

Trends in Research Productivity: A Bibliometric Analysis of Dibrugarh University Publications using Web of Science

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Abstract

The present study contains a Bibliometric analysis of bibliographic records published from 2006 to 2015. 533 items retrieved from Web of Science were studied. It shows increasing publication trend of the Dibrugarh University. The study includes year wise distribution of publications, domain wise distribution of publications, collaborating countries of the institute, authorship pattern and collaboration trend of publications, institutional collaboration of publications, preferred channels of research communications, citation impact of publication, etc. The average output of the organization was 53 publications per year; the peak was 88 items in 2014 and the minimum was 15 items in the year 2006. Single authorship publication accounted for 5%, while multi authorship publication of articles accounted for 95 %. The top 30 institutions which collaborated with Dibrugarh University accounted for about 50.28% share. It was seen that the publications of Dibrugarh University received a total of 2581 citations during the period of 10 years. The average citation per item was 4.84.

Keywords: Bibliometric Analysis, Research Productivity, Publication Trends, Authorship Pattern, Citation Analysis, Dibrugarh University

1. Introduction

The term 'Bibliometric' was first coined by Alan Pritchard in 1969. Pritchard explained the term bibliometrics as "the application of mathematical and statistical methods to books and other media of communication". Communication media comprises of books, serials, periodicals, monographs, reports, theses, e-books and e-journals. During 1970s, bibliometrics developed into a scientific tool for literature assessment and now it has been based mainly on the principles of mathematical statistics. Regarding the scope of bibliometrics, O'Connor and Voos (1981) states that "its scope includes the study of the

relationship among documents e.g. citation studies or describing a literature. Typically, these descriptions focus on consistent patterns involving authors, monographs, journals or subject/language". The backbone of bibliometrics lies on some theoretical foundation, laid by some pioneers, such as, Lotka, Gross, Bradford, Zipf, Derek J de Solla Price, Bookstein, Mandelbrot, Brookes, Narin, Garfield, Vickery, Moravcsik, Cole brothers, Pritchard, Hulme and others. Citation analysis is a commonly used bibliometric method. The present study is carried out to analyse the publication trends in the web of sciences an online subscription based on scientific citation indexing service maintained by Thomson Reuters that provides a comprehensive citation search. The institution selected for the study is



Dibrugarh University established in 1965 situated in far North Eastern part of the country where dawn of light first fall.

2. Literature Review

G. Zachos (1991) evaluated research performance of two Greek University of Departments of Mathematics by employing Bibliometric indicators. Chu Lee (2004) study tends to find out the research output in ten years by the Institute of Molecular and Cell Biology, Singapore producing 395 research papers, 33 book chapters, 24 conference papers, 4 monographs, graduated 46 PhDs and 14 M.Sc, and 10 patents. J.K. Pal and P.K. Das (2012) analyzed research publications produced by the Indian Statistical Institute (ISI) over a period of twenty years (1991-2010) as reflected in Web of Science and quantifies publication data in various dimensions keeping in view of evaluating the growth of publications, authorship pattern, major areas of research, trends in collaboration, preferred channels of research communications, etc. J.K. Singh (2013) conducted a study based on Web of Science and has shown the contribution of various universities under heading like publication culture and year wise growth of publication, strong and weak area of output with special references to the selected universities in India and the contribution of authors in international and national journals .

Thus many studies have been reported institutional research performance; however, no intrinsic study has been made earlier to measure the scholarly performance and trends in research of Dibrugarh University – hence this sincere effort is being made.

3. Objectives

The main objectives of this paper are:

- ❖ To visualize the total number of articles and their types, appeared during the period 2006-2015.
- ❖ Authorship pattern and degree of collaboration.
- ❖ To identify citation status of documents published by the DU scholars.
- ❖ Geographical distribution of Collaborating countries.
- ❖ Institutional collaboration of publications.
- ❖ Preferred channels of research communications.

4. Methodology

The data has been drawn from Web of Science during the period mentioned, an online scientific citation indexing service maintained by Thomson Reuters that provides a comprehensive citation search. It is a multidisciplinary database which covers 30,000 scholarly books, 12,000 journals and 148,000 conference proceedings.

The bibliographical records of publications having an author affiliation of Dibrugarh University, published during 2006 to 2015 were retrieved from the WoS database. Search expression used as “Address = (Dibrugarh University) AND Year Published = (2006-2015)” with all types of documents and databases as covered in the scope.

