Scholarly Communications of Bharathiar University on Web of Science in Global Perspective: A Scientometric Assessment

Muneer Ahmad[1*], Dr. M Sadik Batcha[2]

[1]*Research Scholar, Department of Library and Information Science, Annamalai University, Annamalai Nagar, Tamil Nadu, India*
[2]*Professor and University Librarian, Annamalai University, Annamalai Nagar, Tamil Nadu, India*

Corresponding Authors: Muneer Ahmad, Research Scholar, Department of Library and Information Science, Annamalai University, Annamalai Nagar, Tamil Nadu, India, Email: muneerbangroo@gmail.com

ABSTRACT

Bharathiar University is one of the esteemed university and most vibrant in Tamil Nadu. The University was awarded "A" grade by the National Assessment and Accreditation Council (NAAC) of the University Grants Commission and it has been ranked amongst top 50 Universities in India by the survey taken by the prominent English magazines India Today and The Week in 2013 respectively. The present study has been undertaken to find out the impact of research produced and publication trends of the university during 2009 to 2018. The study merely focuses on year-wise research output, citation impact at local and global level, prominent authors and their total output, top journals of publications, collaborating countries, and most contributing departments of Bharathiar University. The 10 years' publication data of the university indicate that a total of 3440 papers have been published from 2009 to 2018 receiving 38104 citations with h-index as 68. In addition to this scientographical mapping of data is presented through graphs using VOS viewer software mapping technique.

Keywords: *Citations, Scholarly Communications, Web of Science, Research Performance, Most Productive Authors, Scientometric Analysis, Histcite, VOS viewer, Bharathiar University.*

INTRODUCTION

Named after the great national poet, Subramania Bharathiar, Bharathiar University is a state university in Coimbatore, Tamil Nadu with a motto "Educate to Elevate". The university was incepted in 1982 under the provision of Bharathiar University Act, 1981 (Act 1 of 1982) and was accepted by the University Grants commission in 1985.The university is in the foothills of Marudamalai road, Coimbatore and has jurisdiction over the districts of Coimbatore, Erode and Nilgiris. It has 104 affiliated institutions which consist of almost 29 colleges of education, 80 arts and science colleges, eight management institutions, one air force administration college and one college of physical education. The University opted for an evaluation by the National Assessment and Accreditation Council (NAAC) of the University Grants Commission. The apex council NAAC awarded "A" grade and subsequently re-accredited with "A" grade in 2009. The University has been ranked amongst top 50 Universities in India and placed at 32 and 33 in the surveys conducted by the popular English magazines India Today and The Week in 2013 respectively. In 2014, the University was ranked as 29th position by India Today magazine.

REVIEW OF LITERATURE

Several manuscripts have been published in literature dealing with research performance of journals, countries, subjects and institutions. (Batcha, 2018)[1] discussed thoroughly about scientometric output of cardiovascular disease of SAARC countries and offers a powerful set of methods and measures for studying the structure and process of research communication. The paper examines the research trend, authorship, collaborative pattern and activity index of five SAARC Countries regarding the disease which amounts to about 24.8% of deaths in SAARC countries. The result of the paper reveals that India is a leader country among SAARC nations having major research output followed by Pakistan in cardiovascular disease research. The paper also deliberated that USA, England and Australia are the top collaboration countries which has done collaboration with SAARC nations.

(Sivakumar,2018)[2] studied and examined the analysis of research publications of the faculty of Bharathiar University, Coimbatore. Bibliographic records of 4645 items were retrieved from Scopus database between 1982 and 2015 and increasing publications trends were seen in Bharathiar University. The average output of the organization was 137 per year. Among the 4645 papers published in the span of 34 years, highest number of 748 papers was published in the year 2015. The total numbers of citation received by the papers were 50964 and the citing articles were 3559. The average citation per article was 14.3

(Batcha & Ahmad, 2017)[3] analysed comparative analysis of Indian Journal of Information Sources and Services (IJISS) and Pakistan Journal of Library and Information Science (PJLIS) during 2011-2017 and studied various aspects like year wise distribution of papers, authorship pattern & author productivity, degree of collaboration pattern of Co-Authorship , average length of papers , average keywords, etc and found 138(94.52%) of contributions from IJISS were made by Indian authors and similarly 94(77.05) of contributions from PJLIS were done by Pakistani authors. Papers by Indian and Pakistani Authors with Foreign Collaboration are minimal (1.37% of articles) and (4.10% of articles) respectively.

