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Publication Productivity of University of Kerala: A Scientometric View

A. Gopikuttan* and Aswathy S.**

**Department of Library & Information Science, University of Kerala, Palayam, Trivandrum–695 014*
E-mail: agopikuttan@yahoo.co.in

***Library & Documentation Division, Liquid Propulsion Systems Centre, Indian Space Research Organisation (ISRO), Valiamala P.O, Trivandrum–695 547*
E-mail: s_aswathy@lpscv.dos.gov.in

ABSTRACT

Web of Science is a major citation database which provides access to the world's leading scholarly literature. University of Kerala is one of the premier higher education institutes which cater the educational needs of the Kerala. The present study evaluates the research productivity of University of Kerala based on the data collected from *Web of Science* over a period of thirteen years from 2000 to 2012. This study attempts to analyse the overall performance of the faculty members of Science Departments of University of Kerala in research productivity. The parameters such as form-wise, year-wise, subject-wise classification of published papers, most productive authors and the most preferred journals, etc. are considered for the study. The impact factor and the citation received were also analysed. The study reveals that Chemistry is the subject which produces more number of papers while the multi-authorship also possesses a lead role in this subject. Indian journals are the most preferred journals to publish the articles which are followed by UK. Collaborative Coefficient varies from subject to subject. The result shows that the research productivity of the University of Kerala is much recognised at international level.

Keywords: Scientometrics, collaborative co-efficient, impact factor, total citations, research productivity

1. INTRODUCTION

Higher education is the major source which contributes input to technological capability and change, besides higher rates of growth. The function of a university is not merely to impart skills and techniques required for running industries, business and government and non government departments, but to impart to the young minds certain ethics and values that become the bed rocks of social life at large. Universities should uphold the best values and practices in the society and act as the beacon light so that the nation does not drift aimlessly on the shores of uncertainty, chaos and disorder. In the words of Smt. Indira Gandhi, former Prime Minister of India "Education is a liberating force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances". In educational institutions knowledge is present in individual faculty, researchers, administrators and decision-makers which is shared to the community in the form of published sources such as books, journals, course materials, curriculum and research reports, etc. Knowledge rich organisations generate value from their intellectual and knowledge-based assets.

2. UNIVERSITY OF KERALA

University of Travancore , which later became the University of Kerala, was established in 1937 by a promulgation of the Maharajah of Travancore, Sri Chithira Thirunal Balarama Varma who was also the first Chancellor and Sir C.P. Ramaswamy Ayyar, the then Diwan (Prime minister) of the State was the first Vice-Chancellor of the University. It was the sixteenth university to set up in India and 10 colleges within the state of Travancore which were affiliated to the Madras University became the affiliated colleges of the University of Travancore. Presently, the university has 16 faculties and 42 departments of teaching and research in addition to study centers. There are 236 affiliated colleges functioning under the University of Kerala.

3. SOURCE, SCOPE, METHODOLOGY AND LIMITATION

Web of Science (WoS) is an online citation index hosted by Thomson Reuters which is designed for providing access to multiple databases, cross-disciplinary research, and in-depth exploration of specialised subfields within an academic or scientific discipline. It is part of the Web of Knowledge,

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which includes *WoS*, Journal Citation Reports, Essential Science Indicators, Current Contents, ISI Proceedings, BIOSIS previews. The *Science Citation Index* (*SCI*), now *Science Citation Index Expanded* was first promulgated in Science in 1955, as an up-to-date tool to facilitate the dissemination and retrieval of scientific literature[1]. By using a citation index, one determines what subsequent papers have cited a particular source document which is the major advantage of citation indexes over conventional subject indexes and using *SCI* a user can find high-impact articles from peer-reviewed, influential journals, uncover relevant results in related fields, discover emerging trends that help to pursue successful research and grant acquisition, identify potential collaborators with significant citation records and integrate searching, writing, and bibliography creation into one streamlined process.

The bibliographic details of the published literature were collected using general search option of *Web of Science*. In the address field of the general search option, the name of the university as 'University of Kerala' was provided. The search was limited for a period of thirteen years, i.e., 2000 to 2012 and 1068 records were received. Even though all the publications emanating from University of Kerala were not covered in *WoS*, the study is confined to *WoS* only. Another limitation is that the publications of science departments alone were considered and the period was limited to 13 years.

