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2021

Mapping The Research Productivity Of University Of Jammu During 2010-2019

sangita Gupta

University of Jammu, India, sangitauniv@gmail.com

Diksha Rajput

University of Jammu, India, rajputdiksha872@gamil.com

Sumeer Gul

University of Kashmir, India, sumeersuheel@gmail.com

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Gupta, sangita; Rajput, Diksha; and Gul, Sumeer, "Mapping The Research Productivity Of University Of Jammu During 2010-2019" (2021). *Library Philosophy and Practice (e-journal)*. 5249.

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Introduction

Measuring the academic output has long been used to benchmark academic performance across various academic platforms. Research productivity provides an insight into the research and development of a particular educational institution. It provides a framework for knowing the more substantial and weaker areas of institutional research and promoting the researchers to contribute more towards improving the quality of their research and enriching their institution's research productivity. Research productivity is an essential criterion by many universities and research institutions for recruitment, promotion, and allocating and maintaining various resources and facilities for their overall development and achieving their objectives. Universities are ranked based on their overall research performance as the quality of research carried out by a particular university determines the quality of knowledge imparted to the society by that university. From time immemorial, various techniques have been used to measure research output which established a firm branch in Library and Information Science, known as Bibliometrics. **Alan A. Pritchard**¹ introduced the term 'Bibliometrics' in 1969. Pritchard has explained bibliometrics as "the application of mathematical and statistical methods to books and other media of communication." Bibliometrics is the quantitative analysis of the published literature with various statistical techniques to describe the pattern of publications within a given field of study. Researchers use different bibliometric methods to evaluate quantitatively the various aspects of the research productivity of an institution.

Statement of Problem

The current study intends to highlight the trends in research across various disciplines from the University of Jammu.

University of Jammu

The University of Jammu came into existence in 1969 vide Jammu and Kashmir Universities Act 1969, which bifurcates the J&K University into erstwhile University of Jammu and Kashmir. National Assessment and Accreditation Council of India accredited it as an 'A+' University. The University of Jammu is an institution where imparting high-quality education

is not considered just a duty but a commitment towards the enrichment and advancement of the society and country. The University provides instructions in various branches of learning as much as possible and makes provisions for researching emerging and trending areas for a generation and disseminating new knowledge. Jammu University is student-centred that nurtures innovation and ensures high-quality education to promote the individual's overall development to meet the knowledge challenges of the 21st century and contribute towards socio-cultural and economic development of J&K to become a peaceful and prosperous state (<https://jammuuniversity.ac.in/university/about-university>).

Review of Literature

Kumar and Kumar (2019)² conducted a study to examine the Indian Institute of Science's research productivity, Bangalore. The data was collected through the Web of Science database. A total of 12,310 papers were analyzed over five years, i.e.2014-2018. The study has analyzed the various parameters such as productivity pattern, author productivity, collaboration pattern, etc. The study found that the maximum number of publications is during the year 2018 (i.e.2528). Publications for the year 2014 received most of the citations. Most of the research is done in the field of engineering (25.18%), followed by physics (20.86%) and chemistry (18.43%), and IISC Bangalore has a maximum research collaboration with CSIR labs, India. The most prolific journal of IISC Bangalore is RSC Advances with 191 publications (1.57%), followed by current sciences (1.38%) and journal of high energy physics (1.33%), and Kumar, A is the most productive author with 372 publications (3.06%) and received a total of 4538 citations.

Suresh and Thanuskodi (2019)³ examined the research output of ICAR- Indian Institute of Horticulture, Bangalore. A total of 1095 items were retrieved from the WOS database from 1989 through 2018 to analyze various study parameters such as year-wise publication pattern, authorship pattern, collaboration pattern, core journals, etc. The study found that the institute's research output shows exponential growth during 30 years with leading publications during 2017 (8.13%). Most of the publications of the institute are in the form of articles (90.14%).

Indian Journal of Agricultural Sciences is the most preferred journal by faculty members for publishing their research papers. Asokan, R. is the most prolific author and secured the first rank by contributing 61 publications. The multi-authorship pattern is most prominent, and researchers prefer to work in collaboration.