(Batcha, 2018)[4] analysed the various Scientometric components of the articles published by top six universities of Tamil Nadu from 2000-2017. The study identifies research trend, characteristics growth and collaboration pattern of published literature. The analysis of data reveals that the average growth rate increases at the rate of 9.76%. Further, the average citation per paper observed is 12.18%. High degree of international collaboration is notified and USA and South Korea are found to be the most preferred collaborative countries. The CAGR calculated for six universities are 9.76. The major research publications outputs are from the field of Chemistry, Crystallography and Pharmacy.

(Batcha, Jahina, & Ahmad, 2018)[5] has examined scientometric analysis of the DESIDOC Journal and analyzed the pattern of growth of the research output published in the journal, pattern of authorship, author productivity, and, subjects covered to the papers over the period (2013-2017). It found that 227 papers were published during the period of study (2001-2012). The maximum numbers of articles were collaborative in nature. The subject concentration of the journal noted was Scientometrics. The maximum numbers of articles (65 %) have ranged their thought contents between 6 and 10 pages.

(Maurya,2018)[6] examined and analyzed the scholarly communications in terms of scientometric assessment and presented the current scenario of Mizoram University's scholarly communications at the world level based on Web of Science database. Physics and Chemistry subjects found the highest productive area of scholarly communications, multiple authorship is prevalent with high degree of collaboration among authors, Department of Science and Technology (DST) as the topmost funding agency, South Korea found the strong collaborative country with Mizoram University in academic research, Tiwari D as the highest cited author, Thapa RK as the highest productive author, and increased growth in number of scholarly communications as well as citations.

(Batcha & Ahmad, 2017)[7] conducted scientometric analysis of 146 research articles published in Indian journal of Information Sources and Services (IJISS). The number of contributions, authorship pattern & author productivity, average citations, average length of articles, average keywords and collaborative papers was analyzed. Out of 146 contributions, only 39 were single authored and rest by multi authored with degree of collaboration 0.73 and week collaboration among the authors. The study concluded that the author productivity was 0.53 and was dominated by the Indian authors.

(Ahmad & Batcha,2019)[8] analyzed research productivity in Journal of Documentation (JDoc) for a period of 30 years between 1989 and 2018. Web of Science database a service from Clarivate Analytics has been used to download citation and source data. Bibexcel and Histcite application software have been used to present the datasets. Analysis part focuses on the parameters like citation impact at local and global level, influential authors and their total output, ranking of contributing institutions and countries. In addition to this scientographical mapping of data is presented through graphs using VOSviewer software mapping technique.

(Biljecki,2016)[9] examined a set of 12436 papers published in 20 GIScience journals in the gap of 2000-2014 and studied patterns and trends and

its comprehensive scientometric study focuses on multiple aspects like output volume, citations, national output and efficiency, collaboration, altmetrics, authorship, and length of articles. The notable observation are that 5% countries contribute 76% global GIScience output, a paper published 15 years before received a median of 12 citations and the share of global collaborations in GIScience has more than tripled from the year 2000 onwards (31% papers has multiple authors from multiple countries in 2014 and it increased from 10% in 2014).

(Ahmad,et al, 2018)[10] explored scientometric analysis of the Webology Journal. The paper analyses the pattern of growth of the research output published in the journal, pattern of authorship, author productivity, and subjects covered to the papers over the period (2013-2017). It was found that 62 papers were published during the period of study (2013-2017). The maximum numbers of articles were collaborative in nature. The subject concentration of the journal noted was Social Networking/Web 2.0/Library 2.0 and Scientometrics or Bibliometrics. Iranian researchers contributed the maximum number of articles (37.10%). The study applied standard formula and statistical tools to bring out the factual results.

