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CITATION ANALYSIS OF DOCTORAL THESES SUBMITTED TO THE DEPARTMENT OF
CHEMISTRY, DIBRUGARH UNIVERSITY, ASSAM, INDIA

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ABSTRACT

The present study is based on 13057 citations, appended in the 34 Doctoral theses of Chemistry submitted to Dibrugarh university, Assam to confer Ph.d degree during the period of 2015-2019. The primary objectives of this study was to investigate authorship pattern of the citations, type and form of literature cited, and compiled a rank list of core journals in chemistry. The study revealed the fact that journals were the most favourite source of information among Research Scholars in Chemistry Department. The data reveals the fact that journals achieved highest no of citation which is 10446 followed by books with 11.76 % citations. The Journal Chemical Review occupy 987 citations accounting for 9.45 % of the total journal citations. Journal of American Chemical Society with 7.46% citation occupies the second in the ranking list, it is followed by Macromolecules 6.29% with 657 citations. In terms of Authorship pattern for journal, triple author articles are more cited than single authored article which is counted 44.93% citations it means that the collaborative research is more prominent in chemistry. The findings of the study revealed that out of the total number of 10446 journal citation, 44.93% are by more than three authors, followed by two authors with 22.83% and multiple authored articles got 19.30% citation.

Keyword: Citation Analysis, Bibliometric Study, Authorship Pattern; Ranking List of Journal, Doctoral Theses, Dibrugarh University, Department of Chemistry.

Introduction

Citation analysis is a method of analysis the citation or bibliographical reference that is adjoin with the research communication. Citation analysis examine the citations in scholarly works to set up links with other scholarly works or with the researchers by counting the citations added at the end of each scientific publication. In general citation gives an idea about the bibliographic data used in a research publication or article. Citation analysis provide better understanding about the subject relationships, authorship pattern, impact, publication trends etc. It also gives clear information like relative use of different kinds of documents, such as books, journals, conference proceedings, Standards, patents, theses, dissertation, e-resource etc , which can be well utilized by the researchers and academician for research purpose and library professional works in different organization can take help of citation analysis to know the popular books or journal in various discipline to develop their library collection.

Citation analysis is a method to define core references in a subject. In recent time, citation analysis become very favored method used by the researcher for bibliometric analysis. Citation analysis provide an opportunity to evaluate and interpret the citations received by authors,

articles, Institution and other scientific endeavor. It is also useful to determine the quality of information resources and sources.

Dibrugarh university is a premier institute of upper Assam. It was established in the 1965. The Department of Chemistry was established in the year 1968. It started with 3 faculty members and 12 students. From its nascent state, the department now become a full grown department with 12 faculty members and 41 research scholars. The department offers M.Sc., M.Phil., and Ph.D in chemistry. The major areas of research include Catalysis, Organic synthesis, Natural Products Chemistry, Green Chemistry, Polymer Chemistry, Co-ordination Chemistry, Materials Chemistry, Nanomaterials, Theoretical and Computational Chemistry, Biofertilizers, Agricultural delivery, Crystallography, Metal Organic Framework, Computational Biophysics etc.

Objectives of the study:

The primary objectives of the study are as follows:

- 1.To know the most cited sources of information consulted by the researchers in chemistry.
- 2.To determine the authorship pattern and degree of collaboration in research in chemistry.
3. To find out average number of references cited per thesis.
- 4.To know the year wise distribution of theses submitted in the department. of chemistry.
5. To determine the most frequently cited journals in chemistry.
6. To prepare a rank list of core journals of chemistry in order of their frequency of citation.

Literature review

Nasir,J and Kumar,D (2010) studied 4,875 citations in the doctoral dissertations submitted to department of economics, Aligarh Muslim University, during 1990-2010. to ascertain the authorship patterns, distribution of literature by format, language, country, and decade, and ranking of journals by citation frequency etc. Findings stated that books were the most preferred source of information among researcher. The dominant language of the literature cited is English and the single authorship prevails in the citations.