Goswami and Hazarika (2016)⁴ conducted a Scientometric analysis of Assam University's research productivity from 2000 through 2015. Data was collected through the Web of Science. A total of 714 papers were analyzed to study the study's various attributes, such as publication pattern, authorship pattern, collaboration pattern, etc. The study found that the research output of Assam University shows a simultaneous increase from 2 records (0.28%) in 2000 to 131 records (18.35%) in 2015. Most of the published papers are in the form of articles (90.34%). Out of the total 714 published papers, only 21 papers (3%) are single-authored, while 693 papers (97%) are multi-authored, in which 3-5 authored contribution (58%) is maximum. Current Science is the most preferred journal in which 23 papers (6.67%) contributed by various researchers are published.

Teli and Dutta (2016)⁵ conducted the research analysis of Vidyasagar University from 1989-2014. The data were retrieved from the WOS database. The study focuses on various parameters such as publication pattern, authorship pattern, citation pattern, etc. The study showed that 986 papers are published from 1989-2014, with an average citation of 8.3 per paper. Most of the publications are during the year 2013 (i.e-129). The multi-authored publication is more prominent than single-authored. The most prolific author is Syed Sirajul Islam from the department of Chemistry with 89 publications. IITS has the highest number of collaborative papers (i.e-126) with Vidyasagar University, and the most preferred journal is Carbohydrate Research.

Nagarkar, Veer, and Kumbhar (2015)⁶ conducted an in-depth analysis of the research productivity of the life sciences department of Pune university during 1999-2013. WOS database was the primary source of data collection. They examined the various research parameters, such as the number of papers, collaboration pattern, authorship pattern, citation

received, etc. Faculty members of Pune university published 690 papers during 1999-2013 with a total of 6210 citations. Most of the published papers were in collaboration, and maximum collaboration is with Bhabha Atomic Research Centre, Mumbai Nationally, and with USA Internationally. The most preferred journal for paper publication is Current Science, India. The prominent research area is Biology, with a contribution of 356 publications.

Maharana and Sethi (2013)⁷ analyzed the research productivity of Sambhalpur University. The data for analysis were retrieved from the WOS database for five years. i.e., 2007-2011. The study focuses on publication patterns, authorship patterns, collaboration patterns, etc. The results showed that from 2007 through 2011, a total of 170 papers were published with leading publication during 2011(28.82%), and these 170 papers receive a total of 541 citations. Most of the research is done in Chemistry (27.65%), and most of the contributed papers are multi-authored. Researchers prefer to publish their papers in the journal Astrophysics and Space Science, and Mishra, B.K. is the most productive author with a contribution of 28 papers (16.47%), followed by Mohapatra P.K (11.18%), and Behara, B. (10%).

Methodology and Scope of the study

The data for the present study were gathered with the help of Incites database (accessible at <https://incites.clarivate.com/>) in May 2020. For data collection, the University of Jammu organization was selected, and the time range was selected from 2010-2019. The search expression used was “*Organisation Enhanced= University of Jammu and year= 2010-2019*” as covered in Incites Database. A total of 1641 records were retrieved. All the searched results were imported in Microsoft Excel and analyzed by applying different bibliometric techniques for evaluating the research productivity of the University of Jammu.

Research objectives

1. To find out the year-wise growth of literature, various forms of publications, and citation patterns of research publications.
2. To identify the prolific authors.
3. To know the authorship pattern and degree of collaboration among authors.

4. To determine the subject-wise distribution and highly preferred journals.
5. To identify the funding agencies for project-based research.

Data analysis

Year-wise growth of publications

The annual growth rate of research output of the University of Jammu has shown steady growth from 85 records in 2010 to 258 records in 2019, which indicates that the university's publications are increasing year by year. Out of 1641 papers, 258 papers are published during 2019, which shows maximum output, accounting for 15.72% of total publication output. This is followed by publications for 2016 (195; 11.88%) and 2018 (193; 11.76%). During 2010 (5.18%), the research output is the least, in which only 85 papers were published (**Table 1**).

Table 1: Year-wise growth of publications		
Publication Year	No. of records	%age of records
2010	85	5.18%
2011	112	6.82%
2012	138	8.41%
2013	141	8.60%
2014	143	8.71%
2015	188	11.46%
2016	195	11.88%
2017	188	11.46%
2018	193	11.76 %
2019	258	15.72 %
Total	1641	100%

Citations pattern

Out of the 1641 papers, 141 papers published during 2013 received the highest of 4741 citations which accounts for 17.84% of total citations, followed by 143 papers for the year 2014, receiving 3990 citations, and year 2011 receiving a total of 2944 citations. Two hundred fifty-

eight papers from the year 2019 received only 343 citations which shows a gradual decrease from 9.39% to 1.29% of total citations received during the covered period (**Table 2**).