4. REVIEW OF LITERATURE

Bhaskaran[2] analysed the author productivity, discipline-wise and institution-wise collaboration and ranking of authors in research contribution of Alagappa University during 1999-2011 in the present study. Matthews[3] studied publication productivity of physics teachers of South African universities during 2009-2011 based on the data retrieved from departmental websites and Thomson Reuters' *Web of Science* with the objective to find typical ranges of two measures of individual productivity: number of papers and sum of author share, where author share per *n*-author paper is 1/*n* author units. Maharana & Sethi[4] assessed the scientific research output of Sambalpur University during 2007 to 2011, which describes the growth, contribution and impact of research carried out by the faculty members, researchers or students of Sambalpur University.

The study of Thirumagal[5] is based on the scientific publications generated by the Manonmaniam Sundaranar University as reflected in *Web of Science*. The analysis highlights yearly output of research product and focuses on publishing trend, impact factor, authorship pattern, types of articles, institutional collaboration of authors, affiliated institutions of authors, countries of contributing authors and individual author's research. Fakhree[6], *et al*. analysed the scientific outcomes of seven medical science universities by using Scopus as search engine, have been compared with each other. Comparison were made by the number of published articles per year, number of citations received per year, number of citations received per year per article, total *h*-indices, top ten authors, and top ten journals. Gupta & Sangam[7] studied the performance of Karnatak University in terms of its research output during 1999-2008 including the number of papers published annually, its growth rate, international collaborative publication share and major collaborative publications share and major collaborative partner countries, citation quality and impact of publications.

Ponomariov & Boardman[8] analysed the effect of university research centers on the productivity and collaboration patterns of university faculty and measured the productivity and collaboration patterns of university researchers affiliated with a relatively large-scale and 'mature' university research center to discern the effects, if any, of the center mechanism on individual scientists and engineers. Sudhier[9] carried out a study based journals cited by the physicists at University of Kerala to examine the applicability of Bradford's law of scattering on a sample of 303 journals containing 2655 citations collected from 12 doctoral theses during the period 2004-08. Wang[10], *et al*. analysed the scientific performance of National Taiwan University and Peking University by two indicators, namely citations per publication and *h*-index, based on the data extracted from the *WoS* from 2000 to 2009. Jeyshankar[11], *et al.* analysed bibliographical details of 1282 research articles published by the scientists of CECRI during the period 2000-2009 and found that 2009 was the most productive and collaborative research was dominant. Further, the study investigated authorship pattern, co-authorship pattern, highly prolific authors and highly preferred journals by the scientists of CECRI.

Kumbar[12] portray the growth, contribution and impact of research carried out by the scientists of University of Mysore in science and technology and point out the patterns of communications of university scientists and studies the extent of concentration and scattering of their research output in different journals. Akakandelw[13] provides an informetric analysis of 220 papers published by academic faculty at the University of Zambia from 2002 to June 2007, downloaded from the Thomson Scientific database and analysed for authorship patterns and collaboration. Sevukan & Sharma[14] presents a detailed analysis of research performance of biotechnology faculties in central universities of India from 1997-2006 using the data retrieved from two database sources, namely, *PubMed*, National Centre for Biotechnology

Information; and *Science Citation Index Expanded* by applying bibliometric techniques. Gupta & Dhawan[15] analysed India's publications output in three major international multidisciplinary databases, as indexed during 1981-2005. It reports on India's comparative strength in world S&T output, its growth and decline, its strong and weak subject areas of research, media of communication, its collaborative profile and quality of S&T output, institutional productivity and quality, and dynamics of Indian research at institutional and sectoral levels. Sevukan[16] explains research output in plant sciences of the faculties in central universities of India by analysing a total of 348 bibliographic records of plant sciences retrieved from ISI *SCIE* for a period of 10 years from 1997 to 2006 by year, document type, authorship pattern, and collaboration pattern at different levels, viz., international, national, and local.

5. OBJECTIVES

The objectives of the studyare to study and analyse:

- Year-wise distribution of papers
- Subject-wise distribution of papers
- Country-wise distribution of papers
- Authorship pattern
- Collaborative coefficient
- Concentration of publications and top productive authors
- Category-wise analysis of papers
- Impact factor of top productive journals
- Top productive journals with citations received

6. DATA ANALYSIS, RESULT AND INTERPRETATION

6.1 Form-wise Classification

The categorisation of different forms of contribution shows that 94 %, i.e., 1012 documents are in the form of articles which forms the majority of the contribution. Proceedings and meeting abstract comes in second and third position with 28 and 19 contributions each. It is found that there are 14 reviews during 2000 and 2012. Editorial material, Letter, Correction and Bibliographical items also has been contributed during the period of study.