Hussain ,A and Swain, D. K (2011) conducted a study with the top papers of computer science published in Science Direct to examine authorship pattern, ranking of authors, ranking of country productivity, ranking of journals, and highly cited papers in computer science. Authors collected 495 top papers from the study, data revealed that three authored articles are position 1st rank, it is followed by 2 authored articles and it is followed by four authored articles. In terms of county wise production USA is at the top followed by UK, Taiwan, China, and Canada. Finding also stated that European Journal of Operational Research occupies the 1st rank it is followed by Computers in Human Behavior, and Pattern Recognition.

Mishra, D.K Gawde, M and Solanki, MS (2012) attempted to know the citation pattern of research scholars of English by using bibliometrics techniques.

Elango, B. and Rajendran, P. (2012) conducted a study to know the authorship trend and collaboration pattern in marine sciences literature. It is found from the study that in marine science, co-authored papers were noticeably high than single author.

Zafrunnisha, N. (2012) analysed 9,162 citations, added with 77 doctoral theses submitted to Department of Sociology of Sri Venkateswara University, Tirupati and Osmania University, Hyderabad during 1974-2005. Author examined the distribution of authorship pattern, bibliographic form, core journals, country, language, subject wise distribution of journal citations and core periodicals. The study revealed that Researchers in both the Universities, highly depends upon book source than other source. It is also found from the study that most of the cited books followed by the researcher are published from developed countries and all citations were published in English Language.

Bebi (2013) conducted her study on citation analysis of PhD theses submitted in the department of Sociology in Delhi university during 1995-2010. The author Found total 5766 citation from 25 theses submitted to the department of sociology during 1995-2010. The study reveals that highest number of citations was single authored 83.94 %, and 67.23 % citations were from books and only 22.20 % citations were from journals. The country-wise scattering of citations revealed that 2536 (45.52 %) citations were from India, and it is followed by USA and UK.

Goyal, V., Gupta, G.K. and Kumar, A. (2013) carried out their research on authorship trends and collaborative research in Indian Journal of chemistry section-B (IjCB) during 2002-2011. The data collected from the study revealed that multi authored articles 97.24% prevail the single authored articles 2.75%. The degree of collaboration in the field of chemical sciences is 0.97 and average number of authors per paper varies from 3.21 to 3.78.

Banateppanvar1, K and others (2013) conducted a research study on citation analysis of doctoral theses in the department of Zoology, in Kuvempu University during 2002-2006. Their study revealed the fact that journal was the most favoured source of information among the researcher which covers 74.47% of total citations followed by books and monographs 18.02% citations. Citations from conference proceedings, theses, reports, patents, and newspapers were also found. It is also observed from the study that researchers were taken benefit from internet resources. The Journal of Mutation Research occupied first rank with 94 citations accounting for 5.71% of the total journal citations. It is observed that major citation from journal literature and maximum numbers of cited materials were contributed by multi authors and degree of collaboration is 0.71.

Chaurasia, Chavan & Verma (2016) presented a bibliometric analysis of world research output on cloud computing. This study covers a large part of cloud computing articles published in Elsevier's SCOPUS citation database during 2010-2014. From the study the author collected 23811 data and analysed to get the result. The author found that in the academic productivity China occupies top position, it is followed by USA and India occupies 3rd position.

Methodology

To fulfil the predetermined objectives of the present study data are collected from 34 doctoral theses deposited to the department of Chemistry, Dibrugarh University, Assam during 2015-2020. Here one difference is observed that the researcher put bibliographic references at the end of each chapter. So, the bibliographic references were collected from each chapter of each thesis submitted to the Department of chemistry, Dibrugarh university, Assam. For this purpose book, journals, patents, conference/seminar proceedings, standard, Technical Report, Ph.d Theses, E-Resources were considered for this study. The collected data were tabulated, scrutinized, tabulated, and analyzed to draw inferences. The study presents analysis of various parameters like authorship pattern, forms of literature, and a core list of journals which was prepared after compiling highly cited articles of chemistry journals.

