



JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Bibliometric analysis: A Case Study of Hemchandracharya North Gujarat University, Gujarat, India

Prajapati Smita R.

Librarian,

Shri V.Z Patel Commerce College, Anand, Gujarat, India
(Affiliated to Sardar Patel University, Vallbhvidyanagar, Gujarat, India)

Abstract:

Bibliometric study is now becoming an interested study area within the researcher community. The present paper is the original bibliometric study of Botany Ph.D. thesis submitted to Hemchandracharya North Gujarat University, Patan (HNGU) during the year 2011 to 2019. From 47 theses, total 8228 citations were extracted and analyzed. The average no of citation per thesis was 175 which was quite low compared to other science theses; Citation distribution showed that 70.14 % citations were Research articles whereas only 13.45 percent of citations were Books. The other citation including Electronic source, Tech report, Manual, Standard, Patent, Ph.D. & Master's thesis and Miscellaneous collectively constitute remaining part of citations. This paper also consist of analysis of different bibliometric parameter .Here, Zipf's law study of words density of titles do not follow the rules similarly, Bradford's law of scattering of articles on journal was found not to fit in the present study.

Index Terms – Botany, Bibliometrics, Citation analysis, Articles, Books, Zipf's law, Bradford's law

I.Introduction

The term reference or citation mentions the full bibliographic picture of a referred material, which is utilized or is applicable to a specific research work. Its analysis is applied to measure the impact and influence of scholarly work by examining the patterns and frequency of citations. Systematic study of citations is often known as 'Bibliometric analysis' where the study of scientific literature is carried out to identify the patterns, trends and impacts within a certain field. The present study is concern with Bibliometric analysis of Ph.D. theses accepted by The Hemchandracharya North Gujarat University, Patan in the faculty of science during 2011-2019.

II.Review of Literature

Literature review is evaluation of previous studies or studies presented which can provides the foundation for any further research. In the paper 'Citation analysis of Doctoral dissertations in Chemistry', Mubeen, M A (1996) reported the study of 22 Ph.D. theses of Chemistry subject submitted to Mangalore University. In 2001, Gooden and Angela presented research on 30 Ph.D. theses with a total of 3,704 citations of Chemistry Department of Ohio state University. In the study titled 'Bibliometric analysis of Doctorate thesis in the Health sciences area, Camps,Rescuer, Samar, & Avila, (2005) analyzed 290 Ph.D. theses from the Dentistry Faculty. Eckel, Edward J (2009).This research analyses citation trends 24 Ph.D. theses in engineering and applied sciences at Western Michigan University's College from 2002 to 2006. Sheshrao, Jadhav Vandana, and V. S. Khaparde. (2011): A citation study of Ph.D. theses in Physics submitted between 2004 and 2008 to the Dr. Babasaheb Ambedkar Marathwada University Library examined how academics utilized information sources. Banateppanvar K., Biradar B.S., Kannappanavar B.U., (2013) published a paper to determine the materials cited in doctoral theses of botany, submitted to the Kuvempu University during the years 2000 to 2006, with the aim of improving the existing collection development of the library. The study by Hanumappa, Desai, and Dora (2015), titled "A Bibliometric Profile of Gujarat University, Ahmadabad during 2004-2013," provides a detailed Bibliometric analysis of the research publications from Gujarat University over a ten-year period.

III.Objective:

This study aims to investigate the following distribution trend and evaluate the characteristics of Botany theses of Hemchandracharya North Gujarat University during 2011 to 2019. (i) Identify the document Year wise Distribution of Doctoral theses, (ii) Identify the Distribution of types of citations.(iii) Geographical distributions of the citations. (iv) Identify Rank of Journal, (v) Identify most productive countries and Publishers of the journals, (v) To find out cited bibliographic forms subject of botany doctoral theses

IV. Research Methodology:

The current study focuses on the citation analysis of PhD theses in botany submitted at Hemchandracharya North Gujarat University, Patan (HNGU) between 2011 and 2019. The data was gathered from 47 Ph.D. theses. The references were categorized as either 'Book', 'Journal', 'Thesis And Dissertation', 'Web Resource', 'Conference Proceeding', 'Technical Report', 'Manual And Standard', 'Patent', 'Digital Resource' or 'Miscellaneous'. All the information of each reference was obtained in to 'Bibtex' format with the help of 'Google Scholar,' 'Citation finder,' 'Cross ref,' and 'Mendeley.' Subsequently, the data were systematically compiled using 'JabRef,' an open-source data management tool. The further analysis was performed by Microsoft excel.

