Growth and Development of Research Productivity on Green Library at Global Level: A Scientometric Analysis

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Abstract

The study deals with the Scientometric study on the publication of 'Green Library'. The records are collected from Web of Science Databases for the period of 1989–2014. A total of 1983 papers were identified in Web of Science database. The study reveals that most of the researchers preferred to publish their research results in journals; as such 90.42% of articles were published in journals. More numbers of articles were published in the year 2014. The authorship trend shows that, out of total 1983 publication published, 96% of the publications were published under the joint authorship. Furthermore, this study also identifies that analyses coverage growth rates, source wise. Degree of collaboration, areas of research concentration, word frequency, geograpical distribution of the literature and citation analysis is also noted.

Keywords

Green Librar; Scientometrics; Doubling time; Relative growth rate; Authorship, Institutions

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1. INTRODUCTION

Scientific productivity in the form of intellectual contribution communicated in a written form is important to the scientific community. It is measured through publications and citation data. Scientometric involves quantitative studies of scientific activities. The major focus of the study is to apply the scientometric analysis with a view to analyze the growth and development of research output in green library at global level. This study is related to authors and their productivity; collaborative patterns and other aspects are important and useful to understand the mechanism underlying the growth of knowledge of a discipline. This study has resulted in a special attention on the performance of research output in Green Library. It aims to examine the emergence of research areas, research groups and countries with a view to map the cognitive or intellectual structure of research. This study also analyses the growth and development of Green Library research output in terms of its content and coverage relative growth rates, doubling time, source wise. Degree of collaboration, Collaborative index, Areas of research concentration, author productivity, authorship Pattern, and word frequency and citation analysis are also noted.

2.GREEN LIBRARY

Green library refers to library that contributes towards maintaining the natural ecological balance in the environment, and preserving the planet and its natural systems and resources. Green Library has many meanings, including preserving natural resources for the future, living in a carbon-neutral way, and meeting the needs of the community. For the purpose of this task is as living and working in a practical and environmentally responsible manner, to ensure the protection of the world's resources for future generations. It also improved day to day operations and procedures of the library, as well as educating the community about responsible environmental practices. Libraries are in a unique high profile position which enables them to be community role models by implementing sustainable strategies.

3.OBJECTIVES

The main objective of this study was to use Scientometric analyze the key features of Green Library research activities at global level:

1. To identify and analysis the pattern of distribution of Green Library research output.
2. To identify the rate of growth of Green Library research productivity by calculating relative growth rate and doubling time of publications
3. To examine the Year wise distribution of publications;
4. To identify the Source wise distribution of publications;
5. To analyse the authorship pattern and examine the extent of research collaboration and ranking of authors based on publications;
6. To identify the proportion of single and multi-author papers and degree of collaboration in Green Library Research output
7. To identify journal wise distribution of publications on Green Library research output.
8. To assess the Institution wise research concentration on Green Library research output.
9. To identify Country – wise Collaborative Distribution of Publications;

4.METHODOLOGY

The present study is carried out about source documents and research output. The data for the study were downloaded from the web of science database in Dec 2014. All the Publications were retrieved from the Web of Science database on Green Library and cover the period from 1989 to 2014. Furthermore, the research has downloaded the bibliographical data in the form of notepad files. Then, the bibliographical details are converted using Histcite software. Overall data retrieved by the researcher are 1983 records and the researcher chosen only 1983 records for analysing the present study.

5. ANALYSIS

5.1: Growth of Publications

To analysis the year wise publication of research on Green Library, the data has been presented in Table-1. Table- 1 indicate that the clearly see that during the period 1989 - 2014 a total of 1983 publications were published at India level. The highest publication is 173 in 2014 with 128 Global Citation Scores followed by 163papers in 2013with 670 Global Citation Score and 160 papers in 2012 with 967 Global Citation Scores.