Scope of the study

The present study, however, excludes the study of any other department of Dibrugarh university. As a result, the study is limited only to doctoral theses of chemistry department in Dibrugarh university. Moreover, the scope of the study is limited to the proposal of citation analysis of doctoral theses of chemistry department of Dibrugarh university, Assam.

Findings and Analysis

Year-wise Distribution of Doctoral Theses

Analysis of Table 1 reflects the year-wise distribution of Doctoral theses submitted to the department of Chemistry, Dibrugarh University. A maximum number of 35.29% (12) theses were submitted in the year 2018. 23.52% (08) theses submitted in the year 2017, it is followed by 20.58% (7) theses in 2015, 11.78% (4) theses in 2019. The minimum no of doctoral theses is submitted in the year 2016 with 8.83% (3).

Table:1 Year-wise Distribution of Doctoral Theses

Sl.No	Year	No of thesis	%
1	2015	7	20.58
2	2016	3	8.83
3	2017	8	23.52
4	2018	12	35.29
5	2019	4	11.78
	Total	34	100.00

Average No. of citation per Doctoral Theses

Table2 and Fig 1 reflects the average number of citations per doctoral theses. It is observed from the study that on an average 382.76. citations were cited per thesis by the researcher of chemistry. The highest number of average citations per theses 404.25 was found for the year 2017 and the lowest average number of citations 375 was found for the year 2016.

Table 2: Average no. of citation per Doctoral theses

Sl. No	Year	No of thesis	Total no. citation	Average no. of citation Per theses
1	2015	7	2625	375
2	2016	3	1125	375
3	2017	8	3234	404.25
4	2018	12	4552	379.33
5	2019	4	1521	380.25
	Total	34	13057	382.76

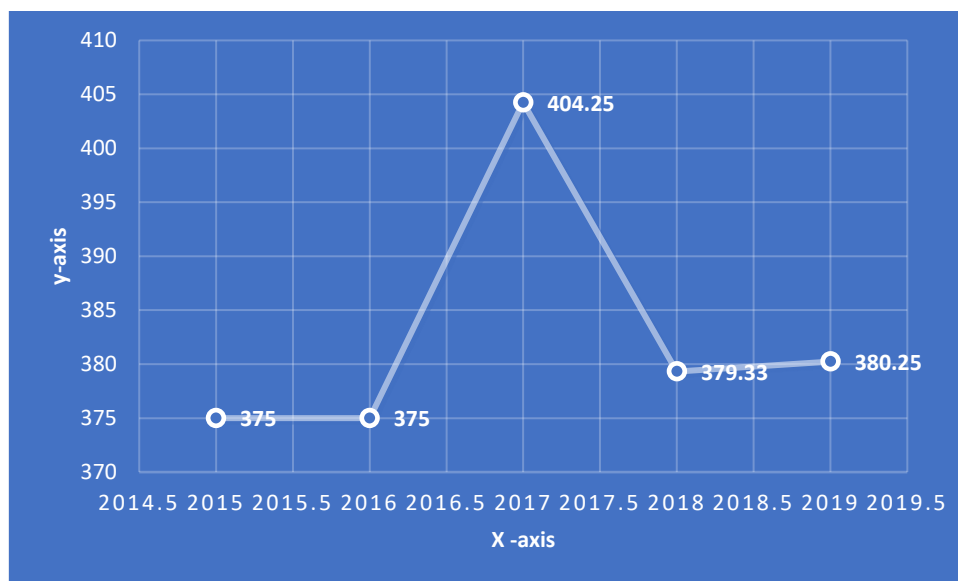


Fig 1: Average no. citation per thesis

Authorship pattern of journal citations in doctoral theses in chemistry

Table 3 and fig 2 shows the authorship pattern of journal citations .It revealed that out of 10,664 journal citation,44.93%(4693) were by three authors, followed by two authors 22.85 %(2387),multiple authors 19.30% (2024) and single author covers only 13.03% (1362). It is observed from the study that majority of the cited documents were by triple author, multiple author or double authored papers which indicate that the collaborative research work is prevailing in Chemistry.

