha (2018) looked at 355 pieces written by staff members at ten Indian Institutes of Technology from 2000 to 2016. There are 219 study papers with contributions from 84 full-time staff members. Varun Dutt, a professor at IIT Mandi, took the top spot with 57 papers. The staff member Malavika A. Subramanyam from IIT Gandhinagar got the most citations (408), which put her in first place.

A citation study of publications of IASLIC Bulletin between 2010 to 2016 was conducted by **Mondal and Raychoudhury (2018)**. It was decided that 1909 links from 149 published works would be used for this study. The study found that journal pieces made up about 42.74% of the mentions. In addition, it was found that researchers mostly chose to share their work in Indian journals, with the Annals of Library and Information Studies getting the most mentions.

Shukla and Verma (2018) examined 178 research papers from 2010 to 2017 that were published in the Journal of Library Progress. Volume-wise distribution, authorship pattern, issue-wise distribution, geographical distribution, state-wise contribution, reference pattern, authorship pattern, and other factors were taken into consideration while interpreting the data. According to this analysis, the majority of the papers were written by writers from India, the host nation.

Sarkar and Bhattacharya (2019) made a bibliometric analysis of 477 number of publications in Social Science from Scopus database from 2004 to 2018. The authors used registered log in I'd for accessing and collecting data from Scopus database.

Singson, Singh Deo and Kadiresan (2019) analyses and compared citations of two famous Indian Open Access Journals in between 2006-2016. Two most cited articles in ALIS and DJLIT were taken into consideration, which consisted of67 and 224 citations respectively. It was observed that open access journals citation advances over close access journals. Similarly, the difference in the theoretical paper and experimental study also showed the citer preferences.

Verma and Jaiswal (2019) conducted an analysis of 105 doctoral dissertations in LIS that were submitted between 1997 and 2017 to nine Uttar Pradesh institutions. It was found that Babasaheb Bhimrao Ambedkar University (BBAU) was highly productive institution. Journals were highly cited source in theses (60.15%) followed by books (23.15%). The prevalence of research on the field of Academic library was also observed. Researchers of these universities were cited Indian journals mostly.

Dutta and Mandal (2020) attempted to analysis showed that 4 institutions of total number theses are situated in the South (46.34%) followed by West (18.86%). Although most of theses in English, other regional languages were used to write doctoral theses. The present study also highlighted the nature of study, their growth rate and the areas in LIS field where research is still not initiated.

Dutta and Rahman (2020) analysed a bibliometric analysis of 179 dissertations of 6 universities of WB with the year ranging from 1979-2018. SPSS and MS Excel were used to analysis of bibliographical data. The study revealed that the year 2018 was the in form of thesis production. This study concluded in some important sub-fields of LIS like five laws and Ethics, Digital Preservation etc. took special attention.

Hugar and Mallappa (2020) highlighted the bibliometric studied on Scopus database was used to study the 10 years' publication highlights in between 2009 to 2018. This study also analyses the content of papers published, with the annual average growth rate percent etc.

Nath and Jana (2020) analyzed authorship trends with collaboration scenario in Biotechnology with the aid of Indian Journal of Biotechnology Research (IJBT) journal for the period 2008-2018. This journal comprised with a total of 842 articles. It is found that about 96.67% publications were the product of shared contribution. The result of this study revealed that the improvement of this journal shown during the under study. It was

also understood from that study that the productivity of the author fitted with the law predicted by Lotka.

The study conducted by **Bhattacharya and Chakrabarti (2021)** showed the progress of research activities on Coronavirus disease during the time span from 2010 to 2019. In all 3539 documents were collected from PubMed Central Database and bibliometric analysis was done by using VOSviewer v.1.6.15 and MS Excel. The result revealed that United States of America performed maximum research work on Coronavirus, followed by China. The journal "Virus" contributed the most in terms of research productivity.

Das and Sarkar (2021) examined 576 publications about malaria that were published between 2015 and 2020 in various documentary formats. The Indian Citation Index (ICI) database is used in this study to demonstrate that the most productive author wrote eight articles and that academics prefer to publish their work as articles (62.7%) rather than other types of documents.

In another study, **Ghosh (2021)** analyses the global trend of research publications on Coronavirus during 2016-2020. The Web of Science database provided the convenient data for this investigation. The pattern clearly indicated that USA performed maximum research work and China stood in second position.

Sawale and Mete (2021) focused on the research productivity in Computer Science in India in 2012-2018. It highlighted the research publication growth, output, country-wise ranking of research output, subject-wise research publications etc. Major research publications based on Computer Network and Communication (20.04%) followed by Computer Science Application (17.61%) and Computer Vision and Pattern Recognition (15.33%). As a developing country, India contributed major part in the research field of Computer Science.

Pal and Bhattacharjee (2022) gathered information from the Web of Science database to analyze the research outputs from 8 between 2012 and 21. A total of 97107 citations from 8848 scholarly contributions were gathered for this investigation. The universities with the most research publications were Tezpur University (2875), NEHU (1609), and Assam University (1436). The survey also found that among researchers at Central Universities in North-East India, chemistry is the most popular field of study.

3.2 National Level Analysis

Mahapatra and Sahoo (2004) examined 164 doctoral theses from Indian institutions from 1997 to 2003. According to their data, "User Study" was the main emphasis of doctorate research, with bibliometrics and citation analysis coming in second and third, respectively. The report also showed that the most PhDs in LIS were conferred by Karnataka universities.

Tigga, Lihitkar, and Rajyalakshmi (2005) focused on 226 articles from 33 issues published between 1997 and 2002. The study employed both quantitative and inferential methods. The findings showed that the majority of the articles covered topics such as information technology, bibliographic databases, and collection development. Additionally, DBIT produced a higher number of special issues in comparison to general issues.

Patra and Chand (2006) conducted a bibliometric analysis primarily focused on analyzing citations included in the articles. The creation of the LIS literature in India, the contributions of different writers, and the top journals that produced half of the total articles were also covered.

Garg et al. (2010) conducted an examination of 2,899 molecular genetics publications published by Indian scientists between 1991 and 2008.The study found that Madras University had the greatest research impact. The majority of the articles focused on molecular genetics concerning humans, plants, and animals.

Joshi, Kshitij, and Garg (2010) looked at 3,313 papers from 50 nations and 839 institutions in 619 journal titles focusing on the subject of Forest Mycology. Forest Mycology represented only 3.3% of the total forestry research output.

Nandi and Bandyopadhyay (2010) analyzed 236 theses in between 1960 to 2000. The authorship patterns, collaboration trends, distribution by year and sub-field, and the impact and ranking of authors in Zoology discussed in this study.

Dhiman (2011) studied the results of LIS research conducted in India between 2006 and 2010. Numerous factors such as the distribution of the data chronologically, linguistically, by universities, by guides, by state, and by subject.

Gupta, Kaur, and Kshitig (2011) examined the output of dementia research conducted in India from 2002 to 2011. Relevant keywords were used to gather dementia-related data from the Scopus Citation Database. Growth trends, the percentage of internationally, contributions from a variety of subject areas with a focus on dementia, and productive journals on dementia were among the parameters used in the study.

Mittal (2011) analyzed research trends in LIS studies from 1990 to 2010, from the Library and Information Science Abstracts (LISA) database to collect 1,408 journal articles. The World Wide Web, Web 2.0, open access, internet usage, and information access were among the new LIS research topics highlighted by the study.

Banateppanvar, Biradar, and Kannappanavar (2012) examined the citations included in eleven doctorate theses that were turned in 2000 and 2006. The survey found that, aside from books, conferences, theses, reports, and patents, journals are the most popular information sources used by academics (74.77%).

Gupta and Kaur (2013) made an examination on global publications output in glaucoma research from the period of 2002 to 2011. The researchers used Scopus International Database to collect relevant data on glaucoma research of world. A total of 33098 records related to glaucoma research was collected. India acquired 6th position (3.26%) with global publication share.

Sudhier and Priyalakshmi (2013) identified the trend and characteristics of the main source of required data was the annual reports of the Centre for the period from 2000 to 2010. A total of 1076 research publications were collected. According to this study, there is a pressing need to manage the bibliography of CTCRI publications, and greater efforts should be made to increase the proportion of female scientists and researchers.

Suma and Sudhier (2013) tried to identify and describe the publication trend of research scholars. For that purpose, a total of 137 Ph.D. theses were analyses from 2001 to 2010. It was clearly indicated from the study that the doctoral students have contributed largely to the R and D efforts of the CSIR-NIIST.

Nagarkar (2014) studied the trends of research publications in between 1999 to 2012. That study indicated that majority of the papers published in the area of Physical

Chemistry. The faculty members of this department preferred core journals of national and international level.

Pandey (2014) investigated the research trends in the field of LIS in between 2009 to 2012. The researchers used various online and print resources to know about the ongoing Ph.D. topics throughout the India. From that study it was concluded that researchers feel no interest in doing Ph.D. in the sub-topic Intellectual Property Rights issues and this field is still neglected.

Patra (2014) analyzed the citations in journals published by the Indian Library and Information Science. Academic citations from Google Scholar were retrieved and examined using the Publish or Perish program. This study recommended that LIS researchers collaborate more in order to make their work more visible.

Salini et al (2014) examined during 2004-2013, Web of Science database had been used to collect the data for the period of study. The detailed 3-dimensional bibliometric analysis from quantity, quality and consistency parameters has been used on Indian output.

Singh and Babbar (2014) analyses all doctoral dissertations of LIS between 1950 & 2012 from 81 LIS departments of 22 states of India. This study indicated that after 1970s, the research in LIS field is continuously increasing. The subject Bibliometric/ Scientometric / Webometric study ranked first in the list of subjects in LIS for study for PhD.

Singh and Bebi (2014) studied the citations appended to 260 doctoral theses from 1995 to 2008. In this study, the main focus was on 9997 journal articles belonging to 934 journals. Bradford's law of dispersal was found to suit the current study's data.

Veerabasavaiah and Padmavathi (2014) delivered the findings from an investigation of 6,688 citations in 42 doctorate theses conducted between 2003 and 2012 at Bangalore University's Department of Education. In order to find out how the university's Ph.D. students rely on certain key sources, this study was carried out. We provided a list of the periodicals that cited our work.

Between 1971 and 2010, 1763 postgraduate dissertations were examined by **Garg and Saini (2015).** Agronomy accounted for 264 theses, with plant breeding and genetics coming in second and third, respectively, with 183. Male academics accounted for the majority of theses. According to this research, Professor S.K. Katiyar oversaw the most theses of any academic.

Gautam and Bala (2015) studied a total of 224 theses from the Department of Botany of Lucknow University from 1921 to 2007. This study highlighted the decade-wise and year-wise distribution of theses, subjects analysis of theses etc. This study concluded that maximum theses was submitted in the branch 'Genetics' (34). Other branches of research included Ecology, Anatomy, Paleobotany, Physiology, Molecular Botany etc.

Dutta and Nikam (2016) focused on the world publication output on Solar Cell Research for the years 1991, 1995, 2000, 2005 and 2010. For this study a total of 10905 publications were analysed. It was come to know from the research that global Solar Cell Research is topped by USA and India was holding the sixth position.

More (2016) determined the research trend of the researcher in the subject Homoeopathy. For that the researcher analysed 549 articles published in different homoeopathic journals during 2004-2007. His topic of analysis was year-wise publication productivity, collaboration rate, geographical distribution, channels of communications, distribution of keywords etc.

In another similar study **Nagarkar and Kengar (2017)**analysed the research contributions by the faculty members of the department of Physics of Savitribai Phule Pune University from 1990 to 2014. That study showed that the faculty members preferred their research in the areas of applied physics, chemical physics, material sciences etc.

Naheem, Nagalingam and Ramesha (2017) studied the research trends on Chronic Liver Disease (CLD) in SAARC countries during 1996 to 2015. It was founded that SAARC countries together contributed 2312 documents from 1996 to 2015 for which the data was collected from Elsevier's Scopus database. This contribution covered only 3.49% of the global CLD output. India was the leading contributor among SAARC members.

Pandita and Singh (2017) studied doctoral dissertations in Library and Information Science submitted to different universities of India for the period from 2010 to 2014. This study highlighted the chronological distribution of theses, guide-ship pattern, state-wise distribution, area of research. A total of 177 Ph.D. theses had been taken into consideration for this study. The study revealed that there was a steady decline in the award of Ph.D. degrees in India.

Garg and Duggal (2018) examined 511 doctoral theses submitted in the field of Zoology, Botany and Physics accepted by Bangalore University in between 1969 to 2015. The study concluded that highest number of theses were accepted in the subject of Zoology followed by Botany. 38% of theses were contributed by female scholars. No thesis was supervised by female supervisor in Physics.

Pradhan and Ramesh (2018) analysed the comparative research performances in terms of publication output and its impact in terms of citations during the period of 2006 to 2015 of six IITs i.e., IIT Delhi, IIT Kharagpur, IIT Madras, IIT Bombay, IIT Kanpur and IIT Roorkee. This study was carried out using the data downloaded from Scopus database from 2006-2015. The research publications of six IITs grew up but in an inconsistent way. It was also concluded that the scientific impact of the six IITs were strongly connected to the mainstream science.

The bibliometric study of publications published in the DJLIT from 1992 to 2019 was detailed by **Garg, Lamba, and Singh (2020)**. Researchers collected 155,338 citations from 1,698 articles throughout the study period. During the research period, 15538 citations were acquired from 1698 publications. The writers from India produced the biggest number of articles (86.1%), followed by authors from the USA, Nigeria, Greece, Iran, and others. Following the United States, Nigeria, Greece, Iran, etc., in terms of article publication rate, India ranked first with 86.1%.

From 2005 to 2012, 1,184 PhD theses were examined by **Garg and Yadav (2020)** at Jawaharlal Nehru University. The whole collection of doctorate theses was culled from the Indian Electronic Theses and Dissertations repository Shodhganga. According to the numbers, there were nearly as many male as female academics per supervisor. The School of International Studies had the most acceptances, followed by the School of Language, Literature, and Culture Studies.

Between 1974 and 2018, **Malik and Mushtaq (2020)** analyzed the citation pattern of 4,112 works published in the Chemical Engineering discipline. According to the research, the countries with the most articles are Brazil, Russia, China, Germany, the United Kingdom, France, Canada, India, Japan, and Spain. Research collaboration was also shown to play a significant role in the study.

Pawar and Chandrappa (2020) made a study of 10437 citations of 35 doctoral theses in Botany accepted by the Pt Ravishankar Shukla University from 1990 to 2017. This study revealed that researchers under study have primarily depended journals of Botany for their source of information and the journal named India Phytopathology ranked first followed by the journal Current Science. The more cited periodicals were those published within 10-15 years from some preferred countries viz. India, USA, Netherland etc.

Using the Annals of Library and Information Science, **Quadri and Shukla (2020)** looked at the development of LIS literature in India. According to the results, the expansion of LIS research was affected by the use of ICT in the field.

Current trends in Indian LIS papers from 2014 to 2018 were examined by **Sahu and Parabhoi (2020)**. Researchers looked through 1,357 articles in the Scopus database for this study. The study emphasized the following: article distributions by year, top ten authors by prolificity, authorship pattern by year, degree of collaboration by year, citation by year, sources of published journals, etc.

Santhakumar, Kaliyaperumal and Louies (2020) illustrated the research output of the University of Madras from 2009 to 2018. For this study 3283 publications were downloaded from Web of Science Database. Year-wise development of publications and citations, types of publications, most prolific authors, collaborative research activities, international research collaboration, preference of journals for publications, subject-wise distribution, highly cited articles etc. were examined thoroughly by the researchers.

Shukla et al (2020) studied 4304 publications by Indian authors from Incited which received 17523 citations. The research themes of highly cited 100 research articles were applications of bibliometrics, knowledge management, information seeking behavior on social media etc. Highest collaboration of Indians was found to be with US authors.

Using information retrieved from the Indian Citation Index, **Yadav, Verma, and Singh (2020)** sought to characterize and determine the research production of Mizoram University from 2004 to 2017. The survey found that the top research fields for scientists at Mizoram University are Biological Science, Environmental Science, General Science and Technology, and Library and Information Science. Among the most popular periodicals were Current Science, Journal of Nature Conservation, and Indian Journal of Physics.

Das, Das and Dutta(2021) showed the bibliometric study of 159 research articles on Indian Physics and Astronomy subject to analyse the research outputs of theses subjects from 1964 to 2020. The findings of this study states that Physics is a focal subject to Indian bibliometricians.

A total of 465 theses spanning the years 1954–2018 were examined by **Garg, Singh, and Rana (2021)** from the Aligarh Muslim University (AMU) Zoology department. We looked at the distribution of theses by year and gender, as well as the pattern of supervision, the most productive supervisors, and more. There appears to be a significant gender disparity in this study, with male students reporting much higher levels of achievement than female students.

Eugene Garfield was a renowned information scientist who developed the citation index. **Pandey and Gupta (2021)** determined a scientometric analysis of 50 highly cited journal articles of Eugene Garfield. These articles were downloaded from Scopus online databases. This work revealed 90% of the papers were published in the USA.

Between 2010 and 2019, **Pandya, Joorel, and Solanki (2021)** looked at the research output of twelve Central Universities of India. The research relied on 3,927 articles culled from Scopus. According to the results, the most papers (765 in total) were provided by the Central University of Rajasthan. The domains of physical and allied science likewise showed a disproportionate amount of research activity as compared to other fields.

Satish (2021) assessed the publisher interest in citations to journal articles. For that, publisher and citation related information was collected from the Scopus indexed list of journals for the year 2016 to 2018 available in Scopus. The result of the study indicated a significant skewness in citations per document for 25 major publishers.

3.3 International Level Analysis

Haque and Khan (2000) made an analysis of 304 PhD theses in Agriculture submitted to the Bangladesh Agricultural University (BAU), Mymensingh during 1974-2014. Chronological distribution of theses, subject allocation, gender-wise contribution, supervisor's distribution, different forms of citations had been discussed. The study concluded that 91.10% PhD holders were male in the field of Agriculture.

The twenty Master of Library and Information Science theses submitted to IIUM's Department between 1994 and 2000 were examined by **Abdoulaye (2002)**. The primary goals of this research were to draw attention to the most important aspects of theses and the fields in which they fall under investigation. Information technology was shown to be the most popular topic of research, accounting for 50% of the total. Faculty members, academic libraries, job design, and reference services were the most common foci of Master of Library and Information Science theses.

Thakur and Trikha (2004) carried out a study of the Post Graduate theses in Development Communication for the period of 1996-2001. This study covered up fourteen areas of research which was topped by Educational Technology (15.38%) followed by Communication Pattern, Development Journalism and Evaluation (11.54% each). Majority of theses had 21-40 illustrations.

Mestri (2008) carried out a study of doctoral theses in LIS submitted to different Indian universities for the period 2001-2007. The researcher provided distribution of theses by time-period, year-wise, geographical area covered, university-wise, state-wise, zone-wise, subject-wise and language-wise. A list of names and websites of all Indian universities awarding Ph.D. degree in LIS were also provided in Appendix I. Different theses were arranged according to subject.

Shivalingiah, Sheshadri and Keralapura (2009) discussed about the trend of LIS in India from the period of 1980-2007 by analysing 851 doctoral theses. Different parameters of study which were taken into consideration by the researchers were decade-wise, supervisor-wise, university-wise, state-wise and subject area-wise distribution of theses. Karnataka University contributed highest number of theses (67) followed by Andhra University (47) and Jiwaji University (43). Bibliographic Literature Studies was the most favoured area of research.

Sudhier and Kumar (2010) examined 168 Ph.D. theses of Biochemistry of the University of Kerala submitted during the time span of 1966-2007. The study divided into two parts – theses analysis and citation analysis. Theses analysis included subject-wise, year-wise, page-wise, gender-wise analysis, authorship pattern etc. Journals were the mostly cited (88.75%) document followed by books(8.92%) and the Journal of Biological Chemistry was highly referred (7.09%) journal.

Agricultural Economics and Extension Master's theses submitted to Nigeria's Federal University of Technology Akure were analyzed by **Fasae (2011),** who counted 21,110 citations. From 2005 to 2009, master's theses were the focus of the research. Journals were determined to be the primary source of information cited by Agricultural Economics scholars. When it came to disseminating factual scientific data, journals were the gold standard. The Journal of Econometrics was ranked second, with the Journal of Agricultural Economics receiving the most citations.

Klassen (2011) presented citation analysis of master's dissertations awarded in the subject of Public Health by Southern Connecticut State University (SCSU) during the period 1995-2007. The study carried on the citations taken from 135 masters theses of Public Health. Journal articles were mostly used in citations. The study showed that Journal of the American Med. Assoc. (42.5%) was highly cited journal followed by American Journal of Public Health (34.8%) and Morbidity and Mortality Weekly Report (21.5%) ranked 2nd and 3rd position respectively.

Rana (2011) analysed the research contribution of different universities of India in the subject field of LIS the year 1957 to 2009. Then the researcher discussed about the contribution of Punjab University, India in the same field in the same time span. Punjab University was the third most productive university (6.58%). Library use and user studies (12.20%) was mostly used research sub-field followed by Classification (9.76%) in Punjab University.

Veer and Sontakke (2011) studied 3528 Ph.D. theses of Dr. Babasaheb Ambedkar Marathwada University during the period of 1962 - 2010. During the period of research, the university has awarded an average of 67 Ph.D. degrees each year. Almost 74.63% of theses were written in English language. Majority of research were carried out in the discipline of science (47.02%) followed by Social Science (26.28%).

Akkus, Sari and Uner (2012) analysed 75 graduation theses of Chemistry from six universities i.e.,Gazi University, Hachette University, Marmara University, Karadeniz Technical University, DokuzEylul University and Ataturk University in Turkey between 2000 to 2010. This study concluded that the researches were focused on the experimental design (60%). SPSS software was used for data collection. All total 38 criteria were developed by the researchers for study, which includes research methods used, type of sampling, validity studies, statistical techniques etc.

Kalbande and Sonwane (2012) analysed 2876 citations appended to the 34 theses in Economics submitted to Dr. Babasaheb Ambedkar Marathwada University. The study analysed doctoral dissertations for the period of 2000-2010. It was found out that the Economics researchers referred mostly books(57.86%) rather than other sources, followed by Reports (19.19%) and Journals (13.70%). Almost 52% cited documents were written in English language.

Nandi and Bandyopadhyay (2012) presented a comparative research performance analysis of Department of Botany and Zoology of the University of Burdwan during the period of 1969 to 2000. For this research purpose 160 Botany theses and 236 Zoology doctoral dissertations were analyses. The analysis was done to find out year-dependent theses distribution, guide rank, degree of collaboration, most prolific authors, co-authorship, journal ranking etc.

Thanuskodi (2012) examined the cited resources used by the doctoral students of Botany of Annamalai University for the period 1990-2010. It was observed that 69.09% references were taken from journals and 14% from books. USA, UK and India contributed 45.91% of total citations.

Banateppanvar, Biradar and Kannappanavar (2013) examined the cited resources used by the doctoral students of Botany of Kuvempu University, India between 2000 - 2006. It was observed that journals (74.77%) were the most preferred resource, followed by books and monographs (16.20%). The journal Plant pathology (16.69%) stood the first position, followed by Conservation biology (8.91%) and Seed pathology (7.72%) acquired 2nd and 3rd position respectively.

Kannappanavar and Banateppanavar (2013) studied 24 PhD theses of Applied Zoology awarded by Kuvempu University were taken as a sample from the year 2002-

2009, there were in all 5135 citations in 24 theses. Most cited documents in Applied Zoology were from journals (75.52%). The journal Mutation Research was mostly cited. In the sub-field of Entomology, journals are highly cited.

Gasparotto (2014) studied on the distribution of dissertations by year, category of cited items, frequently cited journals, age distribution of cited scholarly monographs and articles by year were the objectives of this study. The study revealed that whole scholarly monographs (43.9%) were the highly preferred sources of information used by the research scholars, followed by primary literature monographs and scholarly journal article with 16.6% citations each. The journal RevistaIberoamericana occupied first rank, followed by Atenea and Hispania respectively.

Mishra, Gawde and Solanki (2014) conducted a citation analysis in order to examine various characteristics of the subject English. For this study, citations were collected from 55 PhD theses of Vikram University during the period of 1975 to 2007. Different parameters of this study were year-wise distribution, length of theses, number of chapters, illustrations used, gender-wise distribution, authorship pattern, references used etc.

Research at Utkal University, Bhubaneswar in the field of library and information science from 1989 to 2015 was highlighted by **Barik and Jena (2015)**. In order to compile this data, 41 PhD theses were reviewed. According to the research, the years 2014 and 2015 had the most theses published, with four theses per year. The average number of citations added to a thesis was 278.9, with a journal article citation rate of roughly 60.53 percent. Dr. Puspanjali Jena supervised nine doctoral dissertations, whereas Dr. M. Mahapatra supervised six.

Choudhury and Sarmah (2015) studied doctoral theses in Life Science, submitted to the Assam University for the time span from 2001 to 2007. The study concluded that journals were highly cited documents for their research work factors considered for this study included year-wise, university-wise, state-wise, subject-wise, and guide-wise distribution of theses. The year 1993 and 1995 were the most productive year, where 38 number of theses submitted in each year. Karnataka state contributed highest number of theses (17.75%), followed by Andhra Pradesh (15.38%) and West Bengal (13.01%).

The purpose of the research that **Maity and Hatua (2015)** conducted was to determine the research trends in Library Management by analyzing 1058 doctorate theses that were

written in the discipline of Library and Information Science between the years 1950 and 2012. Additionally, data were gathered from the Vidyanidhi and INFLIBNET databases, as well as the INDCAT database and the University News database. Within the scope of this particular field, a total of 108 theses were discovered..

Pratap (2015) studied the research trends in LIS conducted at different universities of India between 2008 - 2013. The identification of research outputs of different high performing universities, zone-wise distribution, subject-wise research output, guideship pattern etc. had been taken into consideration. It was observed that Dr. Babasaheb Ambedkar Marathwada University, Aurangabad ranked first with 21 research outputs during this period.

The research conducted by **Singh (2015)** looked at 169 Ph.D. theses in Library and Information Science that were submitted to various Indian institutions between the years 1993 and 1997. A publication called University News, which is produced by the Association of Indian Universities in New Delhi, was the source of the information that was used in this study.

Ahmadieh, Nalbandian, and Noubani (2016) examined the master's theses submitted to the American University of Beirut, Lebanon. A sample of two hundred forty-seven master's theses in Biology, Mechanical Engineering, and Political Science was selected from the years 2004 to 2013. There were 233,316 citations. An analysis of citations was conducted to identify the sorts of papers mentioned, their temporal distribution, and a ranked list of cited journals. The survey determined that monographs were the predominant format of referenced publications, succeeded by journal articles.

Chaman Sab (2016) analysed 96 doctoral theses of Department of Library and Information Science of Karnataka University, Dharwal up to 18/11/2016 from Shodhganga. This study mainly focused on year-wise development of theses, chapter-wise distribution, length of theses and ranking of most productive research guide. Shodhganga is a major source of bibliographic information of Indian universities hosted by INFLIBNET.

Malik(2016) carried out a study of the Doctoral theses in Political Science submitted to Vikram University from 2009-2012. A total of forty-three Ph.D. theses awarded between 2009 and 2012 were used as a source. The researcher analysed year-wise distribution,

authorship pattern, length of Ph.D. thesis, geographical distribution based on subject of Ph.D., total number of chapters in each thesis, number of references used, different bibliographic formats of reference used etc.

Mondal and Roy (2017) studied 33 PhD theses submitted to the Department of LIS of The University of Burdwan from 1984 - 2015. The survey indicated that the majority of research was performed in the domain of Bibliometrics. Knowledge Management, Library Legislation, and Community Information Services (CIS). Other parameters of study which were taken into consideration included chronological growth, decade-wise growth, gender-wise contribution, language distribution, number of chapters and references, types of references etc.

Mondal, Bandyopadhyay and Roy (2017) analysed 7711 citations of 56 PhD theses of Political Science of the University of Burdwan from 1986 to 2015. Citation analysis had been done to find out types of cited documents, year-wise distribution of cited documents, rank list of journals, half-life, authorship pattern etc. The study concluded that more online documents were cited in addition to printed books in the area of Political Science study.

Gogoi (2018) made an analysis of 548 Ph.D. theses in Library and Information Science submitted to different universities of India during 2013-2017 from Shodhganga. This research considered the contributions of Ph.D. theses categorized by year, university, state, subject, and advisor. The majority of research has been conducted in the areas of library surveys, user studies, and library utilization. The University of Mysore submitted the maximum number of theses (39) throughout this research period.

Nishat, Chakrabarti and Kirtania (2019) conducted a bibliometric study on 136 M.Phil dissertations completed to the University of Calcutta in the area of LIS in between 2004 to 2016. It was found that 95.59% M.Phil dissertation is single guided and the major areas of research were Community Information Services, ICT and Bibliometrics.

Chakrabarty, Mondal and Maity (2020) made an analysis of 230 Ph.D. theses awarded from the Departments of LIS of six during the period of 1979 to 2018. Jadavpur University contributed maximum number (33.48%) of theses. A total of 168 number of researchers were male during the period of study. Prof. Biplab Chakrabarti of the

University of Calcutta supervised the greatest number of doctorate theses, totaling 21, followed by Prof. Juran Krishna Sarkhel of the University of Kalyani.

Gupta and Sharma (2020) studied 14547 citations of 126 PhD theses of Economics, Public Administration, History and Political Science awarded by Kurukshetra University and Maharshi Dayanand University, India during the period of 2011 to 2018. An examination of citations was conducted to identify the categories of referenced texts, the temporal distribution of these papers, and the subject-wise categorization of PhD theses.

Sonkar, Kushwaha and Sharma (2021) made a study on 28 doctoral theses submitted to the Babasaheb Bhimrao Ambedkar University, Lucknow in the subject of LIS from 1995 to 2018. This study revealed that in the year of 2016 most of the theses (32.1%) were submitted. Library Philosophy and Practice was mostly cited journal (127 citations) followed by Annals of Library and Information Studies (ALIS) (75 citations) and DESIDOC Journal of Library and Information Technology (65 citations) respectively.

Chakrabarti, Mondal and Maity (2020) focused on the research productivity in the field of LIS in West Bengal at the period of 1979-2018. For this study, a total no. of 230 Ph.D. theses were gathered from six universities of West Bengal (Jadavpur University, Rabindra Bharati University, The University of Burdwan, University of Calcutta, University of Kalyani and Vidyasagar University) from 1979 to 2018. Different parameters which were taken into consideration for study are university name, year of submission, gender of researchers, gender of supervisors, supervising pattern, active supervisor, language chosen and subject.

3.4 Statement of the Problem

Despite the significant strides made in higher education, particularly in scientific research, there has been a lack of comprehensive studies that analyze doctoral research trends in Indian universities, particularly in the field of Botany. This study seeks to bridge that gap by examining key aspects of doctoral thesis submissions, including trends in submission numbers, the distribution of theses across years, faculty supervision patterns, gender representation, and subject areas of research. It aims to provide a better understanding of the changing dynamics in academic research and the factors that contribute to successful doctoral programs. In the present study, the statement of the problem is ‘Content Analysis of Doctoral Theses on Botany Submitted to the Universities

of West Bengal (2000 - 2020)'.No doubt the above-mentioned research studies have made important contributions to the field of bibliometric and citation analysis of scientific and technological disciplines. But no work has been done so far towards exploring and understanding the exact condition of Botany research in India as well as in West Bengal through bibliometric study. Further, it may be mentioned that most of the previous researches on Botany undertaken were confined to only one or two sub-disciplines. But our study has covered almost all sub disciplines of Botany. So it may be said that the present study is different from other related researches mentioned above. The findings of this study will assist librarians and information workers in formulating a need-based acquisition policy for library collection development.

CHAPTER IV

RESEARCH METHODOLOGY

4 Introduction

The methodology adopted for any research study plays a crucial role in determining the credibility, validity, and relevance of its findings. In this study, the research methodology has been carefully designed to investigate the nature, patterns, and distribution of doctoral theses in Botany submitted to six selected universities in West Bengal during the period from 2000 to 2020. The study adopts a content analysis framework, integrating both quantitative and qualitative approaches to comprehensively examine the doctoral research output over the twenty-one-year span. The methodology is aligned with the research objectives and ensures that the data is collected, processed, and analysed in a systematic and ethical manner.

4.1 Research Design

The research design adopted for the present study is content analysis-based descriptive research. This design is appropriate for examining the doctoral theses in this case to derive patterns, trends, and thematic orientations without manipulating the research environment. Content analysis is a systematic and verifiable method for condensing extensive material into fewer categories based on defined coding principles. It is particularly useful in educational research where textual data, such as theses, reports, publications, etc., form the primary source of evidence. The study is non-experimental and retrospective in nature.

4.2 Population and Scope of the Study

The population of this study comprises doctoral theses in Botany submitted to the following six universities in West Bengal:

1. University of Calcutta
2. Jadavpur University
3. University of Burdwan
4. University of Kalyani
5. North Bengal University
6. Visva-Bharati University

The study period is from 2000 to 2020, chosen to provide a sufficient temporal scope for identifying meaningful patterns, long-term trends, and shifts in research interests. The focus is

specifically on the discipline of Botany, encompassing all subfields such as plant physiology, taxonomy, cytology, ecology, genetics, and molecular biology.

4.3 Sources of Data

The data required for this study was obtained from two main sources:

4.3.1 University Libraries

Physical and digital catalogues of doctoral theses were consulted in the respective libraries of the six universities. Library staff provided access to lists, abstracts, and, where available, full texts of theses.

4.3.2 Shodhganga Database

Shodhganga (https://shodhganga.inflibnet.ac.in/), an initiative by INFLIBNET under the UGC, was extensively used to download digital copies of Ph.D. theses submitted by researchers affiliated with the selected universities. This platform provided access to metadata (e.g., title, author, supervisor, year, and abstract) and full-text theses in many cases.

4.4 Data Collection Procedure

The data collection process was carried out in several stages:

4.4.1 Compilation of Metadata: Basic information such as thesis title, year of submission, name of researcher, supervisor(s), gender (where identifiable), university name, and subject classification was compiled in a structured spreadsheet format.

4.4.2 Extraction of Full Texts (Where Available): Selected theses were downloaded or accessed from Shodhganga and university archives for detailed content analysis.

4.4.3 Use of OCR online portals: In cases where documents were only available as scanned PDFs, OCR was used to extract text. Care was taken to verify the accuracy of conversion and to correct major transcription errors manually.

4.4.4 Classification and Coding: Research topics were coded based on their thematic content. Supervisory patterns, gender of candidates (where disclosed), and other variables were systematically entered into a central database.

4.5 Methods of Analysis

The study uses a mixed-methods approach, which means that it uses both quantitative and qualitative methods to make sure that all of the data is fully understood.

4.5.1 Quantitative Analysis

Quantitative methods were used to identify numerical trends and distributions. The following statistical parameters and tools were applied:

- Descriptive Statistics such as frequencies, percentages, and ratios to analyse:
    - ✓ Year-wise submission trends
    - ✓ Gender-wise distribution of doctoral candidates
    - ✓ Supervisor-wise contribution to doctoral output
    - ✓ The number of theses under single vs. joint supervision
    - ✓ Distribution across universities
- **Trend Analysis** was carried out to determine the growth rate of research submissions over the years.
- **Tabular and Graphical Representations:**
    - ✓ Bar charts were used to show annual submission numbers and gender distribution.
    - ✓ Pie charts were used to display thematic distribution.
    - ✓ Line graphs were employed to represent trends over time.
- **Software Tool:** All statistical analysis and visualization were performed using **Microsoft Excel**, which facilitated the creation of tables, graphs, charts, and numerical summaries.

4.5.2 Qualitative Analysis

Qualitative content analysis was undertaken to interpret the underlying themes, theoretical frameworks, and research methodologies used in a sample of theses. This process involved:

- ✓ Thematic Coding of abstracts and introductions to identify key areas of focus such as taxonomy, plant breeding, molecular biology, phytochemistry, etc.

- ✓ Narrative Examination of selected full-text theses to explore the evolution of thought, emerging areas of study, and the depth of research questions addressed.
- ✓ Supervisory Styles were also examined qualitatively where feasible, based on acknowledgements and research collaboration models.

CHAPTER V

DATA ANALYSIS AND INTERPRETATION

5.1 Analysis and Interpretation of Data of the University of Calcutta

This chapter provides a detailed analysis of doctoral theses data submitted to the Department of Botany at the University of Calcutta which is established in 1913. Through its pioneering work in plant sciences and consistent efforts in research, the department has contributed significantly to advancing knowledge and human resources, producing a large number of doctoral theses. The department boasts of excellent infrastructure, including cutting-edge cytogenetic and genomic facilities, and a prestigious herbarium, ensuring the continued growth and development of its research and academic output. The following analysis examines trends in research output, supervision, gender representation, and citation practices.

5.1.1 Analysis and Interpretation of Data on Theses

This section examines various aspects of thesis submissions, including year-wise trends, the number of theses supervised by different faculty members, and the distribution of research topics. By analyzing these data points, we aim to understand the growth patterns of doctoral research and the factors influencing these trends. The findings will provide insights into the department's evolving academic landscape and research productivity over the past two decades.