Table 1: Shows Year wise Distribution of Publications

S.No	Year	Publications	%	TLCS	TGCS
1	1989	1	0.05	0	0
2	1990	1	0.05	0	0
3	1991	18	0.90	13	952
4	1992	25	1.26	40	2754
5	1993	19	0.95	8	1443
6	1994	14	0.70	2	594
7	1995	22	1.10	16	1043
8	1996	25	1.26	161	4392
9	1997	45	2.26	71	2569
10	1998	50	2.52	77	2689
11	1999	63	3.17	69	2731
12	2000	60	3.02	47	2825
13	2001	72	3.63	53	3728
14	2002	84	4.23	60	2909
15	2003	78	3.93	55	3959
16	2004	100	5.04	41	3036
17	2005	96	4.84	75	4213
18	2006	106	5.34	100	2669
19	2007	119	6.00	48	3491
20	2008	101	5.09	34	2252
21	2009	116	5.84	41	2820
22	2010	121	6.10	38	1700
23	2011	151	7.61	29	1290
24	2012	160	8.06	26	967
25	2013	163	8.21	16	670
26	2014	173	8.72	3	128
TOTAL		**1983**	**100**		

The lowest publication is 1 in 1989 and 1990 with there is no Global Citation Scores. It shows that even minimum numbers of records were scored higher global citations. The study also reveals all these 1983 publications have 32817 cited references it shows that there is a healthy trend in citing reference is found among the Indian Scientists belongs to Green Library.

5.2 Relative Growth Rate and Doubling Time

Table- 2 indicates the relative growth rates of Green Library literature and also the doubling time for publications. It includes all sources of publications.

Table 2: Shows Relative Growth rate of Green Library Publications

Year	Publication output	Cum. No. of output	W_1	W_2	R(a) W_2- W_1	Mean $\overline{R(a)}$= W_2- W_1	Doubling time Dt=$\frac{0.693}{\overline{R(a)}}$	Mean Dt (a)
1989	1	1		0	0		0	
1990	1	2	0	0.69	0.69		1.00	
1991	18	20	0.69	2.99	2.3		0.30	
1992	25	45	2.99	3.80	0.81		0.85	
1993	19	64	3.80	4.15	0.35		1.98	
1994	14	78	4.15	4.35	0.2		3.46	
1995	22	100	4.35	4.60	0.25	0.46	2.77	
1996	25	125	4.60	4.82	0.22		3.15	
1997	45	170	4.82	5.13	0.31		2.23	
1998	50	220	5.13	5.39	0.26		2.66	**2.18 Years**
1999	63	283	5.39	5.64	0.25		2.77	
2000	60	343	5.64	5.83	0.19		3.64	
2001	72	415	5.83	6.02	0.19		3.64	
2002	84	499	6.02	6.21	0.19		3.64	
2003	78	577	6.21	6.35	0.14		4.95	
2004	100	677	6.35	6.51	0.16		4.33	
2005	96	773	6.51	6.65	0.14		4.95	
2006	106	879	6.65	6.77	0.12		5.77	
2007	119	998	6.77	6.90	0.13		5.33	
2008	101	1099	6.90	7.00	0.1	**0.12**	6.93	
2009	116	1215	7.00	7.10	0.1		6.93	
2010	121	1336	7.10	7.19	0.09		7.7	**6.03 Years**
2011	151	1487	7.19	7.30	0.11		6.3	
2012	160	1647	7.30	7.40	0.1		6.93	
2013	163	1810	7.40	7.50	0.1		6.93	
2014	173	1983	7.50	7.59	0.09		7.7	
Total	**Mean**					**0.29**		**4.10 Years**

It could be observed that the relative growth rates for all sources of Green Library research output have decreased from 2.3 in 1991 to 0.09 in 2014. The mean relative growth rates for the periods 1989-2001 and 2002-2014 are 0.46 and 0.12 respectively. The overall study period has witnessed a mean relative growth rate of 0.29.Contrastingly, the doubling time for publication of all sources of Green Library research output has increased from 0.03 in 1991 to 7.7 in 2014. The mean doubling time for publications for the periods of 1989-2001and 2002-14 are 2.18 and 6.03 years respectively. The whole study period has witnessed a doubling time for publications at 4.10 years. In general, Green Library research output has shown a declining trend as far as the publications are concerned; inversely doubling time for publications has increased progressively.