The searching displayed 533 hit records (as on 12 April 2015), irrespective of whether it is the affiliation (Dibrugarh University) of first author or second

author or last author; which were recorded into MS-Excel worksheets. The raw data were examined, tabulated, and analyzed quantitatively to make observations by means of bibliometric and scientometric indicators, methods and techniques.

5. Analysis

Following tables represent the quantitative performance of Dibrugarh University towards international publication through different metrics.

5.1 Year wise Distribution of Publication

The distribution of 533 published items indexed over a period of ten years in the source database is shown in Table-1.

Table 1: Chronological Distribution of Publications

Year	Publications	%	CU%
2006	15	2.81	2.81
2007	26	4.88	7.69
2008	39	7.32	15.01
2009	31	5.82	20.82
2010	56	10.51	31.33
2011	76	14.26	45.59
2012	65	12.20	57.78
2013	61	11.44	69.23
2014	88	16.51	85.74
2015	76	14.26	100.00
Total	533	100.00	

CU: Cumulative Usage

It is been observed that a maximum of 88 items published in the year 2014, and minimum

publications (15 only) appeared in 2006; thus varies from 2.81% (in 2006) to 16.51% (in 2014) with an average of 53 items per year. The distribution shows a steady growth of publications over the years, as shown in Figure 1.

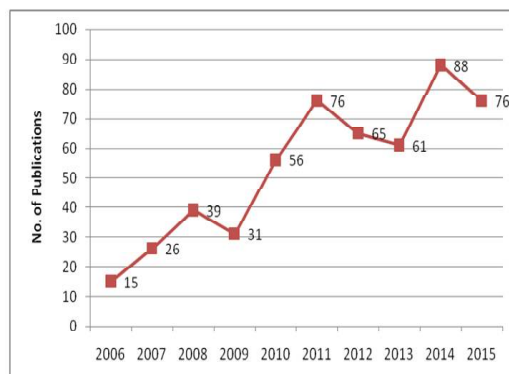


Figure 1: Growth of Dibrugarh University publications from 2006 to 2015

5.2 Types of Documents Published

Table 2 reveals the distribution of scholarly communications made in different forms comprising journal articles (486), meeting abstracts (19), proceeding papers (12), review item (8), letters (4), editorial materials (3), news item (1), etc.

Table 2: Distribution of Publications in different forms

Document Type	Frequency	%
Article	486	91.18
Meeting Abstract	19	3.56
Proceedings Paper	12	2.25
Review item	8	1.50
Letter	4	0.75
Editorial Material	3	0.56
News Item	1	0.19
Total	533	100.00

Expectedly, journal article (91.18%) is predominantly used form of research communications, followed by meeting abstracts (3.56%), proceeding papers (2.25%) and rest of the forms occupied only 3% publications.

5.3 Domain wise Distribution of Publications

Table 3 analyse subject-wise distribution of 533 publications into 54 subject categories, as appeared in the source database. The distribution of publications into various subject categories revealed as many as 725 occurrences and it shows that few publications have covered interdisciplinary research areas, produced more than one subject terms. Such categories and corresponding occurrences were simply drawn from the Web of Science.

Result shows that out of 54 sub-disciplines, the researchers of the Institute are really active as presented in Table-3. Substantial emphasis has been noticed on the areas like Chemistry (20.83%), Pharmacology & Pharmacy (13.79%), Science & Technology - Other Topics (5.79%), Physics (5.52%), Geology (4.41%), Meteorology & Atmospheric Sciences (4.14%), Materials Science (3.72%), Engineering (3.31%), Mathematics (3.31%), Astronomy & Astrophysics (3.17%), Biochemistry & Molecular Biology (2.34%), Polymer Science (2.34%), Agriculture (2.21%) and related sub-domains covered almost 25.1% of the total contributions. However, the researchers also pursued their interests in sub specialities like Operations-research, Remote sensing, Oncology etc.

