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Research Output on Biosensor Literature in India during 1988-2014: A Scientometric Study

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Abstract – The study presents the research output on biosensor literature in India during 1988-2014. A total of 1444 papers were found in the Scopus database. Starting with one research paper has been published on biosensor literature in India in the year 1998 and a maximum of 231 papers were published in the Scopus indexed journals in 2013. The National Physical Laboratory India has contributed the highest number of papers followed by Maharshi Dayanand University. Number of papers in the area of Biochemistry, Genetics, Molecular Biology, and Chemistry are being increased in the research output on Biosensor in India for the past five years.

Keywords: Research Output on Biosensor, Scientometric Study

I. INTRODUCTION

A biosensor is an systematic device that responds to an investigative in an suitable sample and interprets its deliberation as an electrical signal via a appropriate amalgamation of a biological detection system and an electrochemical transducer. Recent scientific and technological progress shown that such devices are likely to play progressively more important role in generating analytical information in all sectors of human endeavour, from medicine to the military. In particular, biosensors will form the basis of cheap, simple devices for acquiring chemical information, bringing sophisticated analytical capabilities to the non-specialist and general public alike. The market opportunities for the rapid exploitation of novel developments in this sector are substantial. In the modern electronic era, the biosensor research plays a vital role in developing the significant impact over society [1]. This study is to examine the research output in Biosensor literature in India during 1988-2014. In this study an attempt has been made to know the performance of Biosensor research output in terms of content and coverage, growth rates and areas of research in Biosensors, research performance of various research institutions, productivity of the author etc.

II. REVIEW OF LITERATURE

S.H.Nagvi (2014) has studied on Polymer Science Research in India based on Science Citation Index-Expanded shows that publication in polymer science by Indian scientists has increased steadily during the period 1999-2012. Total of 25,566 records were retrieved from the SCI for 1999-2012. In terms of world share, India stood at seventh position. India contributed only 4.38 per cent of publications to world output during 1999-2012. The authorship study validates that now-a-days multiple authorship prevails in almost all fields especially science subjects. Therefore, Lotka law when applied in their study does not pass the test. The institutions involved in polymer science research in India are mostly government supported academic institutions [2].

R.Gupta, B.M. Gupta, A.Kshitij, and A.Bala (2014)analysed in their study on Glaucoma research: A scientometric study of Indian publications output, 2002-11. They used SCOPUS database to download the records for 10 years (2002-11) witnessing an annual average growth rate of 18.29%. The average citation impact per paper registered by Indian publications in glaucoma research was 3.03 during 2002-11, which decreased from 3.87 during 2002-06 to 2.49 during 2007-11. The international collaborative share of India in overall glaucoma research was 21.06 % during 2002-11, which increased from 17.92 % during 2002-06 to 23.09 % during 2007-11.

J.H., Noh, O.J. Kwon, S.B.Choi, and S.C. Kil (2014) studied on Scientometric evaluation of research on bioceramics and found that during the past several years, there has been a major advance in the development of biomedical materials including various ceramic materials for skeletal repair and reconstruction. To understand bioceramics research trends, they investigated total 12,157 research papers published from 2003 to 2012. These research papers were published by 100 countries. The bioceramics research had steadily increased each year. The bioceramics research trends had expanded from hydroxyapatite to hydroxyapatite, calcium phosphate and titania for the last 10 years [4].

III.OBJECTIVES OF THE STUDY

The following objectives have been framed in this study.

1. To know the year-wise output of biosensor research in India;
2. To analysis the institution-wise research output on biosensor;
3. To analysis the subject-wise biosensor output;
4. To analysis the author-wise distribution of research;
5. To analysis the citation-wise distribution of research on biosensor.

IV. METHODOLOGY AND LIMITATIION OF THE STUDY

The researcher has downloaded the bibliographical data in the form of excel file from the Scopus Database for the period from 1988-2014. There are 1444 records were found on Biosensor research in India for the study period. The statistical analysis have been made to know the year-wise research output of biosensor research, institution-wise output, Author-wise, document-wise, number of citations, etc.

In this study, the Biosensor literature output in India during 1988-2014 has been taken for research and the records in SCOPUS database only analysed.