Table 3. Authorship pattern of journal citations in chemistry

Sl. No	Year	Total.no of citation	Percentage (%) of citation
1	Single author	1362	13.03
2	Double author	2387	22.85
3	Triple author	4693	44.93
4	Multiple authored paper	2024	19.30
	Total	10446	100.00

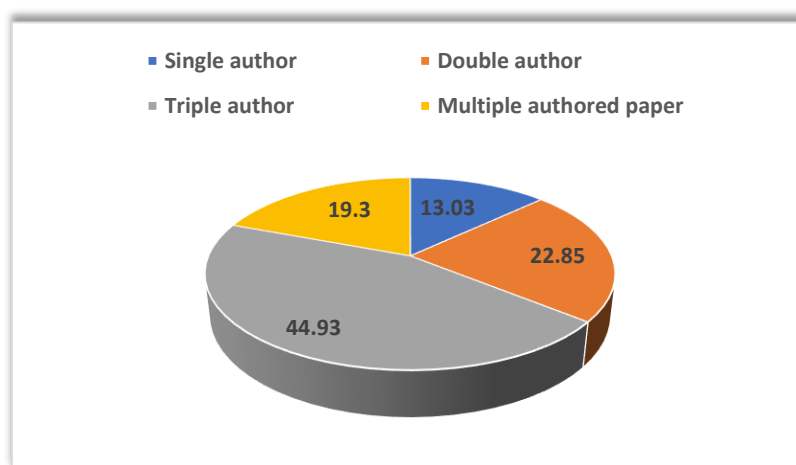


Fig 2: Authorship pattern of journal citations in chemistry

Distribution of citations according to bibliographic format

Analysis of table 4 and Fig 3 reflects the distribution of citations according to bibliographic format in doctoral theses of chemistry. The data reveals that the journal contributes the highest number of citations which is 80.00% (10446) of the total citations. This revealed that journals are the most preferred sources of information used by the researchers in Chemistry discipline. Books were the second most cited source which is 11.76% (1534) of the total citations. The next preferred source of information for chemistry is E-Resources which is 4.19%(547), it is followed by Seminar/Conference Proceedings which is 2.62(342) and only 1.34%(176) Patent/Standard/Technical Report etc which covered least citation in the doctoral theses of chemistry department.

Table 4: Distribution of citations according to bibliographic format

Sl. No	Bibliographic format	Total.no of citation	Cumulative Citation	% of citation	Cumulative %
1	Journal	10446	10446	80.00	80.00
2	Books	1534	11980	11.76	91.76
3	E-resource	547	12527	4.19	95.95
4	Ph.d Theses	12	12539	0.09	96.04
5	Seninar /Conference proceedings	342	12881	2.62	98.66
6	Patent/Standard/ Technical report etc	176	13057	1.34	100
	Total	13057		100	