5.3 Source wise Distribution of Publications

A study of data in table-3 indicates the source wise distribution of research output in Green Library. This study has observed a total of 1983 publications in Green Library during the period of Twenty Six years from 1989 to 2014. Out of various sources of publications in Green Library, journal articles that appeared in the journals have shown a predominant contribution (90.42%) with Global citation score is 46,663 and this source occupies the first position. The source of review comes second in order (4.7%)

with Global citation scores (4132) of sharing total research output in Green Library during the period of analysis. The source of proceeding papers comes in the third position (2.57%) with global citation scores (2896) with respect to total output in Green Library research during the study period.

Table 3: Shows Source wise distribution of Publications

S.No	Document Type	Publi cations	%	TLCS	TGCS
1	Article	1793	90.42	957	46663
2	Review	94	4.74	42	4132
3	Article; Proceedings Paper	51	2.57	88	2896
4	Note	10	0.504	32	1962
5	Review; Book Chapter	10	0.50	3	134
6	Book Review	9	0.45	0	0
7	Editorial Material	7	0.35	0	31
8	Meeting Abstract	4	0.20	0	0
9	News Item	3	0.15	0	0
10	Database Review	1	0.05	1	6
11	Reprint	1	0.05	0	2
Total		**1983**	**100**		

5.4Authorship pattern in Green Library Research Output

Table 4 indicates the authorship pattern of research publication on green library research output. It could be noted that the four authors paper rank first in order (16..94%) where as five authors paper obtain the second order of priority (15.43%) where as three authors paper obtain the third order of priority. The single author paper records the eight order of priority (4.84%). The present study brings papers under analysis contributed by one author to ten authors and above. It is noticed that from single author paper to eight authors and above papers, the trend is under of publications has reduced significantly as the number of authors increases.

Table 4: Showing Authorship pattern in Green Library Research Output

S.No	Year	Single	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten and Above
1	1989	1	-	-	-	-	-	-	-	-	-
2	1990	1	-	-	-	-	-	-	-	-	-
3	1991	-	1	5	4	7	1	1	-	-	-
4	1992	1	4	4	2	6	6	1	-	1	-
5	1993	6	3	3	2	2	1	1	-	1	-
6	1994	-	6	2	1	2	3	-	-	-	-
7	1995	-	8	6	1	3	3	1	-	-	-
8	1996	-	5	4	6	3	1	2	3	-	1
9	1997	3	5	8	9	11	6	1	1	-	-
10	1998	2	7	12	7	8	9	1	2	2	-
11	1999	5	9	12	10	13	6	3	3	1	1
12	2000	2	9	9	12	11	7	5	2	1	2
13	2001	1	11	8	19	11	9	4	4	2	3
14	2002	1	15	14	21	7	12	2	4	3	5
15	2003	6	8	14	16	11	8	6	1	3	5
16	2004	4	17	15	14	14	7	9	10	4	6
17	2005	1	11	14	24	17	10	9	2	2	6
18	2006	6	21	17	13	17	9	11	5	3	4
19	2007	12	9	19	16	14	16	7	8	5	13
20	2008	5	8	18	15	15	12	7	7	4	10
21	2009	5	15	16	15	22	9	12	4	4	15
22	2010	6	16	11	21	14	19	8	9	6	11
23	2011	6	11	26	29	28	16	15	4	2	14

24	2012	10	17	24	25	19	20	16	11	4	13
25	2013	3	17	22	28	30	14	18	8	9	14
26	2014	9	15	19	26	21	28	19	13	6	17
Total		**96 (4.84)**	**248 (12.51)**	**302 (15.23)**	**336 (16.94)**	**306 (15.43)**	**232 (11.70)**	**159 (8.02)**	**101 (5.09)**	**63 (3.17)**	**140 (7.06)_**

5.5 Single Vs Multiple Authored and Degree of collaboration Research output

It is observed that the single version multi author research output during the period 1989 to 2014. At the overall level, the single author contributed papers constitute 4.8 percent of the total publications; whereas the remaining majorities (95.2%) of the papers are contributed by multi-authorship. It is inferred from the table -5 that at the aggregate level, the degree of collaboration is of 0.91 during the study period 1989 to 2014 i.e, that is out of total 1983 literature published, 95% of them or published under the joint author of publications in Green Library research output. The period wise analysis indicates that its level is somewhat less in the first period [1989-2001: 0.80] and it has shown. An increasing trend during the period [2002-14: 0.94]. This brings out clearly the high level of prevalence of collaborative research in Green Library.