6.2 Year-wise Distribution of Papers

In total 1068 articles got included in *WoS* database during 2000 to 2012 from University of Kerala. Table 1 provides year-wise distribution of articles. It is seen that 36 articles published in the year 2000 from University of Kerala, which increased gradually. During 2011, more number of articles was included in *WoS* i.e., 126 (11.79 %), but in 2012 it has decreased to 117 (10.9 %) articles. On an average, there were 82 articles per year.

Table 1. Year-wise productivity

Year	No. of articles (%)
2000	36 (3.371 %)
2001	62 (5.805 %)
2002	64 (5.993 %)
2003	55 (5.150 %)
2004	46 (4.307 %)
2005	61 (5.712 %)
2006	68 (6.367 %)
2007	96 (8.989 %)
2008	121 (11.33 %)
2009	109 (10.206 %)
2010	107 (10.019 %)
2011	126 (11.798 %)
2012	117 (10.955 %)
Total	**1068 (100 %)**

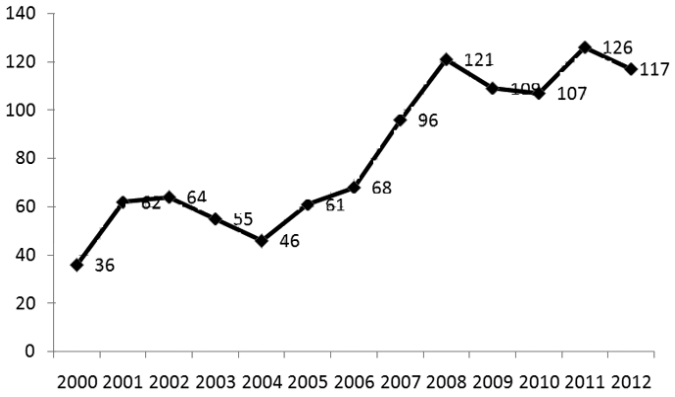

Figure 1. Year-wise distribution.

Figure 1 provides the pictorial representation of the year-wise distribution of articles. It is clear that at the beginning stage, the number of articles published under the category 'University of Kerala' was less and increased progressively. But it can be seen that in between the ups, there is drop downs also in the number of articles.

6.3 Subject-wise Distribution of Papers

The subject-wise categorisation of the published articles from University of Kerala shows that Biology has more number of articles, i.e., 274 (15.83 %) and possesses the first position while Chemistry owns the second position with 257 (14.85 %) articles.

The category Engineering, Physics, and Geology has 231 (13.34 %), 107 (6.18 %), and 78 (4.51 %) articles respectively. Science and Technology in general and the subject Mathematics has 74 (4.27 %) and 47 (2.72 %) articles which is the category which has least number of contribution. From Table 2 it can be inferred that lab-oriented subjects has more number of publications which has international coverage.

Table 2 Subject-wise categorisation

Subject	No. of articles (%)
Biology	274 (15.83 %)
Chemistry	257 (14.85 %)
Engineering	231 (13.34 %)
Geology	78 (4.51 %)
Mathematics	47 (2.72 %)
Physics	107 (6.18 %)
Science & Technology (S&T)	74 (4.27 %)

6.4 Year-wise Distribution of Subjects

Year-wise subject distribution of papers indicates that in the subject Biology (Botany + Zoology) maximum number of papers i.e., 36 was published in 2011 and minimum (7) in 2000. In Engineering maximum productivity was in 2008 (43) and minimum (7) in 2005. In Chemistry, most productive year was 2008 with 30 articles while 2000 is less productive since only 2 articles were published in that year. In Physics, in 2001 productivity was absent while maximum number of paper produced was in 2009 (12) and in 2009 and 2010, 10 papers each were published.

It is found that in 2002 no papers was published in Geology while in 2008, maximum number of papers (9) were published. In 2011 in Science and Technology there were only 5 papers which is less and maximum papers, i.e., 17 were produced in 2008. In Mathematics less productive year was 2006 with 1 paper while maximum papers were published in 2012.