V.DATA ANALAYSIS AND INTERPRETATION

TABLE I YEAR-WISE DISTRIBUTION OF RESEARCH ON BIOSENSOR

Year	No. of papers	Percentage
2014	202	13.9
2013	231	15.9
2012	219	15.1
2011	181	12.5
2010	139	9.6
2009	92	6.3
2008	53	3.6
2007	63	4.3
2006	47	3.2
2005	26	1.8
2004	21	1.4
2003	25	1.7
2002	22	1.5
2001	35	2.4
2000	17	1.1
1999	15	1.0
1998	12	0.8
1997	9	0.6
1996	10	0.6
1995	8	0.5
1994	8	0.5
1993	1	0.1
1992	4	0.2
1991	2	0.1
1990	1	0.1
1988	1	0.1
Total	1444	100

Table I shows the year-wise distribution of research output on biosensor in India from 1988-2014. The starting year 1988 has only one research output and the year 2013 has 231 research papers (15.9%) followed by 219 papers and 209 papers in the year 2012 and 2014 respectively. The research output on biosensor in India has risen from the year 1988 up to 2001 in a gradual manner up to 2.4% and in the year 2002 it has declined to 1.5%. Then it has gradually increased from the year 2003 and reached to 231 papers in the year 2013 with 15.9%. Again the research output has declined a percentage of 2% in the year 2014.

TABLE II INSTITUTION-WISE RESEARCH OUTPUT (TOP 15 INSTITUTIONS)

Sl.No.	Institution	No. of Papers	Percentage
1	National Physical Laboratory India	156	8.9
2	Maharshi Dayanand University	93	5.3
3	University of Delhi	89	5.1
4	Banaras Hindu University	66	3.7
5	Indian Institute of Technology, Delhi	50	2.8
6	University of Delhi, College of Engineering	47	2.7
7	Indian Institute of Technology, Bombay	42	2.4
8	Bhabha Atomic Research Centre	34	1.9
9	Council of Scientific and Industrial Research India	30	1.7
10	Central Food Technological Research Institute India	28	1.6
11	Indian Institute of Technology, Madras	28	1.6
12	Indian Institute of Technology Roorkee	28	1.6
13	Indian Institute of Science	27	1.5
14	Amity University, Uttar Pradesh	23	1.3
15	Institute of Genomics and Integrative Biology India	22	1.2

Table II shows the institution-wise research output on biosensor research in India. The National Physical Laboratory of India has contributed 156 papers (8.9%) followed by Maharshi Davayand University contributed 93 papers (5.3%) and University of Delhi has contributed 89 papers (5.1%). Process Technology Development Division, Institute of Microbial Technology CSIR, and The Maharaja Sayajirao University of Baroda have contributed 2 papers each. Further, Banaras Hindu University has contributed 66 papers and IIT, Delhi contributed 50 papers, IIT Bombay contributed 42 papers, IIT Madras amd IIT Roorkey contributed 28 papers each. It shows that not only the Central Universities and IIT, the private Deemed Universities and engineering colleges have also contributed research papers on biosensors in a considerable numbers.

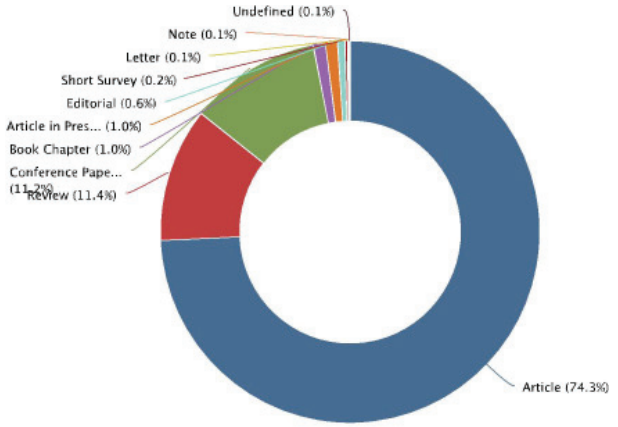

Fig.1 Subject-wise distribution on Biosensor Research

Figure 1 depicts that the subject Biochemistry and Chemistry occupied 41% of research publication in Biosensor in India. Engineering subject occupied 30.8% followed by Materials Science (21.8%), Physics (18.7%), Chemical Engineering (17.8%), Environmental Science (9.1%), Pharmacology (8.2%), and other subjects occupied 19.6% in publishing the research papers in Biosensors in India.

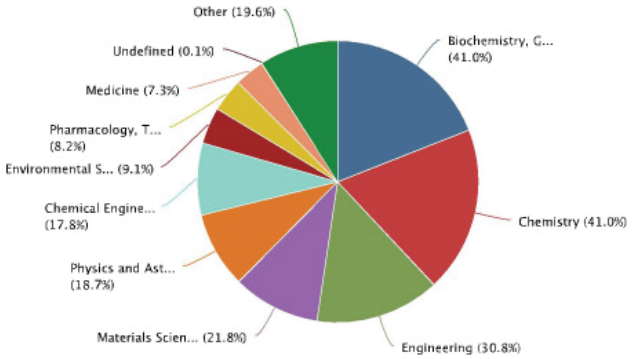

Fig.2 Bibliographic form-wise distribution of records

It is shown from Figure 2 that 74.3% of the records in the form of research papers, 11.4% records are review materials, 11.25% of the documents are conference proceedings, each 1% records are book chapters and article in press, .06% of the records are editorial dcuments, 0.2% are short surveys and each 0.1% records are letters, notes and undefined documents.