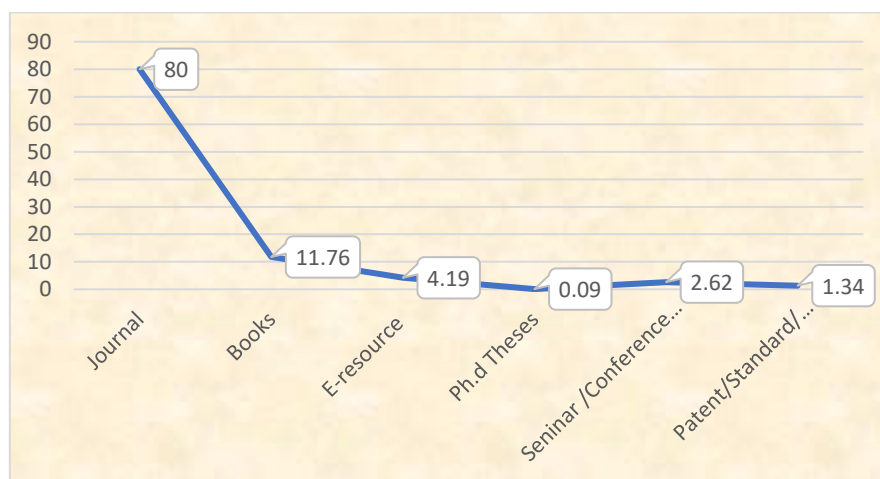


Fig 3: Distribution of citations according to bibliographic format

Rank List of Core Journals in Chemistry

Analysis of Table 5 reflects that total 251 journals with 10446 citations arranged in the Ranking List in of decreasing order of their rank. While preparing the table 5, the journal with the highest number of citations occupies the highest rank and thus found most important journal in the field of Chemistry while the least important titles are placed at the bottom in the ranking list. Chemical Review occupies the first rank as the most preferred journal having been cited 987

times. Journal of American Society occupies 2nd rank in the list with 779 citation, Macromolecules occupies 3rd rank in the list with 657 citations, and Journal of Molecular Catalysis A: Chemical R got 543 citation and occupy 4th rank in the list. 5.51 % with 477 citations occupied fourth rank. The first ten journals in the rank list together account for 49.94 % of the total citations. It is also observed from the table 5 that the first 50 Journals out of 251 journals total ranked journal covers 89.05 % of citations, while the remaining 191 journals together account for 9.98% of total citations

Table 5: Rank list of Core Journals in Chemical Sciences

Sl.no	Name of the Journal	No. of citation	Cumulative Citation	Percentage	Cumulative Percentage	Rank
1	Chemical Review	987	987	9.45	9.45	1
2	Journal of American Chemical Society	779	1766	7.46	16.91	2
3	Macromolecules	657	2423	6.29	23.2	3
4	Journal of Molecular Catalysis A: Chemical	543	2966	5.19	28.39	4
5	Tetrahedron Letters	429	3395	4.10	32.49	5
6	Inorganic chemistry	412	3807	3.94	36.43	6
7	Journal of Polymer Science Part A: Polymer Chemistry	403	4210	3.86	40.37	7
8	Journal of Organic Chemistry	376	4586	3.59	43.96	8
9	Journal of Applied Polymer Science	327	4913	3.13	47.09	9
10	Angewandte Chemie International Edition	298	5211	2.85	49.94	10
11	Tetrahedron	272	5483	2.60	52.54	11
12	Polymer	264	5747	2.53	55.07	12
13	Coordination Chemistry Reviews	253	6000	2.42	57.49	13
14	Journal of Supercritical Fluids	217	6217	2.07	59.56	14
15	Inorganica Chimica Acta	213	6430	2.04	61.6	15
16	Polyhedron	210	6640	2.01	63.61	16
17	Molecular and Cellular Biochemistry:	201	6841	1.92	65.53	17
18	Industrial & Engineering Chemistry Research	172	7013	1.65	67.18	18
19	Applied Catalysis A	164	7177	1.56	68.74	19
20	Reactive and Functional Polymers	159	7336	1.52	70.26	20
21	Chemical Communications	143	7479	1.37	71.63	21
22	Organometallics ,	139	7618	1.33	72.96	22
23	Catalysis Communications	127	7745	1.22	74.18	23
24	Accounts of Chemical Research	98	7843	0.94	75.12	24
25	Green chemistry	94	7937	0.89	76.01	25
26	European Polymer Journal	91	8028	0.87	76.88	26