(Batcha, 2017)[11] analysed the research publication output in the field of robotic technology and shows that the robotic technology is a progressive field increasing the publication output from single digit to 513 year after year during the period from 1990 to 2016. The results shows that developing countries like USA, UK and Germany gives the most output on robotic technology related research. Yet major proportion of contribution (36.30%) is from USA. English language is the most preferred for the research amounting (87.70%) followed by German. The Prolific authors in the field of robotic technology are highly found from USA among them the contribution by Bloss R is appreciable and author from Japan, Dario P competes with more number of publications in the study.

OBJECTIVES

- To examine the pattern of year wise growth of the research output of Bharathiar University.

- Identify the leading journals for publishing of scholarly communications from Bharathiar University.

- To identify the most preferred countries for collaboration for publishing their research results.

- Find out the top 30 prolific authors, collaborating institutions and collaborating countries.

- To determine publication density through mapping of top 20 authors, collaborating countries and institutions based on their number of research papers.

METHODOLOGY

The data for the present study were downloaded from the Clarivate analytics-Web of Science database in July 2019. A total of 3440 research publications was downloaded from 2009-2018. The data downloaded were enhanced with different parameters like title, authors, years, collaborating countries, and research institutions. Furthermore, the downloaded data were analyzed by using Histcite, and VOSviewer software applications.

RESULTS AND DISCUSSION

Evaluate the Annual Output of Publications of Bharathiar University

The table I reveals that the numbers of research documents published from 2009 to 2018 are gradually increased. According to the publication output from the table I the year wise distribution of research documents, 2008 has the highest number of research documents 603 (17.73%) with 94 (2.17%) of total local citation score and 1371 (3.62%) of total global citation score values and being prominent among the 10 years output and it stood in first rank position. The year 2017 has 574 (16.69%) research documents and it stood in second position with 344 (7.92%) of total local citation score and 3184 (8.40%) of total global citation score were scaled. It is followed by the year 2016 with 449 (13.05 %) of records and it stood in third rank position along with 494 (11.38%) of total local citation score and 4107 (10.83%) of total global citation score measured. The year 2015 has 381 (11.08%) research documents and it stood in fourth position with 779 (17.95%) of total local citation score and 5214 (13.75%) of total global citation score were scaled. It is noticed that the increase in publications may not create impact on citation score yet the quality matters on total local citation scores and on total global citation scores. It clearly indicates on the fact that the increased publication rate is not bringing the increased citation rate.

Table1. *Annual Distribution of Publications and Citations*

S. No.	Year	Records	%	Rank	TLCS	%	TGCS	%
1	2009	135	3.92	10	165	3.80	1977	5.22
2	2010	194	5.64	9	226	5.21	3290	8.68
3	2011	212	6.16	8	526	12.12	3807	10.04
4	2012	260	7.56	7	738	17.00	5077	13.39
5	2013	281	8.17	6	472	10.87	4972	13.12
6	2014	351	10.20	5	503	11.59	4909	12.95
7	2015	381	11.08	4	779	17.95	5214	13.75
8	2016	449	13.05	3	494	11.38	4107	10.83
9	2017	574	16.69	2	344	7.92	3184	8.40
10	2018	603	17.53	1	94	2.17	1371	3.62
	Total	**3440**	100.00		4341	100.00	37908	100.00

#TLCS = Total Local Citation Score, #TGCS = Total Global Citation Score

Analysis of the Publication Output of Top 20 Authors of Bharathiar University

Table II and figure 1 displays the ranking of authors of research articles. In the rank analysis the authors who have published 50 articles or more are considered into account to avoid a long list. It was observed that there is total of 5464 authors for 3440 records and it shows the top 20 most productive authors during 2009-2018. Murugan K published 173 (5.03%) articles with 3137 TGCS articles, followed by Rakkiyappan R 133 (3.87%) with 3356 TGCS articles, Mangalaraj D 126 (3.66%) with 2599 TGCS articles, Huang CY 113 (3.28%) with 589 TGCS articles, Balachandran K 109 (3.17%) with 1358 TGCS article, Benelli G 100 (2.91%) with 1988 TGCS articles, other authors have contributed less than 3% during the period of study. The data set clearly depicts that no matter how many publications that an author brings out yet the quality publications alone shows impact in the form of total local citations score and total global citations score. It could be identified that the authors' wise analysis the following authors Murugan K, Rakkiyappan R, Mangalaraj D, Huang CY, Balachandran K, and Benelli G, were identified the most productive authors based on the number of research papers published. The data set puts forth that the authors Rakkiyappan R with 3356 citations, Murugan K with 3137 citations, Selvan RK with 2839 citations and Mangalaraj D with 2599 citations.