V. Analysis of Doctoral dissertations

5.1. Year wise Productivity

At HNGU, 47 scholars earned their Ph.D. degree between 2011 and 2019 (Table-1). The bulk of PhD dissertations (13) were turned in in 2012; 2011 and 2002 came next. The annual average for both thesis submission and award rate was 4.2.

Table-1 : Year wise Productivity of Botany Ph.D. Theses

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
No. of Theses	7	13	3	5	5	5	5	2	2	47

5.2. No. of Citation:

Theses 47 Ph.D. theses in Botany had 8228 references cited. The average number of citations per thesis was 175; this is quite lower average as compared to the average observed in several review papers.

5.3. Distribution of citations:

In terms of citation categories and distribution (Table-2), it was found that "Articles" from research journals made up the majority of the Bibliometric list, accounting for roughly 70.14% (n=5771). Books and Ph.D. theses accounted for the second and third biggest shares in the citation category, with rates of 13.45% (n=1107) and 5.96% (n=490), respectively. Remarkable numbers also contained the other categories of citations, which included In-Collection & Chapters (n=187), Technical reports (n=199), and Proceedings & Conference papers (n= 282). Other than this, the total number of citations is only 2.34 %.

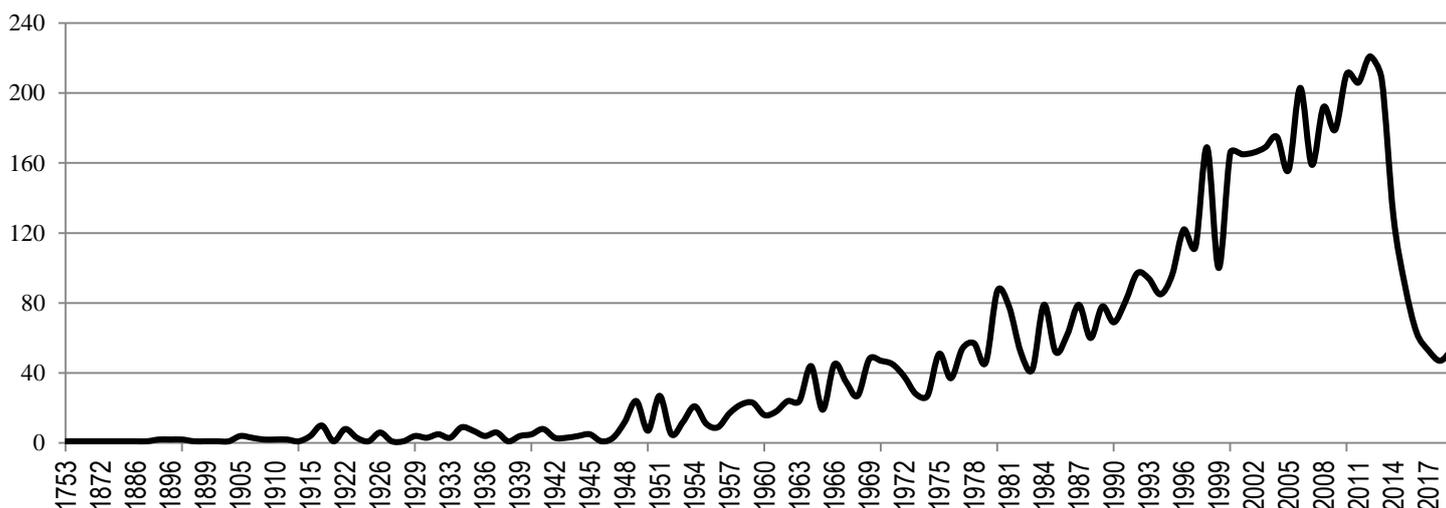
Table-2: Distribution of citations forms (2011-2019)