It could be seen clearly from the above discussion that the degree of collaboration in producing research output on Green Library research has shown an increasing trend during the study period since it is a new discipline. Based on this study, the result of the degree of collaboration **C=0.91** i.e., 91 percent of collaboration authors articles published during the study periods.

Table 5: Single Vs Multiple Authored Research output and Degree of Collaboration

Year	Single Author		Multiple Author		Total	Degree of Collaboration	Mean in Degree of Collaboration
	No of Output	%	No of Output	%			
1989	1	1.04	0	0	1	0	
1990	1	1.04	0	0	1	0	
1991	0	0	19	1.01	18	1.05	
1992	1	1.04	24	1.27	25	0.96	
1993	6	6.25	13	0.69	19	0.68	
1994	0	0	14	0.74	14	1	
1995	0	0	22	1.16	22	1	
1996	0	0	25	1.32	25	1	
1997	3	3.12	41	2.17	45	0.91	
1998	2	2.08	48	2.54	50	0.96	
1999	5	5.20	58	3.07	63	0.92	
2000	2	2.08	58	3.07	60	0.96	**0.80**
2001	1	1.04	71	3.76	72	0.98	
2002	1	1.04	83	4.39	84	0.98	
2003	6	6.25	72	3.81	78	0.92	
2004	4	4.17	96	5.08	100	0.96	
2005	1	1.04	95	5.03	96	0.98	
2006	6	6.25	100	5.29	106	0.94	
2007	12	12.5	107	5.67	119	0.89	
2008	5	5.21	96	5.08	101	0.95	
2009	5	5.21	112	5.93	116	0.96	
2010	6	6.25	115	6.09	121	0.95	
2011	6	6.25	145	7.68	151	0.96	
2012	10	10.41	149	7.89	160	0.93	**0.94**
2013	3	3.12	160	8.47	163	0.98	
2014	9	9.37	164	8.69	173	0.94	
	96	4.84	**1887**	95.16	**1983**		**0.91**

5.6 Ranking of Authors Productivity based on Publications

Table- 6 indicates ranking of authors by number of publications. Authors "Clark RJH" published highest number of articles for the study period with 10 records, consecutive authors "Chang Y T" are published next highest number of articles for the study period with 8 records. **"**Mori" having highest Global Citation Scores of 653 with just 6 publications followed by "Clark RJH" is having Global Citation Score of 676 with just 10 publications, while "Kim J" having lowest Global Citation Score of 11 with 4 publications. Thus the most-cited authors are distinguished from the most-published ones. It is found from the analysis that Lotka's law may not be applicable with regard to author productivity in proliferation of research in Green Library as the research papers equally distributed by a large number of authors.

Table 6: Shows Ranking of Authors Productivity

S.No	Author	Publications	Percent	TLCS	TLCS/t	TLCSx	TGCS	TGCS/t	TLCR	TLCSb	TLCSe
1	Clark RJH	10	0.5	52	3.79	35	676	46.29	16	4	8
2	Chang YT	8	0.4	7	1.15	4	162	29.32	5	1	
3	Saito K	8	0.4	6	0.31	2	403	21.20	5	6	0
4	Waldo GS	8	0.4	31	3.38	26	229	23.16	36	5	1
5	Campbell RE	7	0.4	4	0.40	0	283	33.16	15	2	
6	Chen H	7	0.4	0	0.00	0	197	20.26	0	0	
7	Georgiou G	7	0.4	17	1.41	9	229	19.25	15	3	
8	Zhang L	7	0.4	0	0.00	0	69	12.48	4	0	
9	Bradbury ARM	6	0.3	7	0.83	6	86	10.07	24	2	4
10	DeLisa MP	6	0.3	13	1.19	6	236	24.92	15	3	0
11	Hart DJ	6	0.3	23	3.28	16	238	27.69	26	9	2
12	Liu Y	6	0.3	1	0.06	1	53	7.74	5	0	
13	Mori H	6	0.3	12	0.62	2	653	50.73	5	3	0
14	Nishimura M	6	0.3	9	0.38	0	235	10.79	8	2	0
15	Regan L	6	0.3	22	2.07	18	310	28.43	10	4	2
16	Sohn KS	6	0.3	7	0.87	4	105	13.57	6	2	
17	Tu SJ	6	0.3	3	0.45	0	108	16.56	1	0	
18	Wang J	6	0.3	0	0.00	0	19	3.00	2	0	
19	Yamazaki M	6	0.3	6	0.31	2	323	17.02	3	6	0
20	Zhang XW	6	0.3	2	0.58	0	51	9.75	4	0	
21	Burgio L	5	0.3	13	1.48	7	169	16.58	9	3	1
22	Cao Y	5	0.3	2	0.40	2	20	2.72	8	0	
23	Djaballah H	5	0.3	4	1.08	0	33	8.25	4	0	
24	Johnston PA	5	0.3	5	1.08	0	14	2.67	8	0	
25	Kamb A	5	0.3	28	1.57	22	180	10.30	9	5	4
26	Lee JS	5	0.3	1	0.13	1	130	21.46	4	1	
27	Lee SC	5	0.3	3	0.65	1	84	11.67	2	0	
28	Park JK	5	0.3	0	0.00	0	81	6.45	1	0	
29	Park S	5	0.3	1	0.10	1	30	2.75	1	0	
30	Rojnuckarin P	5	0.3	6	0.62	0	33	4.37	6	2	0