27	Pure and Applied Chemistry	87	8115	0.83	77.71	27
28	Dalton Transactions	82	8197	0.78	78.49	28
29	Journal of Catalysis	79	8276	0.77	79.26	29
30	Journal of Chemical Society, Dalton Transactions	74	8350	0.71	79.97	30
31	Langmuir	72	8422	0.69	80.66	31
32	Journal of Organometallic Chemistry	68	8490	0.65	81.31	32
33	Macromolecular Rapid Communications	65	8555	0.62	81.93	33
34	Journal of Polymer Research	62	8617	0.59	82.52	34
35	Journal of Biological Chemistry	57	8674	0.51	83.03	34
36	Journal of Inorganic Biochemistry	54	8728	0.51	83.54	34
37	Journal of Medicinal Chemistry	54	8782	0.51	84.05	34
38	Journal of Physical Chemistry A	52	8834	0.49	84.54	35
39	Macromolecular Symposia	50	8884	0.48	85.02	36
40	Advances in Polymer Science	47	8931	0.44	85.46	37
41	Chemistry - A European Journal	45	8976	0.43	85.89	38
42	Journal of Chemical Society, Perkin Transactions	43	9019	0.41	86.3	39
43	Journal of Physical Chemistry B	41	9060	0.39	86.69	40
44	Organic Letters	40	9100	0.38	87.07	41
45	Macromolecular Chemistry.	39	9139	0.37	87.44	42
46	Reactive Polymers	37	9176	0.35	87.79	43
47	Journal of Controlled Release	36	9212	0.34	88.13	44
48	Biochemistry	34	9246	0.33	88.46	45
49	Powder Technology	32	9278	0.30	88.76	46
50	Synlett	31	9309	0.29	89.05	47
51	Journal of Chemical Physics	29	9338	0.28	89.33	48
52	Biological Trace Element Research	28	9366	0.27	89.6	49
53	Bioorganic & Medicinal Chemistry Letters	26	9392	0.25	89.85	50
54	Macromolecular Chemistry and Physics	24	9416	0.23	90.08	51
55	Science	23	9439	0.22	90.3	52
56	Chemical & pharmaceutical bulletin	22	9461	0.21	90.51	53

57	Catalysis Today	21	9482	0.20	90.71	54
58	Chemistry of Materials	21	9503	0.20	90.91	54
59	Current Opinion in Solid State & Materials Science	20	9523	0.19	91.1	55
60	Journal of Chemical Society D: Chemical Communications (London)	20	9543	0.19	91.29	55
61	Journal of Colloid and Interface Science	19	9562	0.18	91.47	56
62	Journal of Materials Chemistry	18	9580	0.17	91.64	57
63	Journal of Trace Elements in Medicine and Biology	16	9596	0.15	91.79	58
64	Materials Chemistry and Physics	15	9646	0.14	91.93	59
65	Progress in Polymer Science	15	9661	0.14	92.07	59
66	Archives of Biochemistry and Biophysics	14	9675	0.13	92.2	60
67	Catalysis Letters	13	9688	0.12	92.32	61
68	Chemical Society Reviews	13	9701	0.12	92.44	61
69	Inorganic Chemistry Communications	12	9713	0.11	92.55	62
70	Journal of Scientific and Industrial Research	12	9725	0.11	92.66	62
71	New Journal of Chemistry	11	9736	0.10	92.76	63
72	Process Safety and Environmental Protection...	11	9747	0.10	92.86	63
73	Synthetic Communications	10	9757	0.09	92.95	64
74	Nature	10	9767	0.09	93.04	64
75	SYNTHESIS	10	9777	0.09	93.13	64
76	Advanced Materials	9	9786	0.08	93.21	65
77	Chemtech	9	9795	0.08	93.29	65
78	Chinese Chemical Letters	9	9804	0.08	93.37	65
79	Colloids and Surfaces A: Physicochemical and Engineering	8	9812	0.07	93.44	66
80	Composites Science and Technology	8	9820	0.07	93.51	66
81	Energy Fuels	7	9827	0.06	93.57	67
82	Fuels	7	9834	0.06	93.63	67
83	Journal of Chemical Society, Chemical Communications	7	9841	0.06	93.69	67
84	Journal of Chromatography	6	9847	0.05	93.74	68
85	Journal of Enzyme Inhibition and Medicinal Chemistry.	6	9853	0.05	93.79	68
85	Natural Product Reports	5	9858	0.04	93.83	69
87	Polymer Degradation and Stability	5	9863	0.04	93.87	69
88	RSC Advances	4	9867	0.03	93.9	70