6.5 Top Ten Productive Authors

To find out the top productive authors, total count method was employed and equal weightage were given to each author. During the period 2000 to 2012, WoS covers the papers published by 3803 authors from University of Kerala. Average number of author per article is 3.5. Table 4 provides the top ten productive authors during the study period. Among these authors it can be seen that the author with first position contributed the 10 %

Table 3. Year-wise distribution of subjects

Year	Biology	Engineering	Chemistry	Physics	Geology	S&T	Mathematics	Total
2000	7	8	2	5	3	7	4	36
2001	18	17	12	0	1	8	6	62
2002	16	13	17	6	0	5	7	64
2003	20	12	7	3	3	5	5	55
2004	15	11	7	4	1	5	3	46
2005	22	7	19	5	2	4	2	61
2006	19	17	18	4	1	8	1	68
2007	19	26	23	6	3	10	9	96
2008	16	43	30	4	9	17	2	121
2009	23	33	17	12	7	9	7	108
2010	32	20	25	10	5	10	6	108
2011	36	29	29	10	8	5	9	126
2012	31	23	25	9	4	14	11	117
Total	**274**	**259**	**231**	**78**	**47**	**107**	**72**	**1068**

Table 4. Most productive authors

Rank	Authors	Department	No. of articles (%)	Local citation score	Global citation score
1	Anirudhan, T.S.	Chemistry	114 (10.674 %)	271	1908
2	Pillai, V.P. M.	Opto-electronics	57 (5.337 %)	57	360
3	Oommen, O.V.	Zoology	53 (4.963 %)	87	751
4	Shibli, S.M.A.	Chemistry	53 (4.963 %)	59	384
5	Sudhakaran, P.R.	Biochemistry	49 (4.588 %)	72	442
6	Khadar, M.A.	Physics	35 (3.277 %)	25	421
7	Gopchandran, K.G.	Opto-electronics	34 (3.184 %)	20	456
8	Rajasekharan, K.N.	Chemistry	33 (3.09 %)	38	390
9	Vaidyan, V.K.	Physics	29 (2.715 %)	16	259
10	Nayar, V.U.	Physics	28 (2.622 %)	28	97

of articles, i.e., 114 while the author who possess second position contributed only 57 articles, i.e., 5.337 %. The author with 10th rank contributed 28 articles during the study period, i.e., 2.622 %. From the table it is apparent that Dr T.S. Anirudhan from Department of Chemistry holds the first position with 114 articles, while V.P.M. Pillai of Department of Opto-electronics and Dr O.V. Oommen of Department of Zoology possess second and third position with 57 and 53 articles respectively.

While observing it is clear that these top 10 authors are from lab-oriented departments which indicate the elevated position in publishing their research. In Table 4 Local Citation Score (LCS) and Global Citation Score (GCS), a score of citations derived from WoS is provided. LCS is the citations received from the local collection and GCS is the citation frequency based on the full WoS count at the time of data download. It is clear from the table that Dr T.S. Anirudhan from Department of Chemistry received 271 citations with 1908 global citations. Dr V.K.Vaidyan received only 16 LCS but his GCS is 259.

6.6 Publishing Country of Journals where Indian Authors Published

The analysis shows that 1068 papers were published in journals originated from 27 countries. Among these 873 (81.7 %) of journals were published in journals originated from India and the rest 17.3 % appeared in journal originated from foreign countries scattered in different parts of the globe (Table 5). Around 873 articles, i.e., 81.74 % of articles are published in Indian journals which have international coverage. UK and USA shares the second and third rank with 37 (3.46 %) and 34 (3.18 %) articles respectively. The journals which less number of articles appeared were categorised as other countries which are 45 articles in number and received 23 LCS and 596 GCS. It can be said that only 18 % of the literature are published in foreign journals and the rest of the journals are Indian origin which has international reputation. Journals originated from India received 1011 LCS and 8857 GCS which is the highest citation while journals originated from Peoples Republic of China received 0 LCS but 62 GCS. Thus it is evident from the Table 5 that by and large University of Kerala scientists prefer to publish in Indian journals.

6.7 Authorship Pattern

Table 6 portrays the subject-wise distribution of authorship pattern of teachers of University of Kerala. From the Table 6, it is clear that in Biology, Mathematics, and S&T there are 7 single-authored

Table 5. Country-wise journal articles

Rank	Countries/territories	No. of articles (%)	Local citation score	Global citation score
1	India	873 (81.74 %)	1011	8857
2	United Kingdom	37 (3.46 %)	55	650
3	USA	34 (3.18 %)	13	607
4	Japan	15 (1.4 %)	22	515
5	Slovenia	14 (1.31 %)	14	36
6	Germany	10 (0.94 %)	21	173
7	Netherlands	10 (0.94 %)	6	133
8	South Africa	9 (0.84 %)	36	119
9	Canada	7 (0.66 %)	1	26
10	France	7 (0.66 %)	3	14
11	Peoples R. China	7 (0.66 %)	0	62
12	Other countries	45 (4.21 %)	23	596
	Total	**1068 (100 %)**	**1205**	**11788**

Table 6. Authorship pattern

Subject	Single-authored	Two-authored	Multi-authored	Mega-authored	Total papers	Total multi-authored papers	Collaborative coefficient
Biology	7	75	120	72	274	267	0.33
Chemistry	4	110	95	48	257	253	0.37
Engineering	6	79	93	53	231	225	0.34
Geology	2	28	34	14	78	76	0.36
Mathematics	7	23	8	9	47	40	0.22
Physics	1	26	45	35	107	106	0.34
S&T	7	27	28	12	74	67	0.27
Total	**34**	**368**	**423**	**243**	**1068**	**1034**	**0.33**

papers while in Physics, Geology and Chemistry the single-authored papers are 1, 2, and 4 respectively.