Table-3: Subject-areas of Research in Dibrugarh University

SI No	Subject Areas (WoS)	Freq.	%
1	Chemistry	151	20.83
2	Pharmacology & Pharmacy	100	13.79
3	Science & Technology - Other Topics	42	5.79
4	Physics	40	5.52
5	Geology	32	4.41
6	Meteorology & Atmospheric Sciences	30	4.14
7	Materials Science	27	3.72
8	Engineering	24	3.31
9	Mathematics	24	3.31
10	Astronomy & Astrophysics	23	3.17
11	Biochemistry & Molecular Biology	17	2.34
12	Polymer Science	17	2.34
13	Agriculture	16	2.21
14	Environmental Sciences & Ecology	14	1.93
15	Biotechnology & Applied Microbiology	11	1.52
16	Optics	11	1.52
17	Plant Sciences	10	1.38
18	Geochemistry & Geophysics	9	1.24
19	Food Science & Technology	8	1.10
20	Life Sciences & Biomedicine - Other Topics	8	1.10
21	Thermodynamics	8	1.10
22	Computer Science	7	0.97
23	Genetics & Heredity	7	0.97
24	Microbiology	7	0.97
25	Electrochemistry	6	0.83
26	Energy & Fuels	6	0.83
27	Anthropology	5	0.69

SI No	Subject Areas (WoS)	Freq.	%
28	Education & Educational Research	5	0.69
29	Remote Sensing	5	0.69
30	Business & Economics	4	0.55
31	Mechanics	4	0.55
32	Public, Environmental & Occupational Health	4	0.55
33	Biophysics	3	0.41
34	Entomology	3	0.41
35	Integrative & Complementary Medicine	3	0.41
36	Operations Research & Management Science	3	0.41
37	Parasitology	3	0.41
38	Physical Geography	3	0.41
39	Research & Experimental Medicine	3	0.41
40	Spectroscopy	3	0.41
41	Tropical Medicine	3	0.41
42	Imaging Science & Photographic Technology	2	0.28

43	Microscopy	2	0.28
44	Toxicology	2	0.28
45	Crystallography	1	0.14
46	Evolutionary Biology	1	0.14
47	Instruments & Instrumentation	1	0.14
48	Mathematical & Computational Biology	1	0.14
49	Mycology	1	0.14
50	Oceanography	1	0.14
51	Oncology	1	0.14
52	Psychology	1	0.14
53	Social Sciences - Other Topics	1	0.14
54	Surgery	1	0.14
	Total	725	100.0

5.4 Authorship Pattern and Collaboration Trend of Publications

Table 4 shows the authorship pattern observed in the contributions, which reveals that researchers of the Institute worked in highly collaborative manner. A total of 1783 occurrences of authors were found in 533 publications, thus average authorship obtained 3.34% for each contribution.

Table 4: Distribution of Authorship Among the Publications

Year	Single	Double	Multi	Mega	Total	% of Total	Degree of Collaboration
2006	1	9	5	0	15	2.81	0.93
2007	2	9	15	0	26	4.88	0.92
2008	2	21	13	3	39	7.32	0.95
2009	2	10	16	3	31	5.82	0.94
2010	5	15	30	6	56	10.51	0.91
2011	5	24	42	5	76	14.26	0.93
2012	3	24	31	7	65	12.20	0.95
2013	3	23	28	7	61	11.44	0.95
2014	1	28	48	11	88	16.51	0.99
2015	2	16	44	14	76	14.26	0.97
Total	26	179	272	56	533	100.00	0.95
%	4.88	33.58	51.03	10.51			

It is observed that about 5% contributions were made by single authorship and rest in collaboration (95%), either by two-authors (33.58%) or three-to-five-authors (51.03%), even six-and-more-authors (10.51%) also exist.

Thus multi-authored publications are quite significant and increasing trend of collaboration over the years is prominent. Such a tendency of continued collaboration is highly expected in applied and inter-disciplinary areas of research in the Institute.

Further distribution of 5 mega-authored publications having >10 authors consisted about 63 occurrences (3.53%) of total authorship is presented in Figure 2.

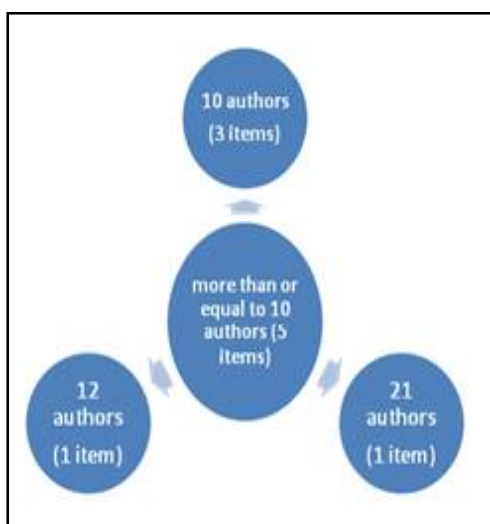


Figure.2 : Highly mega-authored publications (10 or more authorship)

