

## MAPPING THE RESEARCH PRODUCTIVITY OF BANARAS HINDU UNIVERSITY: A SCIENTOMETRIC STUDY

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### ABSTRACT

The study presents the growth and the contribution of research carried out by the scientists of Banaras Hindu University (BHU). The pattern of communications of authors and scattering of their research output in different journals, analysis the strong and weak areas of university research. The data for the study was taken from the Web of Science online database published by Institute for Scientific information (ISI). The study shows that there was a gradual growth of publications during 2000 - 2011. The annual average research output of BHU was 578 records and the research output of the scientists is fairly collaborative. "Current Science" is one of the most preferred journals of the authors of BHU. The Institute of Technology leads in publications productivity with 1482 (21.3%) articles. The authors of BHU have been collaborated with the foreign authors for their research work.

**Keywords:** *Scientometrics Analysis, Scientometrics Study, Bibliometrics, Research Productivity, Banaras Hindu University, Scientific Research-University.*

### 1. INTRODUCTION

Scientific productivity in the form of intellectual contributions and communicated in written form is commonly considered to be of fundamental importance to scientific career advancement. In the last two decades there has been an unprecedented growth of scientometric studies in different fields, mainly because of the government and private organizations that invest large amount of money for research activities need accountability. Moreover funding agencies, scientists and policy makers etc have required frequent assessment of research activities for varied reasons. Similarly there are few studies which have been under taken on the evaluation of the research output of different institutions in India, (including of Indian Institute of Technology, Kharagpur. Indian Institute of Technology, Roorkee. University of Mysore, and Government Medical College and Hospital, Chandigarh). Keeping in view of the above, an attempt has been made to analysis the research performance of authors of Banaras Hindu University. Present study aims to ascertain the growth of literature; sources of publication; identification of authorship pattern and prolific

authors and journals; collaborative efforts by the researchers of Banaras Hindu University for the period 2000 to 2011.

Banaras Hindu University generally known as BHU is a public university situated in Varanasi in the state of Uttar Pradesh, India. Established in 1916 by Pandit Madan Mohan Malviya, BHU is one of the largest residential universities in Asia, with over 20,000 students.

The university's main campus spreads over 1,300 acres (5.3 km) and was built on land donated by Kashi Naresh, the hereditary ruler of Banaras. The Rajiv Gandhi South Campus spreads over 2,700 acres hosts the Krishi Vigyan Kendra (Agriculture Science Centre) and is located in Barkachha in Mirzapur district.

BHU is organized into 4 institutes and 14 colleges. Total students enrolment at the university exceeds 20,000, and includes students from over 34 nations. It has over 60 hostels for resident students. Several of its colleges, including engineering (IIT-BHU), science, linguistics, journalism & mass communication, performing arts, law, agriculture (IAS-BHU), medicine (IMS-BHU) and management (FMS), are ranked among the best in India. The university is well known for its

Department of French Studies. The university's engineering institute was designated an IIT in 2012.

## 2. OBJECTIVES OF STUDY

The specific objective of the present study addresses the following aspects:

1. To examine the year wise distribution of publications in Banaras Hindu University.
2. To identify the authorship pattern and prolific authors of Banaras Hindu University.
3. To study the publication pattern of the researchers of Banaras Hindu University.
4. To identify the choice of the journals of the researchers for the publication of their research findings.
5. To assess the institution/department wise research concentration of Banaras Hindu University.
6. To analyse the international collaborative efforts of the researchers of Banaras Hindu University.

## 3. METHODOLOGY

The data for the study was taken from the Web of Science (WoS) database published by Institute for Scientific Information (ISI). To hunt all records published by the authors of Banaras Hindu University, an advanced search option was used and the query was submitted by defining the terms AU = Banaras Hindu Univ. Time span 2000-2011. This means those records having address of Banaras Hindu University published during 2000-2011 only were retrieved and the total number of such records were 6943. Since the database has provision to export only 500 records at a time the records were saved in different files and analysed in HistCite Software developed by Garfield and his Colleagues. HistCite is an analytical and visualization tool, which helps researchers to identify the most significant work on a topic and trace its growth. It also helps to identify the highly cited author in any area, high impact journals, prominent institutions and most important papers based on citation scores. The graphical representation of the historiography helps to visualize the historical development of research based on the most highly cited papers both within the field and all of science as reflected by the entire web of science.

## 4. RESULTS AND DISCUSSION

### 4.1. Growth of Publication

As indicated in the table 1, authors from BHU have contributed as many as 6943 publications during 2000 to 2011 in different scholarly journals. The highest number of research output 1052 (15.15%) was produced in the year 2011 and the least research output was in the year 2002 with 306 (4.41%). However, there was a gradual growth of publications during 2003- 2011. The annual average research output of BHU is 578 records. The impact of research was ascertained in terms of citations received by university papers of their publication from the date of the publication. A year wise growth of research output and citations received by the authors of BHU is presented in the Table 1. On considering the citation profile of papers of BHU from 2000-2012, it was observed that 641 papers scored highest citation 6122 in the year 2007. The average citation per paper of total publications is 7.64 on the basis of open citation window.