Table2. *Publication output of Top 20 Authors and Citation Score*

| S. No.	Authors	Records	%	TLCS	TGCS
1	Murugan K	173	5.03	1052	3137
2	Rakkiyappan R	133	3.87	137	3356
3	Mangalaraj D	126	3.66	183	2599
4	Huang CY	113	3.28	84	589
5	Balachandran K	109	3.17	199	1358
6	Benelli G	100	2.91	664	1988
7	Ponpandian N	91	2.65	151	1889
8	Selvan RK	91	2.65	234	2839
9	Prasad KJR	89	2.59	154	454
10	Kolandaivel P	84	2.44	181	682
11	Padma VV	82	2.38	248	1443
12	Senthilkumar K	68	1.98	113	582
13	Natarajan K	64	1.86	408	2091
14	Kuo WW	63	1.83	55	365
15	Viswanadha VP	59	1.72	41	321
16	Panneerselvam C	57	1.66	709	1795
17	Nicoletti M	55	1.60	646	1685
18	Prabhakaran R	52	1.51	284	1028
19	Higuchi A	51	1.48	258	840
20	Nataraj D	50	1.45	64	1003
	Total	1710	49.71	5865	30044
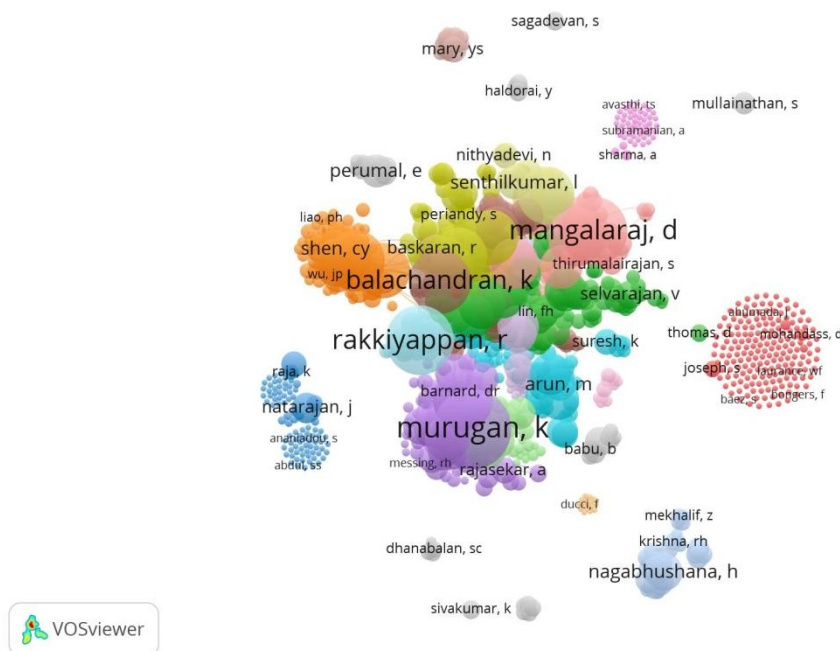
Figure1. *Showing Highly Prolific authors*

Journal Wise Distribution of Documents

The rankings of top 20 journal wise distribution of documents are depicted in the following Table III.