In order to measure the degree of collaboration in quantitative terms, the formula given by Subramanyam (1983) is used. The Degree of Collaboration (DC) is determined by the ratio of number of collaborative publications and total

number of publications during certain period of time. That can be expressed as,

$$DC = \frac{Nm}{Nm + Ns} = \frac{507}{507 + 26} = 0.95$$

Where Nm refers to multi-authored (two or more) contributions and Ns denote the number of single authored contributions published by the Institute during study period. Thus, average degree of collaboration is found to be 0.95 and quite significant. Clearly it indicates the prevalence of team or group research, i.e., the researchers of Dibrugarh University prefer to conduct research in collaboration.

5.5 Collaborating Countries of the Institute

Table 5 shows the country wise distribution of contributing authors of the publications during the study period. Country names have been identified from their affiliations as reflected in their respective publications, primarily available from the address field of the source. Tabulated data shows the corresponding hits, indicate simply the presence of a particular country in that many numbers of items. So, one or more existence of a country in the same publication is counted only 1 hit.

Table-5: Country wise Distribution of Publications

Sl.	Country	Frq.	%
1	India	533	100
2	Japan	8	1.50
3	Italy	7	1.31
4	USA	7	1.31

Sl.	Country	Frq.	%
5	Germany	4	0.75
6	Malaysia	4	0.75
7	South Korea	4	0.75
8	Slovakia	3	0.56
9	Czech Republic	3	0.56
10	Saudi Arabia	2	0.38
11	UK	2	0.38
12	Eritrea	1	0.19
13	France	1	0.19
14	Ireland	1	0.19
15	Portugal	1	0.19
16	Singapore	1	0.19
17	South Africa	1	0.19
18	Ukraine	1	0.19
19	Iran	1	0.19

It appears that the collaborators from 52 countries involved in producing 533 publications of the Institute. Foreign collaboration constituted about 9.76% of the total publications considered in this study, and rest of the collaborations were made by the authors of the home country (India). Japan has shared in maximum number of publications (8), followed by Italy (7), USA (7), Germany (4), Malaysia (4), South Korea (4), etc.

The number-of-countries represented for publishing contributions, can be considered as simplest indicator to measure the internationality of collaboration. It helps to find out the partner countries having similar research interests and extent of their involvement in recognizing the

international repute of the Institute as well. The status of internationality of the Dibrugarh University is clearly observed i.e., the researchers of Dibrugarh University adequately gained the diverse experiences and opinions in publishing their research communications.

5.6 Institutional Collaboration of Publications

Table 6 depicts the leading collaborating institutions in accordance with the occurrence of a particular institute in the numbers of publications. So, corresponding frequency implies the presence of a particular institute in that many numbers of items, thus one or more existence of an institute in the same record is counted 1 frequency. It has been found that a total of 1783 contributors from more than 195 institutions of 51 countries shared their views to produce the publications. Tezpur University has appeared on the top by collaborating 44 publications and other leading institutions like CSIR NEIST (Jorhat), Gauhati University (Guwahati), Indian Council of Medical Research (ICMR) (Dibrugarh), Sibsagar College (Sibsagar), Sam Higginbottom Inst Agriculture Technology & Science (Allahabad), Arya Vidyapeeth College (Guwahati), Vikram Sarabhai Space Centre (Thiruvananthapuram), Jadavpur University (Kolkata), Gurukul Kangri University, (Haridwar), Indian Institute of Technology (Guwahati) etc. collaborated in research contributions of Dibrugarh University.

The leading foreign partner institutions are University of Catania (Italy), University of Malaya (Malaysia), Ball State University (USA), Kyushu University (Japan), RIKEN Advance Institute Computation Science (Japan), Slovak University (Slovakia) etc. University of Catania (Italy) and

University of Malaya (Malaysia) are in the top most position. 199 publications produced by Dibrugarh University scientists without any collaboration. Active participation of various institutions across

geographical boundaries implies the recognition and authoritativeness of the Institute research activities which is evident from the list.