Table 1: Year-Wise Distribution Of Literature Of BHU

S.No	Year	Records	%	TLCS	TGCS
1	2000	393	5.66	760	4262
2	2001	361	5.20	710	4583
3	2002	306	4.41	607	4366
4	2003	364	5.24	676	4635
5	2004	368	5.30	644	4197
6	2005	388	5.59	746	5699
7	2006	486	7.00	731	4951
8	2007	641	9.23	907	6162
9	2008	782	11.26	935	4982
10	2009	878	12.65	967	4482
11	2010	924	13.31	626	3532
12	2011	1052	15.15	168	1194

### 4.2. Authorship Pattern

It is a well-known fact that nowadays, research is carried out by group of researchers rather than by a single researcher. Therefore, the data were analysed to know the authorship pattern of BHU. Through collaboration, researchers share and exchange knowledge and techniques that bring in a mixture of positive scientific thoughts. Bibliometricians have due attention to these phenomena ever since. Intensifying co-author relationship has been reported for all fields and at particularly all levels of aggregations, in the above fact, an attempt has been made to identify the nature of authorship pattern output made by researchers of BHU. It is evident from the table 2



that two authored papers ranked first in order sharing (24.24 %) of the total research output. The three authored papers follow second in the order taking (26.65%) of the total research contributions, followed by four and five authored contributions sharing (17.21%), (9.55%) of the total scientific research output during the study period. It is interesting to note that single authored papers occupy sixth position in order totalling 380 contributions which represent only (5.47%) while six, seven, eight, nine, ten and ten- more authored contributions records (4.98%), (2.59%), (1.33%), (0.75%), (0.39%), (2.84%) respectively. Based on the data presented in the table 2, indicates that the research output of the authors of Banaras Hindu University is fairly collaborative. Among the Authors Sundar, S is in first place with 210 records from the Institute of Medical Science with 4148 1 Citation followed by Srisvastava, O N in second place with 169 records and 1472 Citations Scores from the Department of physics followed by other authors.

Table 3: Types Of Publication

S.No	Document	Recs	%	TLCS	TGCS
1	Article	5977	86.09	7499	45165
2	Article: Proceedings Paper	262	3.77	325	1845
3	Review	226	3.26	497	5236
4	Meeting Abstract	152	2.19	10	14
5	Letter	149	2.15	36	250
6	Editorial Material	110	1.58	103	502
7	Correction	29	0.42	1	5
8	Book Review	12	0.17	0	0
9	Bibliographical item	10	0.14	0	1
10	News items	9	0.13	1	2
11	Book Review Chapter	6	0.09	5	23
12	Article Book Chapter	1	0.01	0	2

Table 2: Authorship Pattern Of Banaras Hindu University

S.No.	No. of Authors	No. of Records	%
1	Single authors	380	5.47
2	Double authors	1961	28.24
3	Triple authors	1850	26.65
4	Four Authors	1195	17.21
5	Five authors	663	9.95
6	Six authors	346	4.98
7	Seven authors	180	2.89
8	Eight authors	92	1.33
9	Nine authors	52	0.75
10	Ten authors	27	0.39
11	>Ten authors	197	2.84
Total		6943	100.00

4.3. Types of Publication

Table 3 presents the distribution of published literature according to type. Out of the 6943 published papers, 5997 (86.09%) were journal articles with 7499 Global Citation Scores followed by 262 (3.77%) Conference proceedings 226 (3.26%) Reviews, 152 (2.19) Meeting abstract, letter 149 (2.15) Editorial Materials 110 (1.58) and other publication followed by other forms. That the highest number of publications, was of journal articles indicate that the authors from BHU were involved enough in various meaningful research activities to disseminate their research findings through scholarly journals.

Table 4 includes the list of the top ten periodicals that published most of the articles contributed by the authors from BHU. The periodicals are arranged in decreasing order by the number of articles published. The table shows that the "Current Science" is one of the most preferred journal of the authors of BHU for publishing their contributions, followed by Spectro Chemical Acta Part A Molecular & Molecular Spectroscopy is in second place and Journal of Geological Society of India is in third place followed by other journals.

Table 4: Scattering Of Articles In Different Journals

#	Journal	Recs	TLCS	TGCS
1	Current Science	169	169	707
2	Spectrochimica Acta Part A- Molecular and Biomolecular Spectroscopy	76	104	571
3	Journal of the Geological Society Of India	66	33	113
4	Materials Science and Engineering A- Structural Materials Properties Microstructure and Processing		99	517
5	Physical Review Letters	62	40	6000
6	Physical Review C	52	0	1814
7	Microwave and Optical Technology Letters	51	57	109
8	International Journal of	49	86	555



9	Hydrogen Energy Journal of Materials Science	48	72	294
10	Indian Journal of Chemistry Section A-Inorganic Bio- Inorganic Physical Theoretical & Analytical Chemistry	47	48	164

contributed articles. From the data in the table, it is clearly understood that Physics 1110 (15.93%) articles and chemistry 1096 (15.73%) is one of the most prolific fields of research areas in BHU.