5.1.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2000	9	4.17
2.	2001	1	0.46
3.	2002	3	1.39
4.	2003	6	2.78
5.	2004	6	2.78
6.	2005	9	4.17
7.	2006	8	3.70
8.	2007	9	4.17
9.	2008	8	3.70
10.	2009	8	3.70

Sl. No.	Year	Total	%
11.	2010	9	4.17
12.	2011	7	3.24
13.	2012	16	7.41
14.	2013	10	4.63
15.	2014	11	5.09
16.	2015	14	6.48
17.	2016	21	9.72
18.	2017	19	8.80
19.	2018	20	9.26
20.	2019	21	9.72
21.	2020	1	0.46
	Total	216	100

Table 1.1 - Year-wise distribution of Ph.D. theses of the University of Calcutta

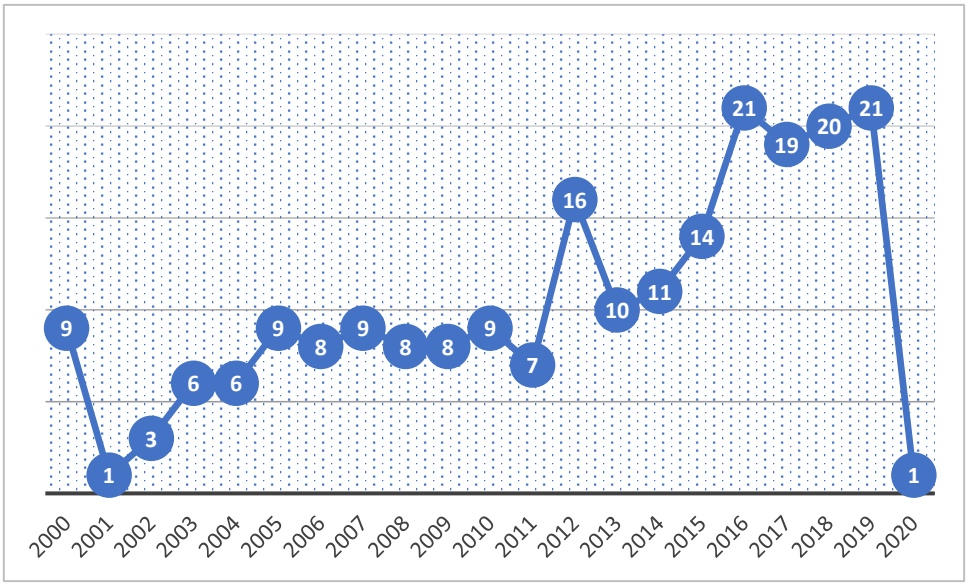

Figure 1.1: Year-wise distribution of Ph.D. theses of the University of Calcutta

The year-wise distribution of doctoral theses in Botany submitted to the University of Calcutta over the period 2000 to 2020 reveals significant trends in the institution's research output. A total of 216 theses were submitted during this 21-year span. In the early years of the study (2000–2005), thesis submissions remained relatively modest. The year 2000 witnessed 9 theses (4.17%), while 2001 recorded the lowest number with only 1 thesis (0.46%). From 2002 to 2005, the output gradually increased, with yearly percentages ranging from 1.39% to 4.17%,

suggesting a slow but steady engagement in doctoral research during that period. The period between 2006 and 2011 saw more consistency in submissions, with annual totals generally ranging from 7 to 9 theses. This phase reflects a moderate but stable growth in research activities within the department. A significant surge occurred in 2012, with 16 theses (7.41%) submitted, marking a turning point in research productivity. The following years, especially 2013 to 2019, showed a sustained and sharp rise. Notably, the years 2016 and 2019 recorded the highest number of submissions, each with 21 theses (9.72%), followed by 2018 with 20 (9.26%), and 2017 with 19 (8.80%). This upward trend can be attributed to enhanced academic support, improved research infrastructure, and perhaps a growing interest in plant sciences. However, the data for 2020 shows a dramatic decline, with only 1 thesis (0.46%) submitted. This sharp drop coincides with the COVID-19 pandemic, which severely impacted academic and research activities, including delays in thesis submissions and evaluations. So, the data from the University of Calcutta presents a picture of gradual academic strengthening, culminating in a peak research period from 2012 to 2019, followed by a sharp dip in 2020 due to external disruptions.

5.1.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1.	Anita Mukherjee	16	1
2.	Sumita Jha	14	2
3.	Subir Bera	11	3
4.	Bratati De	10	4
5.	Ruma Pal	10	4
6.	Krishnendu Acharya	9	5
7.	Amal Kanti Paul	8	6
8.	N. D. Paria	8	6
9.	Sandip Mukhopadhyay	8	6
10.	Surekha Kundu	7	7

Sl. No.	Name of the Supervisor	Total	Rank
11.	Asok K. Biswas	6	8
12.	Debabrata Basu	6	8
13.	Debabrata Maity	5	9
14.	Maumita Bandyopadhyay	5	9
15.	P. K. Mukhopadhyay	5	9
16.	Rita Kundu	5	9
17.	Karabi Datta	4	10
18.	Kumudranjan Naskar	4	10
19.	Swati Gupta Bhattacharya	4	10
20.	D. K. Singh	3	11
21.	Manju Banerjee	3	11
22.	R. Pal	3	11
23.	Satyesh Chandra Roy	3	11

Table 1.2 - Supervisors-wise distribution of Ph.D. theses of the University of Calcutta

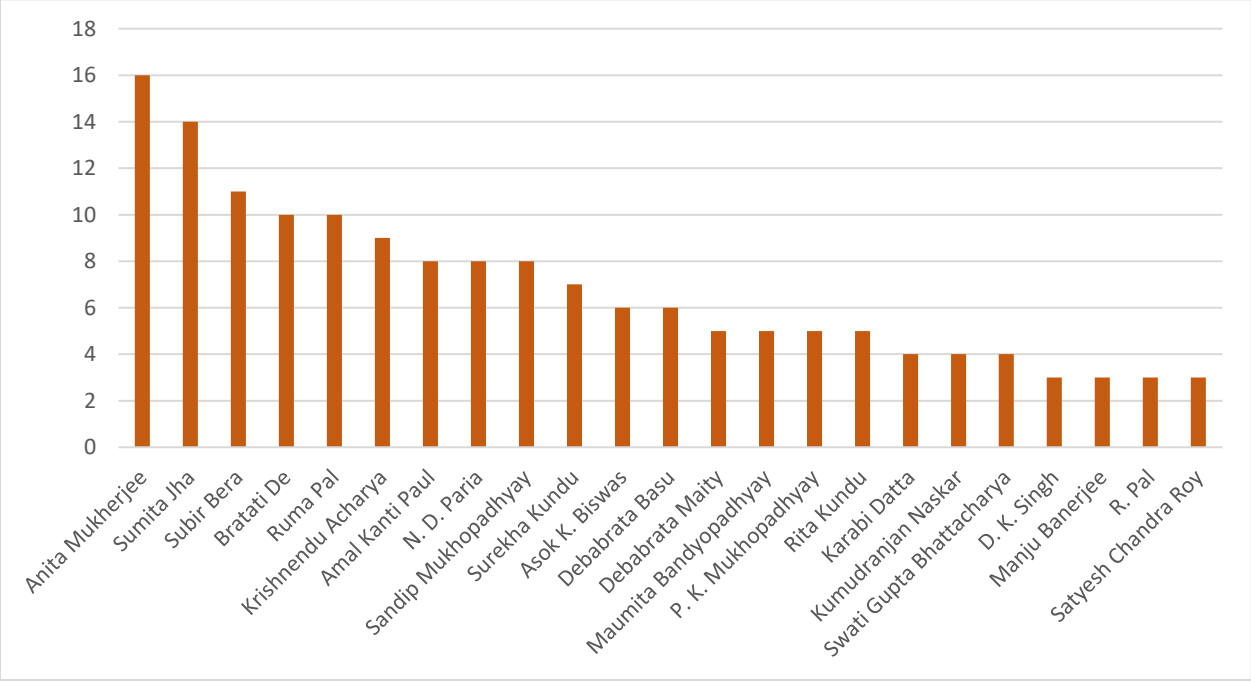

Figure1.2: Supervisors-wise distribution of Ph.D. theses of the University of Calcutta

The supervisor-wise distribution of doctoral theses supervised by faculty members reflects both their scholarly contributions and mentoring patterns. Prof. Anita Mukherjee

emerged as the most prolific supervisor, having supervised 16 theses and secured the 1st rank. She is followed by Prof. Sumita Jha, who guided 14 theses and holds the 2nd rank, and Prof. Subir Bera, who ranks 3rd with 11 theses. Prof. Bratati De and Prof. Ruma Pal share the 4th rank, each supervising 10 theses. Prof. Krishnendu Acharya follows in the 5th position with 9 theses, while Prof. Amal Kanti Paul, Prof. N. D. Paria, and Prof. Sandip Mukhopadhyay share the 6th rank, each having guided 8 theses. Prof. Surekha Kundu ranks 7th with 7 theses, and Prof. Asok K. Biswas and Prof. Debabrata Basu share the 8th rank, each supervising 6 theses. Prof. Debabrata Maity, Dr. Maumita Bandyopadhyay, Prof. P. K. Mukhopadhyay, and Prof. Rita Kundu jointly hold the 9th rank, having guided 5 theses each. At the lower end, Prof. Karabi Datta, Prof. Kumudranjan Naskar, and Prof. Swati Gupta Bhattacharya share the 10th rank with 4 theses each, while Prof. D. K. Singh, Prof. Manju Banerjee, R. Pal, and Prof. Satyesh Chandra Roy are tied at the 11th rank, each supervising 3 theses. The data highlights that a core group of supervisors, particularly the top five, have a significant role in the department's research output, with the top five collectively supervising 61 theses, representing over 28% of the total output.

5.1.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	**Number of theses**	**% of Supervising pattern**
Single	187	86.57
Joint	29	13.43
Total	216	100

Table 1.3 - Supervising Pattern of Ph.D. theses of the University of Calcutta

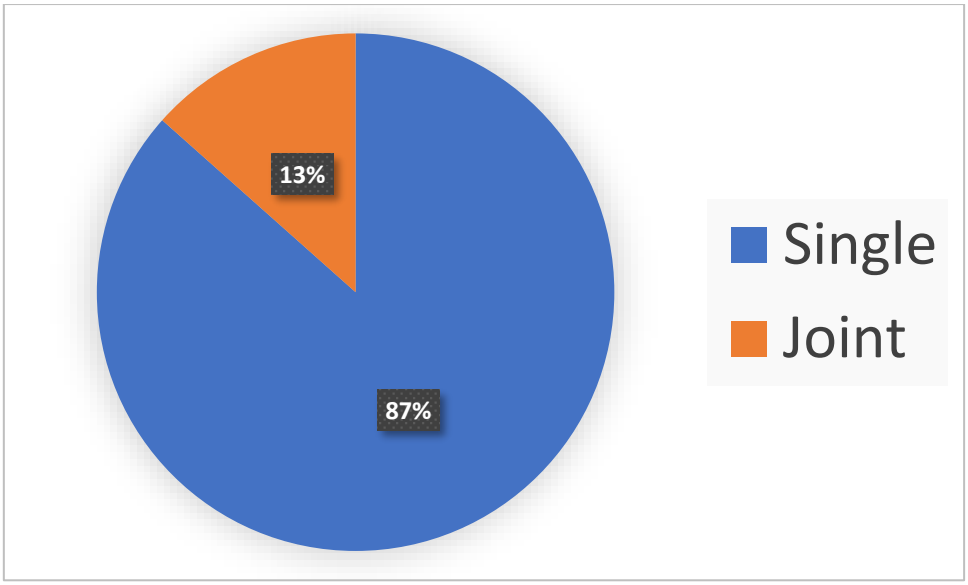

Figure1.3: Supervising Pattern of Ph.D. theses of the University of Calcutta

Table 1.3 presents the supervising pattern of 216 doctoral theses in Botany submitted to the University of Calcutta over the period 2000 to 2020. The data clearly indicates that the single-supervisor model was overwhelmingly dominant throughout the two-decade span. Out of the total 216 theses, 187 theses (86.57%) were completed under single supervision, highlighting the traditional approach of one-on-one academic mentorship in doctoral research at the university. In contrast, only 29 theses (13.43%) were conducted under joint supervision, reflecting limited collaboration or interdisciplinary guidance in the research process. This pattern suggests a strong reliance on individual faculty expertise for doctoral supervision. While the single-supervisor model supports focused guidance, the relatively lower incidence of joint supervision may point to opportunities for greater collaborative and interdisciplinary research efforts in future academic practices.

5.1.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	**Number of theses**	**%**
Male	81	37.5
Female	135	62.5
Total	216	100

Table-5.3: Gender-wise distribution of Ph.D. theses of the University of Calcutta

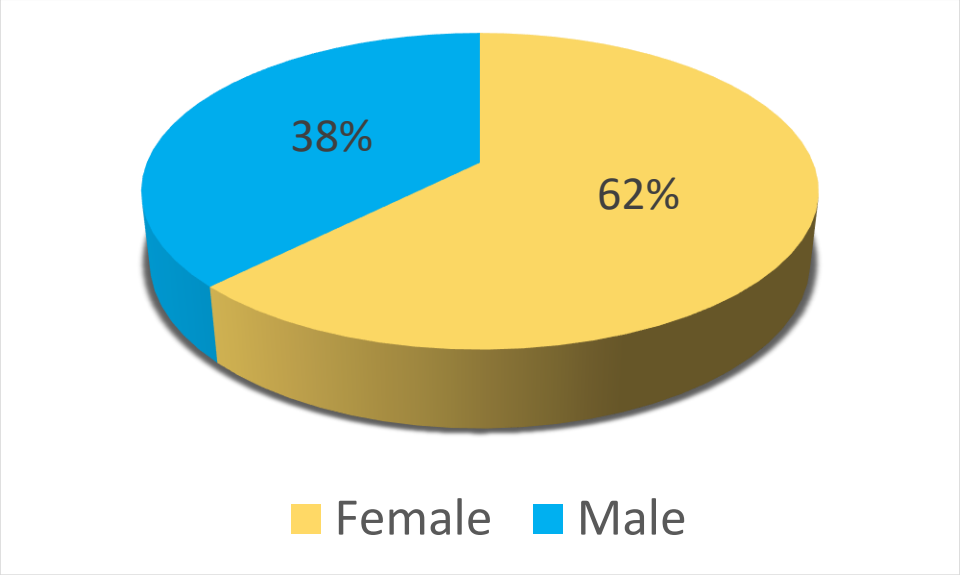

Figure1.4: Gender-wise distribution of Ph.D. theses of the University of Calcutta

The analysis of gender-wise distribution of doctoral researchers in Botany at the University of Calcutta between 2000 and 2020 reveals a notable dominance of female scholars in the field. Out of a total of 216 theses, 135 were submitted by female researchers, accounting for 62.5% of the total, whereas 81 theses (37.5%) were submitted by male researchers. This significant representation of female scholars indicates a positive trend towards gender inclusivity and women's participation in higher research within the discipline of Botany. The data reflects the growing presence and contribution of women in scientific research, particularly in plant sciences, during the two-decade span under study. Such a pattern not only demonstrates changing societal norms and increased opportunities for women in academia but also underscores the need to continue encouraging gender balance and providing institutional support for equitable participation in doctoral-level research.

5.1.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	**Cytology**	59	27.31
2.	**Genetics**	50	23.15
3.	**Plant Ecology**	21	9.72
4.	**Taxonomy**	20	9.26
5.	**Medical Botany**	16	7.41
6.	**Microbiology**	14	6.48
7.	**Plant Pathology**	16	7.41
8.	**Palaeobotany**	8	3.70
9.	**Plant Anatomy**	5	2.31
10.	**Economic Botany**	4	1.85
11.	**Plant Physiology**	3	1.39
Total		216	100

Table 1.5 - Subject-wise distribution of Ph.D. theses of the University of Calcutta

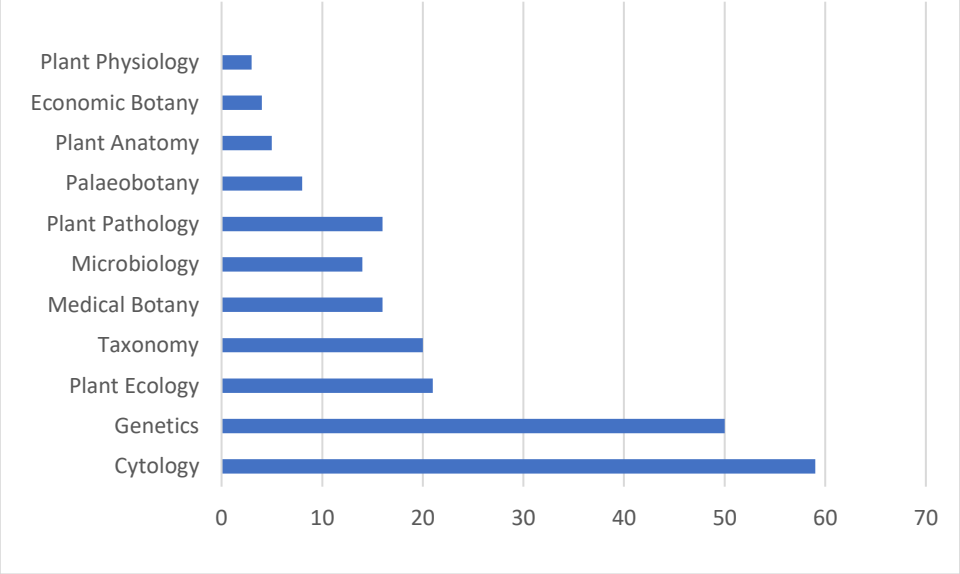

Figure*1.5 - Subject-wise distribution of Ph.D. theses of the University of Calcutta*

The subject-wise distribution shows a strong emphasis on Cytology (27.31%) and Genetics (23.15%), which together account for over 50% of the total content. This highlights a clear focus on cellular and molecular biology, likely reflecting modern research trends and relevance to biotechnology and medicine. Moderate attention is given to Plant Ecology (9.72%), Taxonomy (9.26%), and applied subjects like Medical Botany and Plant Pathology (both 7.41%), indicating a balanced inclusion of ecological and practical plant sciences.

Subjects such as Plant Anatomy, Economic Botany, and Plant Physiology are minimally represented, suggesting a reduced emphasis on traditional and structural aspects of botany. Overall, the data points to a curriculum or question distribution that prioritizes contemporary and applied biological sciences.

5.1.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	2	0.93
2.	6 to 10	37	17.13
3.	11 to 15	95	43.98
4.	16 to 20	59	27.31
5.	21 to 25	21	9.72
6.	26 to 30	2	0.93
7.	30 to 35	0	0.00
	Total	216	100

Table 1.6 - Number of Words Used in the Title of Ph.D. theses of the University of Calcutta

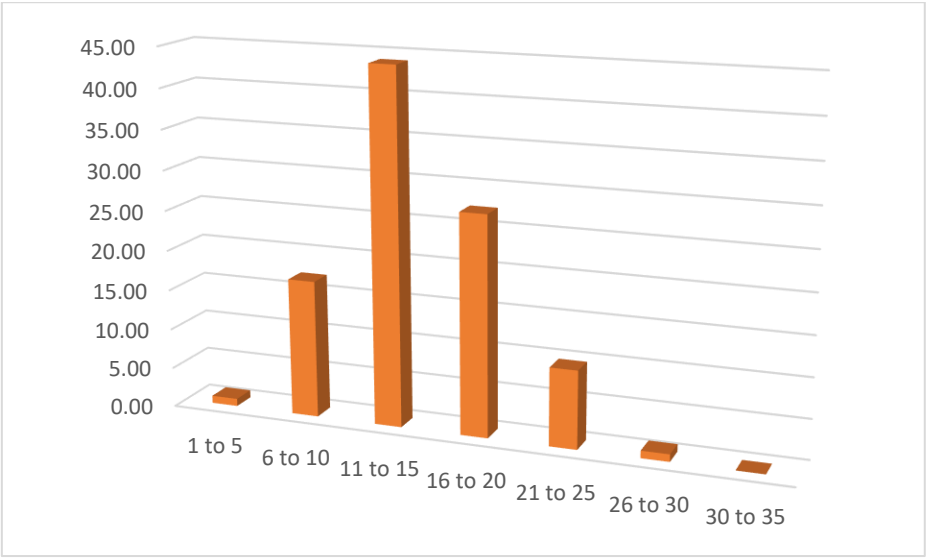

Figure 1.6 - Number of Words Used in the Title of Ph.D. theses of the University of Calcutta

The distribution of title lengths, measured by the number of words used in each thesis title, offers insight into the stylistic and structural practices followed by researchers in Botany at the University of Calcutta between 2000 and 2020. Table 5.4 shows notable variation in title length across the 216 theses examined. Most of the titles fall within the range of 11 to 15 words, representing 95 theses (43.98%), indicating a preference for moderately descriptive titles that balance specificity and clarity. This is followed by 16 to 20 words, with 59 theses (27.31%), and 6 to 10 words, accounting for 37 theses (17.13%). Combined, these three ranges make up over 88% of the total titles, reflecting a general trend toward informative yet concise phrasing. Longer titles in the range of 21 to 25 words appear in 21 theses (9.72%), suggesting a smaller group of researchers opted for more detailed titles, possibly to reflect multi-faceted or interdisciplinary topics. Very short titles (1 to 5 words) and very long titles (26 to 30 words) are rare, with only 2 theses (0.93%) in each category. No theses featured titles exceeding 30 words, indicating an upper limit to title length that aligns with common academic writing norms, where overly long titles may be discouraged for reasons of readability and indexing. Overall, the data highlights a strong tendency among doctoral researchers to adopt titles with 11 to 20 words, aligning with scholarly expectations for titles that are precise, meaningful, and informative without being overly verbose.

5.1.1.7 Frequency of Title Keywords

This section highlights the most used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	Studies	50	22.12
2.	Reference	27	11.95
3.	Plants	26	11.50
4.	Indian	23	10.18
5.	Special	22	9.73
6.	West Bengal	19	8.41
7.	Analysis	17	7.52
8.	Biochemical	14	6.19
9.	Molecular	14	6.19
10.	Production	14	6.19
Total		**226**	**100**

Table 1.7 - Frequency of Title Keywords of Ph.D. theses of the University of Calcutta

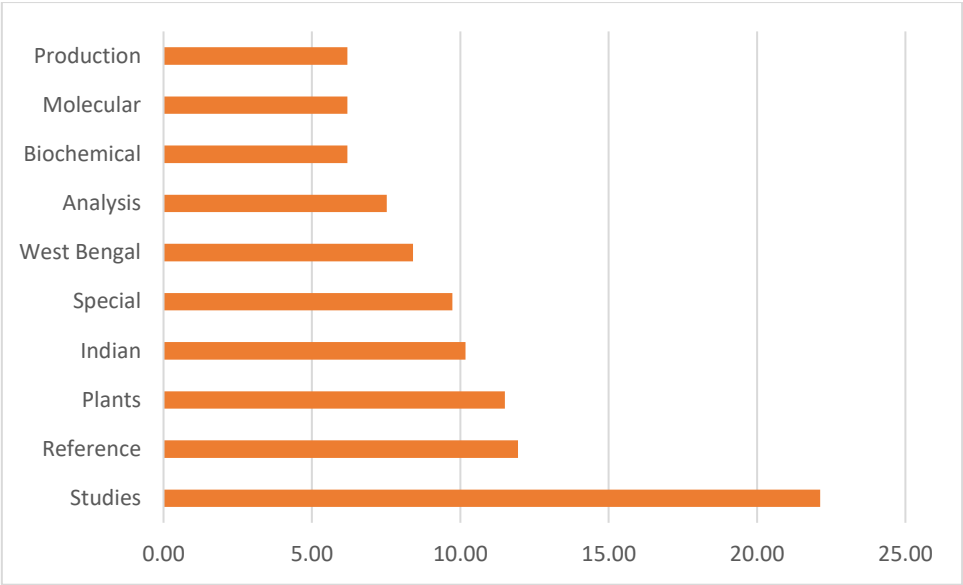

Figure*1.7 - Frequency of Title Keywords of Ph.D. theses of the University of Calcutta*

The analysis of keywords used in the titles of 216 Ph.D. theses in Botany submitted to the University of Calcutta during 2000–2020 reveals distinct thematic trends and commonly explored research areas. A total of 226 keywords were identified from thesis titles, reflecting the academic focus and subject orientation of the research output. The most frequently occurring keyword is "Studies", appearing 50 times (22.12%). Its prevalence suggests that most research titles are framed to emphasize systematic investigation or exploratory work. Following this, the term "Reference" appears 27 times (11.95%), often indicating studies based on specific taxa, locations, or conditions, and highlighting comparative or contextual analysis. The keyword "Plants" features in 26 instances (11.50%), reflecting the central subject of study in the Botany discipline. Other frequently used terms include "Indian" (23 occurrences; 10.18%) and "Special" (22 occurrences; 9.73%), indicating regional specificity and focus on unique or exceptional botanical aspects. "West Bengal", occurring 19 times (8.41%), reinforces the importance of regional studies in the university's research priorities. Keywords such as "Analysis" (7.52%), "Biochemical" (6.19%), "Molecular" (6.19%), and "Production" (6.19%) suggest a significant emphasis on experimental, molecular, and applied plant sciences in the research themes pursued by scholars. The recurrence of these terms reflects both the scientific depth and the regional relevance of the doctoral research produced. The keyword pattern reveals a balance between basic and applied research, ranging from molecular-level investigations to broader ecological or regional plant studies. This keyword analysis not only helps identify popular research areas but also provides valuable insights into the evolving

academic focus of the Botany department at the University of Calcutta over the last two decades.

5.1.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.1.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis in the doctoral research submitted to the University of Calcutta reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2000**	9	1258	139.78
2.	**2001**	1	161	161.00
3.	**2002**	3	495	165.00
4.	**2003**	6	1034	172.33
5.	**2004**	6	985	164.17
6.	**2005**	9	1372	152.44
7.	**2006**	8	1116	139.50
8.	**2007**	9	1248	139.67
9.	**2008**	8	1160	145.00
10.	**2009**	8	1506	188.25
11.	**2010**	9	1469	163.22
12.	**2011**	7	937	133.86
13.	**2012**	16	2020	126.25
14.	**2013**	10	1583	158.30
15.	**2014**	11	1702	154.73

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
16.	**2015**	14	2006	143.29
17.	**2016**	21	3346	159.33
18.	**2017**	19	2394	126.00
19.	**2018**	20	2991	149.55
20.	**2019**	21	3019	143.76
21.	**2020**	1	178	178.00

Table 1.8 - Average Number of References per Theses of the University of Calcutta

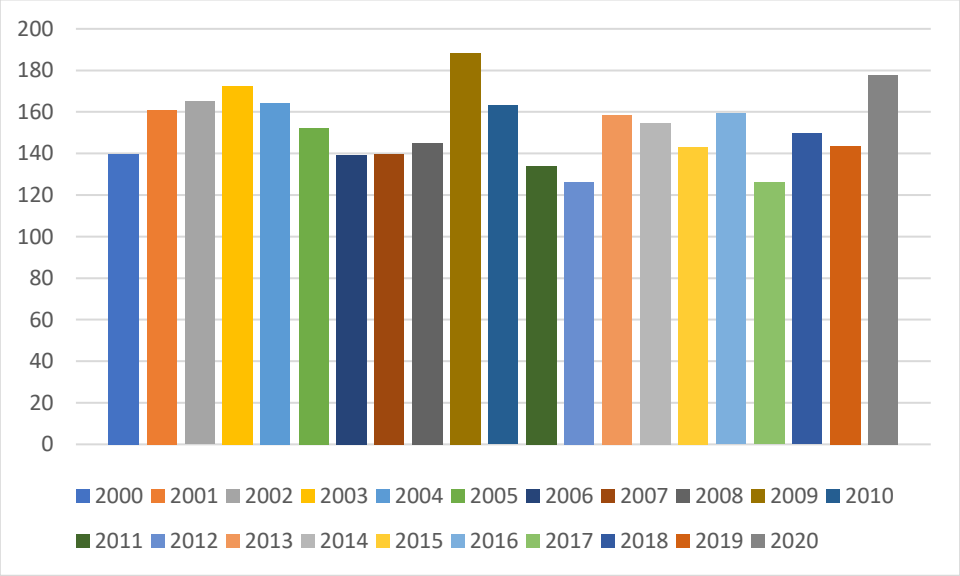

Figure 1.8 - Average Number of References per Theses of the University of Calcutta

The data reveals the average number of references per thesis across various years from 2000 to 2020. The highest average citation per thesis occurred in 2001, with 161 references, followed closely by 2002 and 2003, which saw averages of 165.00 and 172.33 respectively. After a few years of fluctuations, 2009 experienced the highest average citation at 188.25, likely driven by increased research output. The trend generally shows a decrease in average citations in the later years, with the average citation per thesis in 2017 being the lowest at 126.00. A significant drop is observed in 2020, with only one thesis and an average of 178 citations. Despite these fluctuations, the overall trend suggests a general increase in citations in the earlier years, peaking in 2009, followed by a slight decline towards 2020. Notably, the number of theses published varies significantly, with 2016 having the highest number (21 theses) alongside a solid average citation per thesis of 159.33.

5.1.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1.	Journal Articles	16975	53.08
2.	Book Chapters/Edited Books	1400	4.38
3.	Theses/Dissertations	2100	6.57
4.	Conference Proceedings	3150	9.85
5.	Web Resources/Online Articles	4200	13.13
6.	Reports	700	2.19
7.	Miscellaneous/Unclear	3455	10.80

Table 1.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the University of Calcutta

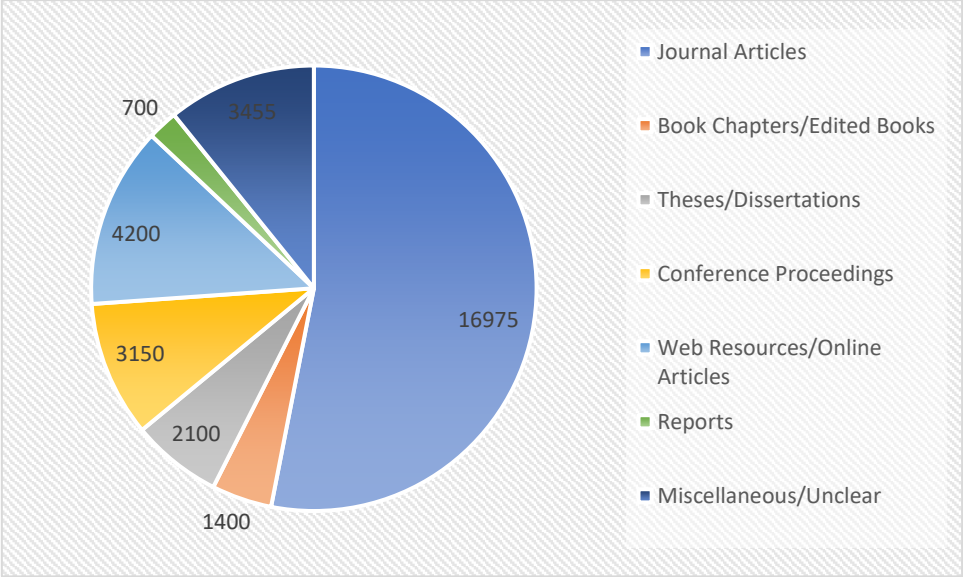

Figure 1.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the University of Calcutta

The bibliographical form-wise distribution of citations in the theses of the University of Calcutta reveals that journal articles account for the largest share, contributing 53.08% of the citations. Web resources/online articles follow closely with 13.13%, while conference proceedings and miscellaneous/unclear sources make up 9.85% and 10.80%, respectively. Theses and dissertations contribute 6.57%, with book chapters/edited books and reports accounting for a smaller portion at 4.38% and 2.19%. This distribution highlights the heavy reliance on journal articles and online resources in academic research at the university.

5.1.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	No. of Citation	% of Citation
One	7603	23.77
Two	8381	26.21
Three	6653	20.80
Four	3715	11.62
Five	2950	9.22
More Than five	2678	8.37

Table 1.10 - Authorship Pattern of Citations of the Theses of the University of Calcutta

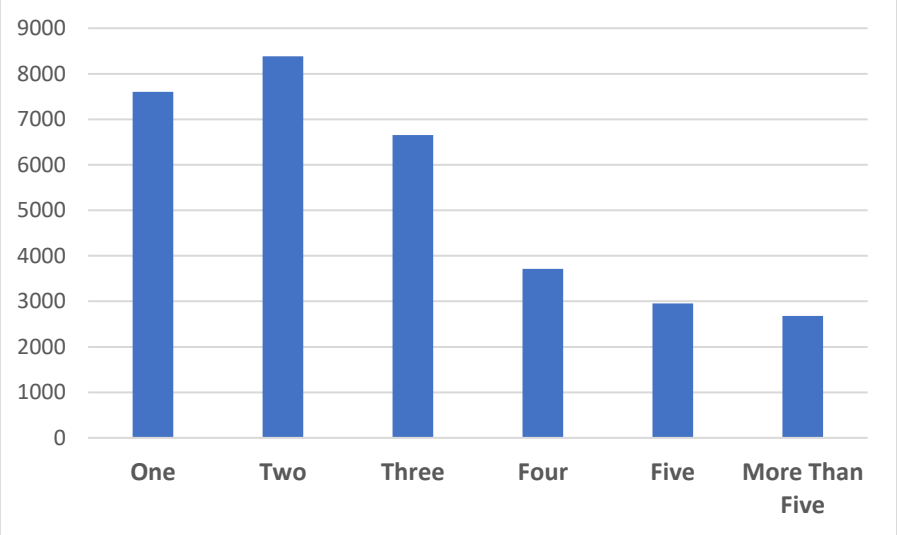

Figure 1.10 - Authorship Pattern of Citations of the Theses of the University of Calcutta

The authorship pattern of citations in the theses of the University of Calcutta shows that most citations come from works with two authors, accounting for 26.21% of the total citations. Citations from single-author works follow closely at 23.77%, while works with three authors contribute 20.80%. Citations from four and five authors make up 11.62% and 9.22%, respectively. Works with more than five authors represent 8.37% of the citations. This distribution indicates a significant tendency toward collaborative research, with most theses involving one to three authors.

5.2 Analysis of Interpretation of Data of University of Kalyani

This chapter presents an in-depth analysis of the data related to the doctoral theses submitted to the Department of Botany at the University of Kalyani. The Department of Botany at the University of Kalyani was established in 1961, just a year after the university's founding. It began under the leadership of Prof. S. P. Sen and was among the core science departments—alongside Chemistry, Physics, Mathematics, and Zoology—aimed at building a strong foundation in science education. Initially offering Honours and Postgraduate courses, the department quickly gained recognition for its commitment to both teaching excellence and foundational research in plant sciences. Over the years, the Botany Department has grown into a well-regarded center for botanical research and education. Its development was supported by a series of major national grants, including departmental research support and specialized assistance programs from the University Grants Commission, as well as funding from the Department of Biotechnology. These initiatives helped strengthen its programs in molecular biology, genetics, taxonomy, pathology, and microbiology. Today, the department is equipped with advanced facilities—such as research laboratories, a fern garden, a fossil museum, and infrastructure for distance-learning programs with practical lab components. Supported by ongoing research projects in areas like spore banks and pollen analysis, the department continues to offer robust undergraduate, postgraduate, and PhD training, playing a vital role in botanical education and scientific outreach.

5.2.1 Analysis and Interpretation of Data on Theses

This section explores key aspects of thesis submissions, including trends over the years, the number of theses supervised by different faculty members, and the distribution of research topics. By analyzing these factors, we aim to identify growth patterns in doctoral research and the elements shaping these trends. The results will offer valuable insights into the department's academic development and research output over the last two decades.

5.2.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2000	5	2.86
2.	2001	10	5.71
3.	2002	11	6.29
4.	2003	4	2.29
5.	2004	8	4.57
6.	2005	5	2.86
7.	2006	10	5.71
8.	2007	7	4.00
9.	2008	8	4.57
10.	2009	17	9.71
11.	2010	12	6.86
12.	2011	9	5.14
13.	2012	8	4.57
14.	2013	14	8.00
15.	2014	10	5.71
16.	2015	14	8.00
17.	2016	9	5.14
18.	2017	2	1.14
19.	2018	5	2.86
20.	2019	4	2.29
21.	2020	3	1.71
Total		175	100

Table 2.1 : Year-wise distribution of Ph.D. theses of the University of Kalyani

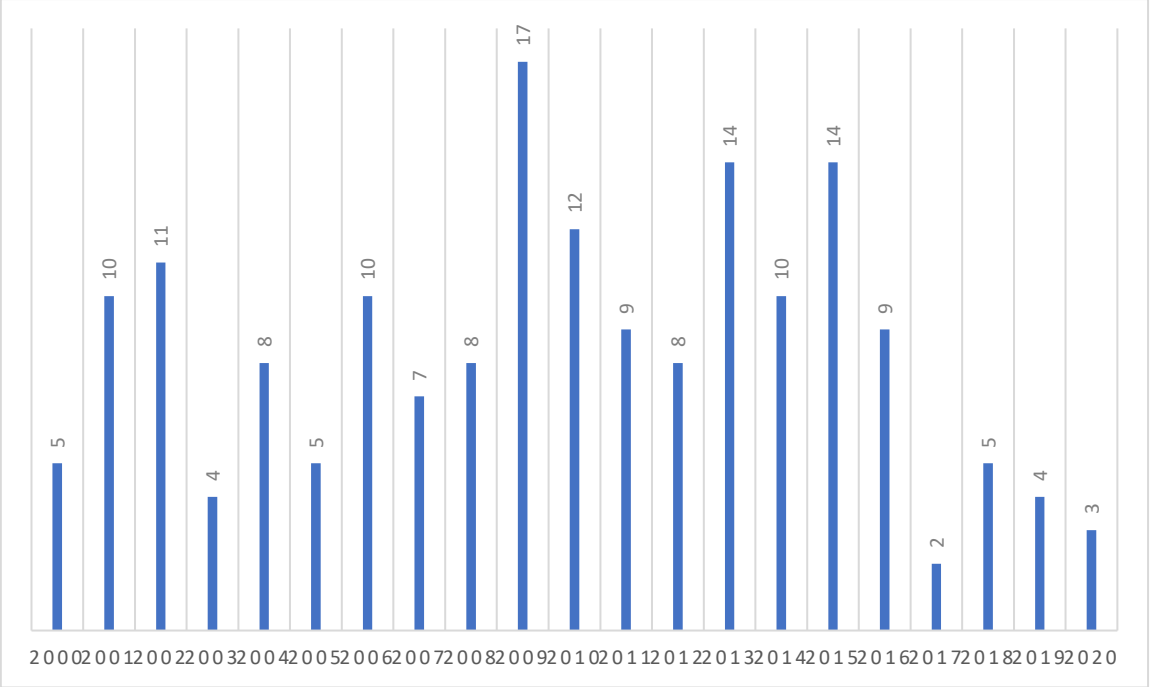

Figure 2.1: Year-wise distribution of Ph.D. theses of the University of Kalyani

Table 2.1 presents the year-wise distribution of Ph.D. theses submitted to the University of Kalyani from the year 2000 to 2020. A total of 175 theses were submitted during this 21-year period. The highest number of theses was recorded in 2009 with 17 submissions (9.71%), followed by 2013 and 2015, each with 14 submissions (8.00%). Other notable years include 2010 with 12 theses (6.86%) and 2002 with 11 theses (6.29%). In contrast, the lowest number of submissions occurred in 2017 with only 2 theses (1.14%), followed by 2020 with 3 theses (1.71%) and 2003 and 2019, each with 4 theses (2.29%). The data indicates a fluctuating trend in thesis submission over the years, with relatively higher activity observed between 2009 and 2016, reflecting a peak phase in research output at the University.