Citation forms	Count (Percentage)
Research Articles	5771 (70.14 %)
Book	1107 (13.45 %)
Collection & Chapters	187 (2.27 %)
Proceedings & Conference papers	282 (3.43 %)
Technical Report	199 (2.42 %)
Manual	48 (0.58 %)
Standard	21 (0.26 %)
Patent	7 (0.09 %)
Ph.D. /Master's Theses	507 (6.17 %)
Web resources	55 (0.67 %)
Unpublished & Miscellaneous	44 (0.53 %)
Total	8228

5.4. Research Paper Articles:

A total of 5771 papers were cited, with an average of 123 articles used per thesis. The most recent research should be more specific. In this analysis, the graph of the age of the articles shows that 52.1% of the articles were written after the year 2000. 22.21% of the articles are recent and the age is less than 10 years.

Figure-1: Year wise distribution of Research Articles from Journals



5.5. Authorship pattern in Research Articles:

Table 3 has 5771 articles written by 15583 authors. An average paper has 2.70 authors. The percentage of two-author articles is the highest (31.35%), with single-author papers (23.93%), three-author papers (21.23%), and four- to five-author papers (17.48%) following in order. A maximum of 17 authors per article was noted during the study.

Author No.	Single	Two	Three	4 or 5	6 to 8	9 to15	15+	Total
Author per paper	1381	1809	1225	1009	273	73	1	5771
%	23.93	31.35	21.23	17.48	4.73	1.26	0.13	100.00
Total Author	1381	3618	3675	4361	1791	740	17	15583

5.6. Rank of Journals:

Table 4 lists the top 35 ranked publications most frequently mentioned by botany scholars. Botany scholars interacted with 2494 journals. 'Indian Forester' and 'Ethanobotany' were the most popular journals among HNGU botany scholars.

Journal Name	Count	Journal Name	Count
Indian Forester	180	American Journal of Botany	29
Ethanobotany	108	Biological Conservation	28
Indian J. of Traditional Knowledge	79	Indian Journal of Geo-Marine Sci.	27
Current Science	69	Plant and soil	27
life sciences leaflets	68	J of Eco. and Taxonomic Botany	26
Nelumbo	65	New Phytologist	26
Tropical Ecology	42	Phyto Chemistry	26
Ecology	40	Pollution research	26
Journal of Eco. and Taxo. Botany	37	06 Journals Cited by 20-25 times	130
Economic Botany	36	34 Journals Cited by 11-20 times	477
Advances in Plant Sciences	35	99 Journals Cited by 6-10 times	736
Annals of Botany	35	115 Journals Cited by 4-5 times	498
Nature	34	120 Journals Cited by 3 times	360
Indian Journal of Forestry	33	334 Journals Cited twice	668
Science	33	1762 Journals Cited once	1762
Plant Physiology	31	Total (2494 Journal)	5771

5.7. Geographic distributions

The geographical dispersion of journals indicates their original publishing places. It may be calculated that the total number of papers and journals is distributed among 69 nations (Table-5). India leads the way with 41.69% of Indian-originated publications, followed by the United States (19.72%), the United Kingdom (10.97%), the Netherlands (7.21%), and so on

Country	Count	Percent	Country	Count	Percent
1. India	2406	41.69	11. Czech Republic	47	0.81
2. USA	1138	19.72	12. Int. organization	46	0.80
3. United Kingdom	633	10.97	13. Switzerland	32	0.55
4. Netherland	416	7.21	14. China	27	0.47
5. Germany	156	2.70	15. Japan	27	0.47
6. Pakistan	106	1.84	16. Poland	26	0.45
7. Canada	78	1.35	17. Romania	26	0.45
8. Australia	77	1.33	18. Bangladesh	24	0.42
9. France	74	1.28	19. Brazil	23	0.40
10. South Africa	61	1.06	20. UAE	22	0.38

5.8. Books and In-collections:

Books are the most reliable form of communication and knowledge distribution. There were 1294 citations, including books, collections, and chapters. Only 179 (2.27%) of the citations were for books. This list features only the best ten books. Approximately 600 different books were used and cited throughout the duration of the theses.