31	Sano H	5	0.3	1	0.04	1	213	12.55	4	1	0
32	Takahashi T	5	0.3	3	0.25	1	292	23.99	2	1	
33	Wang B	5	0.3	2	0.48	1	30	6.19	3	0	
34	Wang H	5	0.3	1	0.14	0	46	6.95	2	0	
35	Wang Y	5	0.3	0	0.00	0	14	2.25	0	0	
36	Xu Y	5	0.3	0	0.00	0	41	6.83	1	0	
37	Yang Z	5	0.3	0	0.00	0	50	6.00	2	0	
38	Chen JH	4	0.2	0	0.00	0	37	4.82	2	0	0
39	Chen SS	4	0.2	3	0.36	2	4	0.47	4	2	1
40	Das AR	4	0.2	2	0.50	0	20	5.17	2		
41	Dawane BS	4	0.2	3	1.17	0	7	2.50	3		
42	Happe T	4	0.2	15	2.15	9	201	23.65	6	0	
43	Hecht SM	4	0.2	3	0.62	0	43	6.24	3	0	0
44	Hughes TE	4	0.2	2	0.18	1	68	6.07	3	0	0
45	Jakobsen KS	4	0.2	0	0.00	0	55	9.87	1	0	
46	Kim J	4	0.2	0	0.00	0	11	1.57	0	0	
47	Kim JB	4	0.2	6	0.56	4	136	12.50	2	0	2
48	Kim KH	4	0.2	2	0.17	1	94	8.82	2	0	1
49	Kim Y	4	0.2	4	0.40	4	85	12.22	2	1	
50	Kondo A	4	0.2	5	0.45	2	210	18.05	3	2	0

5.7 Analysis the Ranking list of Journals and their Published Articles

The study found that the total research output of the Green Library for the study period (1989 – 2014) published in 764 journals. As the major portion of the research productivity (38.62%) covered by 50 journals that is coincide with the theory of Bradford's Law of scattering of journals in research productivity. Top twenty journals produced mostly 27 % of the research output. The journal "APPLIED AND ENVIRONMENTAL MICROBIOLOGY" topped with 53 publications with the Global Citation Score of 3216 next "JOURNAL OF BIOLOGICAL CHEMISTRY" has 43 publications with the Global Citation Score of 2404 and "PLOS ONE" with 40 publications with the Global Citation Score of 274 respectively. "PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA" has scored the highest Global Citation Score of 2887 with 29 publications while "COLOR RESEARCH AND APPLICATION" has scored a Global Citation Score of 7 with just 10 records.