Table-6: Leading Collaborating Institutes of Dibrugarh University

SI No	Institute Name	Frequency	% of 533	Cum %
1	Tezpur University, Tezpur	44	8.26	8.26
2	CSIR-North East Institute of Science & Technology, Jorhat.	33	6.19	14.45
3	Gauhati Univ, Guwahati	19	3.56	18.02
4	Indian Council of Medical Research, Dibrugarh	18	3.38	21.39
5	Sibsagar College, Sibsaagar	11	2.06	23.46
6	Sam Higginbottom Inst Agriculture Technology & Science, Allahabad	11	2.06	25.52
7	Vikram Sarabhai Space Centre, Thiruvananthapuram	10	1.88	27.40
8	Jadavpur University, Kolkata	10	1.88	29.27
9	Arya Vidyapeeth College, Guwahati	9	1.69	30.96
10	Gurukul Kangri University, Haridwar	8	1.50	32.46
11	Indian Institute of Technology, Guwahati	6	1.13	33.59
12	Indian Institute of Technology, KANPUR	6	1.13	34.71
13	JB College, Jorhat	6	1.13	35.84
14	Regional Institute of Paramedical & Nursing Sciences (RIPANS), Aizawl	6	1.13	36.97
15	Assam University, Silchar	5	0.94	37.90
16	Bengal School of Technology, West Bengal	5	0.94	38.84
17	GB Pant Institute of Himalayan Environment & Development, Almora	5	0.94	39.78
18	Institute of Advanced Study in Science & Technology, Guwahati	5	0.94	40.72
19	Oil India Ltd, Duliajan, Assam	5	0.94	41.66
20	Rajiv Gandhi University, Arunachal Pradesh	5	0.94	42.59
21	Allahabad University, Allahabad	5	0.94	43.53
22	Allahabad Agricultural Institute, Allahabad	4	0.75	44.28
23	Bhabha Atomic Research Centre, Kolkata	4	0.75	45.03

SI No.	Institute Name	Frequency	% of 533	Cum %
24	Central Food Technological Research Institute ,Karnataka	4	0.75	45.78
25	Girijananda Chowdhury Institute of Pharmaceutical Science, Guwahati	4	0.75	46.53
26	Indian Institute of Science, Bangalore	4	0.75	47.28
27	University of Catania, Italy	4	0.75	48.03
28	Kumaun University, Nainital, Uttarakhand	4	0.75	48.79
29	Marwari Hindi High School, Dibrugarh	4	0.75	49.54
30	University of Malaya, Malaysia	4	0.75	50.29

5.7 Core Journals of Research Communications

A total of 228 journal titles have been used to communicate 533 contributions of the Institute. Table 7 shows that the highest numbers of contributions were communicated in Asian Journal of Chemistry (22), which is followed by Current Science (19), Tetrahedron Letters (17), RSC

Advances (13), National Academy Science Letters –India (11), International Journal of Agricultural and Statistical Science(10) etc. It appears that the first thirty six source-titles occupied almost 50% of total publications of the Institute. Therefore, the list may be considered as core-journals for the collection development of Dibrugarh University library.

Table 7: Core Journals of Research Communications

Sl. No	Journal Name	Frequency	%	cu%
1	Asian Journal of Chemistry	22	4.13	4.13
2	Current Science	19	3.56	7.69
3	Tetrahedron Letters	17	3.19	10.88
4	RSC Advances	13	2.44	13.32
5	National Academy Science Letters-India	11	2.06	15.39
6	International Journal of Agricultural and Statistical Sciences	10	1.88	17.26
7	Advances in Space Research	9	1.69	18.95
8	Applied Organometallic Chemistry	9	1.69	20.64
9	Indian Journal of Physics	9	1.69	22.33
10	Medicinal Chemistry Research	9	1.69	24.02
11	Current Drug Delivery	8	1.50	25.52