- Plants of Northern Gujarat
- Flora of Saurashtra (Vol.-I,II & III)
- Flora of Gujarat state
- The flora of the presidency of Bombay
- Dictionary of Indian folk medicine and Ethnobotany
- Textbook of Systematic Botany
- Vanaspati Sastara –Barda Dungarni Jadibutita ni ParikshaaneUpyog.(Gujarati)
- Conserving the sacred: for biodiversity management
- Fundamentals of ecology
- A manual for herbarium collections

5.9. Manuals & Standards

The term "manual" refers to a written instruction manual on how to use a certain device or complete a certain task. There were references to 48 manuals (0.58%). The procedure manual-like contents of standards include inflexible criteria for the lowest level of control. Only 21 (or 0.26%) of Botany theses made reference to any sort of norm. This was coming from Bureau of Indian Standards-India, Standard methods for the examination of water and wastewater from APHA, Indian Standard Specification for Methods of Test for Soils

5.10. Technical Reports:

Any technical report is the researcher's written document summarized the results and outcome of any project and submitted to the sponsor of that project. Such documents are useful in survey studies and discussing the results and writing of Review literature in the Doctoral dissertations. Here 199 (2.42percent) citations were technical reports. The main and significant reports includes Census of India.

5.11. Theses:

A Doctoral dissertation-Thesis is a manuscript submitted in support of submission for an academic degree presenting the author's research and findings. The citation of Ph.D. theses is remarkable and 490 (n=5.96) Doctoral dissertations were used. Among them 121 was from Hemchandracharya North Gujarat University, Patan, 249 from other university of Gujarat, 100 from Indian universities and only 20 from foreign Countries. The highest times of the Ph.D. Doctoral dissertations cited was of Punjani, B. L. (n=16) followed by Patel, K. C.(n=14), ANT H, M. (n=12), Patel, N. K. (n=10) and Prajapati, M. M.(n=8). Here, 17 Masters' Theses were cited

5.12. Patent

Dissection of The bibliometrics field observed the less use of patent citations. So far, only 7 of the possible patents have been reported. They were almost exclusively U.S. patents.

5.13. Proceedings & Conference

Proceedings & Conference are the official record of a meeting held by a group or organization, such as a conference, congress, symposium, or other meeting. Out of all the references, 187 references were fit this description, which is 2.27 percent of total.

5.14. Web resource

This includes, among other things, web resources such as web links, URLs, and blog citations. This type of digital information is routinely included by researchers into their work and cited in their doctoral dissertations. When this occurs, the URL or web address is copied into the citation list, along with the retrieval time. This type of link has been acknowledged 55 times by the researchers, or 0.67 percent of the total.

5.15. Miscellaneous

Unpublished article, Bibliography list, Blog quotation, Editorial Note, Fact sheets, Figure, Lecture Note, Magazine, News, News Paper, Notice, Online News, Periodicals, Power point slide, and Technical Brochure are classified as miscellaneous. The study reported eight.

5.16. Other highlights

- Among 47 Doctoral dissertations, 13 (28%) Doctoral dissertations were submitted by female & 34 (72%) were by male candidates. There were five researcher guide recognised for the botany research.
- Articles (70.14 %) cover the largest portion in citations. It shows that the researchers have found more rely on research based information and it is good sign too
- The citations were placed at the end of the Doctoral dissertations as separate chapter in all 47 theses
- The Pattern of citation style was APA in 39 theses, where as other citation pattern including MLA in two, ACM in four and blend type of pattern in two the theses.
- The use of Ph.D. Doctoral dissertations and Technical Report were quite remarkably used.
- Books on Ethan botany and Medicinal Plants were found more.
- Indian Forester(India) occupies 1st rank (n=180) among the journals cited followed by many reputed journals
- Overall preference for Indian Journals and Articles was outstanding. Most of the books were from Indian author