Table 7: Distribution of Ranking list of Journals and their Published Articles

S.No	Journal	Publications	Percent	TLCS	TLCS/t	TGCS	TGCS/t	TLCR
1	Applied and Environmental Microbiology	53	2.7	50	4.28	3216	245.76	45
2	Journal of Biological Chemistry	43	2.2	22	1.56	2404	170.12	15
3	Plos One	40	2.0	0	0.00	274	57.59	37
4	Gene	34	1.7	118	6.23	4020	205.58	16
5	Plant Physiology	31	1.6	8	0.95	1510	119.15	16
6	Plant Molecular Biology	30	1.5	25	1.35	1307	70.35	10
7	Proceedings of The National Academy of Sciences of the United States of America	29	1.5	58	4.23	2887	200.77	26
8	Nucleic Acids Research	26	1.3	22	1.22	599	56.29	31
9	Plant and cell Physiology	22	1.1	5	0.31	470	38.06	8
10	Analytical Biochemistry	19	1.0	10	0.77	293	27.40	22

11	Journal of Biomolecular Screening	18	0.9	4	0.54	161	20.86	6
12	Journal of Molecular Biology	17	0.9	16	1.22	539	49.16	22
13	Journal of Raman Spectroscopy	17	0.9	21	2.57	304	37.06	31
14	Journal of The American Chemical Society	17	0.9	14	1.38	542	61.74	9
15	Biochemical and Biophysical Research Communications	16	0.8	7	0.53	188	16.85	8
16	Febs Letters	16	0.8	22	1.27	898	51.41	8
17	Planta	15	0.8	6	0.31	370	23.95	3
18	Plant Cell	14	0.7	11	1.27	1032	81.28	12
19	Assay and Drug Development Technologies	13	0.7	9	1.95	79	14.49	9
20	Computer Physics Communications	13	0.7	3	0.33	101	16.39	3
21	Environmental Microbiology	13	0.7	9	0.80	937	87.01	16
22	Journal of Virology	13	0.7	4	0.35	787	67.94	4
23	Tetrahedron Letters	13	0.7	2	0.33	280	33.34	0
24	European Journal of Biochemistry	12	0.6	16	0.91	696	39.48	4
25	Fems Microbiology Ecology	12	0.6	8	1.04	470	48.88	5
26	Plant Journal	12	0.6	6	0.77	458	39.21	6
27	Protein Engineering Design & Selection	12	0.6	9	1.35	75	11.38	29
28	Applied Microbiology and Biotechnology	11	0.6	7	0.63	394	40.49	7
29	Journal of Phycology	11	0.6	12	1.02	223	19.46	14
30	Color Research and Application	10	0.5	0	0.00	7	1.37	0
31	Journal of Bacteriology	10	0.5	1	0.05	434	24.01	2
32	Protein Science	10	0.5	22	2.19	190	18.46	6
33	Rsc Advances	10	0.5	0	0.00	13	5.83	3
34	Analytical Chemistry	9	0.5	4	0.59	116	15.09	6
35	Biochemical Journal	9	0.5	7	0.57	436	33.30	1
36	BMC Genomics	9	0.5	0	0.00	186	25.37	7
37	Combinatorial Chemistry & High Throughput Screening	9	0.5	3	0.63	91	12.55	9
38	Molecular Plant-Microbe Interactions	9	0.5	2	0.29	269	26.96	2
39	Biotechnology Letters	8	0.4	4	0.69	31	4.27	4
40	Journal of Experimental Botany	8	0.4	6	0.47	313	28.08	7
41	Journal of Immunological Methods	8	0.4	21	1.55	326	24.22	14
42	Molecular Ecology Notes	8	0.4	2	0.19	86	7.17	1
43	Molecular Microbiology	8	0.4	26	1.49	608	39.87	7
44	ACS Combinatorial Science	7	0.4	1	0.33	59	15.07	2
45	Biotechnology and Bioengineering	7	0.4	2	0.29	43	7.66	7
46	Chemistry & Biology	7	0.4	12	0.77	190	22.43	10
47	Current Microbiology	7	0.4	2	0.50	58	6.36	3
48	Fems Microbiology Letters	7	0.4	4	0.32	111	9.22	9
49	Genomics	7	0.4	1	0.06	280	16.48	2
50	Green Chemistry	7	0.4	4	0.81	104	18.13	0

5.8 Institution wise Distribution of Publications

The table-8 analysis indicates Institution-wise research productivity. It is noted that 50 institutions were contributed 687 of the total research productivity. It is noted that University of Tokyo contributed the highest number of research publications (39) with Global Citation Score 1004. Chinese Academic Science terms Second in order 38 publications with Global Citation Source 353.the highest Global citation score is University of Georgia in 2228 with 14 publications