5.2.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1.	Animesh Kumar Datta	19	1
2.	Sobhan Kumar Mukherjee	16	2
3.	Chandan Sengupta	13	3

Sl. No.	Name of the Supervisor	Total	Rank
4.	Parthadeb Ghosh	13	3
5.	Gaurgopal Maiti	12	4
6.	Sujata Chaudhuri	11	5
7.	Padma Chatterjee	8	6
8.	Tuhinsri Sen	4	7
9.	Basudeb Dasgupta	3	8
10.	Bejoysekhar Datta	3	8
11.	Bharati Nandi	3	8
12.	Sankar Narayan Sinha	3	8
13.	Sudipta Roy	3	8
14.	Tapan Kumar Mondal	3	8
15.	Dilip Gupta	2	9
16.	M.K. Adak	2	9
17.	Neera Sen Sarkar	2	9
18.	Sima Bhattacharya	2	9
19.	Sudha Gupta	2	9
20.	Swapan Kumar Ghosh	2	9

Table 2.2: Supervisors-wise distribution of Ph.D. theses of the University of Kalyani

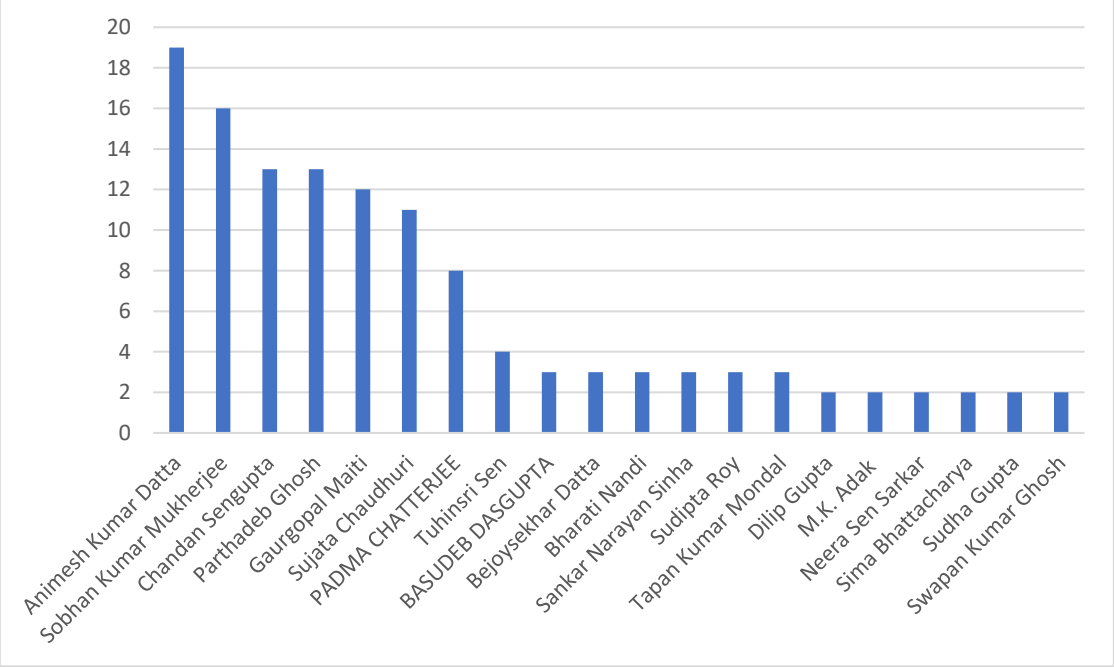

Figure 2.2 : Supervisors-wise distribution of Ph.D. theses of the University of Kalyani

Table 2.2 presents the distribution of Ph.D. theses under the supervision of various faculty members at the University of Kalyani. The data reveals that Animesh Kumar Datta supervised the highest number of theses, totaling 19, securing the 1st rank. He is followed by Sobhan Kumar Mukherjee with 16 theses (2nd rank) and Chandan Sengupta and Parthadeb Ghosh, both with 13 theses, sharing the 3rd rank. Other notable supervisors include Gaurgopal Maiti (12 theses, 4th rank) and Sujata Chaudhuri (11 theses, 5th rank). The remaining supervisors guided between 2 to 8 theses, with Padma Chatterjee supervising 8 theses (6th rank) and Tuhinsri Sen supervising 4 theses (7th rank). Several supervisors, including Basudeb Dasgupta, Bejoysekhar Datta, and others, are tied with 3 theses each, occupying the 8th rank, while six supervisors are tied at the 9th rank, having supervised 2 theses each. This distribution reflects the varying levels of research supervision contributions made by faculty members, highlighting a core group of prolific supervisors at the University of Kalyani.

5.2.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	Number of theses	%
Single	120	68.57
Joint	55	13.43
Total	175	100

Table 2.3 : Supervising Pattern of Ph.D. theses of the University of Kalyani

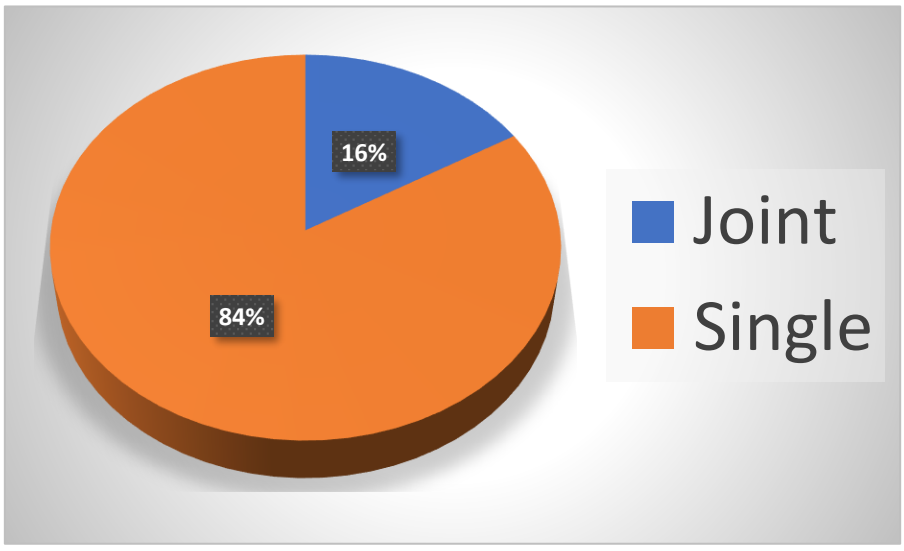

Figure 2.3 : Supervising Pattern of Ph.D. theses of the University of Kalyani

Table 2.3 illustrates the supervising pattern of Ph.D. theses submitted to the University of Kalyani. Out of the total 175 theses, 120 theses (68.57%) were completed under single supervision, making it the most common mode of research guidance at the university. On the other hand, 55 theses (31.43%) were carried out under joint supervision, indicating a substantial practice of collaborative research supervision. This data reveals that while single supervision continues to be the dominant pattern, joint supervision is also significantly adopted to foster interdisciplinary or co-guided research work.

5.2.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	110	62.86
Female	65	37.14
Total	175	100

Table 2.4 : Gender-wise distribution of Ph.D. theses of the University of Kalyani

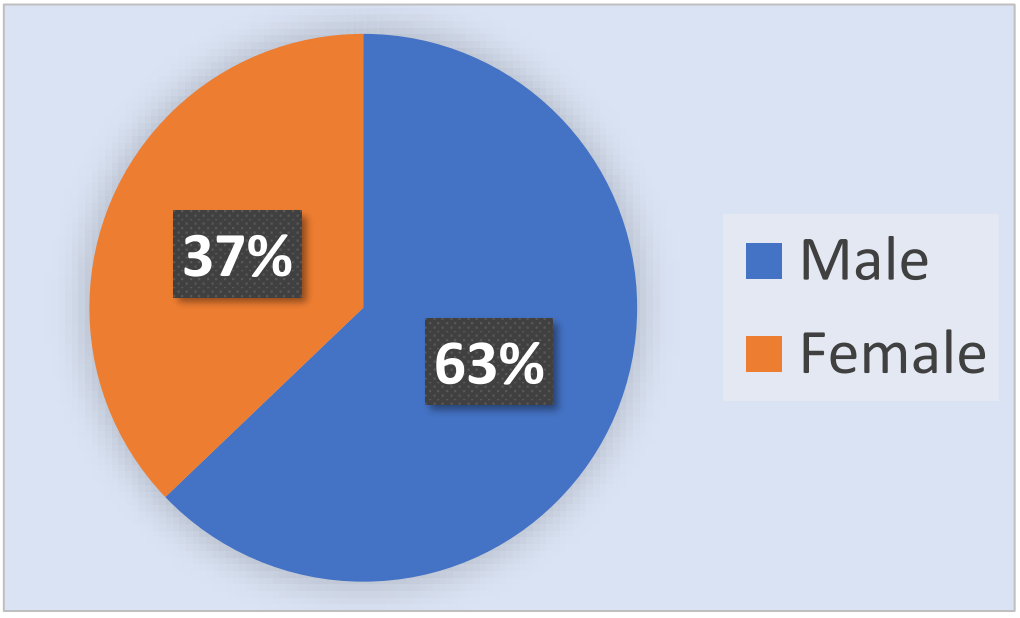

Figure 2.4: Gender-wise distribution of Ph.D. theses of the University of Kalyani

Table 2.4 presents the gender-wise distribution of Ph.D. theses submitted to the University of Kalyani. Out of a total of 175 theses, 110 theses (62.86%) were submitted by male researchers, while 65 theses (37.14%) were submitted by female researchers. The data indicates a noticeable gender gap, with male researchers contributing a higher proportion of doctoral research. However, the participation of female scholars is also significant, reflecting growing involvement of women in advanced academic research at the university.

5.2.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	Cytology	37	21.14
2.	Economic Botany	2	1.14
3.	Genetics	34	19.43
4.	Medical Botany	3	1.71
5.	Microbiology	18	10.29
6.	Palaeobotany	3	1.71
7.	Plant Anatomy	10	5.71
8.	Plant Ecology	28	16.00
9.	Plant Pathology	11	6.29
10.	Plant Physiology	12	6.86
11.	Taxonomy	17	9.71
Total		175	100

Table 2.5 :Subject-wise distribution of Ph.D. theses of the University of Kalyani

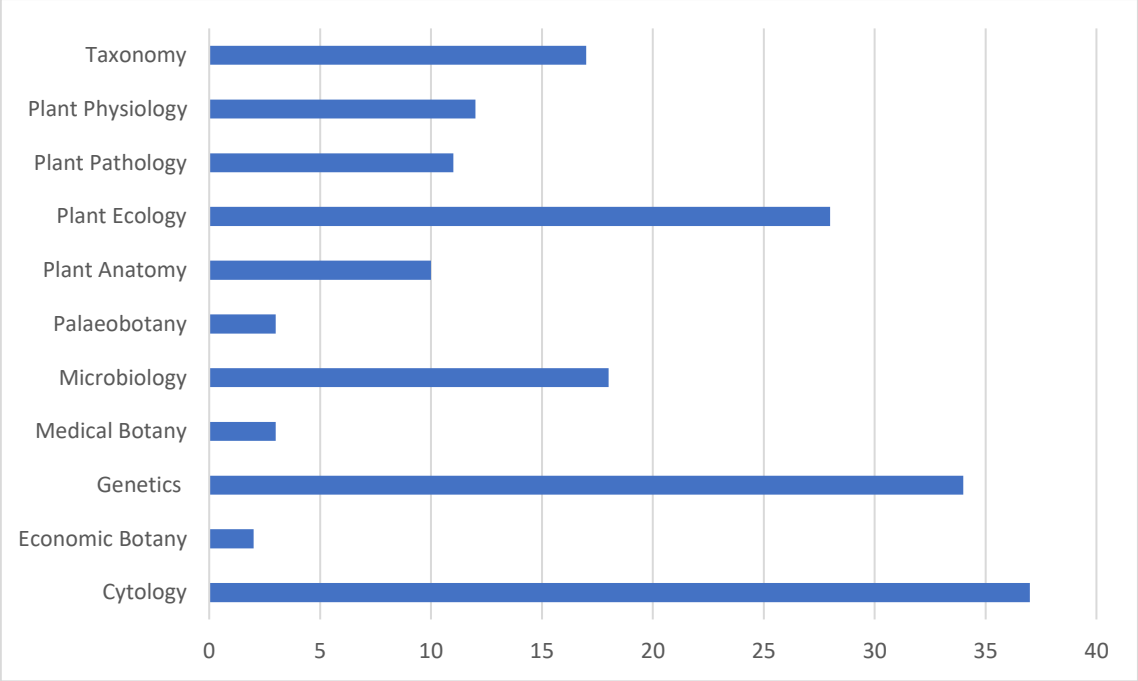

Figure 2.5: Subject-wise distribution of Ph.D. theses of the University of Kalyani

Table 2.5 shows the subject-wise distribution of 175 Ph.D. theses submitted to the University of Kalyani. The highest number of theses were submitted in Cytology (37 theses, 21.14%), followed closely by Genetics (34 theses, 19.43%), and Plant Ecology (28 theses, 16.00%), indicating these as the most prominent areas of research. Other notable subjects include Microbiology (18 theses, 10.29%), Taxonomy (17 theses, 9.71%), and Plant Physiology (12 theses, 6.86%). Subjects with comparatively fewer theses include Economic Botany (2 theses, 1.14%), Medical Botany (3 theses, 1.71%), and Palaeobotany (3 theses, 1.71%). This distribution reflects a strong research focus in core botanical sciences such as cytology, genetics, and ecology, with a balanced representation across several other specialized sub-disciplines.

5.2.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	3	1.71
2.	6 to 10	29	16.57
3.	11 to 15	59	33.71
4.	16 to 20	49	28.00
5.	21 to 25	22	12.57
6.	26 to 30	8	4.57
7.	30 to 35	5	2.86
	Total	175	100

Table 2.6: **Number of Words Used in the Title of *Ph.D. theses of the University of Kalyani***

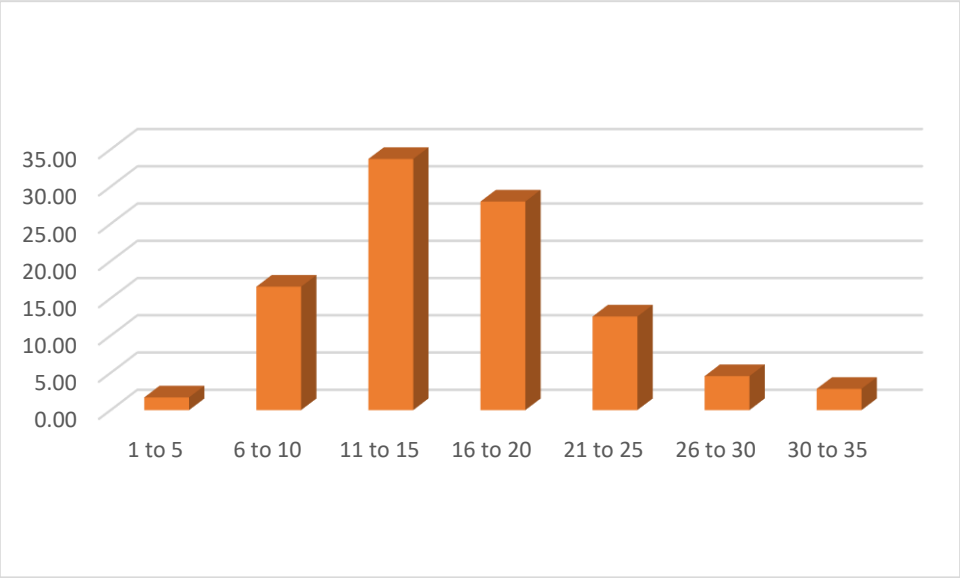

Figure 2.6: **Number of Words Used in the Title of *Ph.D. theses of the University of Kalyani***

The data on the number of words used in the titles of Ph.D. theses at the University of Kalyani shows a concentration in the 11 to 15-word range, with 33.71% (59 theses) falling into this category. The second most common group is the 16 to 20 words range, comprising 28% (49 theses). Titles with 6 to 10 words account for 16.57% (29 theses), while those with 21 to 25 words make up 12.57% (22 theses). Fewer theses have titles with fewer than 5 words (1.71%) or more than 25 words, with only 4.57% (8 theses) falling into the 26 to 30-word range and 2.86% (5 theses) exceeding 30 words. The total number of theses analyzed is 175.

5.2.1.7 Frequency of Title Keywords

This section highlights the most commonly used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	Culture	14	11.67
2.	Biochemical	14	11.67
3.	Indian	13	10.83
4.	Mutagenesis	13	10.83
5.	Assessment	13	10.83
6.	Diversity	12	10.00
7.	Taxonomic	11	9.17
8.	District	10	8.33
9.	Family	10	8.33
10.	Plants	10	8.33
	Total	120	100

Table 2.7: Frequency of Title Keywords of Ph.D. theses of the University of Kalyani

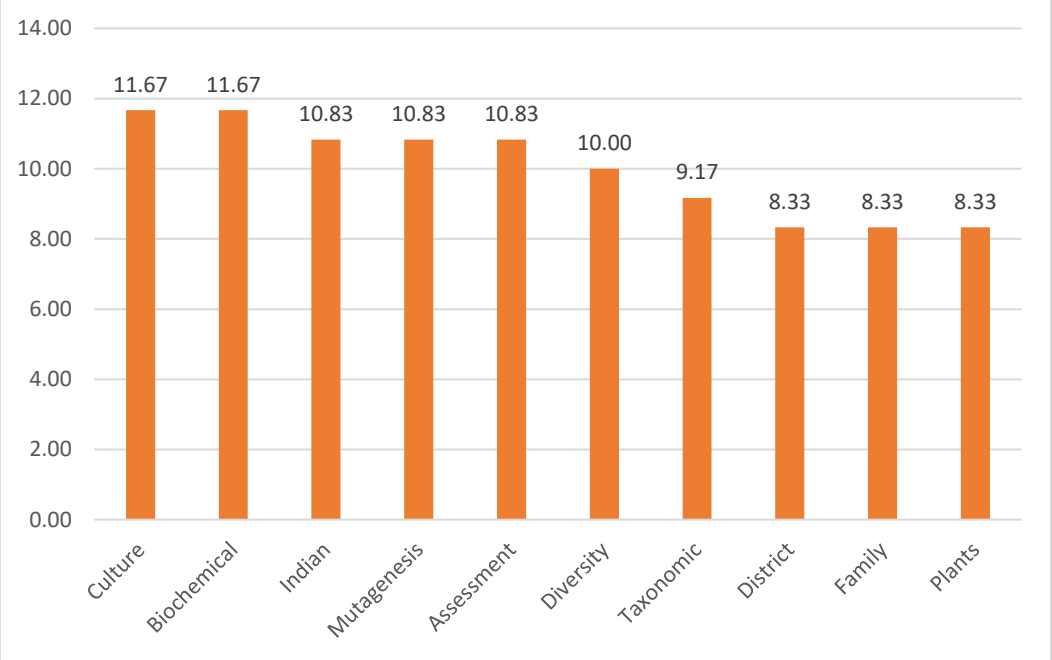

Figure 2.7: Frequency of Title Keywords of Ph.D. theses of the University of Kalyani

The data in Table 2.7 shows the frequency distribution of title keywords in Ph.D. theses from the University of Kalyani. The most frequently occurring keywords are "Culture" and "Biochemical," each with a frequency of 14, representing 11.67% of the total. "Indian," "Mutagenesis," and "Assessment" each appear 13 times, making up 10.83% of the total frequency. Other notable keywords include "Diversity" (12 occurrences, 10%), and "Taxonomic" (11 occurrences, 9.17%). The least frequent keywords are "District," "Family," and "Plants," each appearing 10 times, accounting for 8.33% of the total frequency. The total number of keywords analyzed is 120.

5.2.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.2.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2000**	9	1317	146.33
2.	**2001**	1	161	161.00
3.	**2002**	3	506	168.67
4.	**2003**	6	1005	167.50
5.	**2004**	6	881	146.83
6.	**2005**	9	1214	134.89
7.	**2006**	8	1242	155.25
8.	**2007**	9	1266	140.67
9.	**2008**	8	1238	154.75
10.	**2009**	8	1396	174.50
11.	**2010**	9	1464	162.67
12.	**2011**	7	1036	148.00
13.	**2012**	16	2617	163.56
14.	**2013**	10	1559	155.90
15.	**2014**	11	1424	129.45
16.	**2015**	14	1901	135.79
17.	**2016**	21	2940	140.00
18.	**2017**	19	2636	138.74
19.	**2018**	20	3453	172.65
20.	**2019**	21	3262	155.33
21.	**2020**	1	157	157.00

Table 2.8 : Average Number of References per Theses of the University of Kalyani

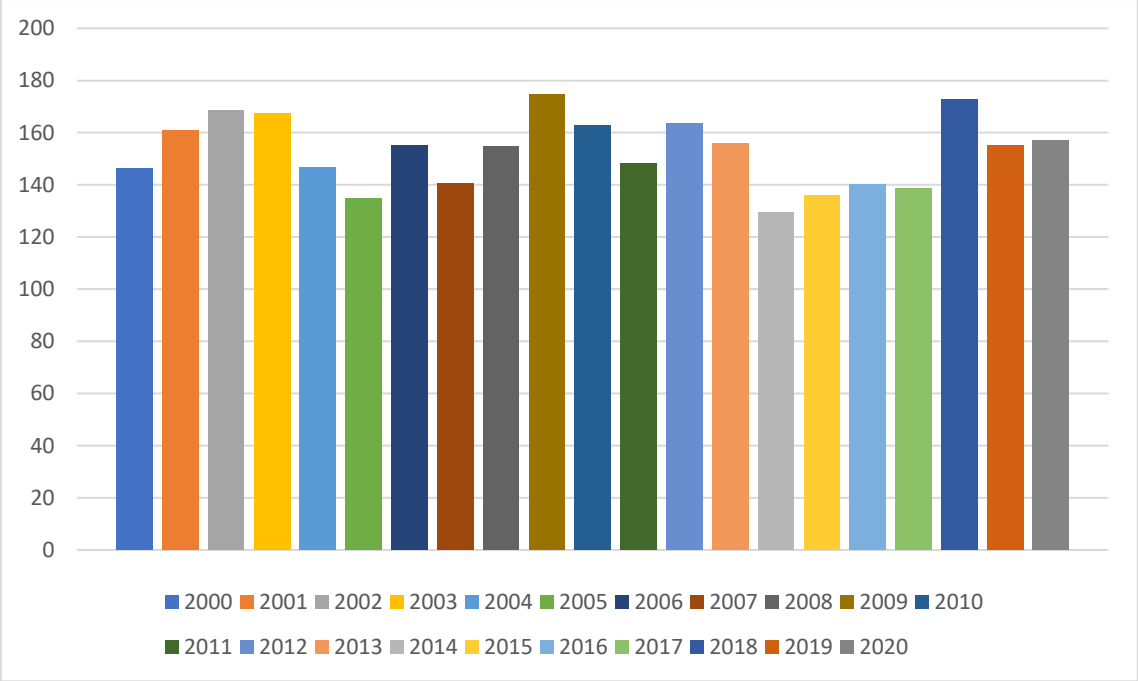

Figure 2.8: Average Number of References per Theses of the University of Kalyani

The data in Table 2.8 illustrates the average number of citations per Ph.D. thesis at the University of Kalyani over the years. In 2000, the average citation per thesis was 146.33, with 9 theses and 1317 citations. The trend fluctuated over the years, with a peak in 2009, where the average citations per thesis reached 174.50, alongside 8 theses and 1396 citations. The average citation per thesis remained relatively high through the years, with noticeable values in 2002 (168.67) and 2018 (172.65). The lowest average was observed in 2014, at 129.45. Over the years, the number of theses generally increased, and although there were fluctuations in the citation averages, the overall trend indicates a steady citation frequency with notable peaks in the later years, such as 2019 with an average of 155.33.

5.2.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1.	Journal Articles	24691	75.57
2.	Book Chapters/Edited Books	4456	13.64
3.	Theses/Dissertations	557	1.70
4.	Conference Proceedings	371	1.14
5.	Web Resources/Online Articles	929	2.84
6.	Reports	557	1.70
7.	Miscellaneous/Unclear	1114	3.41

Table 2.9: Bibliographical Form-wise Distribution of Citations of Ph.D. theses of the University of Kalyani

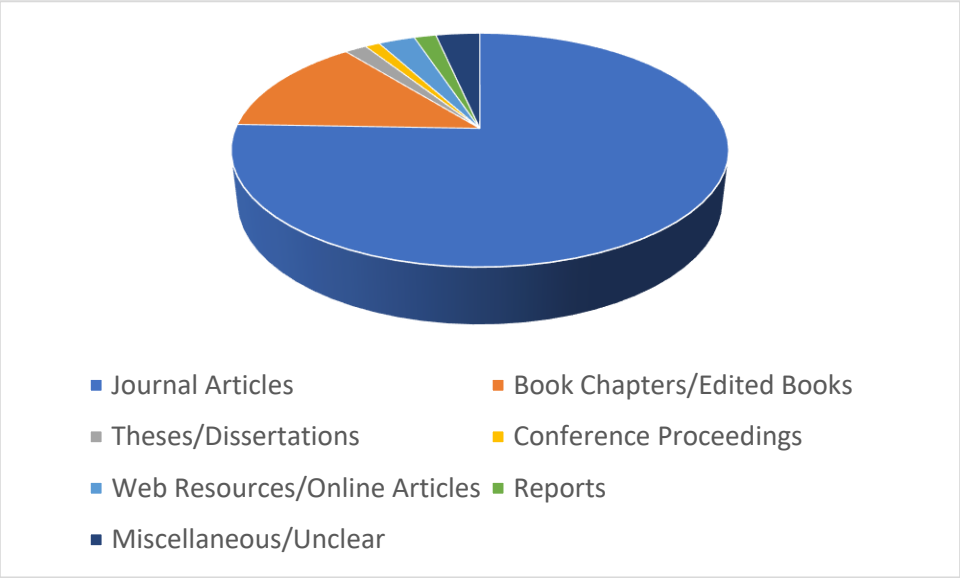

Figure 2.9: Bibliographical Form-wise Distribution of Citations of Ph.D. theses of the University of Kalyani

The bibliographical form-wise distribution of citations for Ph.D. theses from the University of Kalyani reveals a prominent reliance on journal articles, which account for 75.57% of the total citations. Book chapters and edited books follow, contributing 13.64%, while theses and dissertations, conference proceedings, and web resources each contribute relatively smaller percentages, ranging from 1.14% to 2.84%. Reports and miscellaneous/unclear sources each contribute 1.70% and 3.41%, respectively. These figures indicate that journal articles are the primary source of citations, with other forms of bibliographic material playing a minor role in the overall citation landscape.

5.2.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	No. of Citation	% of Citation
One	372	1.14
Two	1300	3.98
Three	2042	6.25
Four	3713	11.36
Five	2228	6.82
More Than five	23021	70.45
Total	32675	100

Table 2.10 : Authorship Pattern of Ph.D. theses of the University of Kalyani

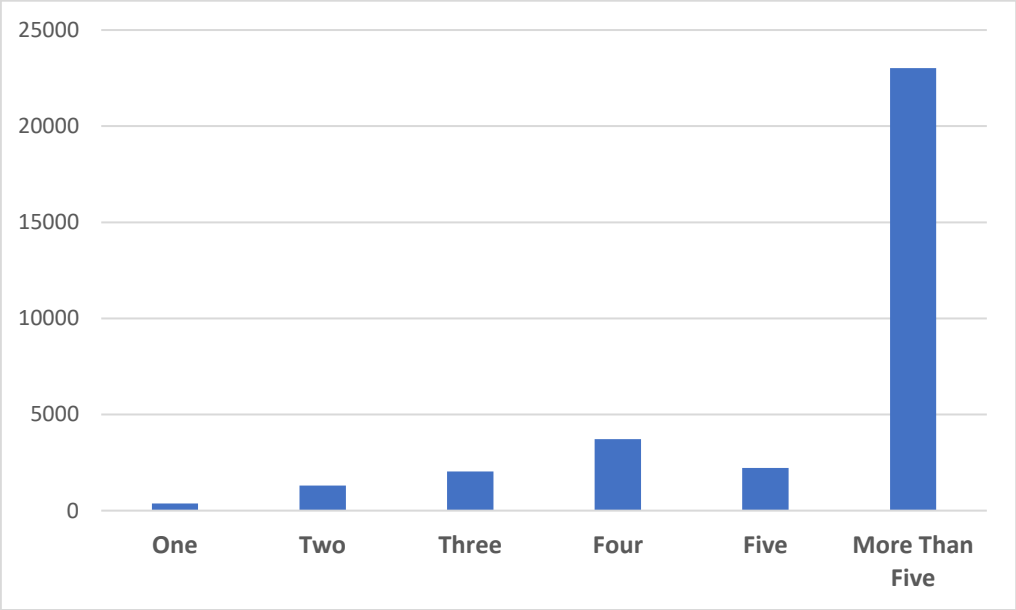

Figure 2.10 : Authorship Pattern of Ph.D. theses of the University of Kalyani

The authorship pattern of Ph.D. theses at the University of Kalyani demonstrates that a significant majority of citations (70.45%) come from works authored by more than five individuals. In contrast, citations from single-authored works make up only 1.14%, with two-

author works accounting for 3.98%. Citations from works with three, four, and five authors contribute 6.25%, 11.36%, and 6.82%, respectively. This distribution indicates that multi-author collaborations, particularly those with more than five authors, dominate the citation landscape in this academic community.

5.3 Analysis of Interpretation of Data of University of North Bengal

The Department of Botany at the University of North Bengal was established in 1984 to support the region's rapidly growing interest in plant sciences and to build academic strength in the Faculty of Science. From the start, the department embraced a progressive curriculum, adopting the semester system and offering specialized papers in fields such as cytogenetics, microbiology, molecular plant pathology, fungal biotechnology, plant biochemistry, and angiosperm taxonomy. This early focus on curriculum breadth and depth positioned the department as a vital centre for botanical education within the university and the broader North Bengal region. Since its inception, the department has consistently expanded its academic and research footprint. In 1991, it launched an herbarium that now conserves around 12,000 specimens, and this collection was upgraded and relocated to a dedicated facility in 2019. From 2007 onwards, the department has published its own peer-reviewed Journal of Plant Sciences, showcasing original research across botany, microbiology, agriculture, and allied areas. Supported by ongoing funding from agencies like UGC and DST-FIST, the department maintains a rigorous research agenda—spanning cytogenetics, plant-microbe interaction, fungal biotechnology, biochemistry, and taxonomy—while providing modern infrastructure such as a central instrumentation facility and advanced labs. Today, it offers M.Sc., M.Phil., and Ph.D. programs, shaping a dynamic learning environment that blends teaching excellence, hands-on research, and scholarly productivity in plant science.

5.3.1 Analysis and Interpretation of Data on Theses

This section reviews various facets of thesis submissions, such as yearly trends, faculty involvement in thesis supervision, and the range of research topics. By examining these elements, we seek to uncover patterns in the growth of doctoral research and the factors driving these changes. The findings will offer a clearer view of the department's academic evolution and research productivity over the past twenty years.

5.3.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2000	4	4.30
2.	2001	5	5.38
3.	2002	5	5.38
4.	2003	0	0.00
5.	2004	1	1.08
6.	2005	2	2.15
7.	2006	3	3.23
8.	2007	1	1.08
9.	2008	1	1.08
10.	2009	1	1.08
11.	2010	0	0.00
12.	2011	7	7.53
13.	2012	3	3.23
14.	2013	12	12.90
15.	2014	6	6.45
16.	2015	6	6.45
17.	2016	7	7.53
18.	2017	20	21.51
19.	2018	5	5.38
20.	2019	4	4.30
	Total	93	100

Table 3.1 - Year-wise distribution of Ph.D. theses of the University of North Bengal

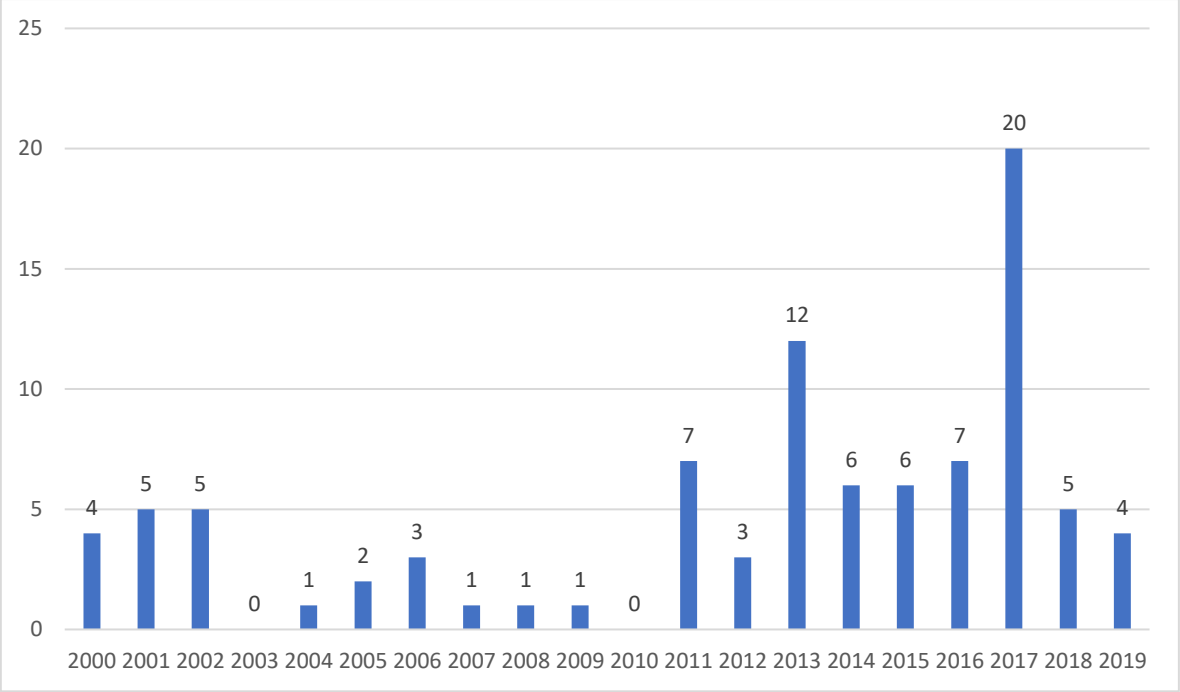

Figure 3.1: Year-wise distribution of Ph.D. theses of the University of North Bengal.

The year-wise distribution of Ph.D. theses from the University of North Bengal reveals significant variation in the number of theses submitted over time. The highest proportion of theses (21.51%) was recorded in 2017, with 20 theses, while years like 2003 and 2010 had no submissions at all. The total number of theses for the period under study was 93, with the most active years being 2011 (7.53%) and 2013 (12.90%). The distribution shows a fluctuation in activity, with periods of low submissions in the early 2000s and a notable increase in the later years, particularly post-2010. This data suggests a growing trend in Ph.D. submissions towards the more recent years.