6. Application of Bibliometric laws

6.1. Applying Zipf's law to thesis titles:

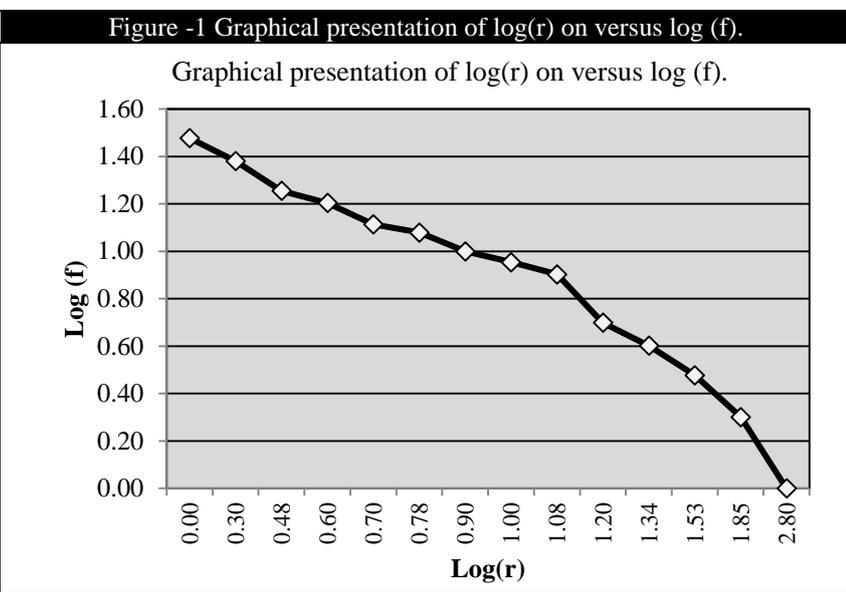
Zipf's law predicts phrase frequency over a text. The law specifies that the words in that text appear in decreasing order, and that the rank of a word on that list multiplied by its frequency equals a constant." (Zipf, 1949). To demonstrate that Zip's rule is valid, we must calculate $r \times f = c$, where r is the rank number and f is the frequency of each sentence. Zipf's rule is not statistically valid, but it is ideal for term weighting in search engines that use automated indexing (Rana, M. S. 2015).

It has been observed from table 4.15 that Zipf's Law approximates the relationship between rank r and frequency f . The log of product of rank (r) and frequency (f) of occurrence of keyword ($\log c$) is ranged between 1.11 to 2.74 which is not consistent in all frequency of words hence Zipf's law is not valid for present study.

Alternatively, plotting the data Zipf's law is valid. Remember that focusing solely on the most and least frequent phrases is the simplest way to prove may be deceiving. Zipf's law has the most errors for these types of words. Instead of plotting r vs. frequency (r), plot $\log(r)$ on the x-axis and $\log(f)$ on the y-axis is better option. In the graphical representation of Log of ranking and Log of frequency (Figure-1), it is observed that there is poor correlation between words ranking and words frequency as the line is not straight in the middle part of graph

Table : 6 Rank frequency of occurrence of keyword

Frequenc y (F)	No. of Key Word	Rank (.r)	Log(r.)	Log(f)	Product (rf=C)	Loge
30	1	1	0.00	1.48	30	1.48
24	1	2	0.30	1.38	24	1.38
18	1	3	0.48	1.26	18	1.26
16	1	4	0.60	1.20	16	1.20
13	1	5	0.70	1.11	13	1.11
12	1	6	0.78	1.08	12	1.08
10	2	8	0.90	1.00	20	1.30
9	2	10	1.00	0.95	18	1.26
8	2	12	1.08	0.90	16	1.20
5	4	16	1.20	0.70	20	1.30
4	6	22	1.34	0.60	24	1.38
3	12	34	1.53	0.48	36	1.56
2	37	71	1.85	0.30	74	1.87
1	554	625	2.80	0.00	554	2.74