Table3. *Top 20 Journal Wise Distribution of Documents*

S. No.	Journals	Documents	%	TLCS	TGCS
1	RSC Advances	88	2.56	187	1582
2	Spectrochimica Acta Part A-Molecular And Biomolecular Spectroscopy	75	2.18	64	1080
3	Journal Of Molecular Structure	57	1.66	48	357
4	Parasitology Research	52	1.51	669	1734
5	Journal Of Materials Science-Materials In Electronics	43	1.25	13	211
6	Journal Of Alloys And Compounds	29	0.84	58	585
7	Optik	29	0.84	15	82
8	Synthetic Communications	29	0.84	39	105
9	Ionics	28	0.81	42	270
10	Inorganica Chimica Acta	27	0.78	83	442
11	Materials Research Bulletin	25	0.73	35	377
12	Neurocomputing	24	0.70	18	669
13	Journal Of Cluster Science	23	0.67	26	134
14	New Journal Of Chemistry	23	0.67	31	152
15	Biomedicine & Pharmacotherapy	22	0.64	13	110
16	Environmental Science And Pollution Research	22	0.64	76	260
17	International Journal Of Biological Macromolecules	22	0.64	14	277
18	Applied Surface Science	21	0.61	39	481
19	Environmental Toxicology	21	0.61	15	97
20	Acta Crystallographica Section E-Structure Reports Online	20	0.58	11	28

Table III reveals that RSC Advances published 88 (2.56%) papers, Spectrochimica Acta Part A-Molecular and Biomolecular Spectroscopy published 75 papers, (2.18%), Journal Of Molecular Structure published 57 (1.66%) papers and Parasitology Research published 52 (1.51%) papers.

Ranking of Collaborative Institutions

The productivity of the author publications based on the collaborative institutions is depicted in the following Table IV.

Table4. *Ranking of Collaborative Institutions*

| S. No.	Institution	Records	%	TLCS	TGCS	ACPP
1	Asia University	107	3.11	73	563	5.26
2	China Medical University	107	3.11	73	563	5.26
3	University Pisa	102	2.97	664	1996	19.57
4	King Saud University	97	2.82	327	1504	15.51
5	Periyar University	81	2.35	115	916	11.31
6	Annamalai University	72	2.09	47	768	10.67
7	Bharathidasan University	71	2.06	154	1045	14.72
8	Thiruvalluvar University	68	1.98	104	565	8.31
9	Govt Arts College	58	1.69	20	267	4.60
10	Anna University	51	1.48	16	386	7.57
11	China Medical University Hospital	49	1.42	43	257	5.24
12	Changhua Christian Hospital	45	1.31	32	228	5.07
13	Karpagam University	44	1.28	19	360	8.18
14	Natl Cent University	42	1.22	97	431	10.26
15	Sungkyunkwan University	42	1.22	24	245	5.83
16	University Putra Malaysia	39	1.13	120	500	12.82
17	Karunya University	38	1.10	19	308	8.11
18	King Abdulaziz University	38	1.10	45	1064	28.00
19	Sri Ramakrishna Mission Vidyalaya College Arts & Science	37	1.08	15	242	6.54
20	VIT University	37	1.08	27	320	8.65
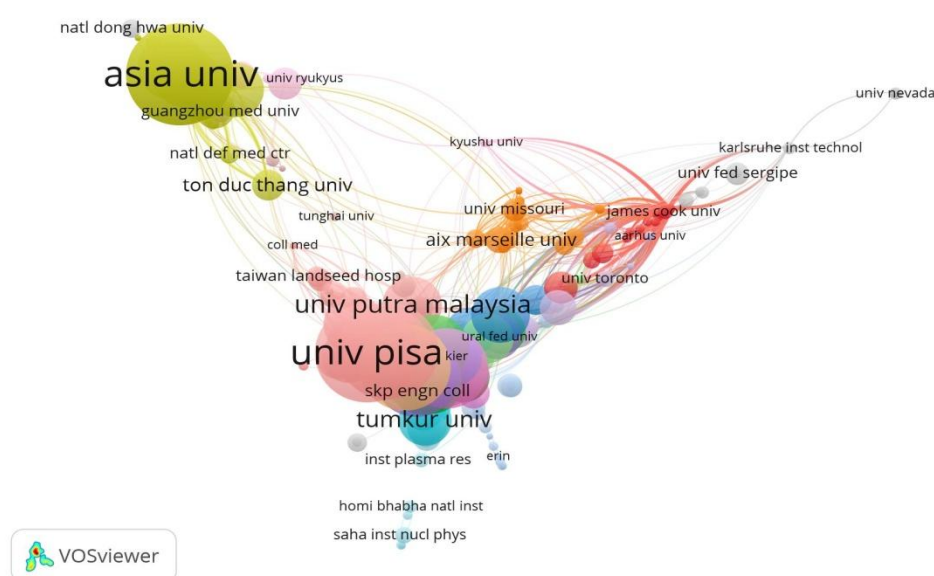
Figure2. *Collaboration of Institutions and their clusters*