Altogether there are only 34 single-authored papers while multi-authored papers are 1034, which indicates the dominance of multi-authorship. In Biology, there are 267 multi-authored papers, which is followed by Chemistry with 253 papers and Engineering with 225 papers. In Mathematics the multi-authorship is less, i.e., 40.

6.8 Collaborative Coefficient

Ajiferuke & Tague[17] introduced collaborative coefficient (CC), for which the single author gets one full credit while multi authored papers will get half credit each, i.e., if 'j' is the number of authors then each author received 1/j credit and the values obtained will be between 0 and 1. By this index, it is possible to differentiate various levels of multiple authorships and the increase in single-authored articles the value of this index decreases and will tend towards zero. Ajiferuke & Tague[17] explained that the degree of collaboration in a discipline is not accurate when the proportion of multiple authorship or mean number of authors per paper calculated. Instead of these, they proposed a measure combining some of the merits of both measures. The CC can be explained as a single-authored paper gets one credit; two-authored paper, each received half credit and in general if there are '*n*' number of authors, each receives 1/*n* credits and the average credit awarded to each author of a random paper is E[1/n], a value which lies between 0 and 1. It vanishes for a collection of single-authored papers, and distinguishes between single-authored, two-authored, etc., papers (Savanur & Srikanth[18]). The mathematical formula to calculate CC is as follows:

$$CC = 1 - \frac{\sum_{j=1}^{A}\left(\frac{1}{j}\right)f_j}{N}$$

where, f_j is the number of authors papers published in a discipline during a certain period of time; N is the total number of papers published in a discipline during a certain period of time; and j is the greatest number of authors per paper in a discipline.

Here the value of CC varies from discipline to discipline and the lowest CC is in Mathematics, i.e., 0.22 and highest CC is in Chemistry, i.e., 0.37 which is followed by Geology with CC 0.36. In Biology, CC is calculated as 0.33 while in Engineering the CC is 0.34.

In Physics and S&T general CC is obtained as 0.34 and 0.27 respectively. Therefore it can be summarised that in Chemistry, Geology, Physics, and Biology multi-authorship are more while in other subjects such as Mathematics and S&T in general collaboration is less. According to Ajiferuke[17] if the value of CC tends to zero, single-authored papers

Table 7. Rank list of journals

S. No.	Rank	Name of journal	Publishing country	No. of articles	Average IF
1.	1	*Current Science India*	India	25	0.70
2.	2	*Indian Journal of Biochemistry and Biophysics*	India	20	0.50
3.	3	*Spectrochimica Acta*	Netherlands	19	1.34
4.	4	*Applied Surface Science*	Netherlands	17	1.47
5.	*5*	*Industrial & Engineering Chemistry Research*	USA	14	1.46
6.	*5*	*Journal of Geological Society of India*	India	14	0.36
7.	6	*Journal of Environmental Biology*	India	11	0.34
8.	6	*Journal of Optoelectronics & Advanced Materials*	Romania	11	0.63
9.	7	*Asian Journal of Chemistry*	India	10	0.21
10.	7	*Journal of Morphology*	USA	10	1.13
11.	8	*Journal of Indian Chemical Society*	India	9	0.32
12.	*8*	*Phytotheraphy Research*	UK	9	1.28
13.	8	*Surface and Coatings Technology*	Netherlands	9	1.52
14.	9	*Chemical Engineering Journal*	Netherlands	8	1.70
15.	9	*Journal of Applied Polymer Science*	USA	8	1.05
16.	9	*Journal of Materials Science*	Netherlands	8	1.12
17.	10	*Endocrine Research*	UK	7	0.90
18.	10	*General and Comparative Endocrinology*	USA	7	2.25
19.	10	*Indian Journal of Experimental Biology*	India	7	0.38
20.	10	*Indian Journal of Fisheries*	India	7	0.10
21.	10	*Journal of Alloys and Compounds*	Netherlands	7	1.47
22.	10	*Materials Chemistry and Physics*	Netherlands	7	1.46

dominate and the increase in CC indicates the rising share of multi-authored papers.