5.3.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculty, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1.	Arnab Sen	13	1
2.	Usha Chakraborty	12	2
3.	Bishwanath Chakraborty	11	3
4.	Abhaya Prasad Das	10	4
5.	Aniruddha Saha	10	4
6.	Dipanwita Saha	5	5
7.	Palash Mandal	5	5
8.	P.K. Sarkar	4	6
9.	Binod Chandra Sharma	3	7
10.	Subhas Chandra. Roy	3	7
11.	Dorjay Lama	2	8
12.	Jyoti Prakash Tamang	2	8
13.	Monoranjan Chowdhury	2	8

Table 3.2 - Supervisors-wise distribution of Ph.D. theses of the University of North Bengal

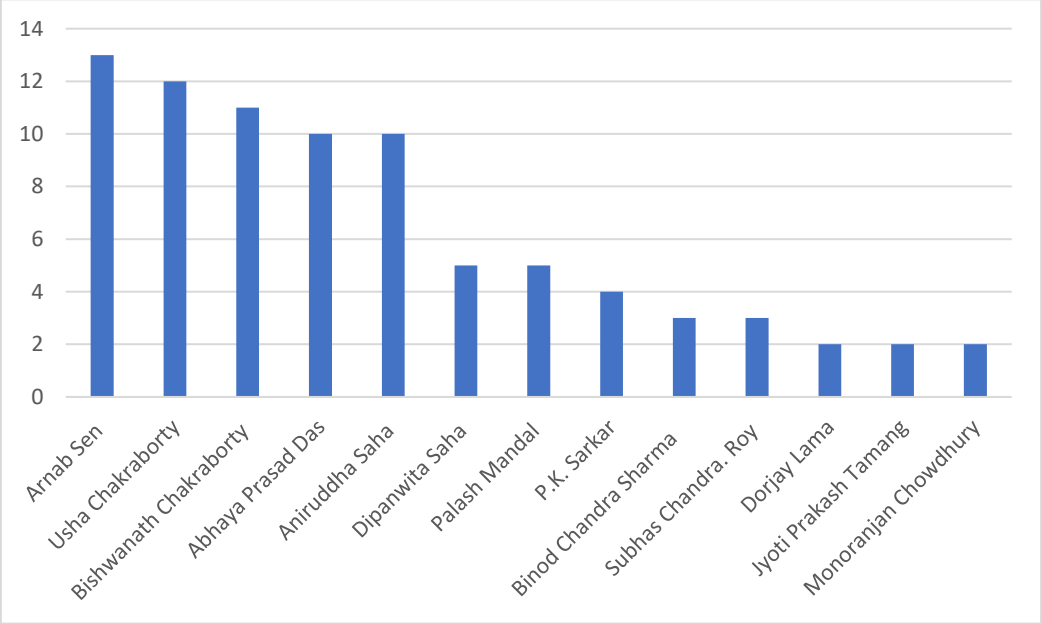

Figure 3.2: Supervisors-wise distribution of Ph.D. theses of the University of North Bengal

The distribution of Ph.D. theses by supervisors at the University of North Bengal highlights the varying contributions of faculty members. Arnab Sen is the leading supervisor with 13 theses, followed closely by Usha Chakraborty with 12, and Bishwanath Chakraborty with 11, securing the top three ranks. Supervisors such as Abhaya Prasad Das and Aniruddha

Saha both have 10 theses, placing them in the fourth position. A noticeable drop occurs after the top five, with supervisors like Dipanwita Saha, Palash Mandal, and others having fewer theses. The data shows a concentration of Ph.D. supervision among a few supervisors, with the remaining faculty members supervising a small number of theses, indicating varied research supervision activity.

5.3.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	Number of theses	%
Single	58	62.37
Joint	35	37.63
Total	93	100

Table 3.3 - Supervising Pattern of Ph.D. theses of the University of North Bengal

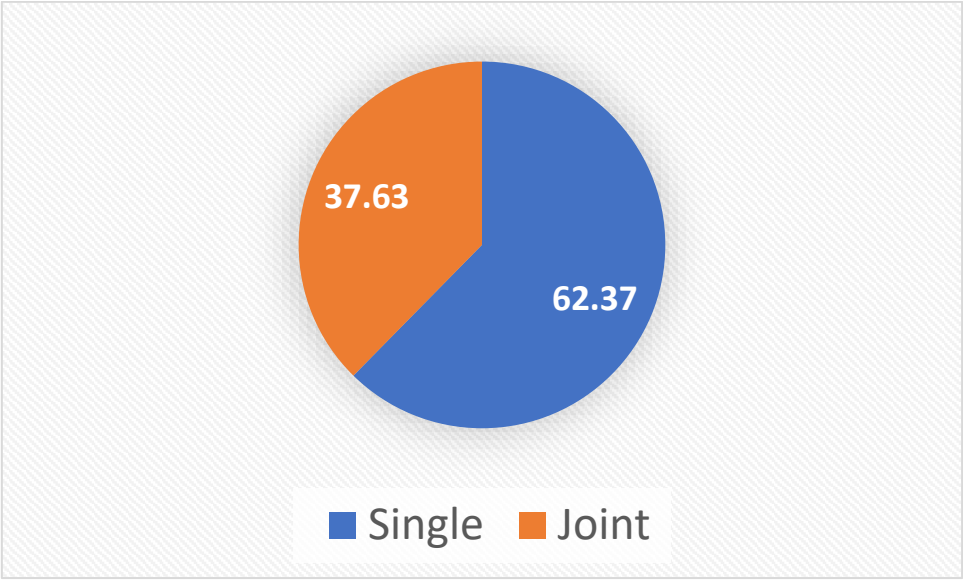

Figure 3.3: Supervising Pattern of Ph.D. theses of the University of North Bengal

The supervising pattern of Ph.D. theses at the University of North Bengal shows a predominant trend towards single supervision, with 58 theses (62.37%) being supervised by a single individual. In contrast, joint supervision accounted for 35 theses (37.63%). This data indicates that while joint supervision is still a significant aspect of the research process, single supervision remains the more common approach in guiding Ph.D. students at the university.

5.3.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	57	61.29
Female	36	38.71
Total	93	100

Table-5.3: Gender-wise distribution of Ph.D. theses of the University of North Bengal

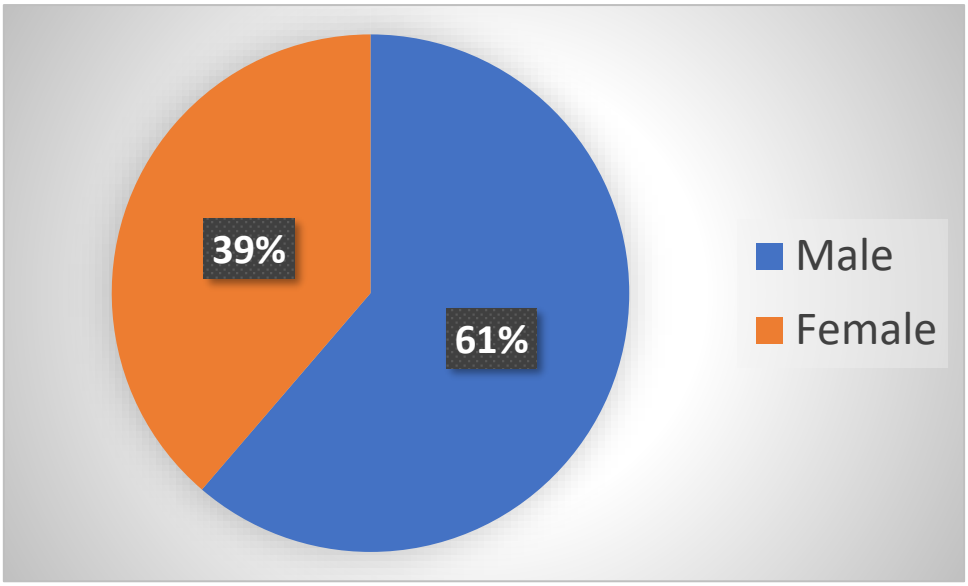

Figure 3.4: Gender-wise distribution of Ph.D. theses of the University of North Bengal

The gender-wise distribution of Ph.D. theses at the University of North Bengal reveals a higher number of male researchers, with 57 theses (61.29%) compared to 36 theses (38.71%) by female researchers. This indicates a gender imbalance in Ph.D. submissions, with male researchers constituting most of the total submissions.

5.3.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	Cytology	18	19.35
2.	Economic Botany	3	3.23
3.	Genetics	8	8.60
4.	Medical Botany	6	6.45
5.	Microbiology	13	13.98
6.	Palaeobotany	0	0.00
7.	Plant Anatomy	0	0.00
8.	Plant Ecology	15	16.13
9.	Plant Pathology	22	23.66
10.	Plant Physiology	2	2.15
11.	Taxonomy	6	6.45
Total		93	100

Table 3.5 - Subject-wise distribution of Ph.D. theses of the University of North Bengal

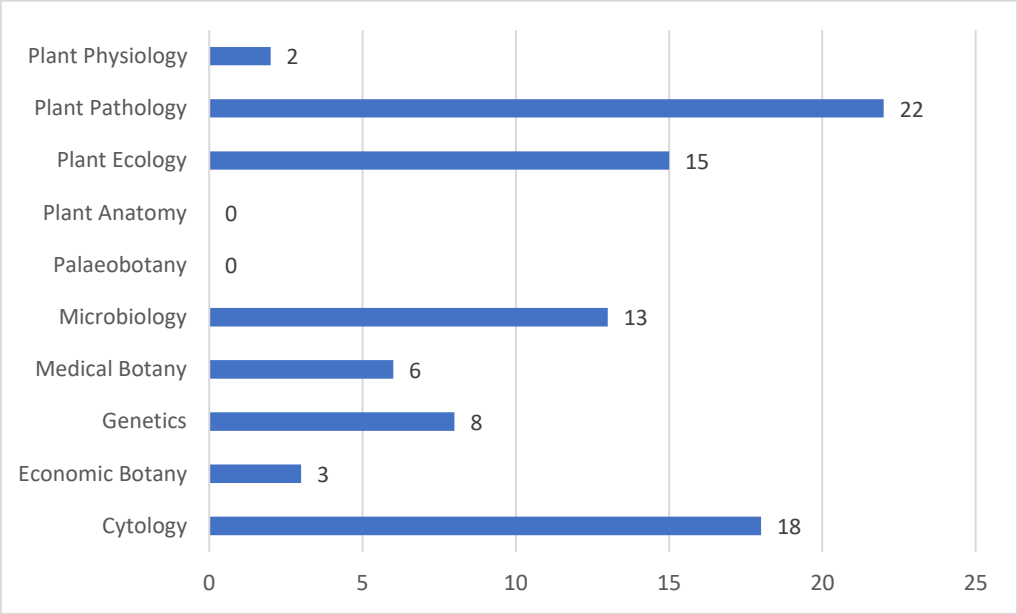

Figure 3.5 - Subject-wise distribution of Ph.D. theses of the University of North Bengal

The subject-wise distribution of Ph.D. theses at the University of North Bengal reveals that Plant Pathology has the highest number of submissions, with 22 theses (23.66%), followed by Cytology with 18 theses (19.35%). Other notable subjects include Plant Ecology (15.13%) and Microbiology (13.98%). Subjects like Economic Botany (3.23%) and Plant Physiology (2.15%) have relatively fewer theses. Additionally, Palaeobotany and Plant Anatomy have no submissions in the observed period. This distribution reflects a strong focus on plant-related sciences, particularly in pathology and cytology.

5.3.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	1	1.08
2.	6 to 10	13	13.98
3.	11 to 15	39	41.94
4.	16 to 20	24	25.81
5.	21 to 25	15	16.13
6.	26 to 30	1	1.08
7.	30 to 35	0	0.00
	Total	93	100

Table 3.6 - Number of Words Used in the Title of Ph.D. theses of the University of North Bengal

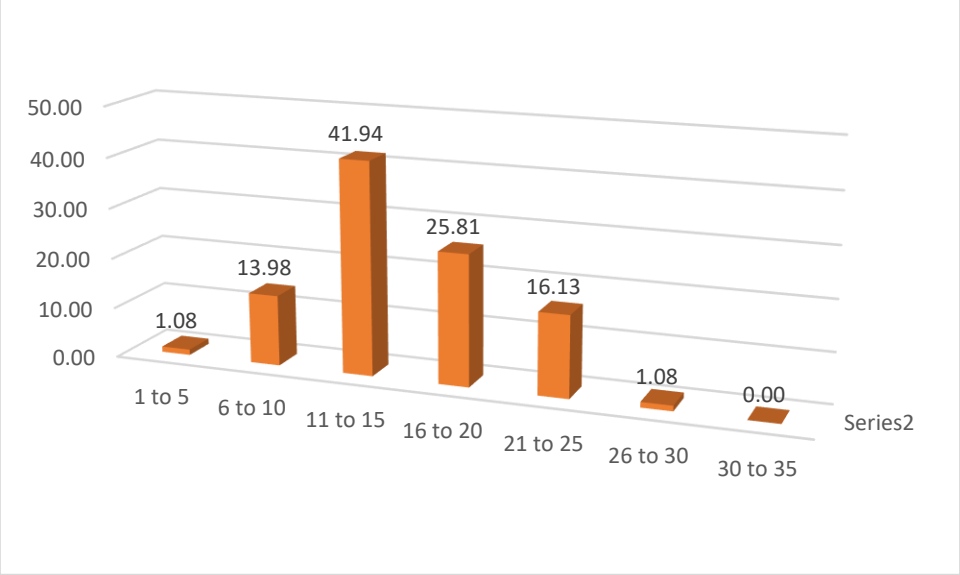

Figure 3.6 - Number of Words Used in the Title of Ph.D. theses of the University of North Bengal

The distribution of the number of words used in the titles of Ph.D. theses at the University of North Bengal shows that most titles fall within the 11 to 15 word range, accounting for 39 theses (41.94%). Titles with 16 to 20 words make up 25.81% of the total,

while titles with 6 to 10 words represent 13.98%. Fewer titles have 21 to 25 words (16.13%), and only a small number have between 1 to 5 words (1.08%) or 26 to 30 words (1.08%). No titles contained 30 to 35 words. This suggests that most Ph.D. theses at the university tend to have moderately long titles, with a preference for conciseness and clarity.

5.3.1.7 Frequency of Title Keywords

This section highlights the most used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	West Bengal	37	20.22
2.	Studies	31	016.94
3.	Diversity	17	9.29
4.	Darjeeling	17	9.29
5.	Tea	16	8.74
6.	India	13	7.10
7.	Plants	22	12.02
8.	Sikkim	11	6.01
9.	Growth	10	5.46
10.	Evaluation	9	4.92
Total		183	100

Table 3.7 - Frequency of Title Keywords of Ph.D. theses of the University of North Bengal

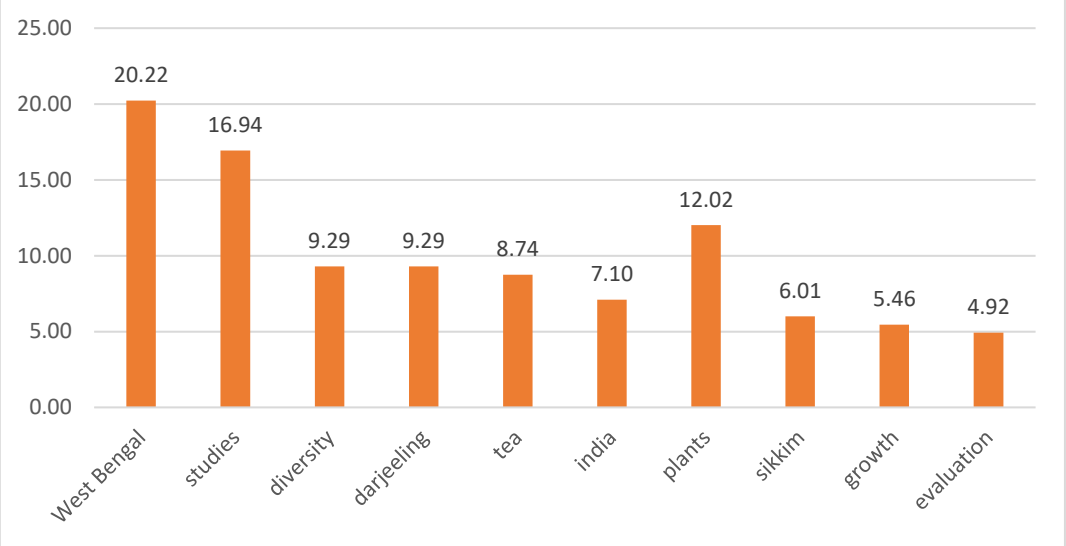

Figure 3.7 - Frequency of Title Keywords of Ph.D. theses of the University of North Bengal

The frequency of title keywords in Ph.D. theses from the University of North Bengal highlights prominent themes in the research. The most frequent keyword is West Bengal, appearing 37 times (20.22%), followed by Studies (16.94%) and Diversity (9.29%), both key themes in regional and academic research. Darjeeling and Tea also rank highly, each with 9.29% and 8.74%, respectively, indicating a focus on specific geographic and agricultural subjects. Other keywords, such as Plants (12.02%) and India (7.10%), suggest a broader research interest in botany and national studies. This distribution underscores the regional, environmental, and botanical focus of the theses at the university.

5.3.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.3.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2000**	4	626	156.50
2.	**2001**	5	866	173.20
3.	**2002**	5	791	158.20
4.	**2003**	0	0	0.00
5.	**2004**	1	164	164.00
6.	**2005**	2	284	142.00
7.	**2006**	3	509	169.67
8.	**2007**	1	159	159.00
9.	**2008**	1	173	173.00
10.	**2009**	1	184	184.00

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
11.	**2010**	0	0	0.00
12.	**2011**	7	1042	148.86
13.	**2012**	3	437	145.67
14.	**2013**	12	1797	149.75
15.	**2014**	6	1007	167.83
16.	**2015**	6	1030	171.67
17.	**2016**	7	1026	146.57
18.	**2017**	20	2900	145.00
19.	**2018**	5	642	128.40
20.	**2019**	4	639	159.75
21.	**2020**	0	0	0.00

Table 3.8 - Average Number of References per Theses of the University of North Bengal

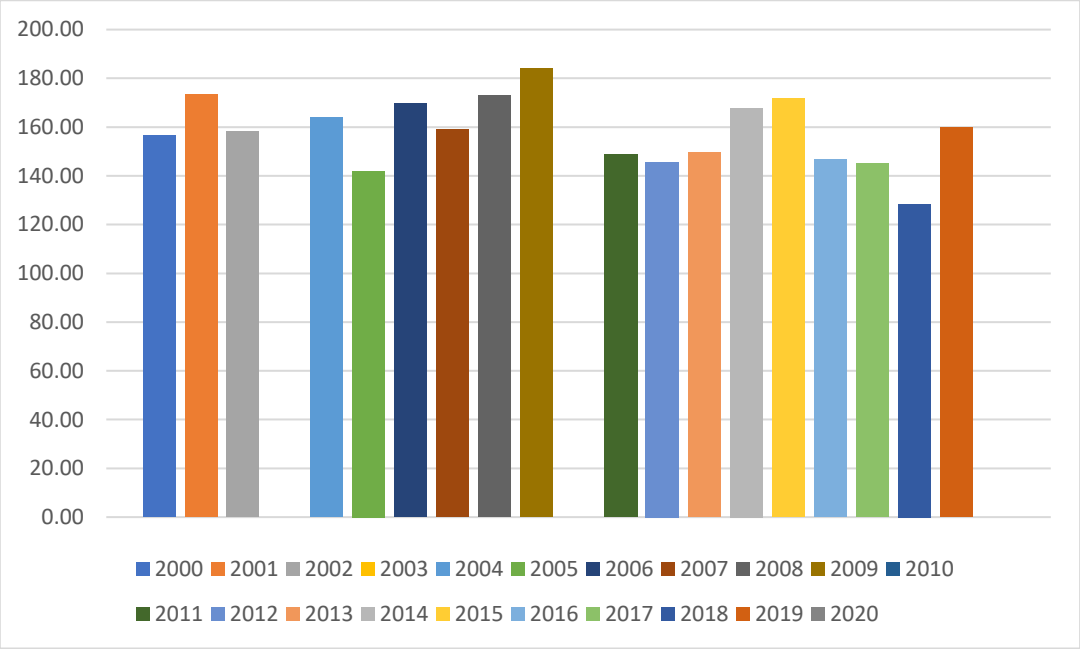

Figure 3.8 - Average Number of References per Theses of the University of North Bengal

The average number of citations per Ph.D. thesis at the University of North Bengal fluctuates over the years, reflecting varying research activities. The highest average citation per thesis occurred in 2009 (184.00), with a notable increase in 2001 (173.20) and 2015 (171.67). A decline in citation counts is seen in 2018 (128.40) and 2012 (145.67), which could suggest fewer references in certain years. Notably, 2003, 2010, and 2020 show no citations or theses, marking gaps in research output. The overall data indicates a trend of increasing citations,

particularly in the later years, which may indicate an expanding research influence and better integration of sources into theses.

5.3.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1	Journal Articles	10563	73.99
2	Book Chapters/Edited Books	1507	10.56
3	Theses/Dissertations	219	1.54
4	Conference Proceedings	493	3.45
5	Web Resources/Online Articles	699	4.89
6	Reports	343	2.40
7	Miscellaneous/Unclear	453	3.17

Table 3.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the University of North Bengal

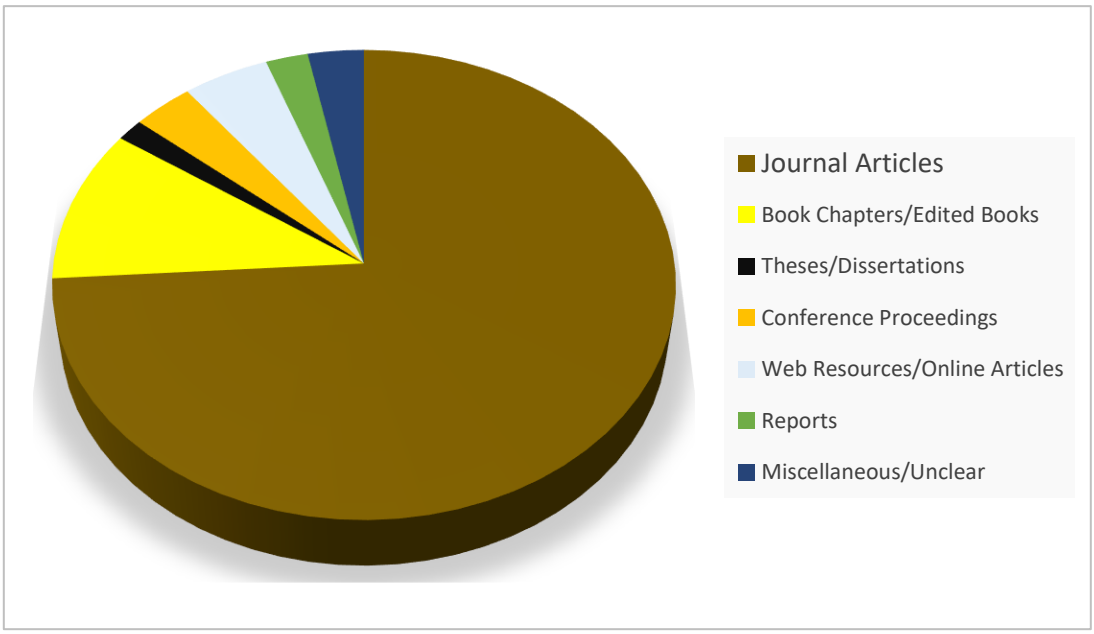

Figure 3.9* - Bibliographical Form-wise Distribution of Citations of the *Theses of the University of North Bengal

The bibliographical form-wise distribution of citations in Ph.D. theses from the University of North Bengal reveals that Journal Articles dominate the citations, accounting for 10,563 citations (73.99%). This is significantly higher than other sources, such as Book Chapters/Edited Books, which contributed 1,507 citations (10.56%). Theses/Dissertations had the smallest share with 219 citations (1.54%), indicating limited self-referencing. Conference Proceedings (3.45%), Web Resources/Online Articles (4.89%), and Reports (2.40%) also contribute, while Miscellaneous/Unclear sources accounted for 453 citations (3.17%). This distribution highlights the primary reliance on journal articles for citation sources in the research process at the university.

5.3.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	**No. of Citation**	**% of Citation**
One	2570	18.00
Two	3855	27.00
Three	4140	29.00
Four	2142	15.00
Five	714	5.00
More Than five	857	6.00
Total	14278	100

Table 3.10 - Authorship Pattern of Citations of the Theses of the University of North Bengal

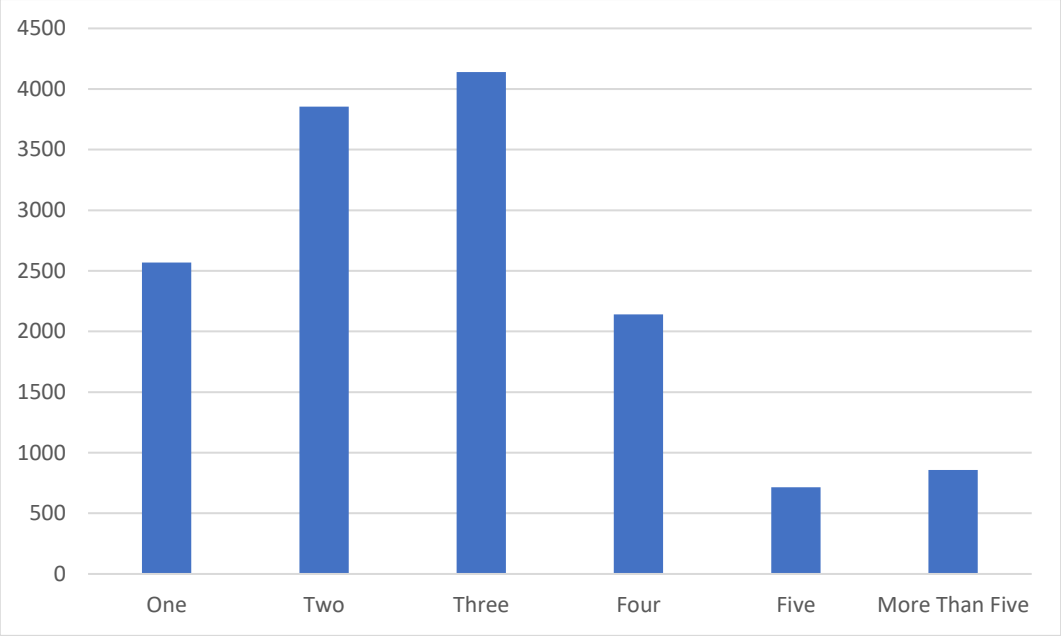

Figure 3.10 - Authorship Pattern of Citations of the Theses of the University of North Bengal

The authorship pattern of citations in the Ph.D. theses from the University of North Bengal reveals a significant collaboration among researchers. The majority of citations are from works with three authors (4,140 citations, 29%), followed closely by those with two authors (3,855 citations, 27%). Single-authored works account for 18% of the citations, contributing 2,570 citations. Works with four authors make up 15% (2,142 citations), while those with five authors contribute 5% (714 citations). Citations from works with more than five authors account for 6% (857 citations). This distribution indicates that collaboration among multiple authors is a common practice in research, with most citations stemming from two to three authors per paper.

5.4 Analysis of Interpretation of Data of University of Burdwan

The Department of Botany at the University of Burdwan was established in 1960, shortly after the University itself came into being. Initially, it started by offering Botany at the pass (general) level to undergraduates, reflecting a growing need for specialized education in plant sciences in this region. Over time, the department transitioned to offering Honours and Postgraduate programs, marking a significant milestone in its academic journey. From its outset, the department was staffed by a small but dedicated team of professors who played a key role in laying a strong foundation for future growth and excellence in both teaching and

research. Over the years, the Department of Botany at Burdwan University has made remarkable progress in developing its academic and research facilities. It successfully secured financial support from the University Grants Commission (UGC) and other funding agencies to undertake numerous research projects and to establish specialized facilities, such as a crop research farm, vermicomposting and mushroom cultivation units, and well-equipped laboratories. The department has produced a large number of PhD graduates and numerous research publications, reflecting its strong research capabilities. Today, it stands as a vibrant center for education and research in plant sciences, offering Honours, Postgraduate, and Doctoral programs, and contributing significantly to knowledge generation and human resource development in the field of Botany.

5.4.1 Analysis and Interpretation of Data on Theses

This section analyzes different aspects of thesis submissions, including annual trends, the number of theses supervised by each faculty member, and the distribution of research topics. By examining these aspects, we aim to identify patterns in doctoral research growth and the factors influencing these shifts. The results will provide valuable insights into the department's academic development and research output over the past two decades.

5.4.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2000	5	5.75
2.	2001	1	1.15
3.	2002	3	3.45
4.	2003	0	0.00
5.	2004	2	2.30
6.	2005	2	2.30
7.	2006	8	9.20
8.	2007	0	0.00
9.	2008	2	2.30
10.	2009	3	3.45

Sl. No.	Year	Total	%
11.	2010	0	0.00
12.	2011	2	2.30
13.	2012	8	9.20
14.	2013	10	11.49
15.	2014	2	2.30
16.	2015	7	8.05
17.	2016	7	8.05
18.	2017	7	8.05
19.	2018	9	10.34
20.	2019	5	5.75
21.	2020	4	4.60
Total		87	100

Table 4.1 - Year-wise distribution of Ph.D. theses of the University of Burdwan

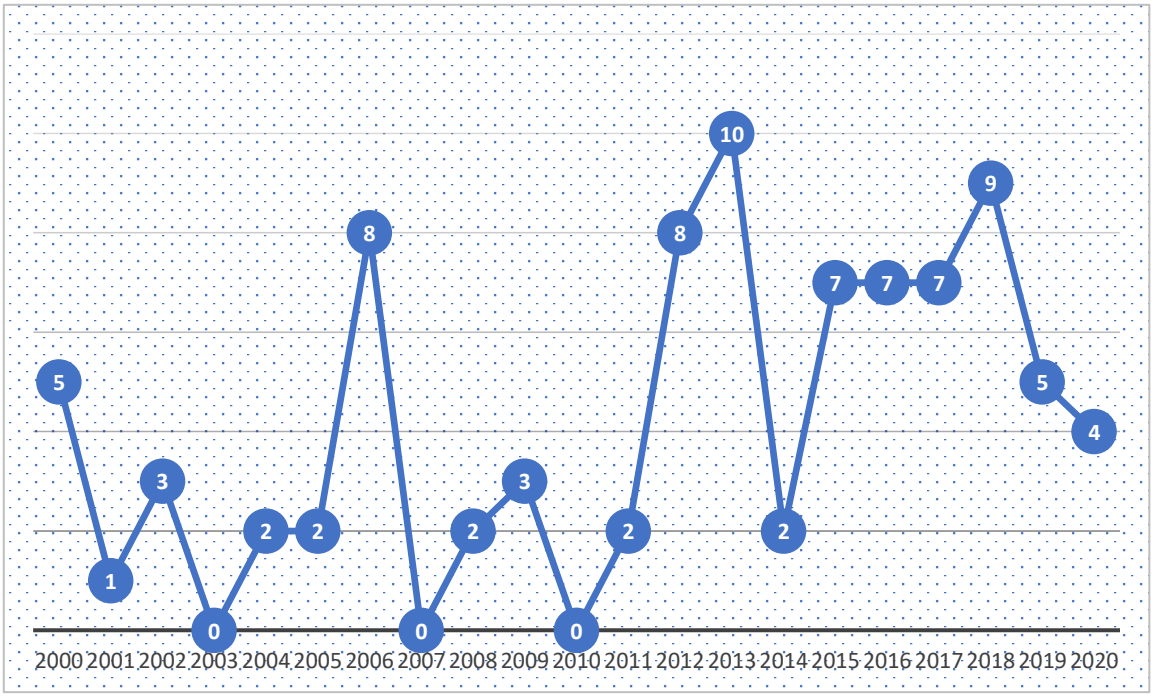

Figure 4.1: Year-wise distribution of Ph.D. theses of the University of Burdwan

The table 4.1 shows the year-wise distribution of Ph.D. theses at the University of Burdwan, with a total of 87 theses over the 21 years. The highest number of theses were published in 2013, with 10 theses (11.49% of the total), followed by 2018 with 9 theses

(10.34%). In contrast, there were several years with no theses, such as 2003, 2007, and 2010. The data indicates variability in the number of theses submitted annually, with a general trend of low to moderate submissions in most years. The years 2006, 2012, 2015, 2016, and 2017 each had 7 theses, representing 8.05% of the total each. The overall distribution reflects intermittent peaks in research activity, with no consistent yearly increase or decrease.

5.4.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1.	Ambarish Mukherjee	15	1
2.	Sikha Dutta	10	2
3.	Radhanath Mukhopadhyay	9	3
4.	N. C. Chatterjee	7	4
5.	Tushar Kanti Maiti	7	4
6.	Aloke Bhattacharjee	6	5
7.	P. K. Pal	6	5
8.	Abhijit Bandyopadhyay	5	6
9.	Jagatpati Tah	5	6
10.	Soumen Bhattacharjee	5	6
11.	Jai Prakash Keshri	4	7
12.	Kajal Gupta	4	7
13.	Prasanta Kumar Bhattacharyya	3	8
14.	Tinkari Dalal	3	8
15.	Balen Nandi	2	9
16.	Jiban Kumar Pal	2	9
17.	P. S. Basu	2	9

Table 4.2 - Supervisors-wise distribution of Ph.D. theses of the University of Burdwan

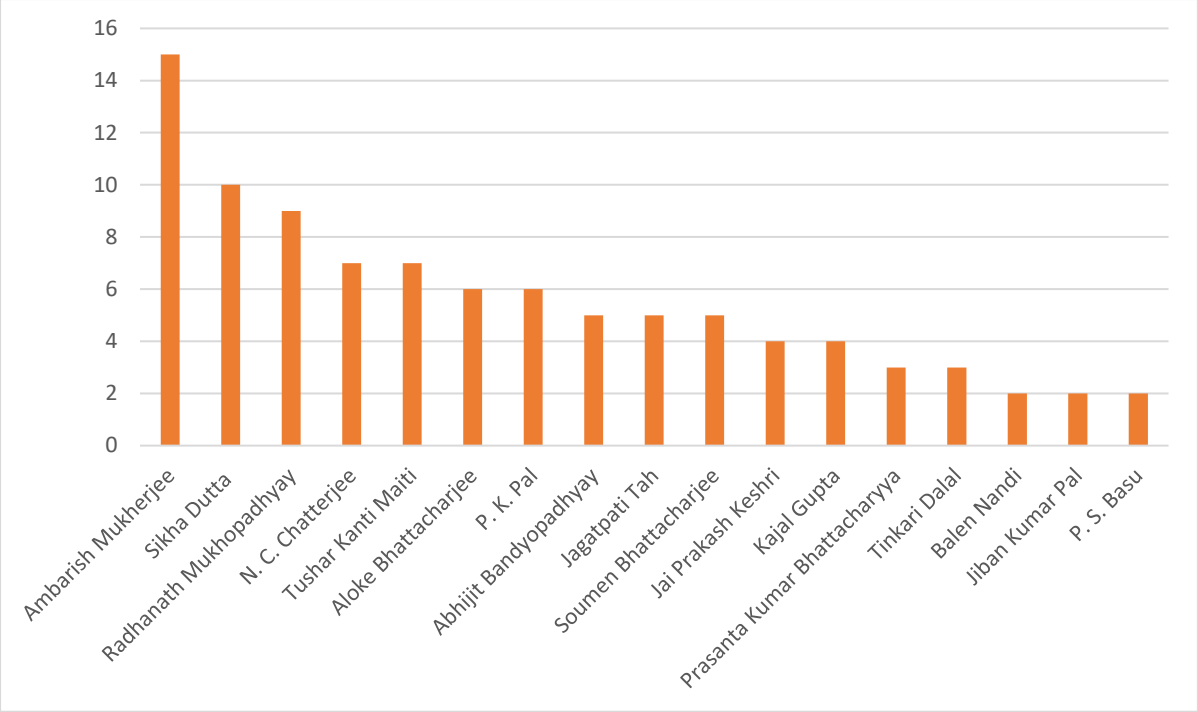

Figure 4.2: Supervisors-wise distribution of Ph.D. theses of the University of Burdwan

The table 4.2 presents the supervisor-wise distribution of Ph.D. theses at the University of Burdwan. Ambarish Mukherjee holds the highest rank, supervising 15 theses (ranked 1st), followed by Sikha Dutta with 10 theses (ranked 2nd). The top three supervisors, including Radhanath Mukhopadhyay with 9 theses (ranked 3rd), have made significant contributions to Ph.D. research. A group of supervisors, including N.C. Chatterjee, Tushar Kanti Maiti, Aloke Bhattacharjee, and P.K. Pal, each supervised 6 theses, securing the 4th rank. Several supervisors, such as Abhijit Bandyopadhyay, Jagatpati Tah, and Soumen Bhattacharjee, supervised 5 theses each, securing the 6th rank. On the lower end, supervisors like Balen Nandi, Jiban Kumar Pal, and P.S. Basu each supervised 2 theses, all ranked 9th. The data highlights the varying levels of research supervision, with a few supervisors contributing significantly to the total number of theses.