It is found that in total 1851 institutions, including 3436 subdivisions published 3440 research papers during 2009 - 2018 and these institutions have collaborated with faculty of Bharathiar University for research and publications. The topmost twenty prolific institutions involved in this research have published 37 and more research articles. The mean average is 1.86 research articles per institution. Out of 1851 institutions, top 20 institutions published 1225 (35.61%) research papers and the rest of the institution published 2215 (64.39%) research papers respectively. Based on the number of published research records the institutions are ranked. Table IV summarizes articles, the global citation score, local citation score and average citation per paper of the publications of these institutions.

Ranking of Department Wise Distribution

The ranking based on the Department wise distribution of the Bharathiar University is depicted in the following Table V.

Table5. *Ranking of Department Wise Distribution.*

S. No.	Department of University	Records	%	TLCS	TGCS	ACPP
1	Department of Physics	572	1.66	786	7305	12.77
2	Centre for Research & Development	382	1.11	322	3239	8.48
3	Department of Chemistry	370	1.08	913	5049	13.65
4	Department of Mathematics	364	1.06	408	5608	15.41
5	Department of Biotechnology	236	0.69	322	2709	11.48
6	Department of NanoScience & Technology	233	0.68	245	3785	16.24
7	Research & Development Centre	204	0.59	67	588	2.88
8	School of Life Science	189	0.55	778	2911	15.40
9	Department of Zoology	153	0.44	343	1909	12.48
10	Department of Botany	130	0.38	62	840	6.46
11	Department of Environmental Science	70	0.20	25	844	12.06
12	Department of Microbial Biotechnology	70	0.20	26	627	8.96
13	Department of Bioinformatics	62	0.18	67	521	8.40
14	DRDO BU Centre for Life Science	50	0.15	112	682	13.64
15	Department of Applied Mathematics	35	0.10	20	208	5.94
16	R&D Centre	34	0.10	12	113	3.32
17	School of Biotechnology & Genetic Engineering	29	0.08	39	391	13.48
18	Department of Medical Physics	20	0.06	3	59	2.95
19	Department of Computer Science	19	0.06	1	38	2.00
20	School of Physical Science	19	0.06	10	179	9.42

Table V shows the department wise distribution. There are 572 articles (1.66%) which were published by the authors of Bharathiar University from department of Physics followed by Centre for Research & Development with 382 articles (1.11%), Department of Chemistry with 370 articles (1.08%), Department of Mathematics with 364 articles (1.06%) and the rest of the departments published less than one percent of research articles from 2009 to 2018.

Country Wise Collaborations

Table VI and figure 3 displays that faculty of Bharathiar University has collaborated with South Korea 289 (8.40%) publications followed by Taiwan with 231 (6.72%) publications and USA with 222 (6.45%) publications. It also shows that Bharathiar University has collaborated and contributed good number of papers with Peoples Republic of China, Saudi Arabia, Italy and Japan.

