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Scientometric Analysis of the Journal "Green Chemistry"

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ABSTRACT

The Study is to examine the Journal "Green Chemistry" during 1999 - 2017. The study covers 19 years. The research coverage includes the Year wise Distribution of Articles, Authorship pattern, Type of document, Growth Ratio, Relative Growth Rate and Country wise Distribution. This paper critically analyses 5703 articles published in the Green Chemistry Journal. The maximum articles 568 were published in the year 2016 and the minimum 46 in the year 1999. In the authorship pattern, the maximum articles 1084 were published by four authors. The RGR in the starting year 2000 is 0.71 and 0.12 in the last year 2017. The Doubling time in the starting year 2000 was 0.98 and in the last year 2017 was 5.96. In the Country wise distribution of articles, the major contribution was from China 1381 (19.25%).

Keywords: Scientometric, Green Chemistry, Authorship pattern, Growth Ratio, Document Type

1. INTRODUCTION

Scientometric is a quantitative evaluation of publication patterns of all macro and micro communication along with their authorship by mathematical and statistical calculation. According to Alan Pritchard the term "Bibliometrics" as the application of mathematical and statistical methods to books and other communication medium. All the studies point towards the merits and weakness of the journal which will be helpful for its further development. This paper studies the Scientometric analysis of the literature published in the Green Chemistry from 1999 – 2017. Green chemistry is peer reviewed journal published by Royal Society of Chemistry. The Journal publishes original and significant cutting-edge research articles. The Journal covers the following, the application of innovation in industrial procedures, synthetic methods and processes to important products, the design of new, greener and safer chemicals and materials, the use of sustainable resources, the use of biotechnology alternatives to chemistry-based solutions methodologies and tools for measuring environmental impact and application to real world examples and chemical aspects of renewable energy. The latest impact factor of 9.125.

2. Review of Literature

Amsaveni. N., and Vasanthi, R. (2012)¹ conducted a study that discusses the publication

developments in Green Biotechnology during 2001 to 2012. The study is based on a sample of 594 articles downloaded from the database of web of knowledge. This study focuses the authorship pattern and collaborative research in Green Biotechnology. Baskaran, C. $(2013)^2$ made a study on the Research productivity of Alagappa University during 1999-2011. The Relative growth rate was floating in this study. The doubling time was increased and decreased trend in this study. Baskaran, C & Sivakami, N. $(2014)^3$ carried out a Study on Swine influenza research output. A total of 2360 articles were

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taken using the search term " Swine" from the Pubmed database. The study consists of publication frequency, country, and institution wise productivity. Results and Findings show that majority of the scientists wished to publish research papers in multiple authorship. Baskaran, C. $(2013)^4$ made a study on the Research growth trend and author collaboration of Alagappa University in India during 1999-2011, The study consists of the authorship Pattern, subject-wise and institution-wise collaboration. The Degree of collaboration and its means value is found to be 0.963. Baskaran, C & Karuilancheran, C. (2015)5 carried out a Scientometric study in Diabetes and Allied Diseases in India During 1995–2013. In this study, the calculated values of Maximum Likelihood Estimator, n and k are 0.24, 2.66 and 0.78 respectively. The calculated value of Chi-Square (X 2) obtained in this case is 5309.368. Bathrinarayanan, A. L., and Tamizhchelvan, M. (2013)⁶ made a bibliometric study on the MEMS output in Scopus database during the year 1988 -2012. A total of 86978 records are downloaded from the Scopus Database for this study. The study shows that 94.4% of MEMS publications are appearing as journal articles and conference paper. Jeyamala, B., and Balasubramanian, P. (2016)⁷ made a study on the research output performance of nuclear physics. A total of 21034 records were analysed for this study. In the athorship pattern, it is noted that out of 21,034 research papers, three 4080 (19.40%) and four authors 3839 (18.24%) contributed papers occupying first and second in the order. Murugaiah, P., and Baskaran, C. (2013)⁸ conducted a study on Scientometric analysis of Human DNA research, about the publications productivity was measured to the Japan researchers during 1990 to 2011, the study reveals that 1619 (6.67%) records were published in Human DNA research, in the year 1994 which occupied the first position followed by secondposition of 5.68 percent papers in 1998, third place occupied with 5.49 percent papers were published in 1993 and 1997 respectively. Velmurugan, C., and Radhakrishnan, N. (2015)⁹ conducted a study on Scientometric Analysis of Research Papers Published on Pharmacognosy during the period 1989-2014. A total of 348 scholarly communications were retrieved from the web of science period. The exponential growth rate of research articles is y = 5E-111e0.1279x, and the R² value is 0.6919 during the period of study. The major contribution of articles is in the year 2010 with 352 global citations and 15 local citations in Pharmacognosy and the least number of articles is one in the year 1989 and 1999 respectively.