Other prolific of research are Material science 772 (11.08%) Engineering 642 (9.21%) Science and Technology 448 (6.43%), Biochemistry, Molecular biology 386 (5.54%), and followed by other subjects.

#### 4.4. Institution/Department wise distribution of publication

As seen from the publications data of BHU indexed in Web of Science for the year 2000-2011, Institute of Technology leads in publications productivity with 1482 (21.3%) articles followed by the Department of Physics 1092 (15.7%) and Institute of Medical Sciences 1016 (14.6%). However, the Department of Physics has received more citations 15170 for 1092 papers among all the departments.

Table 5: Institution With Department Wise Distribution Of Literature

#	Institution with subdivision	Recs	TGCS	Average Citations Per paper
1	Institute of Technology	1482	8597	5.80
2	Department of Physic	1092	15170	13.90
3	Institute of Medical Sciences	1016	7666	7.54
4	Faculty of Science	626	4800	7.67
5	Department of Zoology	412	2228	5.40
6	Department of Botany	359	3724	10.37
7	Department of Chemistry	336	2076	6.17
8	Institute of Agricultural Sciences	170	1024	6.02
9	Department of Geology	160	663	4.14
10	School of Biotechnology	151	1187	7.86

#### 4.5. Subject wise distribution of publications

It is evident from table 6 that the research output of BHU studied during 2000-2011 under subjects as defined by Web of Science. The departmental affiliations of the authors indicate the prominent research areas of BHU. The distribution of papers according to subject is presented in table 6. The table principally lists the top twenty subjects regarding which the authors of BHU have mostly

Table 6: Subject wise distribution of publications

#	Subject	Recs	%
1	Physics	1110	15.93
2	Chemistry	1096	15.73
3	Materials Science	772	11.08
4	Engineering	642	9.21
5	Science & Technology other topics	448	6.43
6	Biochemistry & Molecular biology	386	5.54
7	Pharmacology, Pharmacy	359	5.55
8	Environmental Science	268	3.84
9	Plant Sciences	257	3.69
10	Biotechnology Applied Microbiology	255	3.66
11	Agriculture	215	3.086
12	Geology	215	3.086
13	Optics	119	2.856
14	Metallurgy Metallurgical Engineering	181	2.598
15	Microbiology	180	2.58
16	Electrochemistry	155	2.225
17	Mathematics	155	2.225
18	Surgery	150	2.153
19	Immunology	148	2.124
20	Crystallography	135	1.938

#### 4.6. Collaboration with Other Countries

The university has published nearly (39.2 %) of its papers through international collaboration during the year 2000-2011. The maximum output articles in collaboration USA were 390 records. Germany 302, Japan 201, and France 163 the rest of the countries followed by others.

Table 7: BHU Collaboration With Top 20 Countries

#	Country	Recs	TLCS	TGCS
1	USA	390	626	12867
2	Germany	302	530	11176
3	Japan	201	217	9848
4	France	163	247	10078
5	South Korea	153	157	9333
6	Sweeden	148	188	9923
7	UK	135	283	2236
8	Brazil	130	165	9490
9	Russia	117	160	9306
10	Taiwan	113	180	8153



11	Hungary	102	157	6890
12	Peoples R Chaina	91	98	1392
13	Nepal	70	70	597
14	Belgium	65	93	578
15	Canada	63	235	3467
16	Czech Republic	49	10	1869
17	Israel	44	6	951
18	Switzerland	44	64	517
19	Australia	43	17	669
20	Spain	31	18	183

## 5. CONCLUSION

The research activity in Banaras Hindu University is in growing path, growing with an average rate of 578 records. This analysis is based on the publications data consisting of 6943 research papers published by the university researchers during 2000-2011. It was observed that 641 papers scored the highest citation 6122 in the year 2007. The average citation per paper of total publications is 7.64 on the basis of open citation window. The university has indeed progressed in terms of quality of research. The authorship pattern of BHU research identified that the majority of papers are multi-authored, based on the data presented in the table indicates that the research output of the authors of Banaras Hindu University is fairly collaborative. The ranking of the authors based on their publications shows that Sundar, S in the first place with 210 records and 4148 Citation Scores from the Institute of Medical Sciences. The source wise distribution of research output brings out the fact that the journal articles occupied the predominant place among the other sources of publication. The ranking of the source brings out the fact that the highest numbers of publications were 5977 (86.09%) published in journal articles with 45165 Global Citation Scores. The trends towards collaborative research is gaining currency day-by-day. Every work of researchers depends purely on the library because it contains more source information. The researchers have become an important entity wherein more and more researchers help to make it innovative.

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