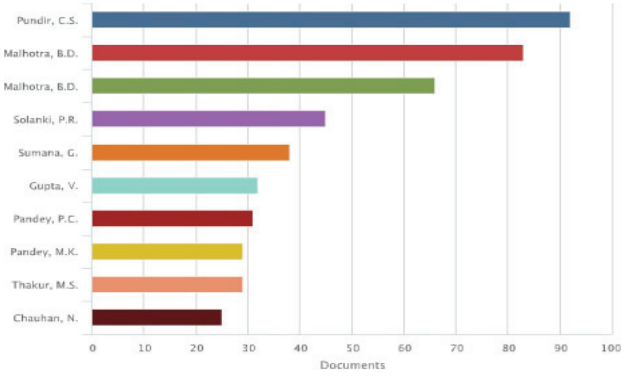

Fig.3 Author-wise distributif research output on biosensor

Figure 3 shows the author-wise contribution in the field of biosensor research in India during 1988-2014. C.S.Pudir has contributed 92 records and B.D.Malhotra has contributed 83 records, P.R.Solanki has contributed 45 records in their credit.

Pandey and Thakur have contributed each 29 research papers and Kowsick, Singh, and tomar have contributed each 29 papers in their credit. Kumbhat, Jeykumari, Chauhan, Mattiasson, vinayaka, and Vijayaraghavan have contributed each four papers on biosensor research in India.

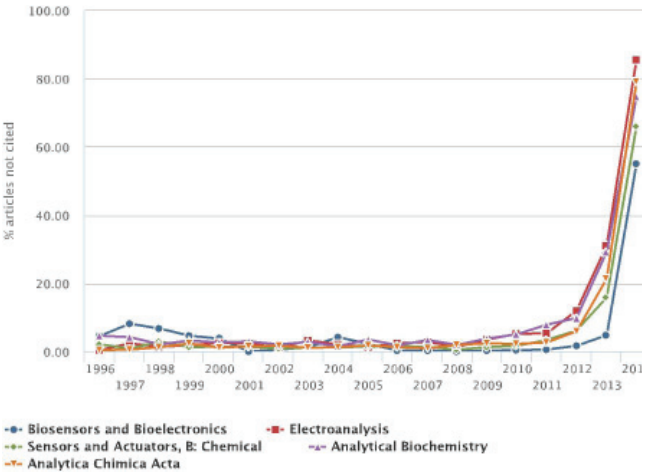

Fig.4 Distribution of Journal citations

The journal Analytica Chimica Acta has 494733 citations from the year 1996-2014 and Analytical Biochemistry has 726814 citations. Biosensors and bioselectronics has 191022 citations, and Electroanalysis journal has 94243 citations. This citation analysis has been made for the year 1996-2014 only since Scopus does not have complete citation information for articles published before 1996.

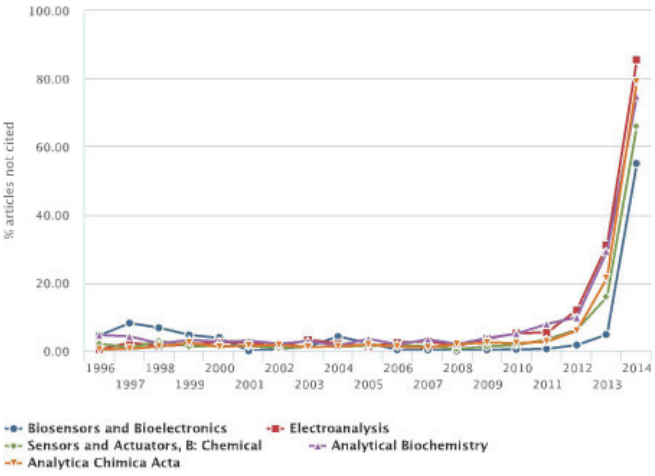

Fig.5 Journals records not cited

It is interest to note from the Figure 5 that in the year 2014 there is no citation in the 79% of the documents published in the Analytica Chimica Acta, and 74% of the documents published in Analytical Biochemistry has not citations. Further, 55.5% of the documents published in Biosensors and Bioelectronics have no citations in the year 2014 and 85.65% of the documents in Electroanalysis has no citations in the year 2014.

VI. CONCLUSION

The findings of the distribution of research output on Biosensor research in India reveals that most of the research records were published in Analytica Chimica Acta, Analytical Biochemistry, Biosensors and Bioelectronics, Electroanalysis, and Sensors and Actuators, B: Chemical. When we compare to other area of research like nanotechnology and etc., the research productivity on biosensor literature in India is less and many higher performing research institutions should produce more number of research records in biosensor and the both research output and the research quality may be increased and multinational collaborative research may further be widened to learn the experiences of foreign countries.

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