6.2. Bradford’s law of scattering for the research journals

According to The Bradford’s Law, Each zone produces 1/3 of total relevant papers and the number of periodicals. As per the law, the ratio of each zone remains 1: n: n² i.e. initially, 1/3 of all journal citations are covered by top fewer journals, whereas the second 1/3 is covered by more journals than the first one-third. The remaining 1/3 of citations are covered by more journals than the second 1/3. Bradford expressed this relationship as 1: n: n², but he never defined the law mathematically – n was set at approximate

Table-7 Application of Bradford’s law of Scattering

Zone	No. of Journals	No. of Citations	Experimental Value	Theoretical Value as per Bradford’s law	
Core zone	80	n=1925 (33.35 %)	1	80	1
Zone 1	568	n=1923 (33.32 %)	n=7.1	560	n=7
Zone 2	1846	n=1923 (33.32 %)	n ² =36.62	3920	n ² =49
Total	2494	n=5771		4560	

In this study, the total article citations were 5771 and 1/3 of it is 1924. As shown in the Table- 7, First 1/3 citations are only from top ranked 80 journals (n=1925). Second 1/3 are articles (n=1923) are from next 568 ranked journals. In the last zone estimated 1846 journals that cover 1923 articles. Thus, the actual ratio is 80:568:1846::1: n: n². Here 80 represent the number of periodicals and a multiplier ‘n’ is 7.1 (‘n’=568/80=7.1) Therefore, as per Bradford’s law the calculated ratio should be 1:7:49, Whereas the actual ratio is 1:7.1: 36.62. Bradford’s distribution states that the relationship between the zones is 1: n: n², yet the relationship of each zone in the current research did not completely fit into Bradford’s distribution. The percentage of error can be calculated as follow.

$$\text{Percentage of error} = \frac{|\text{Experimental Value} - \text{Theoretical Value}| \times 100}{|\text{Theoretical Value}|}$$

$$= \frac{|(4560-2495)|}{|4560|} * 100 = 45.29 \%$$

The Bradford’s algebraic interpretation of his law, 1: n: n² is followed in this case. But the number of articles in third zone follows the one third of the total citations with deviation (Percentage of error = 45.29 %) In one of his articles, Cline responded that such group of data which contains smaller percentage errors indicate a closer adherence to the Bradford distribution (Cline, 1981).

Conclusion

It is tried to trace the development of scientific research through citation Study of Doctoral theses submitted to Hemchandracharya North Gujarat University, Patan in botany subject during 2011 to 2019. It is observed that the Bibliometric analysis in a botany subject has brought insight of the referenced cited, their importance in assistance of Botanical Researches in many ways Such analysis may begin more citation studies for the purpose of research in Botany in India.

References

- [1]. Banateppanvar, K., Biradar, B. S., & Kannappanavar, B. U. (2013). Citation analysis of doctoral theses in Botany submitted to Kuvempu University, India: a case study. *Collection Building*, 32 (1), 12-21. <https://doi.org/10.1108/01604951311295058>
- [2]. Baysan, C., Yapar, D., Tokgöz, M. A., Yapar, A., Baysan, E. K., & Tolunay, T. (2021). Bibliometric analysis of orthopedic theses in Turkey. *Joint diseases and related surgery*, 32(3), 752.
- [3]. Biswas, B. C., Roy, A., & Sen, B. K. (2007). Economic Botany: a bibliometric study. *Malaysian Journal of Library & Information Science*, 12(1), 23-33.
- [4]. Camps, D., Recuero, Y., Samar, M. E., & Avila, R. E. (2005). Bibliometric analysis of doctorate thesis on the health sciences area: first part, odontology. *Journal of the Faculty of Medical Sciences*, Argentina. 62(3), 53-56. <https://europepmc.org/article/med/16972734>
- [5]. Das, J. M. (2020). Citation Analysis of Doctoral Theses in Library and Information Science Submitted To Manipur University during 1989-2017.