6.9 Top Journals and Citation Score

Table 7 depicts the top productive journals in which the faculty members of University of Kerala prefer to publish their article. Average impact factor has been calculated from the Impact Factor (IF) obtained from Journal Citation Reports from 2000 to 2012. According to Table 7, '*Current Science India*' is the most preferred journal and the average IF of this journal is 0.7. Second and third selection journal by University of Kerala is '*Indian Journal of Biochemistry*' and '*Spectrochimica Acta*' which has the average IF as 0.50 and 1.34. It is clear that maximum IF is for the journal '*General Comparative Endocrinology*', i.e., 2.25 and minimum IF is for the journal '*Indian Journal of Fisheries*' 0.10. As far as originating country of these journals is concerned, there are 8 Indian journals which come in top followed by Netherlands with seven journals. Four journals are published from USA while from UK there are two journals published. One journal is published from Romania.

6.10 Articles of Highest Citations Received

The articles which received more citations are provided in Table 8. Here the articles which received more than 10 citations were considered. There are 25 journals which received more than 10 citations during the study period. The bibliographic details with total citations received are provided in the table. With reference to the table, the article which got maximum citation, i.e., 289 is authored by Dr V. Biju, *et al*. of Department of Aquatic Biology and Fisheries which is followed by the article of Dr K.N. Rajasekharan of Department of Chemistry which received 189 citations. Dr Oommen of Department of Zoology got 122 citations for his article which is in the third position.

Table 8. Articles vs. citations received

S. No.	Journal bibliographic details	Total citations received
1.	Biju, V ...[et al.]. (2008). Semiconductor quantum dots and metal nanoparticles: syntheses, optical properties and biological applications. *Analytical and Bioanalytical Chemistry, 391*(7), 2469-95.	289
2.	Rajasekharan, KN ...[et al.]. (2008). Biological activities of curcumin and its analogues (Congeners) made by man and mother nature. *Biochemical Pharmacology, 76*(11), 1590-1611.	189
3.	Aggarwal, BB; Takada, Y & Oommen, OV. (2004). From chemoprevention to chemotherapy: Common targets and common goals. *Expert Opinion on Investigational Drugs, 13*(10), 1327-38.	122
4.	Biju, V...[et al.]. (2010). Bioconjugated quantum dots for cancer research: present status, prospects and remaining issues. *Biotechnology Advances, 28*(2), 199-213.	122
5.	Oomen, OV ...[et al.]. (2004). Phylogeny of caecilian amphibians (Gymnophiona) based on complete mitochondrial genomes and nuclear RAG1. *Molecular Phylogene Tics and Evolution , 33*(2), 413-27.	84
6.	Biju, V ...[et al.]. (2007). Quantum dot-insect neuropeptide conjugates for flourescence imaging, transfection and nucleus targeting of living cells. *Lanmuir, 23*(20), 10254-61.	82
7.	Biju, V ...[et al.]. (2008). Photosensitised breakage and damage of DNA by CdSe-Zns quantum dots. *Journal of Physical Chemistry B, 112*(32), 10005-10011.	75
8.	Sasi, B & Gopchandran, KG. (2007). Nanostructured mesoporous nickel oxide thin films. *Nanotechnology, 18*(11).	47
9.	Helen, A ...[et al.]. (2000). Antioxidant effect of onion oil (Alliumcepa Linn) on the damages induced by nicotine in rats as compared to alphatocopherol. *Toxicology Letters, 116*(2), 61-68.	42
10.	Anila, L & Vijayalakshmi NR. (2002). Flavnoids fromm Emblica officinalis and Mangifera indica - effectiveness for dyslipidemia. *Journal of Ethnopharmacology, 79*(1), 81-87.	41
11.	Nevin KG & Rajmohan, R. (2004). Beneficial effects of virgin coconut oil on lipid parameters and in cirto LDL oxidation. *Clinical Biochemistry, 37*(9), 830-35.	41
12.	Unnithan MR & Anirudhan, TS. (2001). Kinetics and thermodynamics of sorption of chromium(VI) onto the iron(III) complex of a carboxylated polyacrylamide-grafted sawdust. *Industrial & Engineering Chemistry Research, 40*(12), 2693-2701.	40
13.	Anila L & Vijayalakshmi, NR. (2003). Antrioxidant action of flavonoids from Mangifera indica and Embica officinalis in hypercholesterolemic rats. *Food Chemistry, 83*(4), 569-74.	39
14.	Krishnan, KA & Anirudhan, TS. (2002). Removal of mercury(II) from aqueous solutions and chlor-alkali industry effluent by steam activated and sulphurised activated carbons prepared from bagasse pith: kinetics and equilibrium studies. *Journal of Hazardous Materials, 92*(2), 161-83.	39