Table6. *Country Wise Collaborations*

| S. No.	Countries	Records	%	TLCS	TGCS
1	South Korea	289	8.40116	262	4477
2	Taiwan	231	6.71512	545	2759
3	USA	222	6.45349	761	4102
4	Peoples Republic China	183	5.31977	305	3562
5	Saudi Arabia	164	4.76744	420	2836
6	Italy	129	3.75	711	2341
7	Japan	80	2.32558	261	1403
8	Malaysia	63	1.8314	127	646
9	Canada	58	1.68605	47	915
10	Australia	50	1.45349	43	978
11	Germany	47	1.36628	92	598
12	France	44	1.27907	214	771
13	UK	44	1.27907	59	343
14	Singapore	40	1.16279	31	980
15	Turkey	40	1.16279	29	390
16	Spain	35	1.01744	65	560
17	United Arab Emirates	31	0.90116	24	463
18	Brazil	30	0.87209	22	493
19	Belgium	29	0.84302	5	231
20	South Africa	25	0.72674	18	143
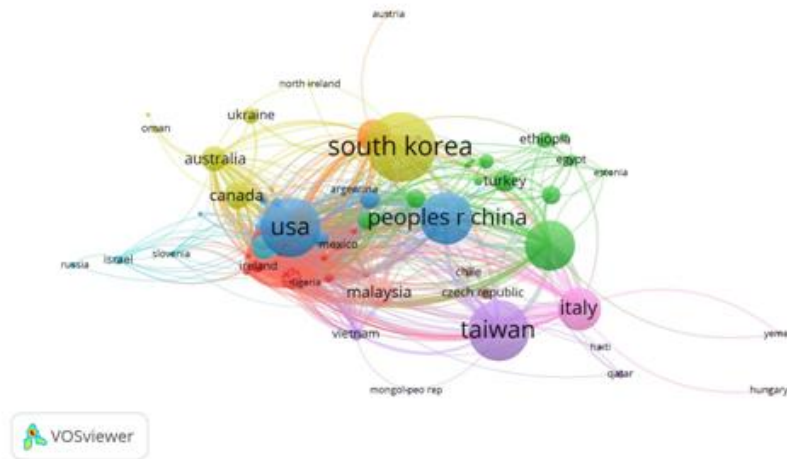
Figure3. *Showing Ranking of Country wise Collaboration*

CONCLUSION

Research productivity in the Bharathiar University among the faculty is significantly high. Though the study started in recent decade but there is really an optimistic growth in the research productivity. Production is the real asset for any institution but as compared to other organization/institution, still, Bharathiar University needs to improve the research performance to a higher level to meet or be at par with leading Universities.

REFERENCES

[1] Batcha S. Cardiovascular Disease Research in SAARC Countries: A Scientometric Study. Informatics Stud. 2018; 5(4).

[2] Sivakumar B. Research Publication Trends among Faculty of Bharathiar University : A Scientometric Study. J Adv Libr Sci. 2018; 5(2):42–50.

[3] M.Sadik Batcha & Muneer Ahmad. Publication Trend in an Indian Journal and a Pakistan Journal : A Comparative Analysis using Scientometric Approach. J Adv Libr Inf Sci. 2017; 6(4):442–9.

[4] Batcha MS. Research Output Analysis of Most Productive Universities of Tamil Nadu, India : A Scientometric Analysis. Libr Philos Pract [Internet]. 2018; 2118–24. Available from: http://digitalcommons.unl.edu/libphilprac/2118

[5] Batcha MS, Jahina SR, Ahmad M. Publication Trend in DESIDOC Journal of Library and Information Technology during 2013-2017 : A Scientometric Approach. Int J Res Eng IT Soc Sci. 2018; 8(4):76–82.

[6] Maurya SK, Shukla A, Ngurtinkhuma RK. Scholarly Communications of Mizoram University on Web of Science in Global Perspective: A Scientometric Assessment. Libr Philos Pract. 2018; (November):1857–72.

[7] M.Sadik Batcha & Muneer Ahmad. Publication Pattern Analysis in Indian Journal of Information Sources and Services (IJISS): A Scientometric Approach. In: Rejuvenating Libraries for Information Access in the Digital Era. 2017. p. 1078–90.

[8] Ahmad M, Batcha MS. Mapping of Publications Productivity on Journal of Documentation 1989-2018 : A Study Based on Clarivate Analytics – Web of Science Database. Library Philosophy & Practice (e-Journal). 2019; 2213–26. Available from: https://digital commons.unl.edu/libphilprac/2213/

[9] Biljecki F. A scientometric analysis of selected GIScience journals. Int J Geogr Inf Sci. Taylor & Francis; 2016; 30(7):1302–35.

[10] Ahmad M, Batcha MS, Wani BA, Khan MI, Jahina SR. Research Output of Webology Journal (2013-2017): A Scientometric Analysis. Int J Mov Educ Soc Sci. 2017; 7(3):46–58.

[11] Batcha MS. Research Output Analysis on Robotic Technology : A Scientometric Study. Indian J Inf Sources Serv. 2017; 7(1):25–31.