5.4.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	Number of theses	%
Single	60	68.97
Joint	27	31.03
Total	87	100

Table 4.3 - Supervising Pattern of Ph.D. theses of the University of Burdwan

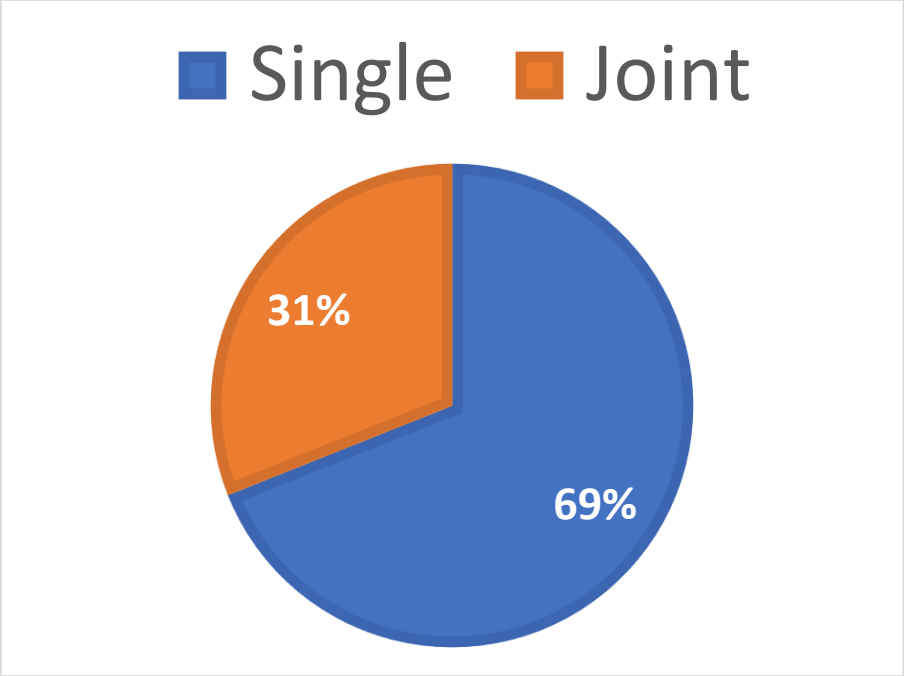

Figure 4.3: Supervising Pattern of Ph.D. theses of the University of Burdwan

The table 4.3 illustrates the supervising pattern of Ph.D. theses at the University of Burdwan. Most of the theses, 60 out of 87 (68.97%), were supervised by a single supervisor, indicating a preference for individual supervision. In contrast, 27 theses (31.03%) followed a joint supervision model, where two or more supervisors were involved. This suggests that while individual supervision is the dominant model, joint supervision is still a significant practice within the university's Ph.D. programs, promoting collaborative research.

5.4.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	42	48.28
Female	45	51.72
Total	87	100

Table 4.4 : Gender-wise distribution of Ph.D. theses of the University of Burdwan

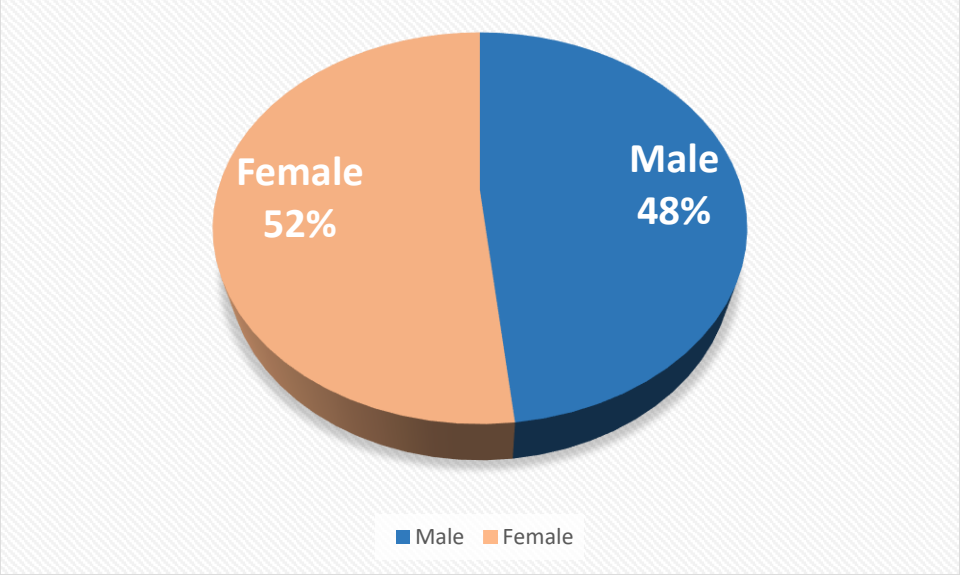

Figure 4.4: Gender-wise distribution of Ph.D. theses of the University of Burdwan

The table 4.4 shows the gender-wise distribution of Ph.D. theses at the University of Burdwan. A slight majority of the theses, 45 out of 87 (51.72%), were submitted by female researchers, while 42 theses (48.28%) were submitted by male researchers. This indicates a balanced distribution of Ph.D. theses between male and female researchers, with a marginal increase in the number of theses contributed by females.

5.4.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	Cytology	16	18.39
2.	Economic Botany	8	9.20
3.	Genetics	6	6.90
4.	Medical Botany	7	8.05
5.	Microbiology	11	12.64
6.	Palaeobotany	1	1.15
7.	Plant Anatomy	4	4.60
8.	Plant Ecology	11	12.64
9.	Plant Pathology	9	10.34
10.	Plant Physiology	5	5.75
11.	Taxonomy	9	10.34
Total		87	100

Table 4.5 - Subject-wise distribution of Ph.D. theses of the University of Burdwan

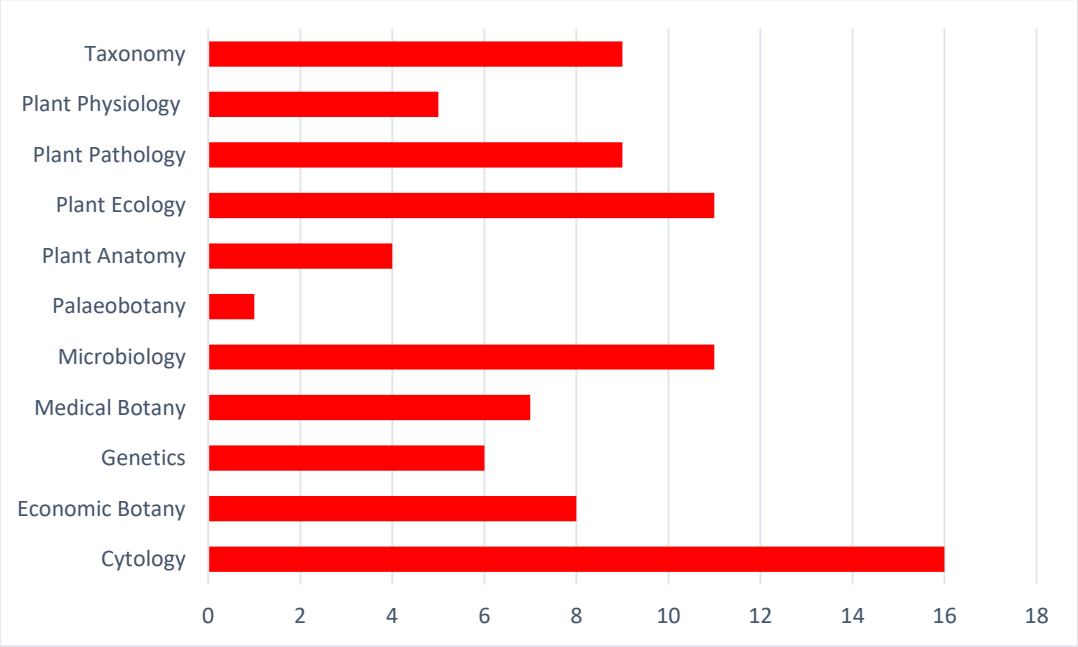

Table 4.5 - Subject-wise distribution of Ph.D. theses of the University of Burdwan

The table shows the subject-wise distribution of Ph.D. theses at the University of Burdwan. Cytology leads with 16 theses (18.39%), followed by Microbiology and Plant Ecology, each contributing 11 theses (12.64%). Other prominent subjects include Economic Botany with 8 theses (9.20%), Plant Pathology and Taxonomy, each with 9 theses (10.34%). Medical Botany, Genetics, and Plant Physiology contributed 7 (8.05%), 6 (6.90%), and 5 (5.75%) theses, respectively. Plant Anatomy and Palaeobotany had the fewest theses, with 4

(4.60%) and 1 (1.15%) thesis, respectively. This distribution highlights a higher focus on Cytology and Microbiology, while other specialized fields, such as Palaeobotany, have a much smaller representation.

5.4.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	0	0.00
2.	6 to 10	22	25.29
3.	11 to 15	26	29.89
4.	16 to 20	24	27.59
5.	21 to 25	11	12.64
6.	26 to 30	3	3.45
7.	30 to 35	1	1.15
	Total	87	100.00

Table 4.6 - Number of Words Used in the Title of Ph.D. theses of the University of Burdwan

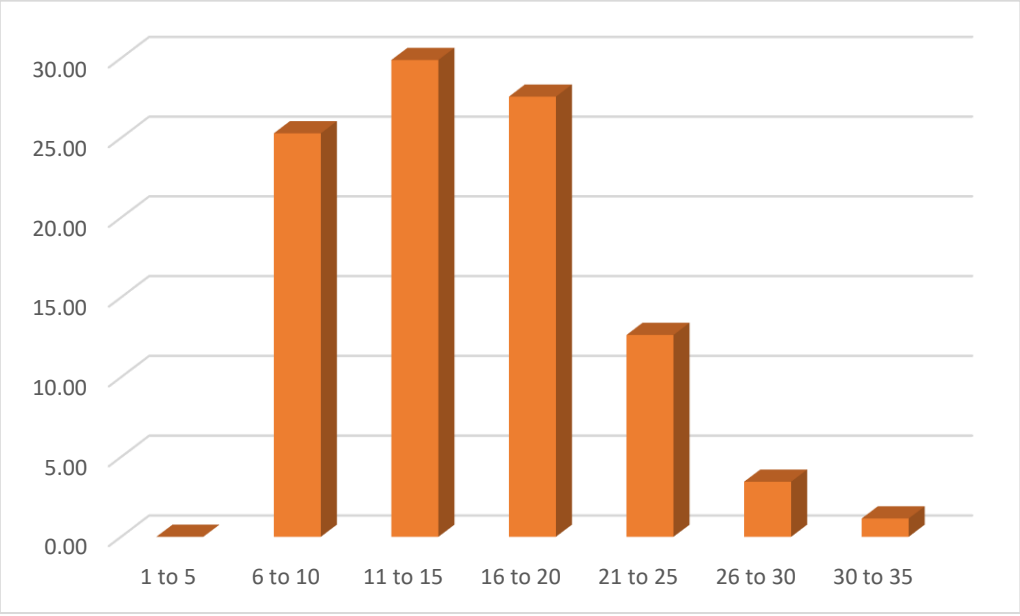

Figure 4.6 - Number of Words Used in the Title of Ph.D. theses of the University of Burdwan

The table presents the distribution of Ph.D. theses based on the number of words in their titles at the University of Burdwan. The majority of theses have titles with 11 to 15 words, accounting for 26 theses (29.89%), followed by titles with 16 to 20 words, which make up 24 theses (27.59%). Titles with 6 to 10 words are also common, comprising 22 theses (25.29%). Fewer theses have titles with 21 to 25 words (12.64%), while only 3 theses (3.45%) have titles containing 26 to 30 words. A single thesis (1.15%) has a title with 30 to 35 words, and no theses fall within the 1 to 5-word category. This distribution indicates that most Ph.D. theses at the university feature relatively detailed titles, with a clear preference for titles containing 11 to 20 words.

5.4.1.7 Frequency of Title Keywords

This section highlights the most commonly used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	Studies	35	23.18
2.	West Bengal	25	16.56
3.	Plant	16	10.60
4.	Growth	14	9.27
5.	District	13	8.61
6.	Reference	12	7.95
7.	Special	10	6.62
8.	India	10	6.62
9.	Production	8	5.30
10.	Stress	8	5.30
Total		151	100

Table 4.7 - Frequency of Title Keywords of Ph.D. theses of the University of Burdwan

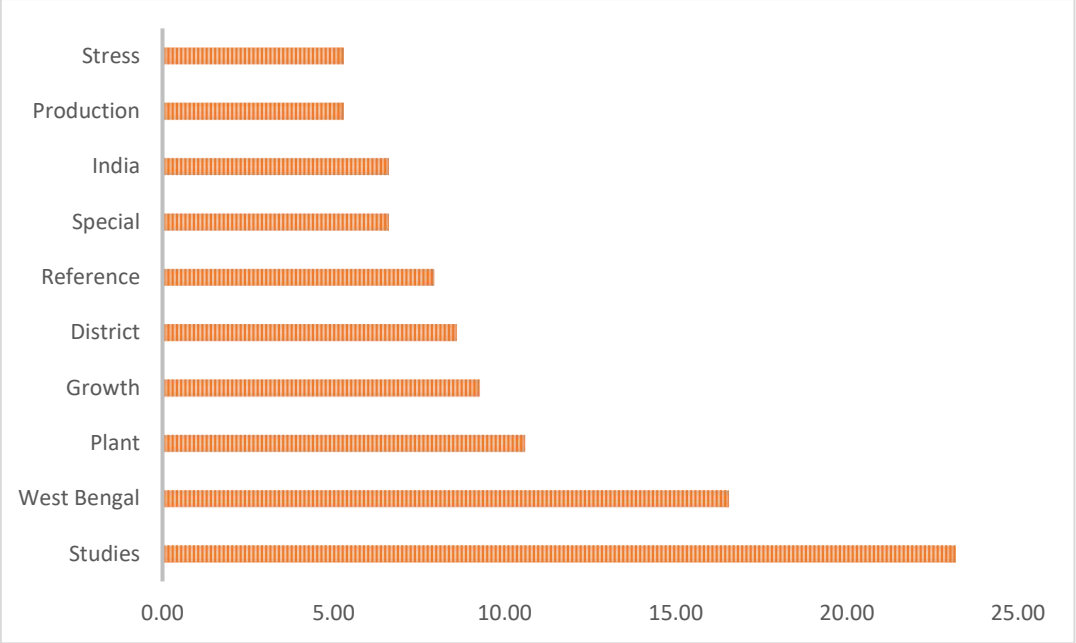

Figure 4.7 - Frequency of Title Keywords of Ph.D. theses of the University of Burdwan

The table 4.7 presents the frequency distribution of keywords used in the titles of Ph.D. theses at the University of Burdwan. The most frequent keyword is "Studies," appearing in 35 titles (23.18%), followed by "West Bengal" in 25 titles (16.56%). "Plant" and "Growth" are also commonly used, appearing in 16 (10.60%) and 14 (9.27%) titles, respectively. Other keywords with notable frequencies include "District" (13 occurrences, 8.61%) and "Reference" (12 occurrences, 7.95%). "Special," "India," "Production," and "Stress" each appeared in 10 (6.62%) or 8 (5.30%) titles. This indicates that the research at the university frequently focuses on studies related to the region (West Bengal and India), plant growth, and various environmental or agricultural topics.

5.4.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.4.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2000**	5	768	153.60
2.	**2001**	1	163	163.00
3.	**2002**	3	471	157.00
4.	**2003**	0	0	0.00
5.	**2004**	2	259	129.50
6.	**2005**	2	322	161.00
7.	**2006**	8	1194	149.25
8.	**2007**	0	0	0.00
9.	**2008**	2	322	161.00
10.	**2009**	3	1068	156.33
11.	**2010**	0	0	0.00
12.	**2011**	2	390	195.00
13.	**2012**	8	1154	144.25
14.	**2013**	10	1504	150.40
15.	**2014**	2	285	142.50
16.	**2015**	7	1039	148.43
17.	**2016**	7	1107	158.14
18.	**2017**	7	1126	160.86
19.	**2018**	9	1407	156.33
20.	**2019**	5	670	134.00
21.	**2020**	4	542	135.50

Table 4.8 - Average Number of References per Theses of the University of Burdwan

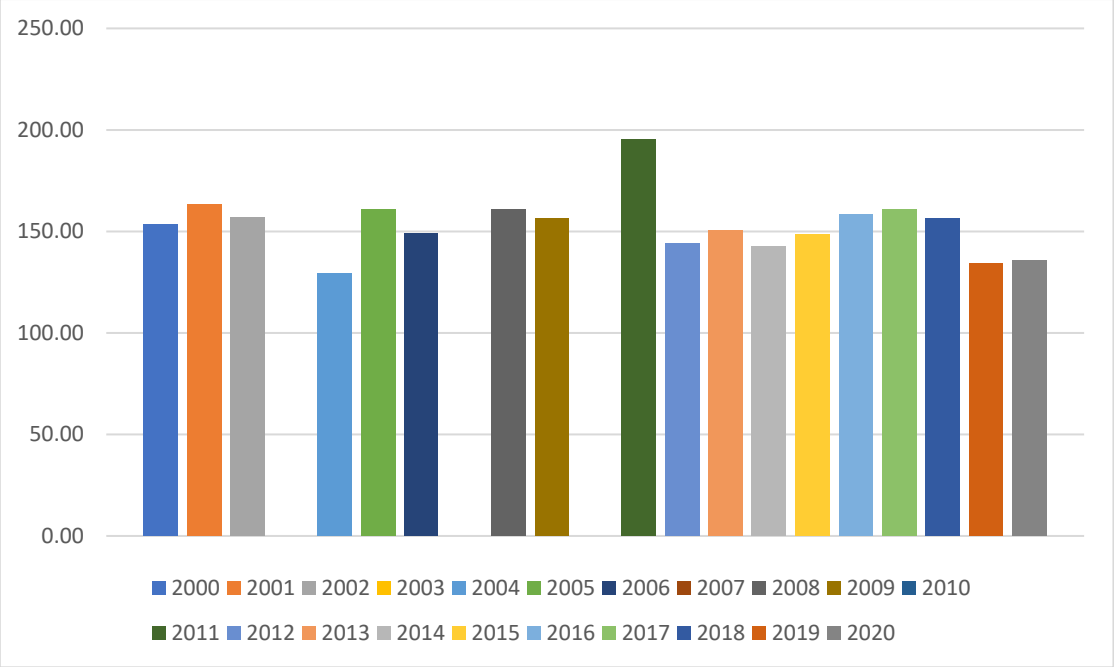

Figure 4.8 - Average Number of References per Theses of the University of Burdwan

The table 4.8 shows the average number of citations per Ph.D. thesis at the University of Burdwan across various years. The highest average citation per thesis was observed in 2011, with 195 citations per thesis, followed by 2017 with an average of 160.86 citations. In contrast, the years with no theses, such as 2003, 2007, and 2010, report zero citations. Years like 2006, 2009, and 2013 also had relatively high citation averages, with 149.25, 156.33, and 150.40 citations per thesis, respectively. On the lower end, years like 2004 and 2019 had lower citation averages, with 129.50 and 134.00 citations per thesis, respectively. The data shows variation in citation patterns, with certain years seeing more impactful research reflected in higher citation counts.

5.4.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1.	Journal Articles	9970	72.29
2.	Book Chapters/Edited Books	1538	11.15
3.	Theses/Dissertations	595	4.31
4.	Conference Proceedings	298	2.16
5.	Web Resources/Online Articles	547	3.97
6.	Reports	348	2.52
7.	Miscellaneous/Unclear	496	3.60
	Total	13791	100

Table 4.9 - Bibliographical Form-wise Distribution of Citations of the *Theses of the University of Burdwan*

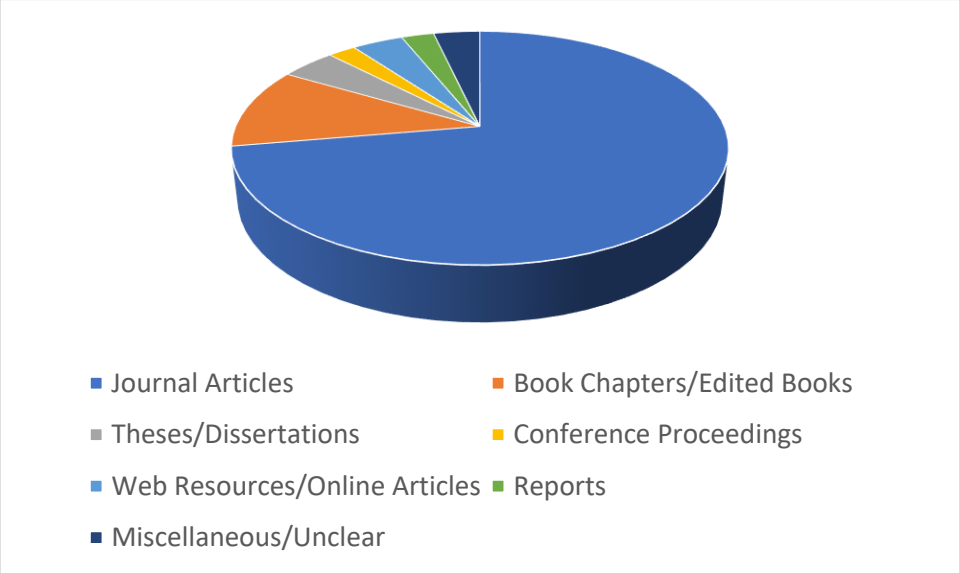

Figure 4.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the University of Burdwan

The table 4.9 shows the bibliographical form-wise distribution of citations for Ph.D. theses at the University of Burdwan. The majority of citations come from journal articles, which account for 9970 citations (72.29% of the total). Book chapters and edited books contribute the second-largest portion, with 1538 citations (11.15%), followed by theses and dissertations with 595 citations (4.31%). Other sources include conference proceedings (298 citations, 2.16%), web resources/online articles (547 citations, 3.97%), and reports (348 citations, 2.52%). Miscellaneous or unclear sources contribute 496 citations (3.60%). This distribution indicates

that journal articles are the dominant source of citations in the research at the university, with other sources contributing much smaller percentages.

5.4.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	No. of Citation	% of Citation
One	3564	25.84
Two	2862	20.75
Three	2376	17.23
Four	1566	11.36
Five	972	7.05
More Than five	2451	17.77

Table 4.10 - Authorship Pattern of Citations of the Theses of the University of Burdwan

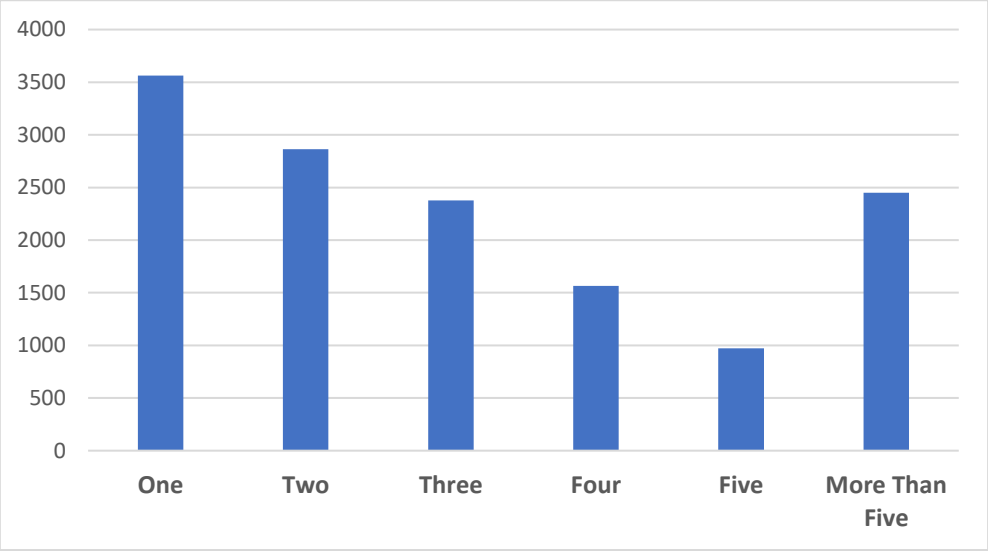

Figure 4.10 - Authorship Pattern of Citations of the Theses of the University of Burdwan

The table 4.10 presents the authorship pattern of citations for Ph.D. theses at the University of Burdwan. The highest percentage of citations comes from theses authored by a single researcher, with 3564 citations (25.84%). Theses with two authors account for 2862

citations (20.75%), while those with three authors contribute 2376 citations (17.23%). Theses with four authors account for 1566 citations (11.36%), and those with five authors have 972 citations (7.05%). Theses with more than five authors collectively account for 2451 citations (17.77%). This distribution suggests that while individual authorship is most common, collaborative research involving multiple authors also significantly contributes to the overall citation count.

5.5. Analysis of Interpretation of Data of Vidyasagar University

The Department of Botany and Forestry at Vidyasagar University began in 1990 as a pioneering effort to merge traditional botanical science with forestry education and research. Despite initial constraints in space, funding, and staffing, the department steadily gained recognition—even earning commendation from NAAC in 2002 for its growing contributions to teaching and research. In 1997, it took a groundbreaking step by introducing a Distance Mode M.Sc. program, setting a trend for other science departments at the university. Over time, the department embraced the Choice Based Credit System and a semester-based curriculum to enrich student learning with a mix of classroom instruction, laboratory work, field studies, and project work. The department has grown significantly, supported by multiple prestigious grants and research schemes. It received Departmental Research Scheme funding under UGC's Special Assistance Programme in both 2011 and 2017, totaling ₹1.45 crores, and secured ₹25 lakhs from the DBT BOOST program in 2017. These investments enabled acquisition of advanced research equipment such as HPLC, HPTLC, cryomicrotome, gel documentation systems, high-end microscopes, rotary evaporators, and cold storage facilities. The department's research spans a broad spectrum of topics including plant diversity in local biodiversity hotspots, entomology-plant interactions, secondary metabolites, ethnomedicinal studies, fungal and microbial biology, palynology, cytogenetics, molecular biology, phyto-remediation, and conservation. Additionally, its herbarium now houses approximately 5,000 specimens, supported by a UGC-funded digital herbarium project designed to document underexplored medicinal flora of South-West Bengal. Today, the department offers a modern M.Sc. program, intensive research training, and has established itself as a dynamic center of botanical and forestry education and innovation.

5.5.1 Analysis and Interpretation of Data on Theses

This section looks into various elements of thesis submissions, such as trends by year, the distribution of theses supervised by faculty members, and the spread of research topics. By

investigating these aspects, we aim to uncover trends in doctoral research growth and the factors driving them. The insights gained will help us understand the department's academic evolution and research productivity over the past twenty years.

5.5.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2010	2	5.71
2.	2011	1	2.86
3.	2012	1	2.86
4.	2013	1	2.86
5.	2014	6	17.14
6.	2015	3	8.57
7.	2016	4	11.43
8.	2017	3	8.57
9.	2018	7	20.00
10.	2019	7	20.00
		35	100

Table 5.1 - Year-wise distribution of Ph.D. theses of Vidyasagar University

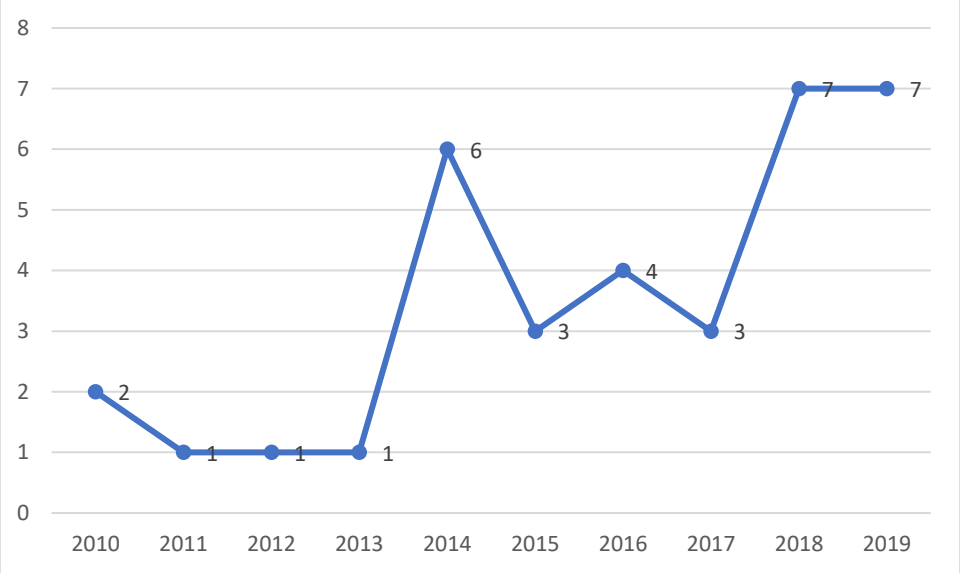

Figure 5.1: Year-wise distribution of Ph.D. theses of Vidyasagar University

The data presents the year-wise distribution of Ph.D. theses at Vidyasagar University. From 2010 to 2019, the number of theses ranged from 1 to 7 per year. Notably, the highest number of these were recorded in 2018 and 2019, each contributing 20% to the total. Other years such as 2014, with 6 theses (17.14%), and 2016, with 4 theses (11.43%), also showed significant contributions. In contrast, the years 2010 to 2013 saw fewer theses, with 1 thesis per year, representing only 2.86% each. The total number of theses recorded during the period is 35, reflecting a diverse distribution across the decade.

5.5.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1.	Amal Kumar Mondal	10	1
2.	Asis Kumar Nandi	7	2
3.	Prakash Karmakar &	5	3
4.	Ram Kumar Vhakat	4	4
5.	Debdulal Banerjee	3	5
6.	Aloke Bhattacharjee	2	6
7.	H. J. Chowdhery	2	6
8.	N.K. Verma	2	6

Table 5.2 - Supervisors-wise distribution of Ph.D. theses of Vidyasagar University

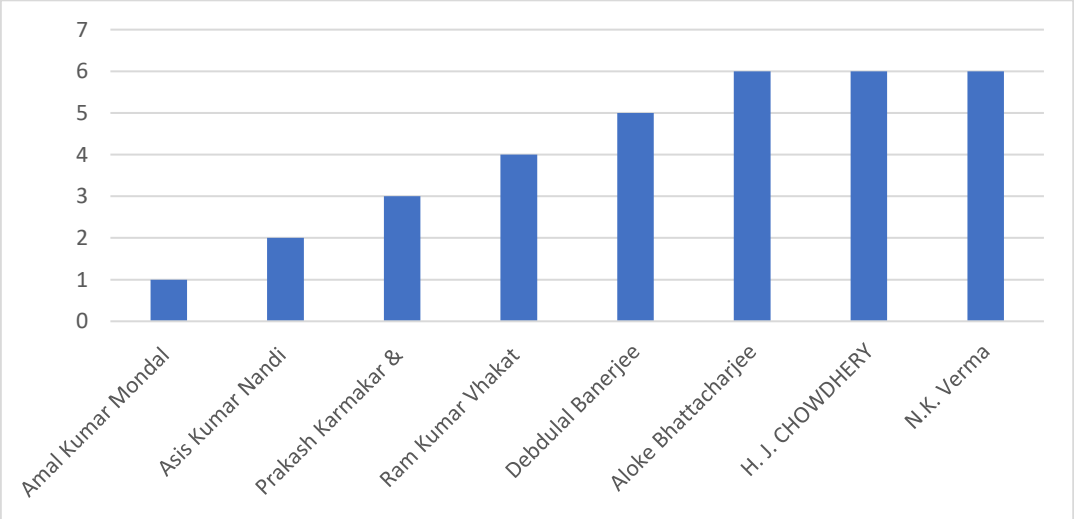

Figure 5.2: Supervisors-wise distribution of Ph.D. theses of Vidyasagar University

The table provides the distribution of Ph.D. theses based on supervisors at Vidyasagar University. The supervisor with the highest number of theses is Amal Kumar Mondal, with 10 theses (Rank 1), followed by Asis Kumar Nandi with 7 theses (Rank 2). Prakash Karmakar holds the third position with 5 theses. Other supervisors such as Ram Kumar Vhakat (4 theses), Debdulal Banerjee (3 theses), and Aloke Bhattacharjee, H. J. Chowdhery, and N.K. Verma (each with 2 theses) occupy the remaining ranks. The data shows a notable concentration of theses under the top three supervisors, with a clear distinction in the number of theses attributed to each.

5.5.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	Number of theses	%
Single	24	68.57
Joint	11	31.43
Total	35	100

Table 5.3 - Supervising Pattern of Ph.D. theses of Vidyasagar University

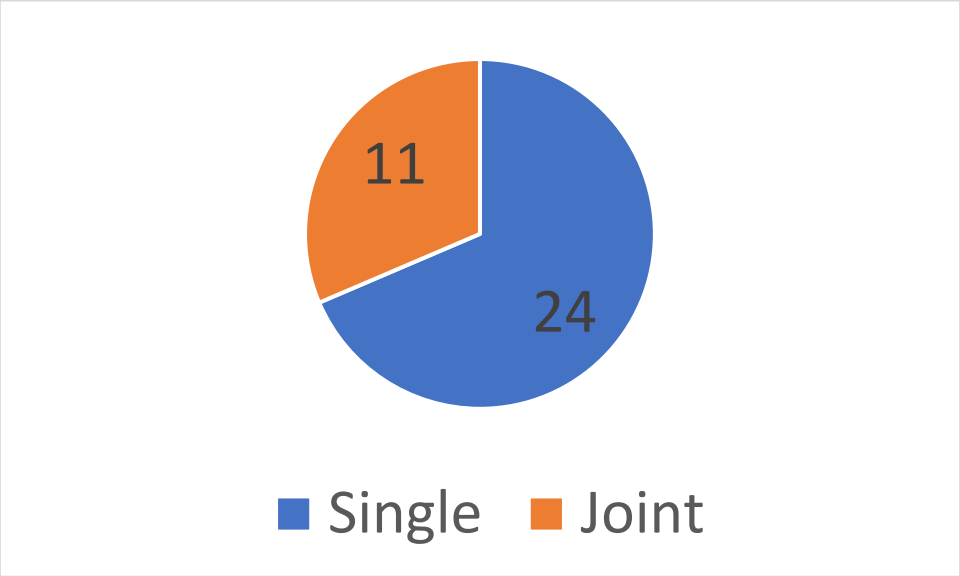

Figure 5.3: Supervising Pattern of Ph.D. theses of Vidyasagar University

The table shows the supervising pattern of Ph.D. theses at Vidyasagar University. A significant majority, 68.57% (24 theses), were supervised by a single supervisor, indicating a preference for individual supervision. In contrast, 31.43% (11 theses) followed a joint supervision pattern, where multiple supervisors were involved. This distribution highlights the predominant use of single supervision while also acknowledging the role of joint supervision in a smaller proportion of cases. The total number of theses considered is 35, providing a comprehensive view of the supervision trends at the university.

5.5.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	26	74.29
Female	9	25.71
Total	35	100

Table 5.4: Gender-wise distribution of Ph.D. theses of Vidyasagar University

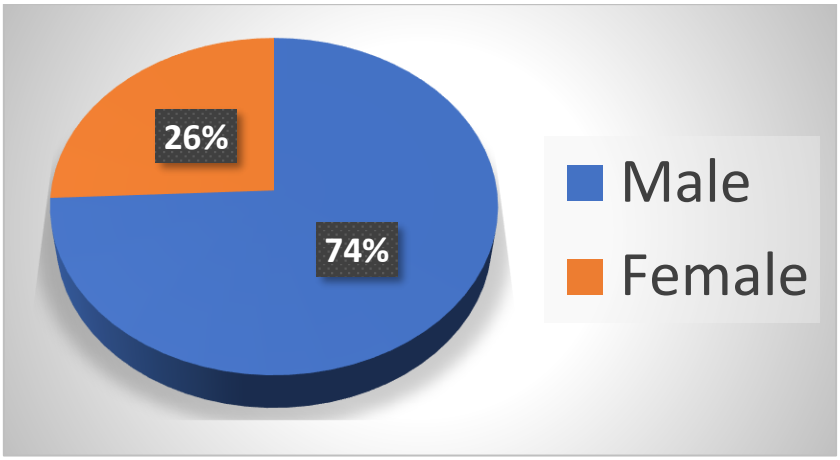

Figure 5.4: Gender-wise distribution of Ph.D. theses of Vidyasagar University

The table presents the gender-wise distribution of Ph.D. theses at Vidyasagar University. A significant majority of the theses were completed by male researchers, accounting for 74.29% (26 theses), while female researchers contributed to 25.71% (9 theses). This data indicates a higher representation of male researchers in the completion of Ph.D. theses at the university. The total number of theses considered is 35, reflecting the overall gender distribution within the research community at Vidyasagar University.

5.5.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	Cytology	5	14.29
2.	Economic Botany	2	5.71
3.	Genetics	3	8.57
4.	Medicinal Botany	2	5.71
5.	Microbiology	0	0.00
6.	Palaeobotany	0	0.00
7.	Plant Anatomy	0	0.00
8.	Plant Ecology	13	37.14
9.	Plant Pathology	3	8.57
10.	Plant Physiology	2	5.71
11.	Taxonomy	5	14.29
Total		35	100

Table 5.5 - Subject-wise distribution of Ph.D. theses of Vidyasagar University

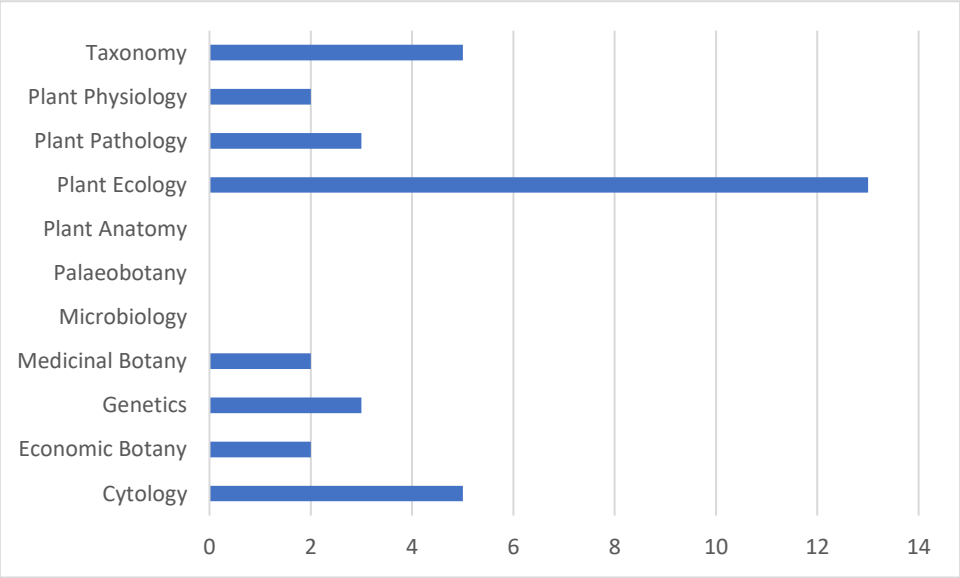

Figure 5.5 - Subject-wise distribution of Ph.D. theses of Vidyasagar University

The table provides the subject-wise distribution of Ph.D. theses at Vidyasagar University. The most prominent subject is Plant Ecology, with 13 theses (37.14%), followed by Cytology and Taxonomy, each contributing 14.29% (5 theses). Subjects like Genetics, Plant Pathology, and Plant Physiology each account for 8.57% (3 theses). Economic Botany and Medicinal Botany each contribute 5.71% (2 theses). Notably, subjects such as Microbiology, Palaeobotany, and Plant Anatomy recorded no theses, highlighting a clear subject preference within the research community. The total number of theses is 35, indicating a varied yet concentrated research focus in certain botanical disciplines.