15.	Krishnan, KA & Anirudhan, TS. (2003). Removal of cadmium(II) from aqueous solutions by steam-activated sulphurised carbon prepared from sugar-cane bagasse pith: kinetics and equilibrium studies. *Water SA, 29*(2), 147-156.	37
16.	Manju, GN; Krishnan KA; Vinod VP & Anirudhan TS. (2002). An investigation into the sorption of heavy metals from wastewaters by polyacrylamide-grafted iron (III) oxide. *Journal of Hazardous Materials, 91*(3), 221-38.	34
17.	Nair, PS ...[et al.]. (2002). Cadmium ethyxanthate: a novel single-source precursor for the preparation of CdS nanoparticles. *Journal of Materials Chemistry , 12*(9), 2722-25.	33
18.	Oommen, OV ...[et al.]. (2002). A molecular phylogeny of ichthyophiid caecilians (Amphibia:Gymnophiona:Ichthyophiidae): Out of India or out of South East Asia? *Proceedings of the Royal Society B: Biological Sciences, 269*(1500), 1563-69.	33
19.	Unnithan, MR; Vinod VP & Anirudhan, TS. (2004). Synthesis, characterisation and application as a chromium (VI) adsorbent of amine-modified polyacrylamide-grafted coconut coir pith. *Industrial Engineering Chemistry Research, 43*(9), 2247-55.	31
20.	Manohar, DM; Krishnan, KA & Anirudhan, TS. (2002). Removal of mercury(II) from acqueous solutions and chlor-alkali industry wastewater using 2-mercaptobenzimidazole-clay. *Water Research, 36*(6), 1609-19.	30
21.	Anirudhan, TS & Radhakrishnan, PG. (2008). Thermodynamics and kinetics of adsorption of Cu(II) from aqueous solutions onto a new cation exchanger derived from tarmarind fruit shell. *Journal of Chemical Thermodynamics, 40*(4), 702-08.	27
22.	Oommen, OV ...[et al.]. (2004). Local endemism within the western Ghats - Sri Lanka biodiversity hotspot. *Science , 306*(5695), 479-81.	27
23.	Noeline, BF; Manohar, DM & Anirudhan, TS. (2005). Kinetic and equilibrium modelling of lead(II) sorption from water and wastewater by polymerised banana stem in a batch reactor. *Separation and Purification Technology, 45*(2), 131-40.	25
24.	Anirudhan, TS & Unnithan, MR. (2007). Arsenic (V) removal from aqueous solutions using an anion exchanger derived from coconut coir pith and its recovery. *Chemosphere, 66*(1), 60-66.	20
25.	Gopchandran ...[et al.]. (2002). Preparation of transparent and semiconducting NiO films. *Vacuum, 68*(2), 149-54.	13

7. MAJOR FINDINGS

The present study tried to provide a comprehensive evaluation of the data obtained from WoS. It is found that at the early stage the coverage of publications from University of Kerala was less but it is increasing gradually even though there are ups and drop downs in a few years and 2011 is the year which possess more number of articles. More articles are published from journals from India, USA and Netherlands. The CC varies from discipline to discipline and in Chemistry the CC is high and in Mathematics the CC is less. Authorship pattern analysis reveals that multi-authorship dominates in university system as two-authored, multi-authored and mega-authored papers are more in all disciplines. The IF of the top productive journals ranges from 0.1 to 2.25 and among the country of origin of the top preferred journals, India possess 1st place which is followed by Netherlands, USA and UK. Form-wise distribution shows that article contribution is more when compared to other forms of publication. The investigation of productivity of authors discloses that the most productive author belongs to Department of Chemistry which is followed by Department of Opto-electronics.

8. CONCLUSIONS

The team research of the faculty and students of universities in turn provides joint authorship which results in high collaboration. This study is limited to the data included in *Web of Science* which means the journal articles which is not covered in this database does not comes under the purview of this study. But the study reveals that the research productivity of the University of Kerala is much recognised at international level. The policymakers of the university should develop more effective approaches to augment research capacities and to persuade research performance to accelerate scientific productivity of faculties. By offering research facilities and financial supports, they could resolve the annual minimum research prospects of the affiliated academic staff of each faculty. Moreover, the task of research activities should be more emphasised in a way that academic staff considers research as a major part of their professional workflow.