3. Objectives of the Study

The Main purpose of the study is to examine the Year wise Distribution of Articles, Authorship pattern, Type of document, Growth Ratio, Relative Growth Rate and Country wise distribution of articles in the Journal "Green Chemistry" from 1999 - 2017.

4. Methodology

Scopus Database was used to get the data from the Journal "Green Chemistry". Articles in the Journal published between 1999 - 2017 were taken for the study. The study covers the 19 years of published articles in the Journal. The collected data has been analysed with OpenOffice Spreadsheet and given in the form of Tables and charts in order to find the Year wise distribution of articles, Authorship Pattern, Growth Ratio, Relative Growth Rate, Doubling Time, Degree of collaboration and Country wise distribution of articles.

5. Analysis and discussion

5.1 Year wise Distribution of Articles

Table 1 shows The Journal "Green Chemistry" published 5703 articles from the period of 1999 to 2017 with an average of 340.48 per year. It is observed that majority of the articles 627 were published in the year of 2016. It is found that very less number of articles 68 were published in the year of 1999. Fig. 1 Clearly shows that there is a Upward growth of articles until the year 2017 in the Journal "Green Chemistry".



Year wise Distribution of articles



Year	Articles	Percentage	Cumulative	Cumulative %
1999	68	1.19	68	1.19
2000	70	1.23	138	2.42
2001	100	1.75	238	4.17
2002	156	2.74	394	6.91
2003	187	3.28	581	10.19
2004	134	2.35	715	12.54
2005	138	2.42	853	14.96
2006	177	3.10	1030	18.06
2007	206	3.61	1236	21.67
2008	213	3.73	1449	25.41
2009	307	5.38	1756	30.79
2010	318	5.58	2074	36.37
2011	450	7.89	2524	44.26
2012	456	8.00	2980	52.25
2013	411	7.21	3391	59.46
2014	524	9.19	3915	68.65
2015	535	9.38	4450	78.03
2016	627	10.99	5077	89.02
2017	626	10.98	5703	100.00
Total	5703	100		

Table.1: Year wise distribution of Articles

5.2 Authorship Pattern

Articles written by four authors 1084 (19.01%) are found to be predominant followed by three authors 1025 (17.97%), five authors 939 (16.47%) and six authors 759 (13.39%) etc. The patternship shows that the single author contribution was very low when comparing with the multiple author contribution of articles in the Journal.

No of Authors	No. of articles	Percentage	Cumulative	Cumulative %
1	209	3.66	209	3.66
2	581	10.19	790	13.85
3	1025	17.97	1815	31.83
4	1084	19.01	2899	50.83
5	939	16.47	3838	67.30
6	759	13.31	4597	80.61
7	496	8.70	5093	89.30
8	278	4.87	5371	94.18
9	137	2.40	5508	96.58
10	95	1.67	5603	98.25
11	35	0.61	5638	98.86
12	24	0.42	5662	99.28
13	14	0.25	5676	99.53
14	8	0.14	5684	99.67
15	6	0.11	5690	99.77
16	1	0.02	5691	99.79
17	3	0.05	5694	99.84
18	3	0.05	5697	99.89
19	2	0.04	5699	99.93
21	2	0.04	5701	99.96
23	1	0.02	5702	99.98
27	1	0.02	5703	100.00
Total	5703	100		

5.3 Types of Document

Table 3 shows the Types of Document published in the Journal "Green Chemistry", the highest contribution was from article 5009 (87.83%) followed by Review 301 (5.28%), Conference Paper 220 (3.86%), Editorial 75 (1.32%), Erratum 56 (0.98%), Short survey 38(0.67) and Note 3 (0.05%). The lowest contribution was from Letter 1 (0.02).

Document Type	No. of Documents	Percentage	Cumulative	Cumulative %
Article	5009	87.83	5009	87.83
Editorial	75	1.32	5084	89.15
Erratum	56	0.98	5140	90.13
Review	301	5.28	5441	95.41
Conference Paper	220	3.86	5661	99.26
Short Survey	38	0.67	5699	99.93
Note	3	0.05	5702	99.98
Letter	1	0.02	5703	100.00
Total	5703	100.00		

Table 3 – Types of articles published in the Green Chemistry

5.4 Growth Ratio by Year-wise

Table 4 is observed, the growth ratio of articles published in the Journal "Green Chemistry" shown in the table 5. The Growth ratio changes from 0.72 to 1.03. Figure 2 shows the fluctuation in the Growth ratio.