- [6]. Eckel, E. J. (2009). The emerging engineering scholar: a citation analysis of theses and dissertations at Western Michigan University. *Issues in Science & Technology Librarianship*, 2009(56). [DOI:10.5062/F4HD7SKP](https://doi.org/10.5062/F4HD7SKP)
- [7]. Gadhvi, G. G., Chavda, P., & Pandya, P. (2020). Citation Patterns followed in Research Papers of the DESIDOC Journal of Library & Information Technology. *Library Philosophy and Practice*, 1-16.
- [8]. Garg, K. C. (2019). PhD theses accepted by Aligarh Muslim University (AMU) in the discipline of chemistry: A Bibliometric Study (1935-2014). *Journal of Indian Library Association*, 54(2).
- [9]. Garg, K. C., & Duggal, M. (2018). A bibliometric study of Ph D theses accepted by Bangalore University in disciplines of zoology, botany and physics during 1969–2015. *Library Herald*, 56(3), 318-327.
- [10]. Hood, W. W., & Wilson, C. S. (2001). The literature of bibliometrics, scientometrics, and informetrics. *Scientometrics*, 52(2), 291-314.
- [11]. Hussain, A., & Fatima, N. (2011). A bibliometric analysis of the 'Chinese Librarianship: an International Electronic Journal,(2006-2010)'. *Chinese Librarianship: an International electronic journal*, 31, 1-14.
- [12]. KG Pillai, S., & Priyalakshmi, V. (2013). Research publication trend among the scientists of Central Tuber Crops Research Institute (CTCRI), Thiruvananthapuram: A scientometric study. *Annals of Library and Information Studies (ALIS)*, 60(1), 7-14.
- [13]. Mubeen, M. A. (1996). Citation analysis of doctoral dissertations in chemistry. *Annals of Library and Information Studies*. 43(2), 48-58. <https://nopr.niscair.res.in/handle/123456789/27538>
- [14]. Pandita, R., & Singh, S. (2017). Doctoral dissertations in humanities in Indian universities during 2010-2014.
- [15]. Pawar, M. S., & Chandrappa, S. (2020). Bibliometric Analysis of Botany Doctoral dissertations Award by Pt Ravishankar Shukla University Year 1990-2017. *Research Journal of Humanities and Social Sciences*, 11(3), 241-246.
- [16]. Prajapati Smita, Prajapati Rajendra & Jani Kanakbala (2022). Bibliometric Study of Microbiology Ph.D. Thesis Submitted to Hemchandracharya North, Gujarat University, Patan. "Role of Libraries In Transforming Societies" Proceeding in National Seminar at BAOU on 28-03-2022, Ahmedabad Gujarat, 173-180. ISBN : 978-93-5598-308-4
- [17]. Ravichandran, M., Sivaprasad, G., & Manoharan, K. (2014). Bibliometric Citations in Ph. D. Theses in Library and Information Science at Bharathidasan University, Tiruchi. *International Journal of Digital Library Services*, 5(3), 18-23.
- [18]. Sheshrao, J. V., & Khaparde, V. S. (2011). Citation Analysis of Ph. D. Theses on Physics Submitted to Dr. Babasaheb Ambedkar Marathwada University. *Collnet Journal of Scientometrics and Information Management*, 5(1), 115-127. <https://doi.org/10.1080/09737766.2011.10700906>
- [19]. Singh, J. K. (2015). Bibliometric Analysis of Ph. D theses in LIS during 1993-1997. *International Journal of Digital Library Services*, 5(4), 44-53.
- [20]. Singh, K. P., & Bebi, M. (2013). Citation Analysis of PhD Theses in Sociology Submitted to University of Delhi during 1995-2010. *DESIDOC Journal of Library & Information Technology*, 33(6).
- [21]. Srivastava, N. (2016). *Bibliometric Study of Ph.D. Thesis on Botanical Science Submitted to Dr BR Ambedkar University Agra and Lucknow University Lucknow During 2000 to 2010 A Comparative Study*. Jiwaji University,
- [22]. Kumar, H. A., Dora, M., & Desai, A. (2015). A bibliometrics profile of Gujarat University, Ahmedabad during 2004-2013. *DESIDOC Journal of Library & Information Technology*, 35(1), 9-16.
- [23]. Rana, M. S. (2015). Content analysis and application of Zipf's Law in Computer Science literature. In *2015 4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services* (pp. 223-227). IEEE.