5.5.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	0	0.00
2.	6 to 10	7	20.00
3.	11 to 15	11	31.43
4.	16 to 20	9	25.71
5.	21 to 25	5	14.29
6.	26 to 30	2	5.71
7.	30 to 35	1	2.86
	Total	35	100

Table 5.6 - Number of Words Used in the Title of Ph.D. theses of Vidyasagar University

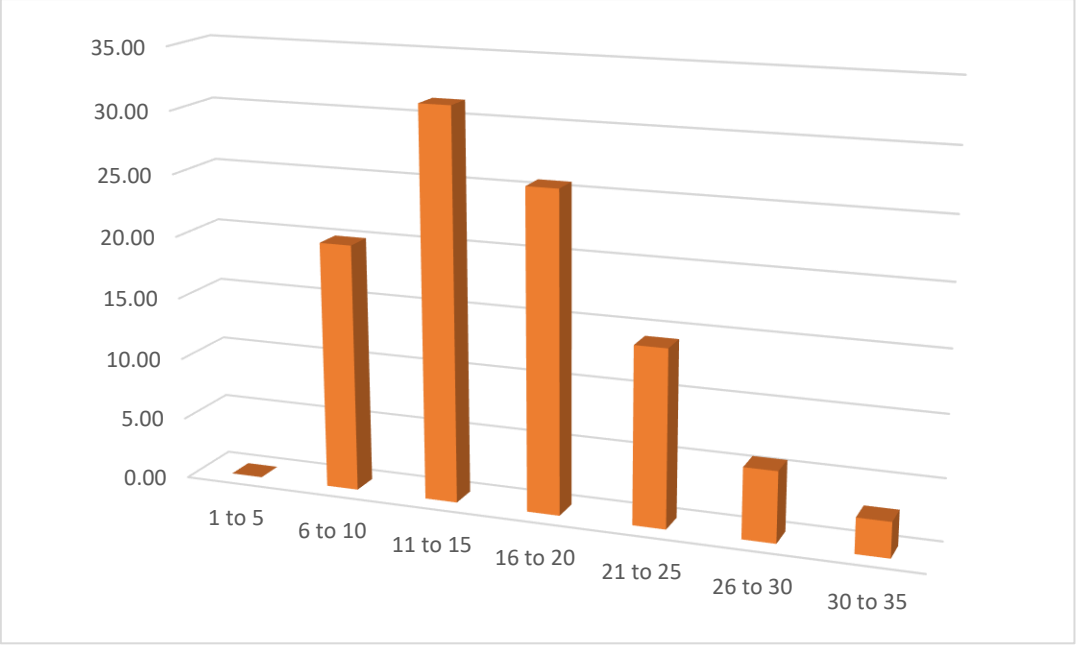

Figure 5.6 - Number of Words Used in the Title of Ph.D. theses of Vidyasagar University

The table shows the distribution of Ph.D. theses at Vidyasagar University based on the number of words in their titles. Most theses have titles between 11 and 15 words, accounting for 31.43% (11 theses). This is followed by titles in the 16 to 20 word range, comprising 25.71% (9 theses), and titles with 6 to 10 words, representing 20% (7 theses). Fewer theses have titles with more than 20 words, with 14.29% (5 theses) having titles between 21 and 25 words. The data also shows a gradual decrease in the number of theses with titles longer than 25 words, with only 2.86% (1 thesis) falling in the 30 to 35 word range. The total number of theses is 35, reflecting the diversity in title lengths across the university's research output.

5.5.1.7 Frequency of Title Keywords

This section highlights the most used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	West Bengal	35	30.43
2.	District	10	8.70
3.	Studies	15	13.04
4.	Diversity	9	7.83

Sl. No.	Name of keywords	Frequency	% of Frequency
5.	India	7	6.09
6.	Paschim Medinipur	13	11.30
7.	Investigation	6	5.22
8.	Medicinal	6	5.22
9.	Flora	5	4.35
10.	Special	5	4.35
11.	Plants	4	3.48
		115	100

Table 5.7 - Frequency of Title Keywords of Ph.D. theses of Vidyasagar University

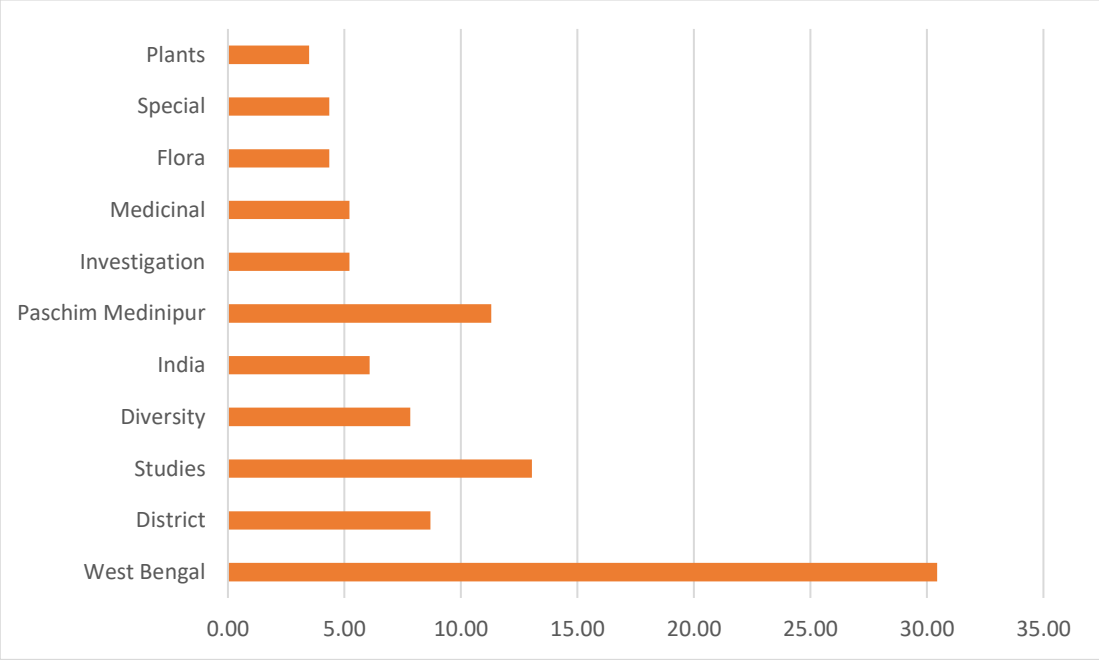

Figure 5.7 - Frequency of Title Keywords of Ph.D. theses of Vidyasagar University

The table provides the frequency distribution of keywords used in the titles of Ph.D. theses at Vidyasagar University. The most frequent keyword is West Bengal, appearing in 30.43% of the titles (35 occurrences), followed by Studies with 13.04% (15 occurrences) and Paschim Medinipur with 11.30% (13 occurrences). Other notable keywords include Diversity (7.83%, 9 occurrences), India (6.09%, 7 occurrences), and Flora and Special (each with 4.35%, 5 occurrences). The remaining keywords such as District, Investigation, Medicinal, and Plants appear with lower frequencies. The total frequency of all keywords is 115, illustrating the prominence of specific regional and research-related terms in the theses titles.

5.5.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.5.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis in the doctoral research submitted to Vidyasagar University reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2010**	2	315	157.50
2.	**2011**	1	194	194.00
3.	**2012**	1	137	137.00
4.	**2013**	1	171	171.00
5.	**2014**	6	929	154.83
6.	**2015**	3	507	169.00
7.	**2016**	4	739	184.75
8.	**2017**	3	595	198.33
9.	**2018**	7	1342	191.71
10.	**2019**	7	1082	154.57
11.	**2020**	0	0	0.00

Table 5.8 - Average Number of References per Theses of Vidyasagar University

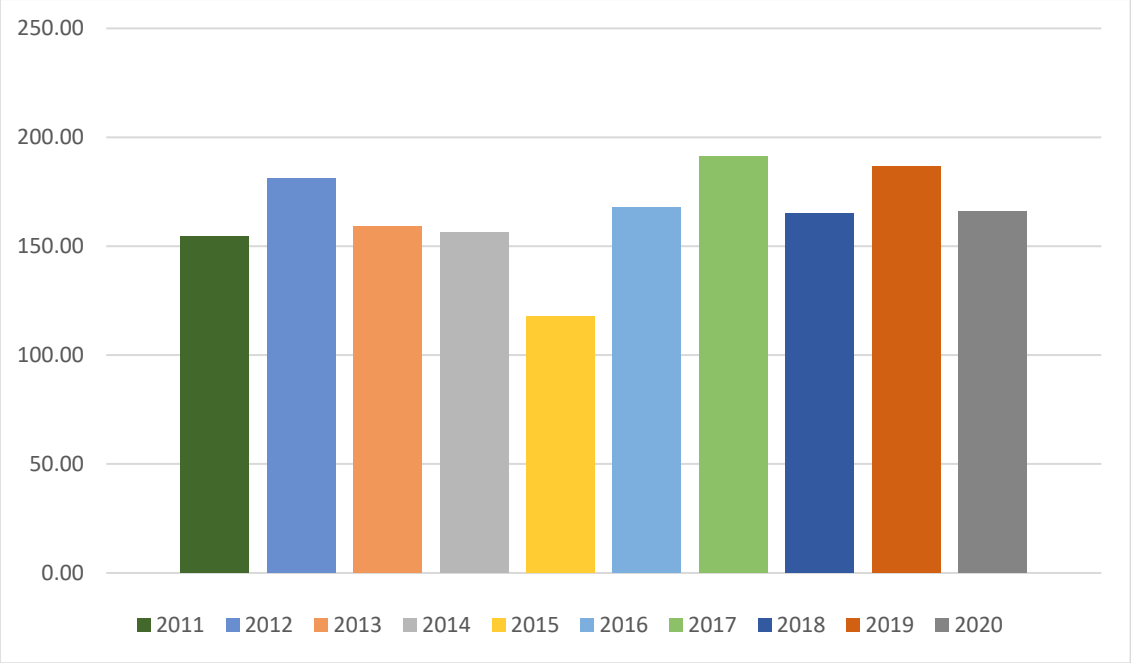

Figure 5.8 - Average Number of References per Theses of Vidyasagar University

The table shows the average number of citations per Ph.D. thesis at Vidyasagar University from 2000 to 2020. Notably, the years 2000 to 2009 show no recorded theses or citations, with an average citation of 0.00. However, in subsequent years, the number of theses and citations gradually increases. In 2010, there were 2 theses with an average of 157.50 citations per thesis. The highest average citation per thesis occurred in 2017, with 198.33 citations for 3 theses. The years 2018 and 2016 also saw high citation averages, with 191.71 and 184.75 citations, respectively. The total citations reached a peak in 2018, with 7 theses earning a total of 1342 citations, resulting in an average of 191.71 citations per thesis. Overall, the data shows an increasing trend in both the number of theses and their citations after 2010, reflecting growing research activity and impact.

5.5.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1.	Journal Articles	4545	75.61
2.	Book Chapters/Edited Books	495	8.23
3.	Theses/Dissertations	270	4.49
4.	Conference Proceedings	225	3.74
5.	Web Resources/Online Articles	90	1.50
6.	Reports	135	2.25
7.	Miscellaneous/Unclear	251	4.18

Table 5.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the Vidyasagar University

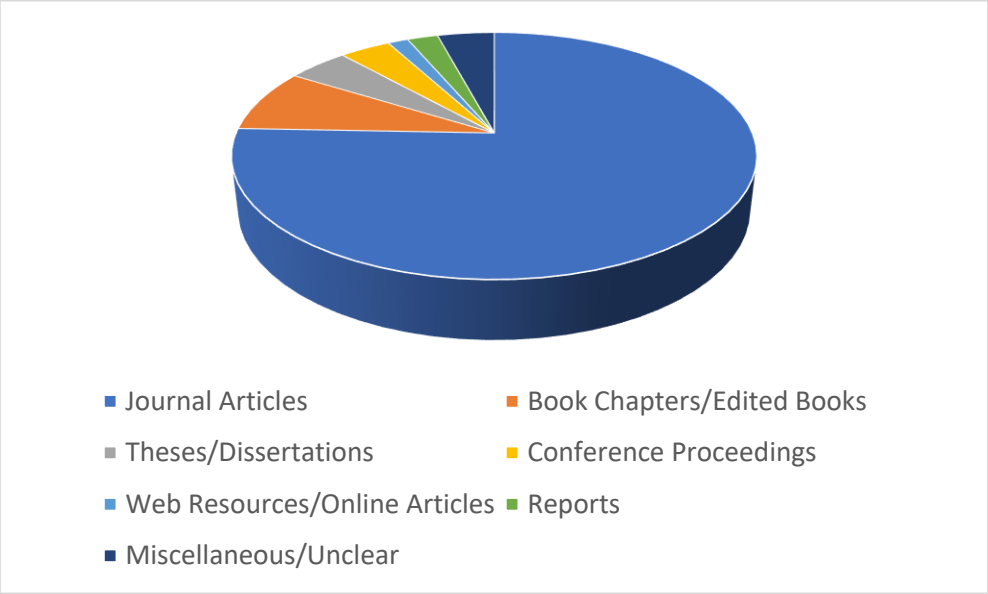

Figure 5.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the Vidyasagar University

The table presents the bibliographical form-wise distribution of citations for Ph.D. theses at Vidyasagar University. Most citations come from Journal Articles, which account for 75.61% of the total citations (4545 citations). This is followed by Book Chapters/Edited Books, which contribute 8.23% (495 citations), and Theses/Dissertations at 4.49% (270 citations). Other notable sources include Conference Proceedings (3.74%, 225 citations) and Reports (2.25%, 135 citations). Web Resources/Online Articles and Miscellaneous/Unclear sources make up smaller portions, contributing 1.50% (90 citations) and 4.18% (251 citations),

respectively. The data highlights the dominance of journal articles as the primary source of citations, reflecting the emphasis on peer-reviewed scholarly articles in the research output of Vidyasagar University.

5.5.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	No. of Citation	% of Citation
One	1502	24.99
Two	1802	29.98
Three	1201	19.98
Four	691	11.50
Five	343	5.71
More Than five	472	7.85
Total	**6011**	**100**

Table 5.10 - Authorship Pattern of Citations of the Theses of the Vidyasagar University

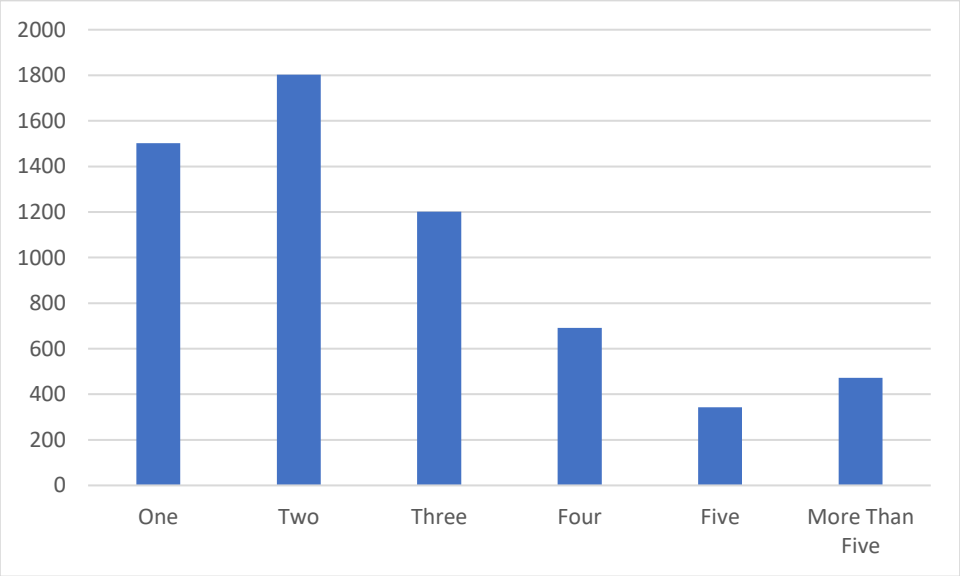

Figure 5.10 - Authorship Pattern of Citations of the Theses of the Vidyasagar University

The table provides the distribution of citations based on authorship for Ph.D. theses at Vidyasagar University. The highest percentage of citations, 29.98% (1802 citations), comes from works with two authors, followed by single-author works at 24.99% (1502 citations). Citations from three-author papers account for 19.98% (1201 citations), while four-author papers contribute 11.50% (691 citations). Works with five authors and more than five authors represent smaller proportions, contributing 5.71% (343 citations) and 7.85% (472 citations), respectively. The total number of citations is 6011, highlighting a predominance of citations from papers with one or two authors.

5.6. Analysis of Interpretation of Data of Visva Bharati

The Department of Botany, part of Siksha Bhavana (Institute of Science) at Visva-Bharati, has its roots in the university's goal to foster natural science education under Rabindranath Tagore's vision. Although no exact founding date is listed, the department is grouped with longstanding core science disciplines, indicating its longstanding presence. It grew steadily into a full-fledged academic entity, offering B.Sc. (Hons.), M.Sc., and Ph.D. programs. Early on, it emphasized traditional plant sciences and expanded to include specialization areas such as palynology, ecology, biodiversity, microbial endophytes, and molecular plant biology—reflecting evolving scientific interests and institutional priorities. Today, the Department of Botany hosts a diverse and experienced faculty engaged in cutting-edge research. Areas of focus include palynology and aeroallergens, microbial endophytes, plant–microbe interactions, taxonomy, molecular ecology, and stress physiology. The department maintains well-equipped laboratories and is led by scholars such as Prof. Kashinath Bhattacharya, whose work spans pollen allergy research, ecology, and biodiversity. Its research output includes numerous publications and Ph.D. graduates. The department delivers robust academic programs (B.Sc., M.Sc., Ph.D.), blending classroom instruction, advanced laboratory work, field studies, and research projects—serving as a key hub for botanical education and scholarship within the Visva-Bharati scientific community .

5.6.1 Analysis and Interpretation of Data on Theses

This section investigates key aspects of thesis submissions, including year-over-year trends, faculty supervision patterns, and the variety of research topics. By analyzing these factors, we aim to highlight the growth trajectory of doctoral research and the underlying influences shaping these patterns. The findings will offer valuable insights into the department's academic progress and research output over the past two decades.

5.6.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

Sl. No.	Year	Total	%
1.	2011	2	3.51
2.	2012	7	12.28
3.	2013	3	5.26
4.	2014	5	8.77
5.	2015	4	7.02
6.	2016	12	21.05
7.	2017	3	5.26
8.	2018	8	14.04
9.	2019	8	14.04
10.	2020	5	8.77
Total		57	100

Table 6.1 - Year-wise distribution of Ph.D. theses of the Visva Bharati

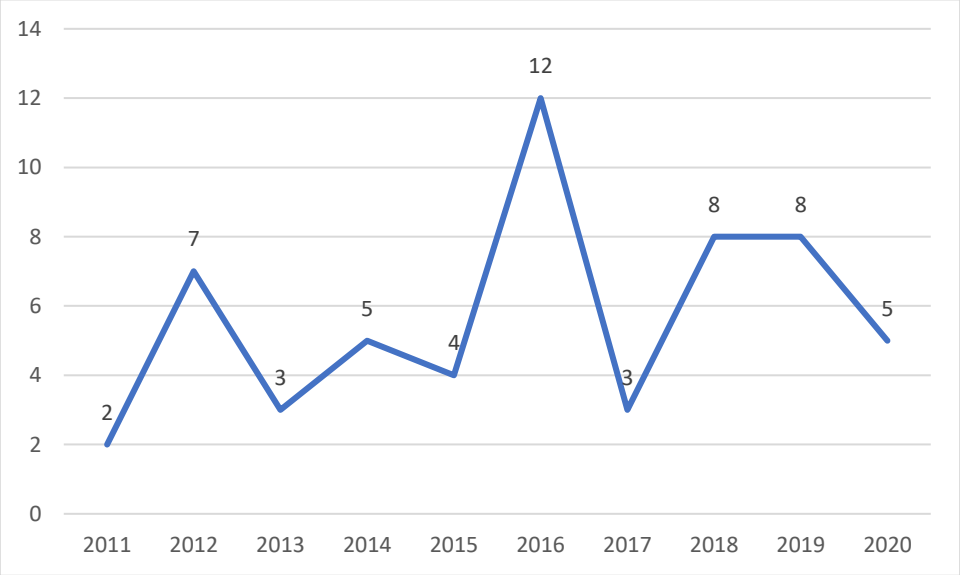

Figure 6.1: Year-wise distribution of Ph.D. theses of the Visva Bharati

The following chapter presents a detailed analysis of the year-wise distribution of Ph.D. theses submitted to Visva Bharati. Table 6.1 provides a breakdown of the total number of theses published over the years, highlighting trends in academic research output. This data offers insights into the growth and shifts in research focus within the institution from 2011 to 2020.

5.6.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisor	Total	Rank
1	Nirmalya Banerjee	9	1
2	Chowdhury Habibur Rahaman	8	2
3	Narayan Chandra Mandal	7	3
4	Subrata Mondal	6	4
5	Sudhendu Mandal	5	5
6	Kashinath Bhattacharya	4	6
7	Samit Ray	4	6
8	Sukanta K. Sen	4	6
9	Bomba Dam	3	7
10	Rup Kumar Kar	3	7
11	Soma Sukul	3	7
12	Swadesh Ranjan Biswas	3	7
13	Jnanendra Rath	2	8
14	P. Lakshminarasimhan	2	8
15	Somenath Bhattacharya	2	8

Table 6.2 - Supervisors-wise distribution of Ph.D. theses of the Visva Bharati

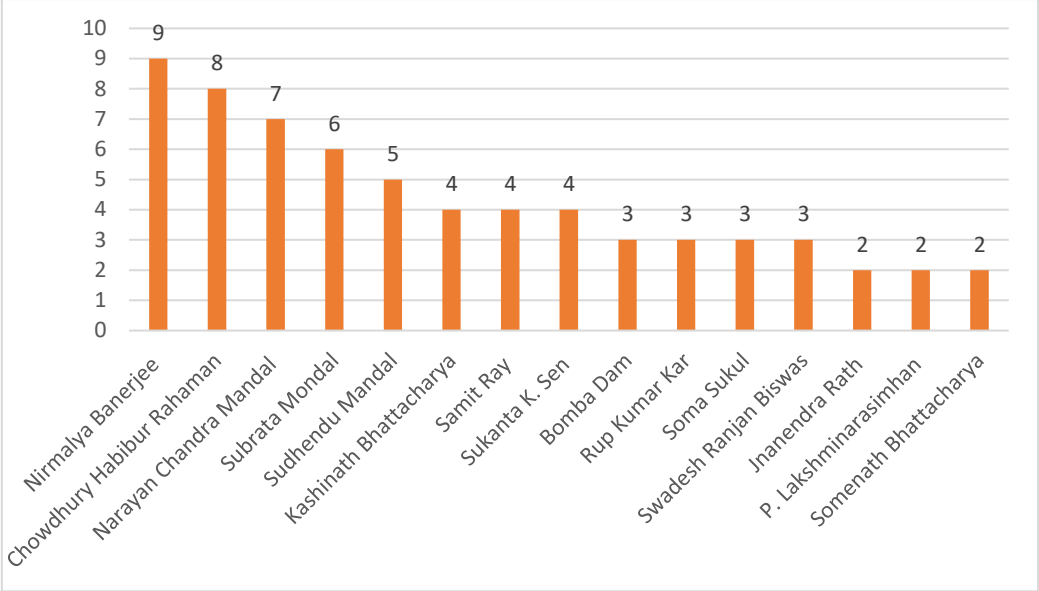

Figure 6.2: Supervisors-wise distribution of Ph.D. theses of the Visva Bharati

This section presents a detailed analysis of the distribution of Ph.D. theses at Visva Bharati based on the supervising faculty members. Table 6.2 provides a list of supervisors, along with the total number of theses they have supervised and their respective ranks. The ranking system is based on the total number of students each supervisor has mentored during the study period. Nirmalya Banerjee stands at the top with the highest number of theses supervised, followed by Chowdhury Habibur Rahaman and Narayan Chandra Mandal. The table also includes several supervisors with an equal number of students, ranked jointly. This data sheds light on the individual contributions of faculty members towards the growth and development of research at Visva Bharati. By analyzing the supervisory patterns, we gain a deeper understanding of the institutional research dynamics.

5.6.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	**Number of theses**	**%**
Single	39	68.42
Joint	18	31.58
Total	57	100

Table 6.3 - Supervising Pattern of Ph.D. theses of the Visva Bharati

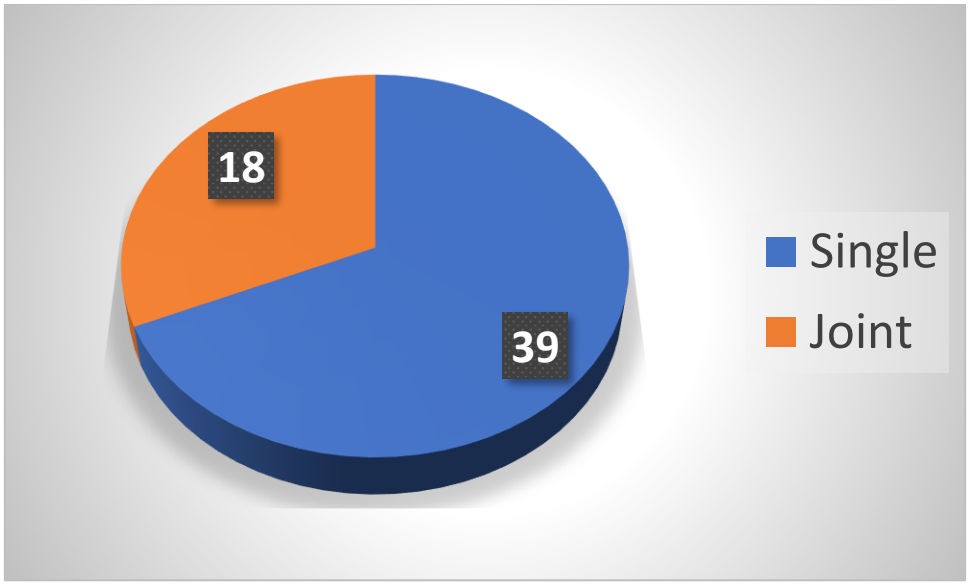

Figure 6.3: Supervising Pattern of Ph.D. theses of the Visva Bharati

This section analyzes the supervising pattern of Ph.D. theses at Visva Bharati, as shown in Table 6.3. The data categorizes the theses into two main groups: single supervision and joint supervision. The breakdown highlights that a significant majority of theses were supervised individually, while a smaller portion involved joint supervision, offering insights into the supervisory trends at the institution.

5.6.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	32	56.14
Female	25	43.86
Total	57	100

Table 6.4 : Gender-wise distribution of Ph.D. theses of the Visva Bharati

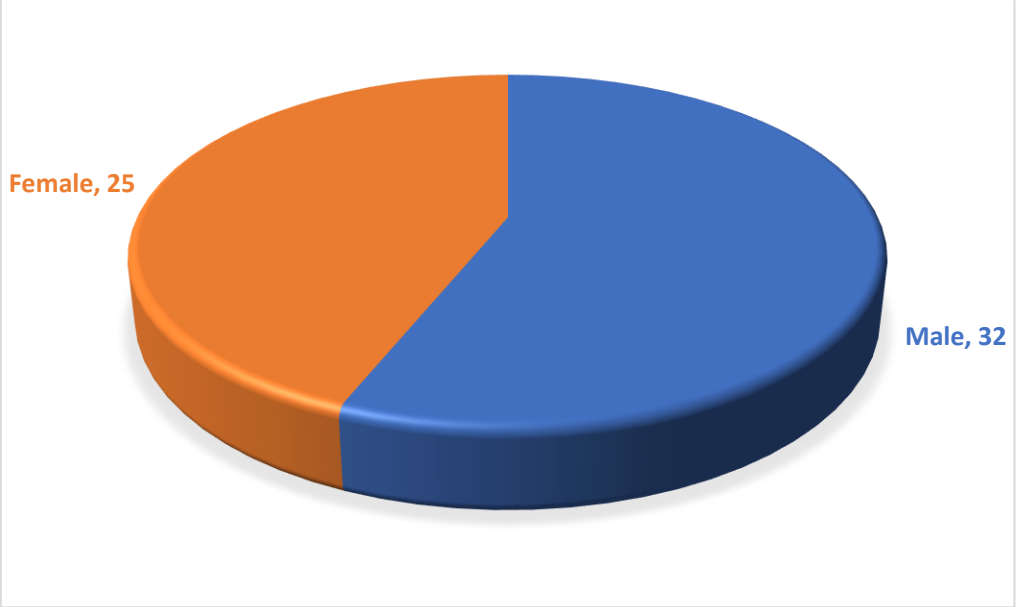

Figure 6.4: Gender-wise distribution of Ph.D. theses of the Visva Bharati

This section delves into the gender-wise distribution of Ph.D. theses at Visva Bharati, as presented in Table 6.4. The data provides an overview of the gender representation among researchers contributing to the institution's academic output over the years. A total of 57 Ph.D. theses were submitted during the study period, with 32 theses (56.14%) supervised by male researchers and 25 theses (43.86%) by female researchers. This distribution reflects the participation of both male and female scholars in the research community at Visva Bharati. While male researchers slightly outnumber their female counterparts, the data highlights the significant role played by women in academic research. Understanding this gender distribution is essential in analyzing trends in scholarly contributions and fostering a balanced research environment. This section aims to provide a deeper insight into the evolving gender dynamics within the institution's research landscape.

5.6.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	Subject Name	Total	%
1.	Cytology	6	10.53
2.	Environmental Botany	1	1.75
3.	Genetics	13	22.81
4.	Medicinal Botany	4	7.02
5.	Microbiology	9	15.79
6.	Palaeobotany	1	1.75
7.	Plant Anatomy	0	0.00
8.	Plant Ecology	6	10.53
9.	Plant Pathology	9	15.79
10.	Plant Physiology	7	12.28
11.	Taxonomy	1	1.75
Total		57	100

Table 6.5 - Subject-wise distribution of Ph.D. theses of the Visva Bharati

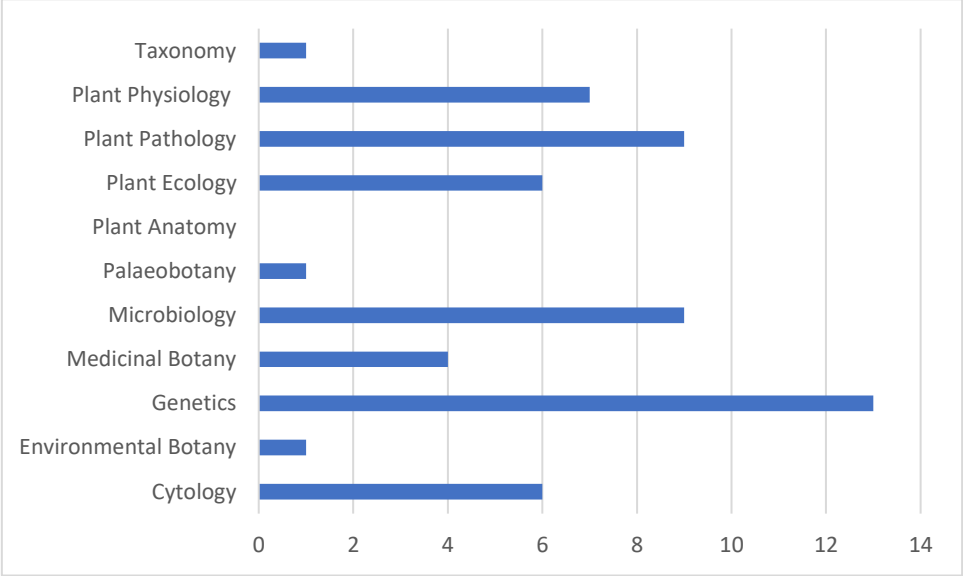

Figure 6.*5 - Subject-wise distribution of Ph.D. theses of the Visva Bharati*

This section presents a detailed analysis of the subject-wise distribution of Ph.D. theses at Visva Bharati, as shown in Table 6.5. The data categorizes the 57 Ph.D. theses into various subjects, reflecting the diverse research areas within the institution's academic community. Genetics emerges as the most prominent field, with 13 theses (22.81%), followed by Microbiology and Plant Pathology, each contributing 9 theses (15.79%). Other notable subjects include Cytology and Plant Physiology, each contributing 6 theses (10.53%). Certain fields such as Plant Anatomy and Environmental Botany have fewer contributions, with only one

thesis submitted in each. This distribution highlights the focus areas within the research landscape of Visva Bharati and provides valuable insights into the academic interests of its Ph.D. scholars.

5.6.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

Sl. No.	No. of Title Words	Number of Theses	% of Theses
1.	1 to 5	0	0.00
2.	6 to 10	15	26.32
3.	11 to 15	23	40.35
4.	16 to 20	17	29.82
5.	21 to 25	2	3.51
6.	26 to 30	0	0.00
7.	30 to 35	0	0.00
	Total	57	100

Table 6.6 - Number of Words Used in the Title of Ph.D. theses the Visva Bharati

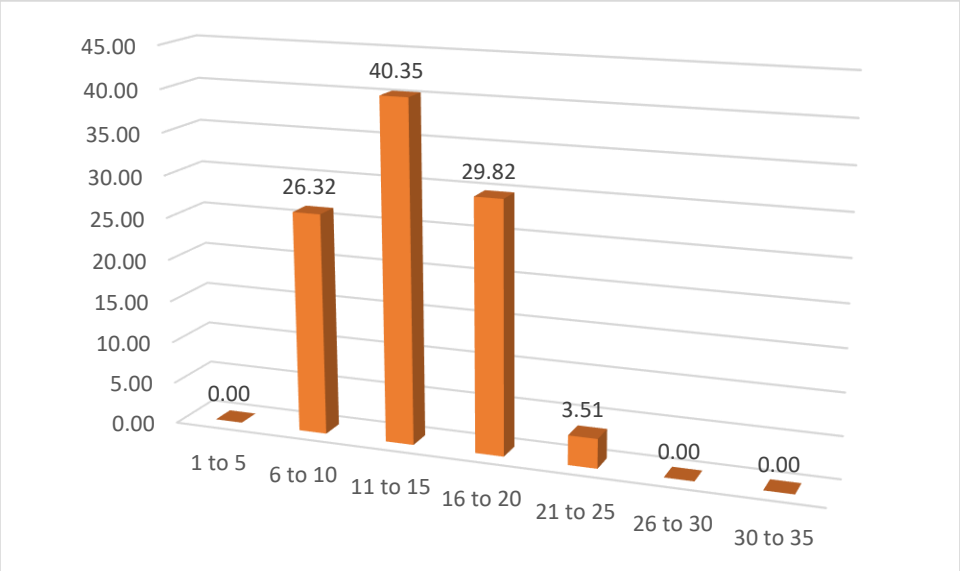

Figure 6.6 - Number of Words Used in the Title of Ph.D. theses of the Visva Bharati

This section examines the distribution of the number of words used in the titles of Ph.D. theses at Visva Bharati, as shown in Table 6.6. The data categorizes the titles based on the word count, offering insights into the typical length of thesis titles. The majority of theses (40.35%) have titles consisting of 11 to 15 words, followed by 6 to 10 words, which account for 26.32%. Titles with 16 to 20 words represent 29.82% of the total, indicating a preference for concise yet informative titles. Fewer theses have titles with 21 to 25 words (3.51%), while there are no titles in the ranges of 1 to 5, 26 to 30, or 30 to 35 words. This distribution suggests that researchers at Visva Bharati generally prefer mid-range word counts for their thesis titles. The chapter provides a deeper understanding of the conventions followed in academic research at the institution.