Table 8: Institution wise Distribution of Publications

S.No	Institution	Publications	Percent	TLCS	TGCS
1	University of Tokyo	39	2.0	14	1004
2	Chinese Acad Sci	38	1.9	8	353
3	Harvard Univ	25	1.3	22	1404
4	Kyoto Univ	23	1.2	10	861
5	Cornell Univ	20	1.0	14	511
6	CNRS	18	0.9	14	646
7	CSIC	17	0.9	8	471
8	Seoul Natl Univ	17	0.9	5	178
9	Osaka Univ	16	0.8	7	430
10	Univ Texas	16	0.8	14	464
11	INRA	15	0.8	13	800
12	Johns Hopkins Univ	15	0.8	10	770
13	Yale Univ	15	0.8	22	547
14	Los Alamos Natl Lab	14	0.7	39	287
15	Nagoya Univ	14	0.7	3	322
16	Univ Calif Berkeley	14	0.7	6	578
17	Univ Calif San Diego	14	0.7	5	420
18	Univ Cambridge	14	0.7	2	490
19	Univ Georgia	14	0.7	29	2228
20	Univ Paris 06	14	0.7	14	499
21	Univ Wisconsin	14	0.7	23	891
22	Univ Calif Los Angeles	13	0.7	1	118
23	Univ Calif San Francisco	13	0.7	12	986
24	Natl Inst Adv Ind Sci & Technol	12	0.6	6	214
25	Natl Univ Singapore	12	0.6	3	150
26	UCL	12	0.6	33	362
27	Univ Nottingham	12	0.6	6	327
28	Unknown	12	0.6	0	6
29	NCI	11	0.6	2	295
30	Purdue Univ	11	0.6	3	307
31	Stanford Univ	11	0.6	9	915
32	Univ Calif Davis	11	0.6	4	336
33	Univ Illinois	11	0.6	0	171
34	ARS	10	0.5	0	88
35	Japan Sci & Technol Agcy	10	0.5	5	244
36	MIT	10	0.5	13	635
37	Texas A&M Univ	10	0.5	5	627
38	Univ Florida	10	0.5	2	118
39	Univ Maryland	10	0.5	3	548
40	USDA ARS	10	0.5	4	184

41	Hokkaido Univ	9	0.5	3	302
42	Korea Adv Inst Sci & Technol	9	0.5	5	76
43	Natl Taiwan Univ	9	0.5	4	125
44	Penn State Univ	9	0.5	2	212
45	Princeton Univ	9	0.5	27	382
46	Russian Acad Sci	9	0.5	1	140
47	Tokyo Inst Technol	9	0.5	2	85
48	Univ Alberta	9	0.5	4	369
49	Univ British Columbia	9	0.5	3	223
50	Univ Manchester	9	0.5	0	112

5.9 Country – wise Collaborative Distribution of Publications

The below table indicates that among the country wise distribution of Green Library covered by the study tops USA with 705(35%) publications followed by Japan with 224(11.2%), Peoples R China with 219(11%),research publications respectively. First place goes USA having total Global Citation Score of 25,533 with 705 publications. Japan secured second rank in terms of GCS 7364 with 224 publications.

Table 9: Country – wise Collaborative Distribution of Publications

S. No	Country	Publi cations	Percent	TLCS	TGCS
1	USA	705	35.3	445	25533
2	Japan	224	11.2	105	7364
3	Peoples R China	219	11.0	35	1967
4	Germany	160	8.0	92	5749
5	UK	134	6.7	107	4494
6	France	99	5.0	68	3823
7	Canada	82	4.1	30	2259
8	India	82	4.1	13	860
9	South Korea	70	3.5	27	956
10	Unknown	68	3.4	147	2765
11	Spain	62	3.1	25	1264
12	Australia	58	2.9	22	1174
13	Italy	48	2.4	15	1133
14	Netherlands	34	1.7	10	999
15	Belgium	27	1.4	16	737
16	Switzerland	27	1.4	10	973
17	Taiwan	26	1.3	7	448
18	Israel	25	1.3	12	605
19	Brazil	24	1.2	3	374
20	Sweden	23	1.2	25	601
21	Iran	22	1.1	3	170
22	Singapore	16	0.8	4	296
23	Austria	15	0.8	0	334
24	Denmark	15	0.8	7	387
25	Finland	15	0.8	4	315