Publication Year	No. of Records	No. of Citations	Average Citation Per Paper
2010	85	3517 (13.23%)	41.37
2011	112	2944 (11.07%)	26.28
2012	138	3876 (14.58%)	28.09
2013	141	4741 (17.84%)	33.63
2014	143	3990 (15.01%)	27.90
2015	188	2496 (9.39%)	13.28
2016	195	2296 (8.64%)	11.77
2017	188	1606 (6.04%)	8.54
2018	193	768 (2.89%)	3.98
2019	258	343 (1.29%)	1.33
Total	1641	26,580	19.62

Document type

Most of the publications, 1468 (89.46%), are published in the form of *Journal Articles*, followed by *Conference Proceedings* (93; 5.67%) and *Reviews* (45; 2.74%). Only 1 (0.06%) document each stands published in the form of the *News-Item*, *Biographical Item*, and *Retraction* (**Table 3**).

Rank	Document type	No. of records	%age
1	Article	1468	89.46%
2	Proceeding Papers	93	5.67%
3	Review	45	2.74%
4	Correction	12	0.73%
5	Letter	6	0.36%
6	Editorial Material	5	0.30%
7	Book Chapter	4	0.24%

8	Meeting Abstract	3	0.18%
9	Book Review	2	0.12%
10	News Item	1	0.06%
10	Biographical Item	1	0.06%
10	Retraction	1	0.06%
Total		1641	100%

Top 10 prolific authors

Among the top 10 prolific authors, Bhasin, A. contributes the maximum number of papers (450; 27.42%) and also has the maximum number of citations (18,728), followed by Gupta, A. (439; 26.75%); Gupta, R. (283; 17.24%); Sambyal, S. (282; 17.18%); and Bala, R. (237; 14.44%) respectively. A detailed description can be had in **Table 4**.

Author	Rank	No. of records	%age	Total Citations received
Bhasin, A.	1	450	27.42%	18728
Gupta, A.	2	439	26.75%	18099
Gupta, R.	3	283	17.24%	13474
Sambyal, S.	4	282	17.18%	13496
Bala, R.	5	237	14.44%	6786
Sharma, A.	6	222	13.53%	3297
Bhat, I.R.	7	212	12.92%	3829
Rajput, S.	8	193	11.76%	2715
Singh, R.	9	183	11.15%	11461
Sharma, M.	10	163	9.93%	2013

Authorship pattern

Table 5 clearly shows that the multi-authorship pattern is more prominent in the University of Jammu. The single-authored contribution is much less as compared to the multi-authored contribution. Thirty-three papers are contributed by single authors, accounting for only 2.01%

of total publications. In comparison, as maximum papers are contributed by more than five authors (737), which account for 44.91% of total publications.

Year	1-Author	2- Author	3- Author	4- Author	5- Author	More than 5- Author
2010	1	13	16	14	7	34
2011	3	28	19	18	13	31
2012	2	19	17	17	27	56
2013	2	17	17	13	22	70
2014	3	8	22	26	17	67
2015	7	40	19	25	31	66
2016	3	30	27	37	16	82
2017	1	22	33	26	19	87
2018	9	20	26	40	17	81
2019	2	17	30	27	19	163
Total	33(2.01%)	214(13.04%)	226(13.77%)	243(14.80%)	188(11.46%)	737(44.91%)

6.6 Degree of Collaboration

Most of the publications are multi-authored, signifying the trend of collaboration among researchers. To calculate the strength of collaboration, the formula is given by **Subramanyam (1983)⁸** is used:

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

Where,

C = Degree of Collaboration, N_m = Number of multi-authored papers, and N_s = Number of single-authored papers.

From **Table 6**, it is evident that the degree of collaboration ranges between 0.95 to 0.99. The average degree of collaboration is 0.98, which indicates that researchers prefer to work collaboratively.