89	Talanta	4	9871	0.03	93.93	70
90	Chemical Science	4	9875	0.03	93.96	70
91	Journal for Nanoscience and Nanotechnology (JNN)	4	9879	0.03	93.99	70
92	Journal of Macromolecular Science, Part A. Pure and Applied Chemistry	3	9882	0.02	94.01	71
93	102 Journals with 4 Citations each	409	10291	3.91	97.92	72
94	49 Journals with 3 Citations each	147	10438	1.40	99.32	73
95	8 Journals with 1 Citations each	8	10446	0.08	100	74
96				100		
97		10446				

Findings of the Study

In the present study 13057 citations were analyzed from 34 Doctoral Theses in the Department of Chemistry. On the basis of study the following conclusions can be drawn:

- ✓ It is observed in the study that the highest number (12) of doctorate degree awarded in the year 2018.
- ✓ It is observed from the study that on an average 382.76. citations were cited per thesis by the researcher of chemistry. The highest number of average citations per theses 404.25 was found for the year 2017 and the lowest average number of citations 375 was found for the year 2016.
- ✓ Findings revealed that out of 10,664 journal citation, 44.93% (4693) were by three authors, followed by two authors 22.85 % (2387), multiple authors 19.30% (2024) and single author covers only 13.03% (1362). It is observed from the study that majority of the cited documents were by triple author, multiple author or double authored papers which indicate that the collaborative research work is prevailing in Chemistry.
- ✓ Authorship pattern for journal citations shows that most of the citations were contributed by three authors and multiple authors and double authors that proved the fact that the Research Scholars of Chemistry preferred collaborative works for citation.
- ✓ Analysis of data reflects that the journal contributes the highest number of citations which is 80.00% (10446) of the total citations. This revealed that journals are the most preferred sources of information used by the researchers in Chemistry discipline. Books were the second most cited source which is 11.76.% (1534) of the total citations. The next preferred source of information for chemistry is E-Resources which is 4.19%(547), it is followed by Seminar/Conference Proceedings which is 2.62(342) and only 1.34%(176) Patent/Standard/Technical Report etc which covered least citation in the doctoral theses of chemistry department.
- ✓ It is observed from the study that Journals and books are most preferred source of information among research scholars in chemistry department.

- ✓ The Ranking List of Journals revealed the fact that Chemical Review occupies the first rank as the most preferred journal having been cited 987 times. Journal of American Society occupies 2nd rank in the list with 779 citation, Macromolecules occupies 3rd rank in the list with 657 citations, and Journal of Molecular Catalysis A: Chemical got 543 citation and occupy 4th rank in the list. 5.51 % with 477 citations occupied fourth rank.
- ✓ The first ten journals in the rank list together account for 49.94 % of the total citations. It is also observed from the table 5 that the first 50 Journals out of 251 journals total ranked journal covers 89.05 % of citations, while the remaining 191 journals together account for 9.98% of total citations

Conclusion

Citation analysis is considered as an important method in Research. Through Citation analysis one can study subject relationships, authorship pattern, impact, publication trends, and can identify core journal in a particular discipline. Present study reveals that the scholars of Chemistry Department in Dibrugarh University consulted a wide variety of literature while preparing their doctoral theses. Present study revealed the fact that Journals are the highly preferred choice of information source among research scholars. Chemical Review occupies the first rank as the most preferred journal having been cited 987 times. Journal of American Society occupies 2nd rank in the list with 779 citation, Macromolecules occupies 3rd rank in the list with 657 citations, and Journal of Molecular Catalysis A: Chemical got 543 citation and occupy 4th rank in the list. 5.51 % with 477 citations occupied fourth rank. Rank list of Journals can be considered as a torch bearer for Library and information science (LIS) Professionals. Rank List has its' importance while LIS professional consider procuring journal for their library. After going deep into any analysis of citation in any stream LIS professional develop deep insight about journals and its' importance. Citation analysis helps librarians and researchers to select the best journals among many journals in any discipline. The study of citation analysis is very beneficial to identify the needs of Research Scholars and other users and can serve as a feedback collection tool to LIS professional in the selection and acquisition of best journals for their library and Information Centre. Again this type of study provide an opportunity to analyze the best economic decision to procure journal for their library and information centre.

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