Growth of Literature in Chemistry Research Output in Tamil Nadu Universities: A Scientometric Study (1989 -2015)

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Abstract

This paper presents a Scientometric analysis of the Chemistry Research Growth rate of the faculty of Tamil Nadu Universities. Data has been downloaded from the Web of Science from (1989 – 2015 up to May). Among the 5468 in the span of 26 years, highest number of 0.59 percentage Relative Growth rate in the year 1990, highest exponential growth rate 17056 was found during the year 2015. The degree of collaboration for the period of twenty six years is 0.98. .

Keywords

Chemistry Research Output; Tamil Nadu Universities; Scientometric Study; Growth Rate;

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INTRODUCTION

Scientometrics is one of the most important measures for the assessment of scientific production. Scientometrics is the science of measuring and analyzing science. In practice, scientometrics is often done using bibliometrics that is measurement of (scientific) publications. In 1969, Nalimov and Mulchenko(1969)1 coined the Russian equivalent of the term “Scientometrics” (‘naukomtriya’). This term has grown in popularity and is used to describe the study of science: growth, structure, interrelationships and productivity. Scientometrics is related to and has overlapping interests with Bibliometrics and Informetrics

REVIEW OF LITERATURE

Garg et al (2006) analysed the research output on Malaria during the period 1900 to 2000, using Pub Med and CABI CD-Rom which included Tropical Disease Bulletin Database. During 2005, Jeyasekar and Saravanan (2013) carried out a bibliometric study of the Journal of Forensic Sciences and found that there is an increase in publications on digital and multimedia aspects of forensic science and the literature related to application of DNA technology in forensic science is also increasing. Jones identified with the help of Web of Science (WoS) the most highly cited papers published in the Journal of Forensic Sciences between 1956 and 2005. The most highly cited paper was by Kasai, Nakamura and White concerning DNA Profiling

OBJECTIVES

The main objective of the study are:

- To Distribution and growth of Chemistry Research output in Tamil Nadu Universities for the period of 27 years (1989-2015)
- To Analyze Growth in publication given by Relative Growth Index (RGR) and Doubling time (Dt) Measure of collaboration given by Collaborative Index (CI), Degree of Collaboration.

METHODOLOGY

The data in this study has been retrieved from web of Science. Web of Science is the world’s largest Citation and Indexing database of peer-reviewed literature. The time period considered in this study is from 1989 to 2015.

Analysis and Interpretations

Table 1 :Relative Growth Rate (Rgr) and Doubling Time (Dt)

Table 1 shows the Relative growth Rate and doubling time of Chemistry research by the Tamil Nadu State

YEAR	PUBLICATIONS	CUMULATIVE TOTAL	LOG_eW_1	LOG_eW_2	RGR	DOUBLING TIME (DT)
1989	72	72		4.28		
1990	58	130	4.28	4.87	0.59	1.17
1991	67	197	4.87	5.28	0.41	1.69
1992	86	283	5.28	5.65	0.37	1.87
1993	85	368	5.65	5.91	0.26	2.67
1994	100	468	5.91	6.15	0.24	2.88
1995	108	576	6.15	6.36	0.21	3.30
1996	119	695	6.36	6.54	0.18	3.85
1997	123	818	6.54	6.71	0.17	4.08
1998	118	936	6.71	6.84	0.13	5.33
1999	138	1074	6.84	6.98	0.14	4.95
2000	109	1183	6.98	7.08	0.10	6.93
2001	127	1310	7.08	7.18	0.10	6.93
2002	162	1472	7.18	7.29	0.11	6.30
2003	150	1622	7.29	7.39	0.10	6.93
2004	218	1840	7.39	7.52	0.13	5.33
2005	229	2069	7.52	7.63	0.11	6.30
2006	261	2330	7.63	7.75	0.12	5.78
2007	293	2623	7.75	7.87	0.12	5.78
2008	237	2860	7.87	7.96	0.09	7.70
2009	325	3185	7.96	8.06	0.10	6.93
2010	323	3508	8.06	8.16	0.10	6.93
2011	414	3922	8.16	8.27	0.11	6.30
2012	423	4345	8.27	8.38	0.11	6.30
2013	492	4837	8.38	8.48	0.10	6.93
2014	597	5434	8.48	8.60	0.12	5.78
2015	34	5468	8.60	8.61	0.01	69.3

Universities from the period 1989 -2015.It is clearly noticed from the table RGR is decreeing every year, whereas Doubling Time is increasing every year. The RGR is highest in the year 1990 with 0.59 and lowest in the year 2013 with 0.19.The Doubling time is highest in the year 2008 and 2010 with 7.70 and lowest in the year 1990 with 1.17.