5.6.1.7 Frequency of Title Keywords

This section highlights the most commonly used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency	% of Frequency
1.	Studies	21	26.25
2.	West Bengal	15	18.75
3.	Plants	10	12.50
4.	Species	7	8.75
5.	Pharmacognostic	6	7.50
6.	Biology	5	6.25
7.	India	4	5.00
8.	Birbhum	4	5.00
9.	Phytochemical	4	5.00
10.	Antioxidant	4	5.00
Total		80	100

Table 6.7 - Frequency of Title Keywords of Ph.D. theses of the Visva Bharati

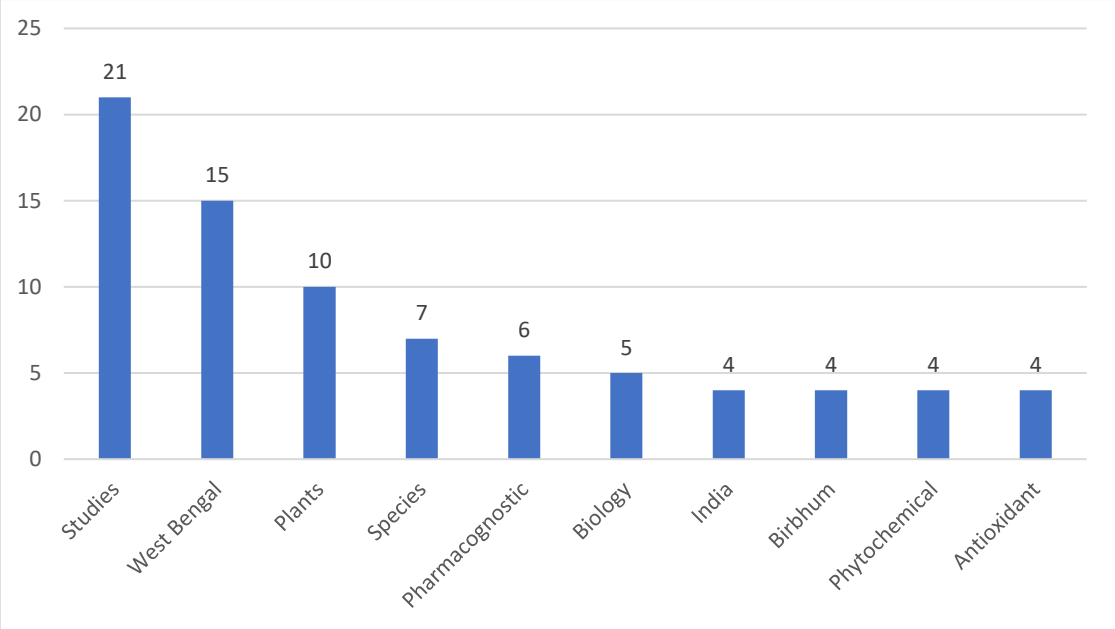

Figure 6.7 - Frequency of Title Keywords of Ph.D. theses of the Visva Bharati

This section analyzes the frequency of keywords used in the titles of Ph.D. theses at Visva Bharati, as presented in Table 6.7. The data highlights the most common terms that appear in the titles, providing insight into the key research themes at the institution. The most frequently used keyword is "Studies," appearing in 26.25% of titles, followed by "West Bengal" (18.75%) and "Plants" (12.50%). Other notable keywords include "Species," "Pharmacognostic," and "Biology," which also appear with significant frequency. Keywords such as "India," "Birbhum," "Phytochemical," and "Antioxidant" are found with moderate frequency. This distribution of keywords reflects the primary areas of research focus, particularly in the fields of plant biology, pharmacognosy, and regional studies. The chapter provides a deeper understanding of the thematic orientation of research at Visva Bharati.

5.6.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

5.6.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis in the doctoral research submitted to the Visva Bharati reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

Sl. No.	Year	No. of Theses	No. of Citations	Average Citation per Thesis
1.	**2011**	2	309	154.50
2.	**2012**	7	1268	181.14
3.	**2013**	3	478	159.33
4.	**2014**	5	782	156.40
5.	**2015**	4	470	117.50
6.	**2016**	12	2016	168.00
7.	**2017**	3	574	191.27
8.	**2018**	8	1321	165.13
9.	**2019**	8	1494	186.75
10.	**2020**	5	831	166.20

Table 6.8 - Average Number of References per Theses of the Visva Bharati

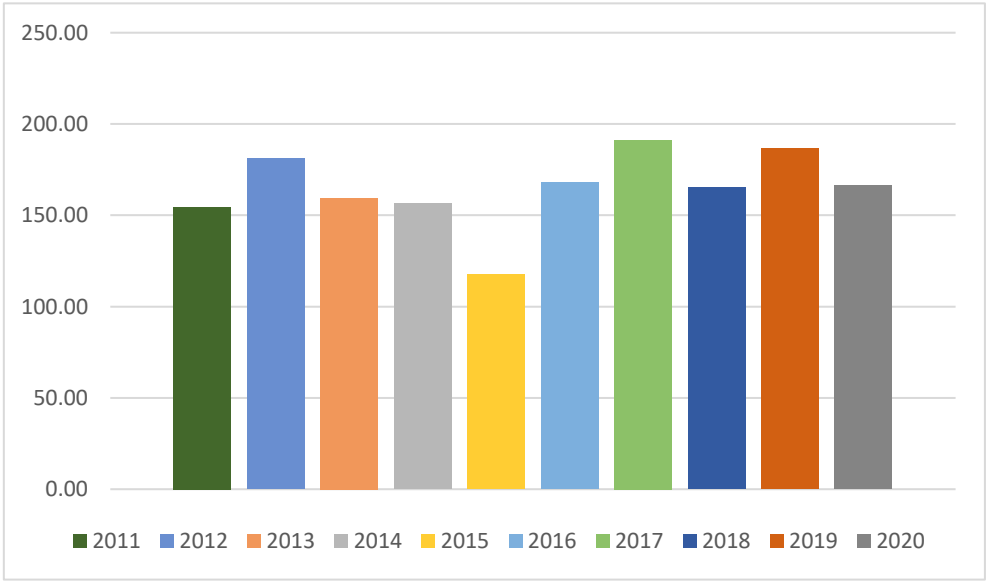

Figure 6.8 - Average Number of References per Theses of the Visva Bharati

This section presents an analysis of the average number of citations per Ph.D. thesis at Visva Bharati, as shown in Table 6.8. The data covers a period from 2011 to 2020, providing insights into the citation patterns of theses submitted during these years. The table highlights the number of theses, the total number of citations, and the average citations per thesis for each year. Notably, the year 2012 has the highest average citation per thesis, at 181.14, with 7 theses contributing to a total of 1,268 citations. Over the years, the average citation per thesis shows variability, reflecting different trends in academic referencing. This analysis serves to illustrate the scholarly impact and the depth of research within Visva Bharati's Ph.D. community. The chapter aims to explore the correlation between research output and citation frequency, shedding light on the institution's academic influence.

5.6.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	No. of Citation	% Citation per Thesis
1.	Journal Articles	8202	85.96
2.	Book Chapters/Edited Books	804	8.43
3.	Theses/Dissertations	107	1.12
4.	Conference Proceedings	52	0.54
5.	Web Resources/Online Articles	56	0.59
6.	Reports	107	1.12
7.	Miscellaneous/Unclear	214	2.24

Table 6.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the Visva Bharati

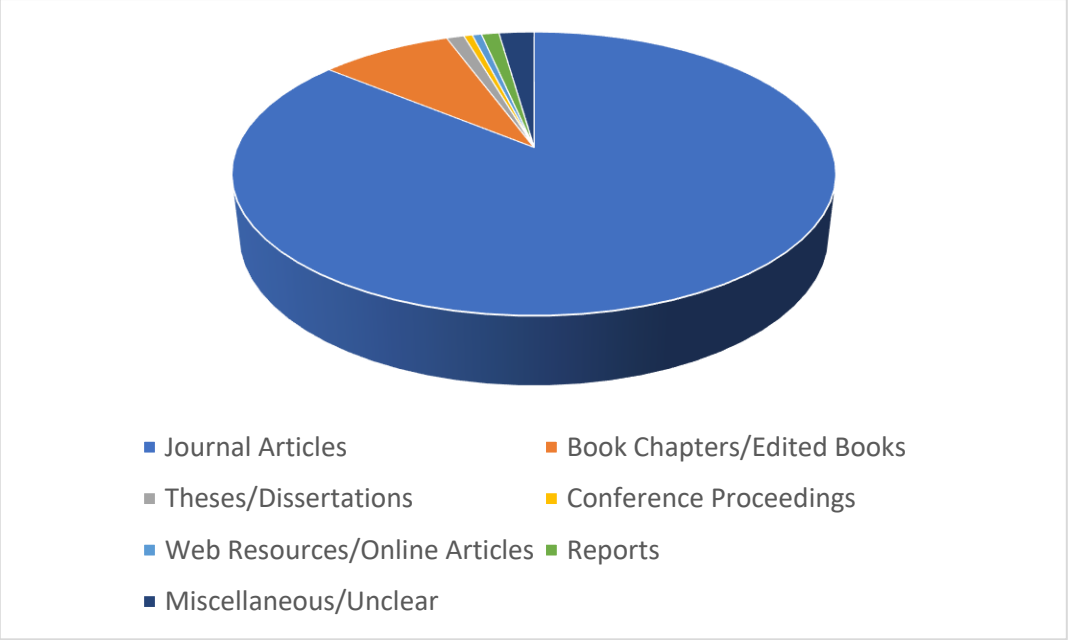

Figure 6.9 **- Bibliographical Form-wise Distribution of Citations of the *Theses of the Visva Bharati***

This section examines the bibliographical form-wise distribution of citations for Ph.D. theses at Visva Bharati, as presented in Table 6.9. The data highlights the types of sources that are most frequently cited in the theses submitted at the institution. Journal articles dominate the citation landscape, contributing to 85.96% of the total citations. Book chapters and edited books follow with 8.43%, while other forms such as theses/dissertations, conference proceedings, and web resources make up a smaller proportion of the citations. Reports and miscellaneous/unclear sources contribute 1.12% and 2.24%, respectively. This distribution offers insights into the types of scholarly resources that shape research at Visva Bharati. The chapter provides a deeper understanding of how researchers at the institution rely on various bibliographic sources to support their academic work.

5.6.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

Authorship	No. of Citation	% of Citation
One	2335	24.47
Two	2944	30.85
Three	2081	21.81
Four	1167	12.23
Five	558	5.85
More Than five	457	4.79

Table 6.10 - Authorship Pattern of Citations of the Theses of the Visva Bharati

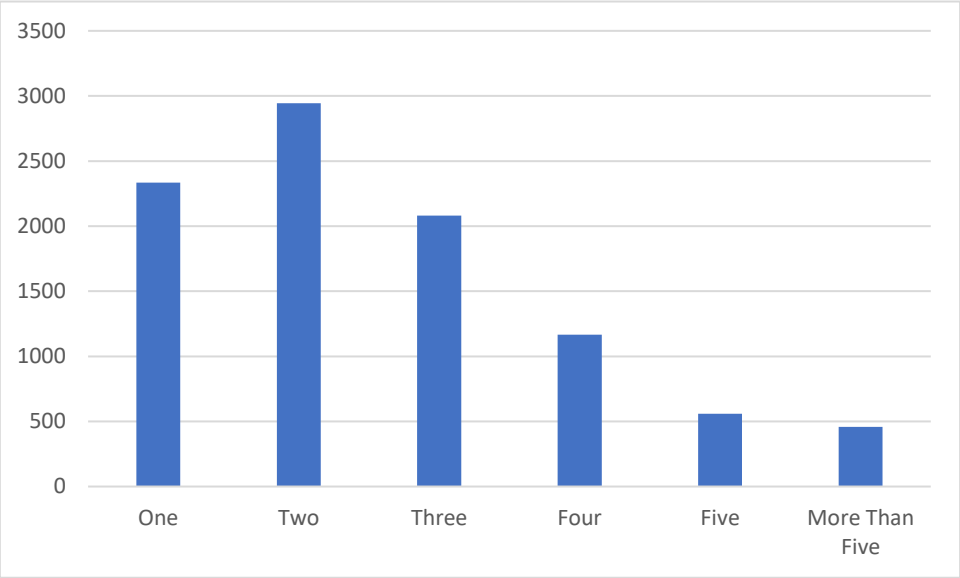

Figure 6.10 - Authorship Pattern of Citations of the Theses of the Visva Bharati

This section analyzes the authorship pattern of citations for Ph.D. theses at Visva Bharati, as shown in Table 6.10. The data categorizes the citations based on the number of authors, providing a clear picture of collaborative research efforts within the institution. Citations with two authors make up the largest proportion, accounting for 30.85% of the total citations, followed closely by those with one author at 24.47%. Citations with three authors represent 21.81%, while those with four authors contribute 12.23%. Citations involving five or more authors constitute a smaller portion, with 5.85% and 4.79%, respectively. This distribution reflects the level of collaboration in the academic work at Visva Bharati, offering insights into the research practices at the institution. The chapter explores how these authorship patterns contribute to the overall scholarly output and impact.

CHAPTER VI

COMPARATIVE STUDY OF SIX UNIVERSITIES

6 Introduction

This study provides a comparative analysis of doctoral research output across six universities focusing on the field of Botany and related disciplines over a span of two decades. The analysis explores various aspects of doctoral research, including trends in thesis submissions, supervisor contributions, gender representation, research topics, and citation patterns. By examining the year-wise and supervisor-wise distribution of Ph.D. theses, along with subject-specific research areas and citation practices, this study reveals both consistent trends and significant variations across these institutions, offering insights into their academic strengths, challenges, and evolving research focus. The findings not only highlight the growth trajectories of these universities but also provide valuable information for future academic strategies and potential research collaborations in the field.

6.1 Analysis and Interpretation of Data on Theses

This section examines various aspects of thesis submissions, including year-wise trends, the number of theses supervised by different faculty members, and the distribution of research topics. By analyzing these data points, we aim to understand the growth patterns of doctoral research and the factors influencing these trends. The findings will provide insights into the department's evolving academic landscape and research productivity over the past two decades.

6.1.1 Year-wise Distribution of Theses

This section analysis highlights trends in research output over two decades, reflecting the department's growth and evolving academic environment.

	CU		KU		NBU		BU		VU		VBU		ALL	
Year	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**TOTAL**	**%**
2000	9	4.17	5	2.86	4	4.3	5	5.75	-	-	-	-	23	3.47
2001	1	0.46	10	5.71	5	5.38	1	1.15	-	-	-	-	17	2.56
2002	3	1.39	11	6.29	5	5.38	3	3.45	-	-	-	-	22	3.32
2003	6	2.78	4	2.29	0	0	0	0	-	-	-	-	10	1.51
2004	6	2.78	8	4.57	1	1.08	2	2.3	-	-	-	-	17	2.56
2005	9	4.17	5	2.86	2	2.15	2	2.3	-	-	-	-	18	2.71
2006	8	3.70	10	5.71	3	3.23	8	9.2	-	-	-	-	29	4.37
2007	9	4.17	7	4	1	1.08	0	0	-	-	-	-	17	2.56

	CU		KU		NBU		BU		VU		VBU		ALL	
Year	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**Total**	**%**	**TOTAL**	**%**
2008	8	3.70	8	4.57	1	1.08	2	2.3	-	-	-	-	19	2.87
2009	8	3.70	17	9.71	1	1.08	3	3.45	-	-	-	-	29	4.37
2010	9	4.17	12	6.86	0	0	0	0	2	5.71	0	0	23	3.47
2011	7	3.24	9	5.14	7	7.53	2	2.3	1	2.86	2	3.51	28	4.22
2012	16	7.41	8	4.57	3	3.23	8	9.2	1	2.86	7	12.28	43	6.49
2013	10	4.63	14	8	12	12.9	10	11.49	1	2.86	3	5.26	50	7.54
2014	11	5.09	10	5.71	6	6.45	2	2.3	6	17.14	5	8.77	40	6.03
2015	14	6.48	14	8	6	6.45	7	8.05	3	8.57	4	7.02	48	7.24
2016	21	9.72	9	5.14	7	7.53	7	8.05	4	11.43	12	21.05	60	9.05
2017	19	8.80	2	1.14	20	21.51	7	8.05	3	8.57	3	5.26	54	8.14
2018	20	9.26	5	2.86	5	5.38	9	10.34	7	20	8	14.04	54	8.14
2019	21	9.72	4	2.29	4	4.3	5	5.75	7	20	8	14.04	49	7.39
2020	1	0.46	3	1.71	0	0	4	4.6	0	0	5	8.77	13	1.96
TOTAL	216	100	175	100	93	100	87	100	35	100	57	100	663	100

Table 7.1 - Year-wise distribution of Ph.D. theses of six Universities

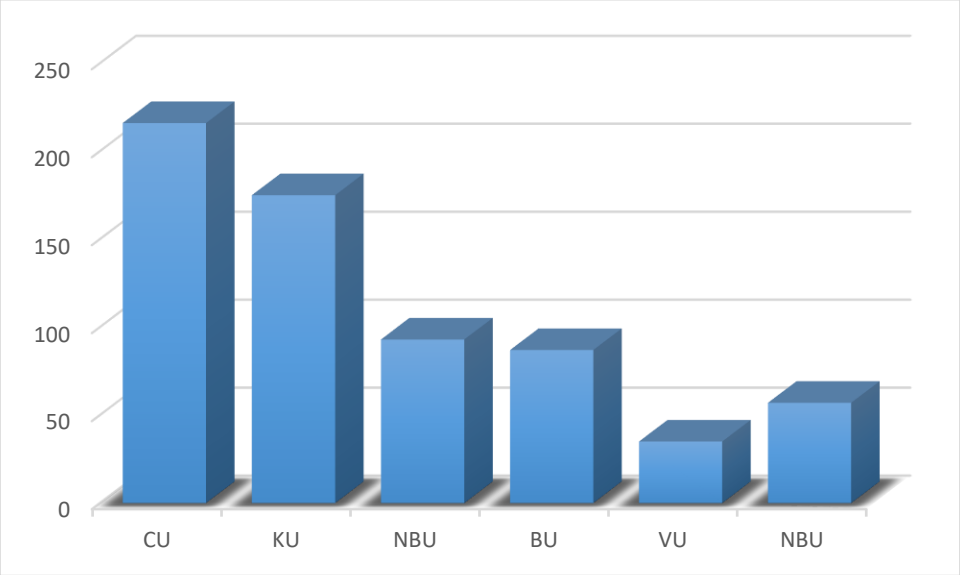

Figure 7.1: University-wise distribution of Ph.D. theses of six Universities

The data presented in Table 7.1 outlines the year-wise distribution of Ph.D. theses across six universities, including the University of Calcutta (CU), University of Kalyani (KU), University of North Bengal (NBU), University of Burdwan (BU), Vidyasagar University(VU), and Visva Bharati University (VBU), from 2000 to 2020. Over the 21-year period, there were a total of 663 doctoral theses submitted. The University of Calcutta (CU) had the highest contribution, consistently leading with significant submission percentages, peaking in 2016 with 9.72%. The University of Kalyani (KU) and

the University of North Bengal (NBU) also saw notable contributions, especially in the early years. Conversely, Visva Bharati University (VU) had fewer submissions, particularly in the first decade, with a noticeable peak in 2016 and 2017. Data reveals that certain years, such as 2020, saw a significant drop in overall submissions, likely influenced by the global pandemic. Additionally, 2016 recorded the highest total submissions (60), marking a peak in doctoral research activity across all universities. The overall trend shows fluctuations in research output, with some universities experiencing steady growth while others faced varying levels of engagement in doctoral research over time.

6.1.2 Supervisor-wise Distribution of Theses

This section highlights the contributions of individual faculty members, identifying key supervisors who guided a significant number of theses. The data reveals a concentration of research mentorship among a select group of faculties, with some supervisors playing a dominant role in shaping the department's academic output.

Sl. No.	Name of the Supervisors	No. of Theses Guided	Rank	Name of The University
1.	Animesh Kumar Datta	19	1	KU
2.	Anita Mukherjee	16	2	CU
3.	Sobhan Kumar Mukherjee	16	2	KU
4.	Ambarish Mukherjee	15	3	BU
5.	Sumita Jha	14	4	CU
6.	Chandan Sengupta	13	5	KU
7.	Parthadeb Ghosh	13	5	KU
8.	Arnab Sen	13	5	NBU
9.	Gaurgopal Maiti	12	6	KU
10.	Usha Chakraborty	12	6	NBU
11.	Subir Bera	11	7	CU
12.	Sujata Chaudhuri	11	7	KU
13.	Bishwanath Chakraborty	11	7	NBU
14.	Bratati De	10	8	CU
15.	Ruma Pal	10	8	CU
16.	Abhaya Prasad Das	10	8	NBU
17.	Aniruddha Saha	10	8	NBU
18.	Sikha Dutta	10	8	BU
19.	Amal Kumar Mondal	10	8	VU
20.	Krishnendu Acharya	9	9	CU
21.	Radhanath Mukhopadhyay	9	9	BU
22.	Nirmalya Banerjee	9	9	VBU

Table 7.2 - Supervisors-wise distribution of Ph.D. theses of six Universities

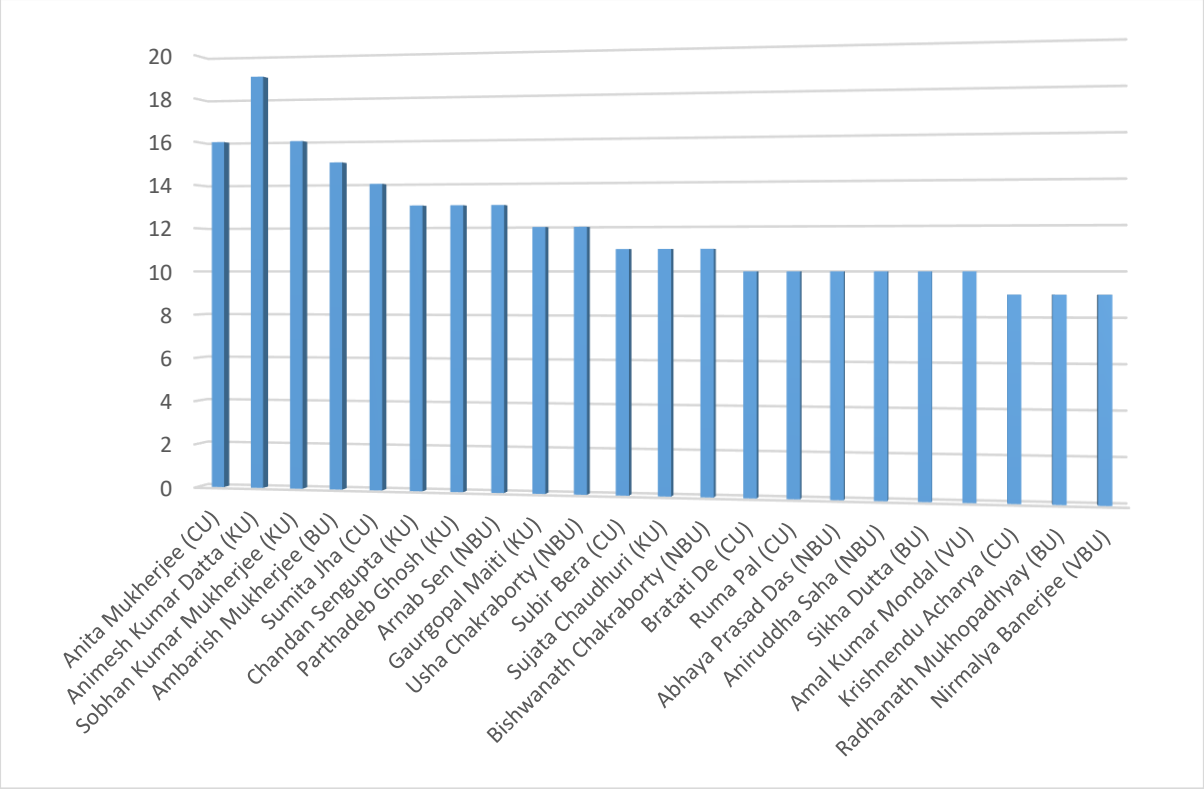

Figure1.2: Supervisors-wise distribution of Ph.D. theses of six Universities

The data presents a comprehensive overview of the number of theses guided by various supervisors across different universities. The analysis shows that Animesh Kumar Datta leads with the highest number of theses guided, totaling 19, followed by Anita Mukherjee and Sobhan Kumar Mukherjee, both with 16 theses each, placing them in the second rank. The majority of the supervisors in the list are from KU (Kolkata University), CU (Calcutta University), and NBU (North Bengal University), indicating a concentration of research activity in these institutions. The ranking reveals a competitive distribution, with the top 5 supervisors guiding between 13 to 19 theses. Notably, a significant portion of the supervisors, 13 in total, have guided 10 or more theses, underscoring a high level of academic contribution. There is also a noticeable trend where several supervisors from CU, NBU, and KU appear in the top ranks, reflecting their institutional prominence in fostering research. On the other hand, institutions such as BU (Burdwan University) and VBU (Vidyasagar University) show fewer supervisors with higher numbers of theses, suggesting a potential area for growth in these universities. This data can be used to assess the distribution of research guidance and may provide insights into the academic and research strengths of these institutions.

6.1.3 Supervising Pattern

This section examines the dominance of the single-supervisor model. This pattern reflects a strong preference for one-on-one mentorship but also suggests potential opportunities for greater interdisciplinary collaboration in future research efforts.

Supervising pattern	Number of theses	%
Single	488	73.60
Joint	175	26.40
Total	663	100

Table 7.3 - Supervising Pattern of Ph.D. theses of six Universities

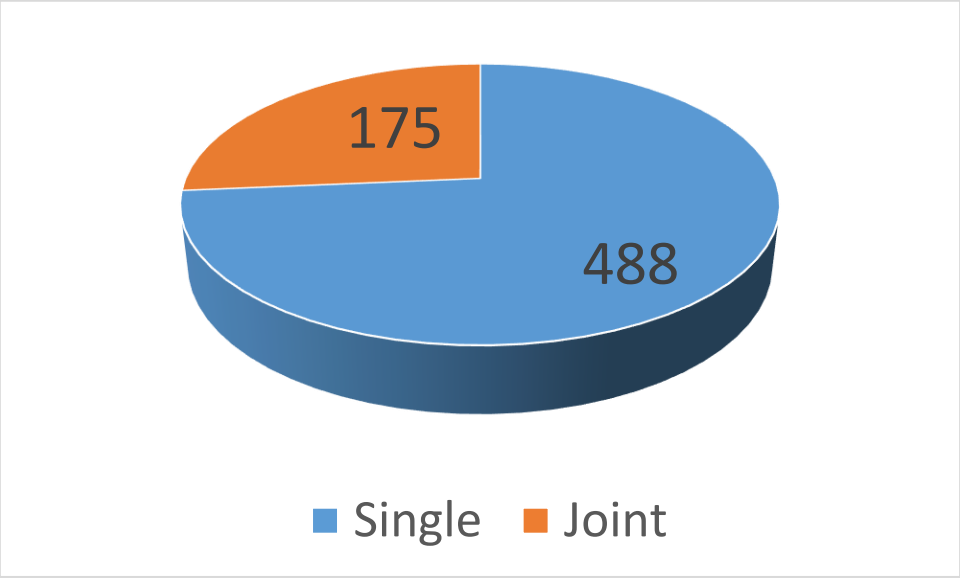

Figure 7.3: Supervising Pattern of Ph.D. theses of six Universities

The data on the supervising pattern of Ph.D. theses across six universities reveals that most theses (73.60%) were supervised under a single supervisor, while 26.40% of theses were guided by joint supervision. This indicates a strong preference for individual supervision, although joint supervision is still a significant approach, accounting for more than a quarter of the total theses. In total, 663 Ph.D. theses were analyzed, with the distribution emphasizing the dominance of single-supervisor guidance in academic research within these institutions.

6.1.4 Gender-wise Distribution of Researchers

This section aims to provide an overview of the participation of male and female researchers in doctoral studies within the department. It offers insights into gender representation trends in the academic research landscape.

Gender of Researchers	Number of theses	%
Male	348	52.49
Female	315	47.51
Total	663	100

Table-5.3: Gender-wise distribution of Ph.D. theses of six Universities

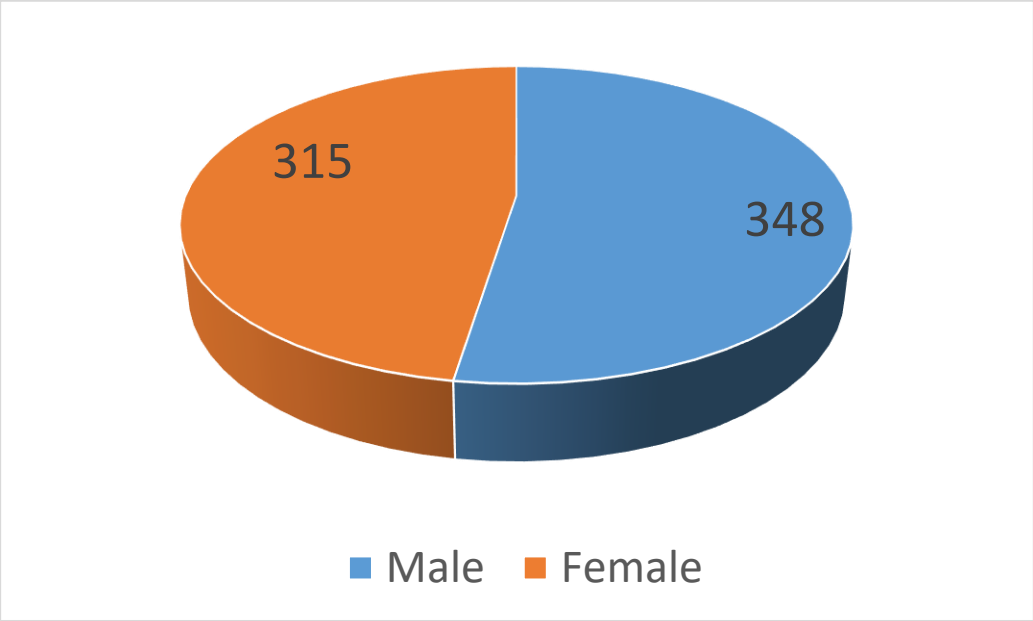

Figure 7.4: Gender-wise distribution of six Universities

The gender-wise distribution of Ph.D. theses across six universities shows a nearly balanced representation of male and female researchers. Males accounted for 52.49% of the total theses, with 348 submissions, while females represented 47.51%, with 315 submissions. This indicates a relatively equal participation of both genders in doctoral research, highlighting the ongoing progress towards gender parity in higher education and research across these institutions. The total number of theses analyzed is 663.

6.1.5 Subject-wise Distribution of Theses

This section categorizes the research output based on specific areas of study, showcasing the diverse academic focus of the department. This section highlights the key subject areas explored by doctoral candidates, offering insight into the evolving trends and research priorities in the field of Botany over the years.

Sl. No.	SUBJECT	CU	KU	NBU	BU	VU	VBU	TOTAL	%
1.	Cytology	59	37	18	16	5	6	141	21.27
2.	Environmental Botany	50	2	3	8	2	1	66	9.95
3.	Genetics	21	34	8	6	3	13	85	12.82
4.	Medicinal Botany	20	3	6	7	2	4	42	6.33
5.	Microbiology	16	18	13	11	0	9	67	10.11
6.	Palaeobotany	14	3	0	1	0	1	19	2.87
7.	Plant Anatomy	16	10	0	4	0	0	30	4.52
8.	Plant Ecology	8	28	15	11	13	6	81	12.22
9.	Plant Pathology	5	11	22	9	3	9	59	8.90
10.	Plant Physiology	4	12	2	5	2	7	32	4.83
11.	Taxonomy	3	17	6	9	5	1	41	6.18
	Total	216	175	93	87	35	57	663	100

Table 7.5 - Subject-wise distribution of Ph.D. theses of six Universities

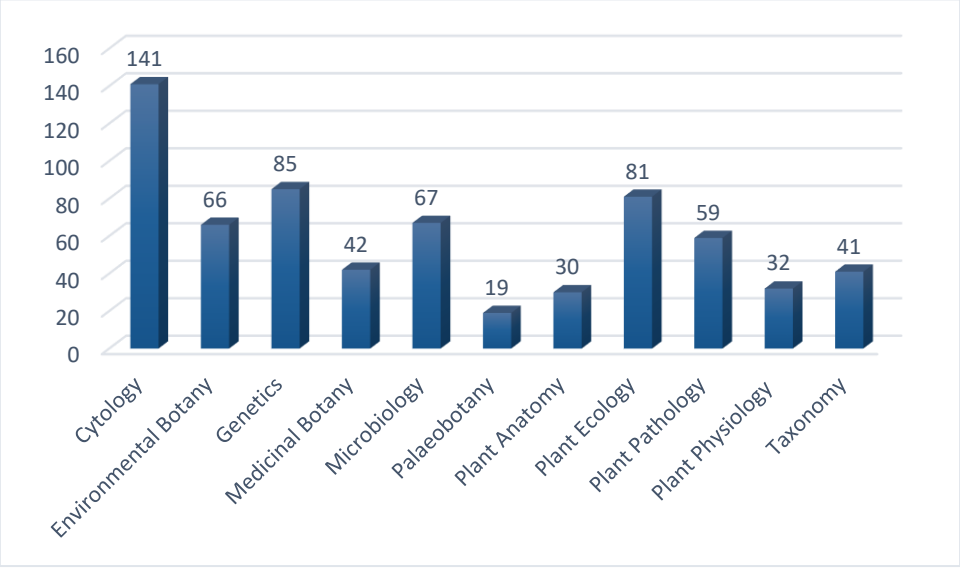

Figure*1.5 - Subject-wise distribution of Ph.D. theses of six Universities*

The subject-wise distribution of Ph.D. theses across six universities shows that Cytology is the most prominent subject, accounting for 21.27% of the total with 141 theses. Genetics and Plant Ecology follow closely, contributing 12.82% and 12.22%, respectively, with 85 and 81

theses. Microbiology (10.11%) and Environmental Botany (9.95%) also make significant contributions, with 67 and 66 theses, respectively. Other subjects like Medicinal Botany (6.33%), Plant Pathology (8.90%), and Taxonomy (6.18%) have a moderate representation. Overall, the data highlights a strong focus on Cytology and Genetics, while subjects such as Plant Ecology and Microbiology also play an important role in doctoral research.

6.1.6 Number of Words Used in the Title of Theses

This section provides an overview of the structural approach to thesis titles. It categorizes the titles based on their word count, offering insight into the typical length and style followed by researchers. This section highlights the preferences in title formulation within the department.

		CU	KU	NBU	BU	VU	VBU	ALL	
Sl. No.	No. of Title Words	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**TOTAL**	**%**
1.	1 to 5	2	3	1	0	0	0	6	0.90
2.	6 to 10	37	29	13	22	7	15	123	18.55
3.	11 to 15	95	59	39	26	11	23	253	38.16
4.	16 to 20	59	49	24	24	9	17	182	27.45
5.	21 to 25	21	22	15	11	5	2	76	11.46
6.	26 to 30	2	8	1	3	2	0	16	2.41
7.	30 to 35	0	5	0	1	1	0	7	1.06

Table 7.6 - Number of Words Used in the Title of Ph.D. theses of six Universities

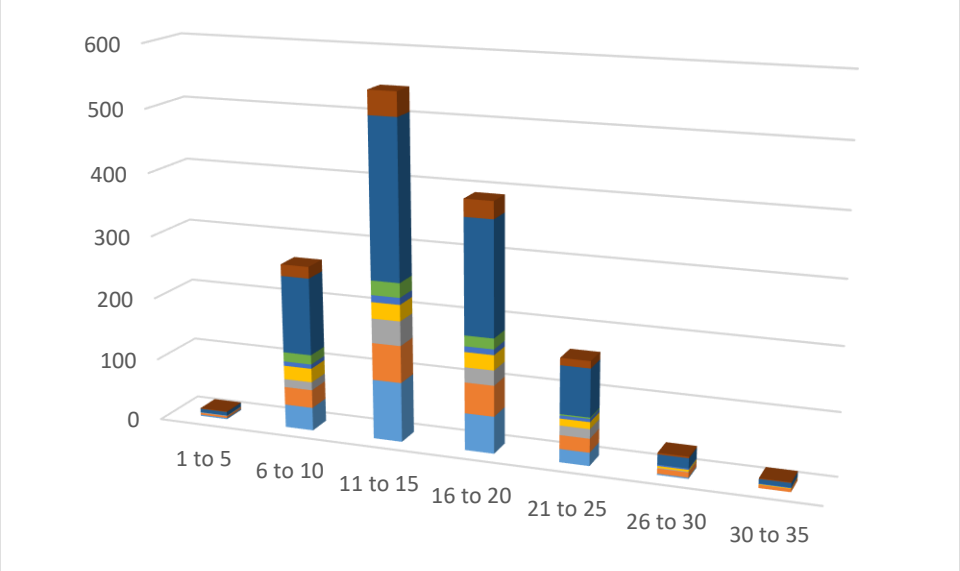

Figure 7.6 - Number of Words Used in the Title of Ph.D. theses of six Universities

The data on the number of words used in the titles of Ph.D. theses across six universities shows that the majority of titles (38.16%) fall within the 11 to 15-word range, totaling 253 titles. This is followed by titles with 6 to 10 words, which make up 18.55% of the total, with 123 titles. Titles containing 16 to 20 words account for 27.45% (182 titles), while titles in the 21 to 25-word range make up 11.46% (76 titles). Fewer titles have 1 to 5 words (0.90%), 26 to 30 words (2.41%), and 30 to 35 words (1.06%), indicating that shorter titles are less common. Overall, the data highlights a preference for moderately long titles, with the majority ranging from 6 to 20 words. The total number of theses analyzed is 663.

6.1.7 Frequency of Title Keywords

This section highlights the most commonly used keywords, offering insights into the main research themes and areas of focus within the department. The frequency of these keywords reveals key trends and dominant topics in the field of Botany during the period under study.