REFERENCES

1. Garfield, E. Citation indexes for science: A new dimention in documentation through association of ideas. *Science*, 1955, **122**, 108-11.
2. Bhaskaran, C. Research productivity of Alagappa University during 1999-2011: A bibliometric study. *DESIDOC J. LIb. Inf. Technol.*, 2013, **33**(3), 236-42.
3. Matthews, A. Physics publication productivity in South African universities. *Scientometrics*, 2013, **95**(1), 69-86.

4. Maharana, Rabindra & Sethi, Bipin Bihari. A bibliometric analysis of the research output of Sambalpur University's publication in ISI Web of Science during 2011. *Lib. Phil. Pract.*, 2013, 5-15.
5. Thirumagal, A. Scientific publications of Manonmanian Sundaranar University, Thirunelveli, Tamilnadu: Scientometric analysis. *Lib. Phil. Pract.*, 2012, 1-10.
6. Abolghassemi Fakhree, Mohammad & Jouyban, Abolghasem. Scientometric analysis of the major Iranian medical universities. *Scientometrics*, 2011, **87**(1), 205-20.
7. Gupta B.M. & Sangam S.L. Contribution and impact of Karnatak University publications during 1999-2008: A study in comparison with three other universities in Karnataka. *In* S.S.L, Scientometric Studies. Karnatak University, Bangalore, 2011, pp. 89-112.
8. Ponomariov, Branco L. & Broadman, P. Craig. Influencing scientists' collaboration and productivity patterns through new institutions: University research centres and technical human capital. *Research Polict*, 2010, **39**(5), 613-24.
9. Sudhier Pillai K.G. Bradford's law of scattering revisited: A study based on the references in doctoral theses in the area of Physics. COLLNET *J. Sciento. Inf. Manag.*, 2010, **4**(2), 35-47.
10. Wang, M.; Fu, H. & Ho, Y. Comparison of universities' scientifuc performance using bibliometric indicators. *Malaysian J. Lib. Inf. Sci.*, 2011, **16**(2), 1-19.
11. Jeyshankar, R.; Babu, B.R. & Rajendran, P. Research output of CSIR-central electro chemical research institute (CECRI): A study. *Annals Lib. Inf. Stud*., 2011, **58**(4), 301-06.
12. Mallinath Kumbar. Growth and impact of research output of University of Mysore, 1996-2006: A case study. *Annals Lib. Inf. Stud*., 2009, **55**(3), 185-95.
13. Akakandelwa. Author collaboration and productivity at the University of Zambia, 2002-2007. *African J. Lib., Arch. Inf. Sci*., 2009, **19**(1), 13-23.
14. Sevukan, R. & Sharma, Jaideep. Bibliometric analysis of research output of biotechnology faculties in some Indian central universities. *DESIDOC J. Lib. Inf. Technol.*, 2008, **28**(6), 11-20.
15. Gupta B.M. & Dhawan S.M. A scientometric analysis of S&T publications output by India during 1985 -2002. *DESIDOC J. LIb. Inf. Technol.*, 2008, **28**(2), 73-85.
16. Sevukan, R. Research output of hte faculties of plant sciences in central universities of India: A bibliometric study. *Annals Lib. and Inf. Stud*., 2007, **54**(3), 129-39.
17. Ajiferuke, I; Burrel, Q. & Tague, J. Collaborative Coefficient: A single measure of the degree of collaboration in research. *Journal of Scientometrics*, 1988, **14**, 421-33.
18. Savanur, Kiran & Srikanth, R. Modified collaborative coefficient: A new measure for quantifying degree of research collaboration. *Journal of Scientometrics*, 2010, **84**(2), 365-71.

About the Authors

Dr A. Gopikuttan is currently working as Associate Professor in Department of LIS, University of Kerala, and Director, School of Communication and Library Science; Director, UIT; Chairman, Board of Studies, University of Kerala. He is having more than 25 years of experience. He authored 30 journal articles and one book in LIS. He is also member in Board of Studies of Madras University and University of Calicut. His area of interest includes: Scientometrics, digital libraries, information technology, etc.

Dr (Smt) Aswathy S. is working as Sr. Scientific Assistant at Liquid Propulsion Systems Centre, Indian Space Research Organisation (ISRO), Valiamala, Trivandrum. She holds Masters Degree in Hindi as well as MPhil (LIS). She has completed her PhD from University of Kerala. She has 4 journal articles, 3 edited books, and 3 conference papers to her credit. Her area of interest includes:Scientometrics, information communication technology, open access initiatives, open source softwares, etc.