Table 2: Exponential Growth Rate

S.NO.	YEAR	PUBLICA-TIONS	EXPONENTIAL GROWTH RATE
1	989	72	-
2	1990	58	1.24
3	1991	67	0.86
4	1992	86	0.78
5	1993	85	1.01
6	1994	100	0.85
7	1995	108	0.93
8	1996	119	0.91
9	1997	123	0.97
10	1998	118	1.04
11	1999	138	0.86
12	2000	109	1.27
13	2001	127	0.86
14	2002	162	0.78
15	2003	150	1.08
16	2004	218	0.69
17	2005	229	0.95
18	2006	261	0.88
19	2007	293	0.89
20	2008	237	1.24
21	2009	325	0.73

22	2010	323	1.01
23	2011	414	0.78
24	2012	423	0.98
25	2013	492	0.86
26	2014	597	0.82
27	2015	34	17.56
Total		**5468**	**40.83**

Table 2 reveals the exponential growth rate of publications for the period of twenty seven years. The highest growth rate (17.56%) was found during the year 2015 with 34 publications. The year of 2004 witnessed the lowest growth (0.69%) with 218 publications. It finds the average exponential growth rate as 1.57 during the period.

Table 3: Degree of Collaboration

Single Author	Percentage	Multiple Authors	Percentage	Total
55	1.01	5413	98.99	5468

To determine the degree of collaboration in quantitative terms, the formula given by Subramaniyam was used. The formula is as follows:

$$C = \frac{N_m}{N_s}$$

where C = Degree of Collaborations
N_m = Number of Multi Authorized paper
N_s = Number of Single Authorized paper

$$C = \frac{5413}{55} = 0.98$$

The Degree of collaboration for the period of twenty six years is 0.98.

Table 4: Time Series Analysis

S.NO	YEAR	Y	X	X^2	XY
1	1989	72	-3	169	-936
2	1990	58	-2	144	-696
3	1991	67	-1	121	-737
4	1992	86	-0	100	-860
5	1993	85	-9	81	-765
6	1994	100	-8	64	-800
7	1995	108	-7	49	-756
8	1996	119	-6	36	-714
9	1997	123	-5	25	-615
10	1998	118	-4	16	-472
11	1999	138	-3	9	-414
12	2000	109	-2	4	-218
13	2001	127	-1	1	-127
14	2002	162	0	0	0
15	2003	150	1	1	150
16	2004	218	2	4	436
17	2005	229	3	9	687
18	2006	261	4	16	1044
19	2007	293	5	25	1465
20	2008	237	6	36	1422
21	2009	325	7	49	2275
22	2010	323	8	64	2584
23	2011	414	9	81	3726
24	2012	423	10	100	4230
25	2013	492	11	121	5412
26	2014	597	12	144	7164
27	2015	34	13	169	442
TOTAL		ΣY = **5468**		ΣX^2 = **1638**	ΣXY = **22927**

$$Y = a + bx$$

$$a = \frac{\Sigma Y}{N} = \frac{5468}{27} = 202.5$$

$$b = \frac{\Sigma XY}{\Sigma X^2} = \frac{22927}{1638} = 13.99$$

Estimated literature in 2020 is when

X = 2020 – 2002 = 18
Y = 202.5 + 13.99 (18)
Y = 202.5 + 251.82 = 454.02

i.e. 454

On the application of the formula of Time Series Analysis for the prediction of literature output by the Tamil Nadu State universities' in Chemistry research for the year 2020, it was found that the future trend of growth in Chemistry Research

Literature output may take an decreasing trend during the years to come. The inference is that there is a fluctuating growth level in Chemistry research output in the State Universities in Tamil Nadu.

CONCLUSION

Considering the above facts it is concluded that the research output in the field of Chemistry Research output higher during the block year 2014 and 2013. RGR and Dt are inversely proportional i.e. rate of growth of publication was decreased and the corresponding Dt was increased. To evaluate the author collaboration Collaborative Index (CI), Degree of Collaboration (DC), Collaborative Coefficient (CC) and Modified Collaborative Coefficient (MCC) were employed and proved that 95% of the research outputs were of collaborative in nature.

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