Sl. No.	Name of keywords	Frequency
1.	Analysis	17
2.	Studies	152
3.	West Bengal	131
4.	Plants	72
5.	Reference	39
6.	Diversity	38
7.	Special	37
8.	Indian	36
9.	India	34
10.	District	33
11.	Biochemical	28
12.	Growth	24
13.	Production	22
14.	Darjeeling	17
15.	Plant	16
16.	Tea	16
17.	Culture	14
18.	Molecular	14
19.	Assessment	13
20.	Mutagenesis	13
21.	Paschim Medinipur	13
22.	Sikkim	11
23.	Taxonomic	11

Sl. No.	Name of keywords	Frequency
24.	Family	10
25.	Evaluation	9
26,	Stress	8
27.	Species	7
28.	Investigation	6
29.	Medicinal	6
30.	Pharmacognostic	6
31.	Biology	5
32.	Flora	5
33.	Antioxidant	4
34.	Birbhum	4
35.	Phytochemical	4

Table 7.7 - Frequency of Title Keywords of Ph.D. theses of six Universities

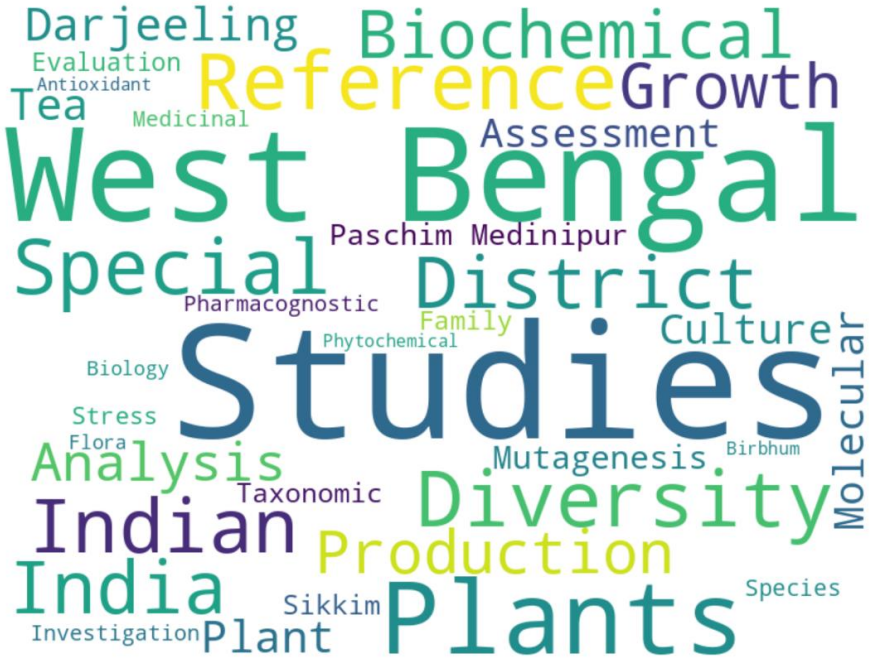

Figure 7.*7 - Frequency of Title Keywords of Ph.D. theses of six Universities*

The analysis of title keywords in Ph.D. theses across six universities reveals that "Studies" is the most frequently used keyword, appearing 152 times, followed by "West Bengal" (131 occurrences). Other commonly used keywords include "Plants" (72), "Reference" (39), and "Diversity" (38), indicating a strong focus on regional and plant-related research. Keywords such as "Indian" (36), "India" (34), and "District" (33) suggest a geographical emphasis, particularly on specific areas like West Bengal and Darjeeling. "Biochemical," "Growth," and "Production" also appear frequently, reflecting the scientific and production-oriented nature

of the research. Less common but notable keywords include "Medicinal," "Molecular," and "Assessment." The overall distribution of keywords points to a diverse range of research topics, with a strong regional and botanical focus in the titles of the theses.

6.2 Analysis and Interpretation of Data on Citations

The analysis and interpretation of data on citations focuses on understanding the patterns and trends in the sources referenced in the doctoral theses. This section examines various aspects, such as the average number of references per thesis, the bibliographical forms used, and the authorship patterns of the cited works. Through this analysis, the chapter provides insights into the research practices of research scholars and the scholarly resources that influence their work.

6.2.1 Average Number of References per Theses

The analysis of the average number of references per thesis in the doctoral research submitted to the University of Calcutta reveals fluctuations in citation practices over the years. The data shows variations in the average citation count across different years, reflecting trends in research depth and referencing habits.

		CU	KU	NBU	BU	VU	VBU	ALL	
Sl. No.	Year	No. of Citation	No. of Citation	No. of Citation	No. of Citation	No. of Citation	No. of Citation	Total No. of Citation	Average Citation per Thesis
1.	**2000**	1258	1317	626	768	-	-	3969	3.67
2.	**2001**	161	161	866	163	-	-	1351	1.25
3.	**2002**	495	506	791	471	-	-	2263	2.09
4.	**2003**	1034	1005	0	0	-	-	2039	1.88
5.	**2004**	985	881	164	259	-	-	2289	2.11
6.	**2005**	1372	1214	284	322	-	-	3192	2.95
7.	**2006**	1116	1242	509	1194	-	-	4061	3.75
8.	**2007**	1248	1266	159	0	-	-	2673	2.47
9.	**2008**	1160	1238	173	322	-	-	2893	2.67
10.	**2009**	1506	1396	184	1068	-	-	4154	3.84
11.	**2010**	1469	1464	0	0	315	0	3248	3.00
12.	**2011**	937	1036	1042	390	194	309	3908	3.61
13.	**2012**	2020	2617	437	1154	137	1268	7633	7.05
14.	**2013**	1583	1559	1797	1504	171	478	7092	6.55
15.	**2014**	1702	1424	1007	285	929	782	6129	5.66
16.	**2015**	2006	1901	1030	1039	507	470	6953	6.42
17.	**2016**	3346	2940	1026	1107	739	2016	11174	10.32
18.	**2017**	2394	2636	2900	1126	595	574	10225	9.44
19.	**2018**	2991	3453	642	1407	1342	1321	11156	10.30
20.	**2019**	3019	3262	639	670	1082	1494	10166	9.39
21.	**2020**	178	157	0	542	0	831	1708	1.58

Table 7.8 - Average Number of References per Theses of six Universities

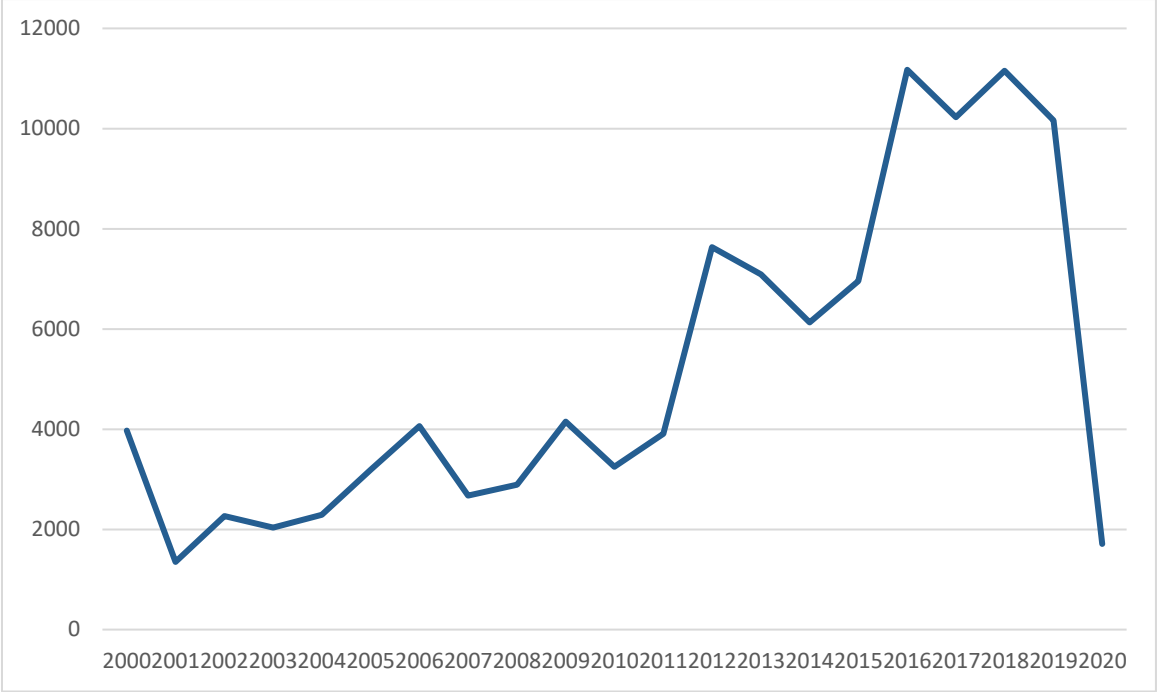

Figure 7.8 - Average Number of References per Theses of six Universities

The data on the average number of citations per thesis across six universities shows a general upward trend from 2000 to 2019, with some fluctuations. In 2000, the average citations per thesis was 3.67, with a total of 3969 citations. There was a decline in citations in the early 2000s, with 2001 showing a significant drop to 1.25 citations per thesis. However, from 2005 onwards, the average citation number steadily increased, peaking at 10.32 in 2016. The years 2017 and 2018 maintained high averages of 9.44 and 10.30, respectively, indicating continued growth in citation frequency. In 2020, the average citation dropped significantly to 1.58, likely due to fewer thesis submissions and citations. Overall, the data reflects an increasing trend in citations, especially between 2012 and 2016, with a noticeable decline in 2020. The total number of citations peaked in 2016, with 11,174 citations across all universities.

6.2.2 Bibliographical Form-wise Distribution of Citations

The bibliographical form-wise distribution of citations in the doctoral theses outlines the various sources referenced by the researchers. It categorizes the citations into different forms, such as journal articles, books, conference proceedings, and online resources. This distribution provides a clear view of the types of references that influence academic research within the department.

Sl. No.	Name of Bibliographic form	CU	KU	NBU	BU	VU	VBU	Total No. of Citation	
		No. of Citation	No. of Citation	No. of Citation	No. of Citation	No. of Citation	No. of Citation		
1.	Journal Articles	16975	24691	10563	9970	4545	8202	74946	69.22
2.	Book Chapters/Edited Books	1400	4456	1507	1538	495	804	10200	9.42
3.	Theses/Dissertations	2100	557	219	595	270	107	3848	3.55
4.	Conference Proceedings	3150	371	493	298	225	52	4589	4.24
5.	Web Resources/ Online Articles	4200	929	699	547	90	56	6521	6.02
6.	Reports	700	557	343	348	135	107	2190	2.02
7.	Miscellaneous/Unclear	3455	1114	453	496	251	214	5983	5.53

Table 7.9 - Bibliographical Form-wise Distribution of Citations of the Theses of the University of Calcutta

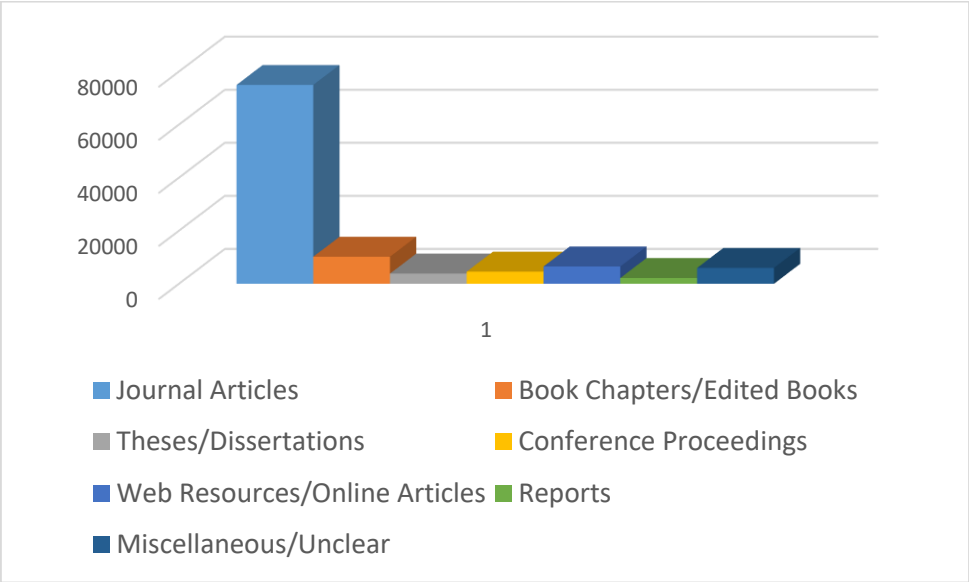

Figure 7.9 - Bibliographical Form-wise Distribution of Citations of the Theses of six Universities

The bibliographic form-wise distribution of citations across the theses from the University of Calcutta reveals that journal articles are the most frequently cited source, accounting for 69.22% of the total citations with 74,946 citations. Book chapters and edited books follow with 9.42% of the total citations, amounting to 10,200 citations. Theses and dissertations contribute 3.55% (3,848 citations), while conference proceedings account for 4.24% (4,589

citations). Web resources and online articles contribute 6.02% of the citations, totaling 6,521, and reports make up 2.02% (2,190 citations). Miscellaneous or unclear sources represent 5.53% with 5,983 citations. Overall, journal articles dominate the bibliographic sources in the research, while other forms such as book chapters, conference proceedings, and online resources play a secondary yet significant role.

6.2.3 Authorship Pattern

The authorship pattern of citations in the doctoral theses categorizes the number of authors associated with the cited works. This distribution highlights the collaborative nature of research, with a significant proportion of citations coming from works authored by two or three individuals. The data reflects trends in research collaboration and the role of multi-author studies in shaping the academic output of the department.

	CU	KU	NBU	BU	VU	VBU	ALL	
Authorship	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**TOTAL**	**%**
One	7603	372	2570	3564	1502	2335	**17946**	**16.57**
Two	8381	1300	3855	2862	1802	2944	**21144**	**19.53**
Three	6653	2042	4140	2376	1201	2081	**18493**	**17.08**
Four	3715	3713	2142	1566	691	1167	**12994**	**12.00**
Five	2950	2228	714	972	343	558	**7765**	**7.17**
More Than five	2678	23021	857	2451	472	457	**29936**	**27.65**

Table 7.10 - Authorship Pattern of Citations of the Theses of six Universities

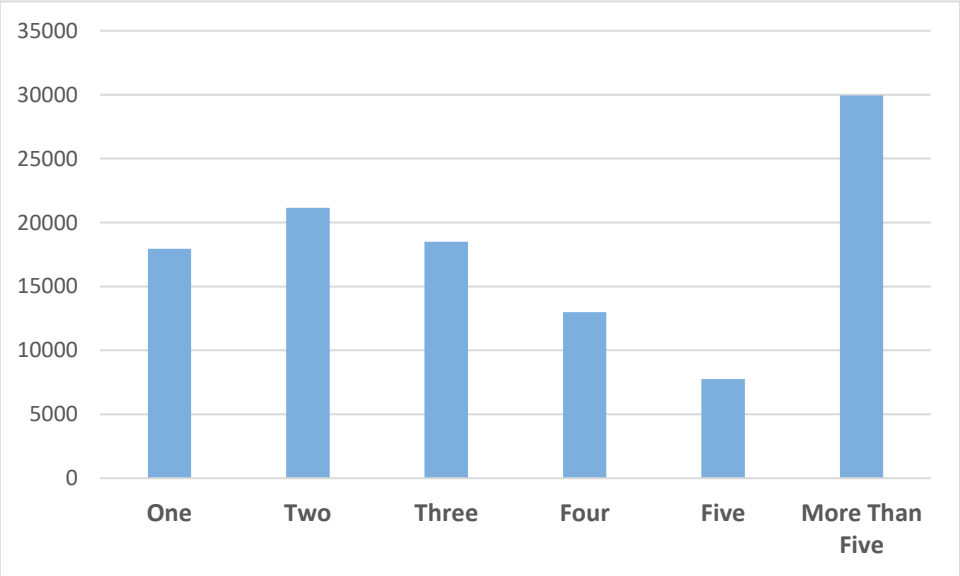

Figure 7.10 - Authorship Pattern of Citations of the Theses of six Universities

The authorship pattern of citations across six universities reveals a diverse range of collaboration in research. The category with the highest contribution is "More Than Five" authors, accounting for 27.65% of the total citations, with 29,936 citations. This is followed by "Two" authors, contributing 19.53% (21,144 citations), and "Three" authors, with 17.08% (18,493 citations). The category "One" author represents 16.57% of the total citations (17,946 citations), while "Four" authors contribute 12.00% (12,994 citations). "Five" authors have a smaller share, accounting for 7.17% (7,765 citations). Overall, the data indicates a significant trend toward multi-author collaborations, particularly with more than five authors contributing the largest proportion of citations.

CHAPTER VII

FINDINGS, SUGGESTIONS AND CONCLUSION

7 Introduction

This chapter provides a detailed analysis of examining various facets of doctoral research, such as the distribution of theses over the years, the patterns of academic supervision, the focus areas within the field of Botany, and the gender representation among researchers, the study paints a comprehensive picture of the evolution of doctoral education in these institutions. The analysis reveals trends in research productivity and the shifting priorities within the field of Botany. It also explores how academic supervision has influenced the quality and direction of research, highlighting the evolving role of faculty members in guiding students. Additionally, the chapter reflects on the changing dynamics of gender representation in the doctoral research landscape, a factor that speaks volumes about broader societal shifts over the past two decades. In essence, this chapter aims to offer more than just a snapshot of research output; it seeks to uncover the underlying patterns, shifts, and influences that have shaped the doctoral research environment across these universities. By delving into these elements, the study hopes to contribute to a deeper understanding of the state of doctoral education in Botany in this region and how it has evolved in response to both academic and societal changes.

7.1 Summary of Findings

The findings are summarized as follows:

7.1.1 Year-wise Distribution of Theses

- The total number of Ph.D. theses submitted across the six universities from 2000 to 2020 was 663.
- The University of Calcutta (CU) had the highest contribution, particularly in 2016, contributing 21 theses, which was the peak year across all universities.
- The University of Kalyani (KU) followed closely, showing consistent submissions, especially from 2010-2016.
- The total submissions showed a marked decline in 2020, primarily due to the global pandemic's impact on academic activities.

7.1.2 University-wise Distribution of Theses

- CU led with a total of 216 theses, accounting for 32.6% of the total submissions.

- KU and NBU followed with 175 and 93 theses, respectively, showing significant academic output in the first decade.

7.1.3 Supervisor-wise Distribution of Theses

- The majority of these were supervised by a small group of faculty members.
- At CU, Anita Mukherjee and Sumita Jha guided the most theses, with 16 and 14 theses respectively.
- Similarly, Animesh Kumar Datta at KU and Ambarish Mukherjee at BU supervised a significant portion of the theses.
- The concentration of supervision among a few key faculty members suggests that the top supervisors play a critical role in the research output.

7.1.4 Supervising Pattern Distribution of Theses

- Single supervision was the dominant model across all universities, with 73.6% of the theses being supervised by a single faculty member.
- Joint supervision accounted for 26.4%, indicating that collaborative research is still practiced but to a lesser extent.
- The preference for single-supervisor models is consistent across all six universities, showing a traditional approach to mentoring doctoral students.

7.1.5 Gender-wise Distribution of Researchers

- The gender distribution of researchers revealed a near-equal split, with males contributing to 52.5% and females to 47.5% of the total submissions.
- CU and KU showed a relatively balanced gender representation, while VU had a higher proportion of male researchers, contributing to 74.3% of the total theses.

7.1.6 Subject-wise Distribution of Theses

- Cytology was the leading research subject across all universities, with a total of 141 theses (21.27% of all theses).
- Genetics (66 theses) and Plant Ecology (54 theses) followed as significant research areas.

- The subject distribution indicates a strong focus on cellular biology and environmental studies, with other fields like Palaeobotany and Plant Anatomy contributing relatively fewer theses.

7.1.7 Number of Words Used in the Title of Theses

- The majority of thesis titles had between 11 to 15 words, which is the most common title length across the six universities.
- There was a clear preference for descriptive titles, with fewer theses having very short or excessively long titles.

7.1.8 Frequency of Title Keywords

- Common keywords in titles across all universities were related to core areas of Botany such as “Cytology,” “Genetics,” and “Plant Ecology,” reflecting the primary focus areas of research.
- Less frequent but still notable keywords included “Medicinal Botany” and “Microbiology,” aligning with emerging trends in environmental and biomedical research.

7.1.9 Average Number of References per Thesis

- The average number of references per thesis varied by university, with CU showing the highest reference count, indicating a well-researched academic approach.
- References primarily included academic journal articles, books, and conference papers, reflecting comprehensive literature reviews in the submitted theses.

7.1.10 Bibliographical Form-wise Distribution of Citations

- The majority of citations came from journal articles, constituting 69.22% of the total citations, making them the dominant source in academic research.
- Books and book chapters accounted for 9.42% of citations, reflecting their significant role in supporting doctoral research, though secondary to journal articles.

7.1.11 Authorship Pattern

- Most theses were written by single authors, with a smaller proportion co-authored by two or more individuals.

- This reflects the traditional approach to doctoral research at these institutions, with less emphasis on collaborative authorship.

7.2 Barriers of the Study:

This study faced several barriers that limited the depth of analysis and presented challenges in presenting a complete picture of the research landscape across these universities.

One major barrier was the inconsistency in data availability, particularly regarding thesis submissions. Some universities exhibited fluctuating trends in submissions, which could be attributed to several external factors, such as shifts in departmental priorities, variations in faculty engagement, and changes in institutional support for research. These variables are difficult to quantify and hinder efforts to establish consistent trends. Additionally, data gaps, such as missing years like 2003, 2007, and 2010 in certain universities, likely reflect institutional or administrative challenges, further complicating the task of drawing conclusions regarding the progression of research activities. These inconsistencies limit the reliability of long-term trend analysis.

Another significant barrier was the disruption caused by the COVID-19 pandemic. The global health crisis severely affected academic institutions worldwide, including in India, leading to university closures, research disruptions, and delays in thesis submissions. For instance, during 2020, some universities, such as the University of Calcutta and Visva Bharati, saw a significant decline in research output. This disruption calls for further research on how academic institutions can adapt to and continue their research activities during global crises.

While the data captured the year-wise and supervisor-wise distribution of doctoral research, it did not provide insights into the quality or impact of the research conducted. Future studies could assess the broader influence of doctoral research by evaluating metrics such as publications, citation counts, and the employment trajectories of graduates.

7.3 Suggestions:

Based on the findings of this study, several recommendations can be made to improve the quality and quantity of doctoral research in Botany across the universities involved:

7.3.1 Enhance Collaborative Research: More collaborative supervision might encourage multidisciplinary research, even if solitary supervision is still the most common type. Encouraging faculty members from other departments to work together to supervise doctorate

students may enhance the research process and promote the investigation of many viewpoints, which will eventually provide more creative results.

7.3.2 Strengthen Research Funding: According to the study, research funding and doctorate research output are correlated. As a result, academic institutions have to think about boosting research funding, especially for initiatives pertaining to new areas of botany. In addition to increasing research output, such initiatives would support the retention of top researchers in the organizations.

7.3.3 Encourage International Collaborations: Individuals with doctorates may participate in international and cross-cultural research by establishing collaborations with universities and research institutions around the globe. Researchers' academic experiences may be enhanced by these partnerships, which can result in the sharing of resources, the sharing of information, and the creation of international networks.

7.3.4 Encourage Interdisciplinary Research Themes: Research in botany should be promoted to interact with other fields like genetics, environmental science, and biotechnology rather than being carried out in isolation. By creating new opportunities for creativity and problem-solving, interdisciplinary research may increase its relevance and influence.

7.3.5 Research Topic Diversification: Universities need to think about broadening their scope of study. Research subjects should become more diverse by focusing on cutting-edge areas like bioinformatics, plant-based therapeutics, and environmental sustainability.

7.3.6 Addressing Research Gaps: Certain areas, such as cytogenetics, molecular biology, or ecology, are preferred in many PhD initiatives, whereas newer ones, like plant-based medications or climate change, get less attention. Universities might set up internal review panels to find areas that need more study and motivate students to concentrate on them.

7.4 Scope of the further Research:

Given the barriers encountered in this study, several areas require further investigation to provide a more comprehensive understanding of doctoral research trends and challenges in Indian universities. These areas include:

7.4.1 Broader Institutional Comparison:

This study focused on a select group of universities, but future research could expand the sample to include a wider array of institutions across India. A cross-university comparison

could shed light on institutional factors such as funding, faculty experience, research infrastructure, and institutional policies, offering insights into how these factors influence doctoral productivity. A broader scope would also help establish whether the trends observed in these five universities are representative of national patterns or if they are isolated to specific regions or departments.

7.4.2 Gender Disparities: Despite some progress in gender representation, the study found that certain universities, like the University of North Bengal, still had a higher proportion of male researchers. A more in-depth exploration of the causes behind these gender disparities—especially in departments with low female representation—could uncover institutional or societal barriers preventing women from pursuing doctoral studies. Research could focus on mentorship availability, work-life balance, and gender biases in academia, with the goal of fostering a more inclusive academic environment.

7.4.3 Supervision Models: The study observed the dominance of the single-supervisor model across the universities, yet a significant proportion of doctoral theses were co-supervised. Further research into the comparative benefits and drawbacks of single-supervisor versus joint supervision could provide valuable insights into how the latter fosters interdisciplinary research, encourages collaboration, and enhances research quality. Exploring faculty collaboration and external partnerships would also help identify strategies for improving research output through enhanced cooperation.

10.4.4 Funding and Research Output: The relationship between research funding and doctoral research output remains a crucial area of investigation. A study into how funding levels correlate with thesis submissions could offer insights into how financial resources influence the quantity and quality of research. Institutions or departments with greater funding may experience higher levels of research activity, and examining these disparities could lead to strategies for balancing funding allocation and supporting research productivity.

7.5 Conclusion

The analysis of doctoral research across five major universities in India reveals a steady growth in research output over the past two decades, particularly between 2012 and 2019. This growth is largely attributed to improvements in academic infrastructure, faculty involvement, and departmental support. The study indicates that while the single-supervisor model remains prevalent, there is a noticeable trend toward joint supervision, reflecting a broader emphasis on interdisciplinary research. Female participation in doctoral research has also increased,

especially at the University of Calcutta. However, gender imbalances persist in certain universities, signalling a need for continued efforts toward gender parity in academic research. Research subjects such as Cytology, Genetics, and Plant Ecology have seen a marked focus, aligning with global trends, while areas like Microbiology and Palaeobotany received fewer submissions, suggesting a need to explore shifts in research priorities or expertise gaps. Additionally, fluctuations in thesis submissions across years, influenced by faculty turnover, departmental changes, and global disruptions, indicate the necessity of strategies to stabilize research output. In conclusion, while significant progress has been made, further attention is required to address gender disparities, stabilize research output, promote interdisciplinary supervision, and better understand the impact of external factors like funding and the COVID-19 pandemic. By adapting academic strategies, Indian universities can continue to enhance their research capabilities, contributing to the advancement of global scientific knowledge.

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APPENDICES

APPENDIX-1

Citation Analysis of Doctoral Theses on Botany Completed at the University of Burdwan (2000-2019)

Sayantani Majumder* and Dr. Subarna Kumar Das**

Abstract

The purpose of this study is to examine the distribution of botany theses at The University of Burdwan from 2000 to 2019 and to oversee research, analyse the performance in a particular field, determine the mean number of written citations for botany, and assess research collaboration using citation authorship. Taking this investigation's findings into consideration, data were collected, analysed, and produced. The scientific research has changed over time, citation analysis of 79 PhD theses of botany completed at The University of Burdwan from 2000 to 2019 has been done. There are 23527 bibliographic references in the 79 botany PhD theses. The mean number of references each thesis is 297.81.The study found that the trend in authorship was toward team works instead of works done by one person. Even though the number of single-author contributions has been going down, they are still being made. There was also an analysis of how different aspects of the cited literature changed over time. The rate of collaboration, as well as the supervisory pattern, authorship pattern, and productivity of theses according to year, are all subjected to research. In order to determine what kinds of documents are most often used in the research activity, the citations are examined. This descriptive study examines the progression of the research activities that followed University of Burdwan Botany Doctorate degrees.

Keyword: Citation Analysis, Botany, Supervisors, Authorship, References

Introduction: The utilization of a publication is most accurately represented by its citations, which are the most reliable indicators currently available. The entire bibliographic description of a referenced source that is utilized in or is pertinent to a specific research endeavor is referred to as a citation. The word "citation" refers to this description. A comprehensive examination of citations in a field gives a criterion for assessing the level of contact among scholars. Bibliometrics is a collection of methodologies for studying and measuring texts and information. Contentanalysis and citation analysis are two typical bibliometric methodologies. In the discipline of library and information science, bibliometrics is a growing research focus. Calculations based on mathematics and statistics are used to conduct this process, which include the quantitative analysis of publications covering all micro and macro communications. The study of bibliometrics may be used to any subject to determine the patterns and development of the literature.

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LIS Today. 8, 1-2; Dec 2022, p. 101

Trends in Library and Information Science: a content analysis of Library Hi Tech News 2017-2021

Sayantani Majumder

Research Scholar, Department of Library and Information Science, Jadavpur University

Dr. Subarna Kumar Das

Professor, Department of Library and Information Science, Jadavpur University

Abstract

This paper analyses the various areas of library and information science (LIS) research published in Library Hi Tech News journal, focusing on authorship patterns, collaboration trends, and globalisation. This study looked at research and changes in the LIS fields. It did this by looking at all of the Library Hi Tech News articles that came out between 2017 and 2021.The total number of papers published in each issue, the number of authors, the national rankings of publications, the research field, research design, bibliographic analysis, and downloads are just a few elements of key criteria for data analysis. Results are based on a statistical analysis of published articles available in the journal portal based on different parameters i.e. - article per issue, authorship, locations, keywords, research area, research design, references, downloads, etc. In light of this, this article may be helpful for all library scholars and professionals working in the world of LIS who are involved in various initiatives, including the usage of cutting-edge ICT and other pertinent fields.

Keywords: Bibliometrics, Content Analysis, Data analysis, ICT, Library and Information Science, Library Hi Tech News

1. Introduction

Library Hi Tech News is a very popular journal in the LIS field and many articles are published in the fields of artificial intelligence, big data, etc. in this journal. Library High Tech News (LHTN) is one of the leading international journals on library technology. This journal's current H-Index is 20 and its last five-year impact factor was 1.697. In LHTN, you'll find articles of various lengths, conference reports, and in-depth assessments of technology's implications for libraries. Everyone who reads LHTN agrees that it is the ideal source for information about upcoming technology developments for academic and public libraries. In this study, the importance of this journal in the domain of LIS is shown from different points of view and through statistical data analysis.

2. Literature review

Trends in distance education research areas, keywords indicated, data collection tools, references cited, etc. were investigated by Bozkurt et al. (2015) in seven journals, i.e.- AJDE, DE, EURODL, JDE, JOLT, OL, and IRRODL. These periodicals contributed a total of one thousand two hundred twenty-five papers that were chosen and published during the years 2009 and 2013. The findings of the

APPENDIX-2

REPLICA OF TITLE PAGES OF THESES

Cloning, Sequence analysis and Characterization of DNA polymerase from *Geobacillus* sp. WBI

A thesis submitted to the

Visva-Bharati (A central University)

for the degree of Doctor of philosophy (Science)

By

Shreenath Nayak

Department of Botany

Institute of Science

Visva-Bharati

Santiniketan – 731235

India

2012

SEARCH FOR NOVEL ANTIMICROBIAL COMPOUND FROM SOME PLANT RESIDUE

THESIS SUBMITTED

for

THE DEGREE OF DOCTOR OF PHILOSOPHY (SCIENCE)

of

VISVA-BHARATI

by

POMPEE CHANDA

DIVISION OF MICROBIOLOGY
DEPARTMENT OF BOTANY
SCHOOL OF LIFE SCIENCE
VISVA-BHARATI
SANTINIKETAN 731 235

2013

BOTANICAL AND SOCIO-CULTURAL STUDIES ON SOME SACRED GROVES OF WEST MIDNAPORE DISTRICT, WEST BENGAL

Thesis submitted to Vidyasagar University in partial fulfillment of requirements for the degree of
Doctor of Philosophy in Science

Submitted by
UDAY KUMAR SEN

Department of Botany & Forestry
Vidyasagar University
Midnapore - 721102

2016

STUDY ON SOIL FERTILITY RESTORATION IN OVERBURDEN DUMPS THROUGH BIOLOGICAL MEANS IN BASTACOLA OPENCAST MINE, JHARIA (JHARKHAND) COALFIELDS

Thesis submitted to Vidyasagar University on partial fulfilment for the requirement for the award of the degree of

Doctor of Philosophy in Science

Submitted by

CHITRALEKHA SENGUPTA

Department of Botany and Forestry

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West Bengal, India

&

Central Pollution Control Board,

(Under Ministry of Environment Forest and Climate Change)

Eastern Zonal Directorate, 1582 Rajdanga Main Road,

Kolkata-700107, West Bengal, India

2018

Survivability and Growth of Foodborne Bacterial Pathogens As Influenced by Processing Technologies During the Production and Storage of Some Legume-based Traditional Foods of India

Thesis submitted to the University of North Bengal for the Award of Doctor of Philosophy in Botany

BY
Mousumi Rakshit

SUPERVISOR
Prof. P.K. Sarkar

Department of Botany
University of North Bengal
August, 2014

STUDIES ON BIOLOGY OF *SECHIUM EDULE* SW. IN DARJEELING HILLS : 1. IMPROVEMENT OF CROP PRODUCTIVITY 2. SURVEY OF ANIMAL PESTS

THESIS SUBMITTED FOR THE THE DEGREE OF DOCTOR OF PHILOSOPHY (SCIENCE) OF THE UNIVERSITY OF NORTH BENGAL

By
Satyabrata Roy, M.Sc.

DARJEELING GOVERNMENT COLLEGE
UNIVERSITY OF NORTH BENGAL
AUGUST, 2000

INVITRO AND *INVIVO* STUDIES IN *Basilicum polystachyon* (L) Moench WITH REFERENCE TO GROWTH, BIOMASS AND SECONDARY METABOLITES.

THESIS
SUBMITTED FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (SCIENCE)
OF
THE UNIVERSITY OF BURDWAN

2006

BY

DIPJYOTI CHAKRABORTY

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BURDWAN-713104
WEST BENGAL
INDIA

SURVEY OF WETLANDS IN PURULIYA DISTRICT, WEST BENGAL, WITH SPECIAL EMPHASIS ON THEIR MACROPHYTES.

THESIS
SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN SCIENCE (BOTANY)
OF
THE UNIVERSITY OF BURDWAN

2012

SUJIT KUMAR MANDAL

UGC Centre for Advanced Study
Department of Botany
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CARPOLOGICAL STUDIES OF SOME MEMBERS OF THE FAMILY COMPOSITAE

THESIS SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (SCIENCE)

OF THE UNIVERSITY OF KALYANI

Volume-1

By

Bidyut Kumar Jana

Department of Botany
Faculty of Science
University of Kalyani
Kalyani-741235, Nadia, West Bengal, India

2015

STUDY ON SOIL ISOLATES OF *FUSARIUM* OF MURSHIDABAD DISTRICT, WEST BENGAL

Thesis submitted to the University of Kalyani

For the Degree of Doctor of Philosophy in the Faculty of Science

By

Roushan Islam

(Regn. No. 011535 of 2003-2004)

Mycology & Plant Pathology Laboratory

Department of Botany

University of Kalyani

West Bengal, India

2018

CORRECTED COPY

STUDY OF CHICKPEA (*Cicer arietinum* L.) TRANSCRIPTOME AND MOLECULAR CLONING OF A CANDIDATE GENE

THESIS SUBMITTED FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY (SCIENCE)

IN

BOTANY

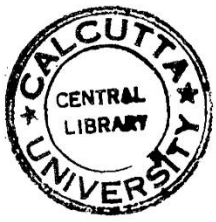
BY

SUSHMITA BISWAS

DEPARTMENT OF BOTANY
UNIVERSITY OF CALCUTTA
2016

Arsenic induced physio-chemical changes in rice (*Oryza sativa* L.) and its amelioration by phosphate

Thesis submitted for the degree of
Doctor of Philosophy (Science) in Botany of the
University of Calcutta



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Plant Physiology and Biochemistry Laboratory
Department of Botany, University of Calcutta

June, 2011

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Paper/Submission ID	4064473
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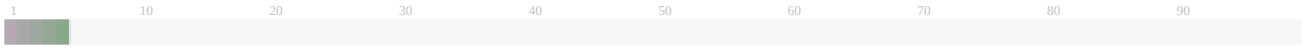

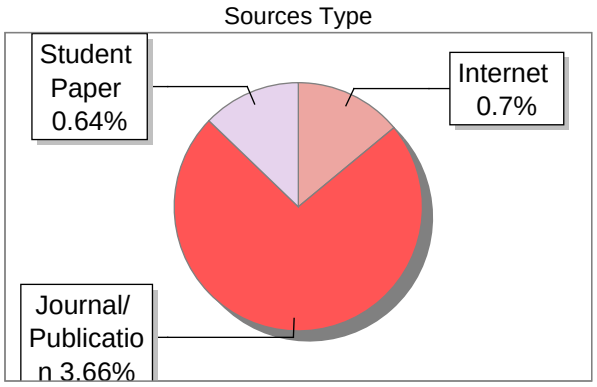

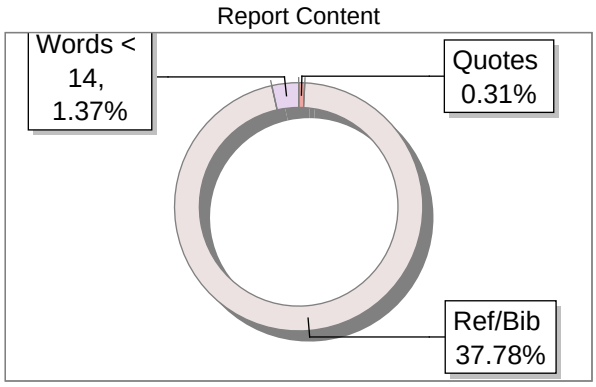

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