Sl. No	Journal Name	Frequency	%	cu%
12	Geochimica et Cosmochimica Acta	8	1.50	27.02
13	Journal of the Geological Society of India	8	1.50	28.52
14	Indian Journal of Physics and Proceedings of the Indian Association for the Cultivation of Science	7	1.31	29.83
15	Acta Poloniae Pharmaceutica	6	1.13	30.96
16	Bangladesh Journal of Pharmacology	6	1.13	32.08
17	Bulletin of Materials Science	6	1.13	33.21
18	Indian Journal of Chemistry Section A - Inorganic Bio-Inorganic Physical Theoretical & Analytical Chemistry	6	1.13	34.34
19	Indian Journal of Pharmacology	6	1.13	35.46
20	International Journal of Biological Macromolecules	6	1.13	36.59
21	Latin American Journal of Pharmacy	6	1.13	37.71
22	Indian Journal of Chemical Technology	5	0.94	38.65
23	Indian Journal of Pharmaceutical Education and Research	5	0.94	39.59
24	Journal of Geophysical Research-Atmospheres	5	0.94	40.53
25	New Journal of Chemistry	5	0.94	41.47
26	Atmospheric Environment	4	0.75	42.22
27	Bulletin of the Korean Chemical Society	4	0.75	42.97
28	Carbohydrate Polymers	4	0.75	43.72
29	Communications in Statistics-theory and Methods	4	0.75	44.47
30	Computational and Theoretical Chemistry	4	0.75	45.22
31	Expert Opinion on Drug Delivery	4	0.75	45.97
32	Ionics	4	0.75	46.72
33	Journal of Polymer Materials	4	0.75	47.47
34	Journal of Thermal Analysis and Calorimetry	4	0.75	48.22
35	Letters in Organic Chemistry	4	0.75	48.97
36	Starch-Starke	4	0.75	49.72

5.8 Citation Impact of Publication

The publications of Dibrugarh University have received a total of 2581 citations in 10 years i.e.,

from 2006 – 2015. The average citation per item is 4.84. The citations data were drawn from the source database on 12th April, 2016. The citation trend shows

consistent rise in the impact of Dibrugarh University's research papers.

Out of 533 publications, 134 highly cited items received 2 - 5 times citations each. Besides, 177 publications did not receive even a single citation, 189 received 1 citation.

Table 8: Citation Map of the Publications

Year	Publication	Total Citation	Cu. Citation	% of total Citation
2006	15	80	80	3.10
2007	26	134	214	5.19
2008	39	237	451	9.18
2009	31	202	653	7.83
2010	56	535	1188	20.73
2011	76	358	1546	13.87
2012	65	467	2013	18.09
2013	61	283	2296	10.96
2014	88	185	2481	7.17
2015	76	100	2581	3.87
Total	533	2581		100.00

Table 9: Citation of Contributions

Range of Citation	Items count	Total Citations received	% of total	Cu%
0	177	0	0.00	0.00
1	89	89	3.45	3.45
2-5	134	422	16.35	19.80
6-10	71	541	20.96	40.76
11-20	42	617	23.91	64.66
21-50	17	509	19.72	84.39
51- 100	2	127	4.92	89.31
101-200	0	0	0.00	89.31
201-300	1	276	10.69	100.00
0 - 300	533	2581	100.00	

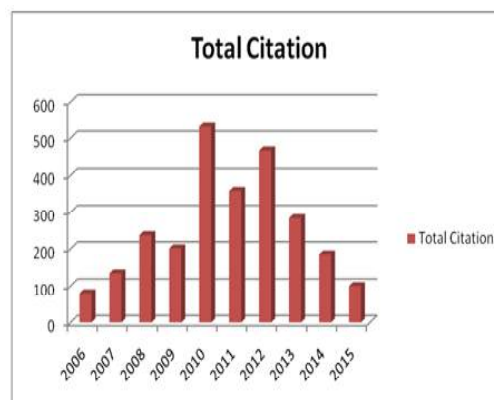


Figure 4: Citation Mapping

6. Conclusion

Publication of the university is increasing year by year though a decreasing trend is seen in the year 2015 for that it should be ensured by the University authority that there should be constant publication

on research projects. The ranking of Indian Universities which has been started from this year i.e. 2016 by the Ministry of Human Resource Development (MHRD) Government of India under the heading research, professional practice & collaborative performance has fixed parameter to measure the quantity and quality of research output as seen through international databases, to match with the parameter the University should increase the research output. One of the good prospects being noticed that the degree of collaboration is in increasing trend and collaborative research is preferred by the researchers and this is a good sign of growth in the field of international research collaboration. Periodicals are essential resources for carrying out research and teaching. Faculty, Research Scholars and students depend heavily on these resources. But the costs of journals are more than books and number titles of journals are many and the collections also grow rapidly. Sometimes double in short period of time. So, in library proper policy should be adopted for journal collection. The bibliometric analysis will help in deciding titles of journals to be acquired, to continue or discontinue a subscription, to weed or not to weed.

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