Fig.2: Year wise Growth Ratio

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Year	Articles	Growth Ratio
1999	68	
2000	70	1.03
2001	100	1.43
2002	156	1.56
2003	187	1.20
2004	134	0.72
2005	138	1.03
2006	177	1.28
2007	206	1.16
2008	213	1.03
2009	307	1.44
2010	318	1.04
2011	450	1.42
2012	456	1.01
2013	411	0.90
2014	524	1.27
2015	535	1.02
2016	627	1.17
2017	626	1.00
Total	5703	

Table.4: Year wise Growth Ratio

5.5 Relative Growth Rate (RGR) and Doubling Time (DT) of Year-wise Publications

Table 5 found that the rate of growth of articles published in the Journal "Green Chemistry" is observed by calculating relative growth rates and doubling time for publications. The RGR from the year 2000 is 0.71, the final year 2017 is 0.12, and the overall value is 0.25. The values are decreased year by year. At the same time the Doubling Time (DT) shows increasing trend, from the year 2000 is 0.98 and the final year 2017 is 5.96.





Fig. 3: Relative Growth Rate

Year	Articles	Cumulative	W1	W2	RGR	DT
1999	68	68		4.22		
2000	70	138	4.22	4.93	0.71	0.98
2001	100	238	4.93	5.47	0.55	1.27
2002	156	394	5.47	5.98	0.50	1.37
2003	187	581	5.98	6.36	0.39	1.78
2004	134	715	6.36	6.57	0.21	3.34
2005	138	853	6.57	6.75	0.18	3.93
2006	177	1030	6.75	6.94	0.19	3.68
2007	206	1236	6.94	7.12	0.18	3.80
2008	213	1449	7.12	7.28	0.16	4.36
2009	307	1756	7.28	7.47	0.19	3.61
2010	318	2074	7.47	7.64	0.17	4.16
2011	450	2524	7.64	7.83	0.20	3.53
2012	456	2980	7.83	8.00	0.17	4.17
2013	411	3391	8.00	8.13	0.13	5.36
2014	524	3915	8.13	8.27	0.14	4.82
2015	535	4450	8.27	8.40	0.13	5.41
2016	627	5077	8.40	8.53	0.13	5.26
2017	626	5703	8.53	8.65	0.12	5.96
Total	5703					

5.6 Country wise Distribution of articles

Table 6 shows the country wise distribution of articles in the Journal "Green Chemistry" during the year 1999 - 2017. A total of 77 countries contributed 7175 articles. Out of the 7175 articles, the major contribution was from China 1381 (19.25%) followed by United States 942 (13.13%); United Kingdom 607(8.46%); Germany 468 (6.52%); India 422 (5.88%); Japan 366 (5.10%); France 358 (4.99%); Spain 338 (4.71%); Italy 287 (4.00%) etc. The lowest contribution was from the following countries Belarus, Bolivia, Ecuador, Indonesia, Iraq, Jordan, Malta, Nigeria, Peru, Qatar, Uganda. The above mentioned countries equally contributed to the lowest contribution of articles category 1 (0.01%)

Table.6: Country wise Distribution of articles

Country	No. of articles	Percentage	Cumulative	Cumulative %
China	1381	19.25	1381	19.25
United States	942	13.13	2323	32.38
United Kingdom	607	8.46	2930	40.84
Germany	468	6.52	3398	47.36
India	422	5.88	3820	53.24
Japan	366	5.10	4186	58.34
France	358	4.99	4544	63.33
Spain	338	4.71	4882	68.04
Italy	287	4.00	5169	72.04
Netherlands	177	2.47	5346	74.51
Canada	163	2.27	5509	76.78
Australia	150	2.09	5659	78.87
Portugal	128	1.78	5787	80.66
South Korea	124	1.73	5911	82.38

6. Conclusion

For this study 19 years of Data from Scopus database were taken. The Journal" Green Chemistry" published 5703 articles. The average year wise publication of articles from the Green Chemistry is 340.48. In the Authorship pattern the major contribution of articles was from single authors 5131. Related to Type of Document published, the highest contribution was from article 4349 (44.04%) followed by Note 1987 (20.12%) and Short Survey 1168 (11.83%). The Growth ratio change from 0.79 to 9.65. The RGR in the year 1990 is 0.78 and the final year 2017 is 0.03. The values are decreased year by year . At the same time, the Doubling Time (DT) shows increasing trend, from the year 1990 is 0.88 and the final year 2017 is 27.47. As far as the Country wise distribution of articles, a total of 77 countries contributed 7175 articles. Out of the 7175 articles, the major contribution was from China 1381 (19.25%) followed by United States 942 (13.13%) and United Kingdom 607 (8.46%).

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