5.10 Documentation of Keywords Appeared in the Publications

Publications convey precisely the thought contents of the papers. The potency of information concentrated on the titles of the papers is more than the rest of the section of the papers. Therefore, if a word occurs more frequently than expected it to occur, then it reflects the emphasis given by the authors about the research field of their interest. The important words called 'Key Word' are one of the best indicators to understand and grasp instantaneously the thought content of the papers, methodologies used and areas of research addressed to the high frequency keywords were "PROTEIN" is topped with 271 publications with the Global Citation Score of 11,869 , next "GREEN" with the Global Citation Score of 8825 respectively. "LIBRARY" has scored the highest Global Citation Score of 2976 with 131 publications.

Table 10: Key Word Appeared in the Publications

S. No	Word	Publi cations	Percent	TLCS	TGCS
1	Protein	271	13.6	423	11869
2	Green	269	13.5	357	8825
3	Gene	240	12.0	92	8068
4	Expression	209	10.5	111	5673
5	Characterization	177	8.9	57	4226
6	Analysis	156	7.8	94	3869
7	Novel	146	7.3	53	3504
8	Using	146	7.3	134	3498
9	Library	131	6.6	112	2976
10	Based	117	5.9	88	2774
11	Identification	117	5.9	65	2862
12	Synthesis	116	5.8	19	1442
13	High	115	5.8	54	2396
14	Genes	110	5.5	65	3657
15	Cloning	108	5.4	45	3317

16	Molecular	108	5.4	107	4517
17	Fluorescent	95	4.8	284	6771
18	Screening	94	4.7	71	1476
19	Proteins	86	4.3	69	2995
20	Cell	82	4.1	39	2342
21	Cells	76	3.8	46	2450
22	Isolation	76	3.8	47	1620
23	Human	75	3.8	21	2146
24	CDNA	72	3.6	55	2701
25	Throughput	70	3.5	32	1143

6.FINDINGS

Scientometric data provide precise and accurate observation. Based on the analysis undertaken the present study, the following findings are drawn.

1. The findings of research productivity in Green Library has the highest publication is 173 in 2014 with 128 Global Citation Scores followed by 163papers in 2013with 670 Global Citation Score and 160 papers in 2012 with 967 Global Citation Scores. The lowest publication is 1 in 1989 and 1990 with no Global Citation Scores.
2. The findings of study Authors "Clark RJH" published highest number of articles for the study period with 10 records, consecutive authors "Chang Y T" are published next highest number of articles for the study period with 8 records. **"**Mori" having highest Global Citation Scores of 653 with just 6 publications followed by "Clark RJH" is having Global Citation Score of 676 with just 10 publications, while "Kim J" having lowest Global Citation Score of 11 with 4 publications. Thus the most-cited authors are distinguished from the most-published ones.
3. The study found that the total research output of the Green Library for study period (1989 – 2014) published in 764 journals. As the major portion of the research productivity (38.62%) covered by 50 journals that is coincide with the theory of Bradford's Law of scattering of journals in research productivity.
4. Top 50 institutions were contributed 687 of the total research productivity. It is noted that University of Tokyo contributed the highest number of research publications (39) with Global Citation Score 1004. Chinese Academic Science terms Second in order 38 publications with Global Citation Source 353.the highest Global citation score is University of Georgia in 2228 with 14 publications
5. The findings of degree of collaboration analysis reveal the following .facts that the case of single author contributed papers is less. It brings out clearly the high level prevalence of collaborative research in Green Library. Based on this study, the result of the degree of collaboration *C*=0.91, i.e., 91% of collaboration author articles published during the study periods.
6. The findings of distribution of Green Library scientists published articles in the journals of various countries reveal the USA with 705(35%) publications followed by Japan with 224(11.2%), Peoples R China with 219(11%),research publications respectively. First place goes USA having total Global Citation Score of 25,533 with 705 publications. Japan secured second rank in terms of GCS 7364 with 224 publications.

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