Year	Single Authored Papers (N_s)	Multi Authored Papers (N_m)	$N_m + N_s$	Degree of Collaboration
2010	1	84	85	0.99
2011	3	109	112	0.97
2012	2	136	138	0.98
2013	2	139	141	0.98
2014	3	140	143	0.98
2015	7	181	188	0.96
2016	3	192	195	0.98
2017	1	187	188	0.99
2018	9	184	193	0.95
2019	2	256	258	0.99

Total	33	1608	1641	0.98
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6.7 Research areas

Researchers from various disciplines contribute to the intellectual output of the University. The most prominent subject area is Nuclear Physics in which 304 papers are published, accounting for 18.53% of total publications, followed by Particles and Fields Physics (15.78%), Multidisciplinary Chemistry (10.36%), Astronomy and Astrophysics (8.35%), Multidisciplinary Physics (6.22%), and Physical Chemistry (5.42%). **Table 7** highlights the top ten Research Areas in which the highest %age of research output is witnessed.

S. No	Research Areas	No. of Records	%age (out of 1641)	Total Citations Received
1	Physics, Nuclear	304	18.53%	8860
2	Physics, Particles and fields	259	15.78%	9615
3	Chemistry, Multidisciplinary	170	10.36%	908
4	Astronomy and Astrophysics	137	8.35%	5497
5	Physics, Multidisciplinary	102	6.22%	5923
6	Chemistry, Physical Chemistry, Organic	89	5.42%	771
7	Physics Applied	83	5.06%	134
8	Material Sciences, Multidisciplinary	82	5.00%	433
9	Engineering, Electrical and Electronic	78	4.75%	179
10	Plant Sciences	74	4.51%	899

6.8 Preferred journals

Physics Letter B is the most preferred journal in which 106 papers are published, accounting for 6.46% of total published papers. Physical Review C is the second most preferred journal contributing 85 papers (5.18%), followed by Nuclear Physics A (4.63%), Physical Review Letters (4.45%), Journal of High Energy Physics (2.86%), European Physical Journal C (2.68%), and Physical Review D (1.71%). **Table 8** highlights the Top 10 publication platforms preferred by the academia of the University of Jammu.

Journal	Rank	Publisher	No. of Records	%age (out of 1641)	Total Citations Received
Physics Letter B	1	Elsevier	106	6.46%	4755
Physical Review C	2	American Physical Society	85	5.18%	3190

Nuclear Physics A	3	Elsevier	76	4.63%	146
Physical Review Letters	4	American Physical Society	73	4.45%	5745
Journal of High Energy Physics	5	Springer	47	2.86%	1591
European Physical Journal C	6	Springer	44	2.68%	1986
Physical Review D	7	American Physical Society	28	1.71%	730
Crystallographic Reports	8	Pleiades Publishing Inc.	23	1.40%	3
Tetrahedron Letters	9	Pergamon-Elsevier Science Ltd.	22	1.34%	238
Monatshefte Fur Chemie	10	Springer Wien	21	1.28%	66

6.9 Research Funding Agencies

Table 9 entails the top funding agencies in which the National Natural Science Foundation of China acquires the first rank by funding 376 various research projects of University of Jammu, followed by the Council of Scientific and Industrial Research, Science and Technology Facilities Council and National Science Foundation. **Table 9** highlights the Top 10 Funding agencies that funded research at the University of Jammu.

Funding Agencies	Rank	Country	No. of
National Natural Science Foundation of China	1	China	376
Council of Scientific and Industrial Research (CSIR), India	2	India	321
Science and Technology Facilities Council (STFC)	3	United	316
National Science Foundation (NSF)	4	USA	292
National Research Foundation of Korea	5	Korea	257
Ministry of Education, China	6	China	256
National Council for Scientific and Technological Development	7	Brazil	251
Science and Technology Facilities Council	8	United	249
Fundaco de Amparo a Pesquisa do Estado de Sao Paulo	9	Brazil	248
Department of Atomic Energy	10	India	242

7. Conclusion

This study focuses on analyzing the various parameters of research productivity of the University of Jammu. A total of 1641 papers are analyzed, and it is concluded that the annual growth rate of the University of Jammu is continuously increasing from 2010 to 2019. Various researchers from different disciplines of the University contribute research papers to enhance

the research productivity of the University of Jammu. Research at the University of Jammu is multidisciplinary. Various National and International agencies funded the University of Jammu's research projects, and multi authorship trends and patterns are prominent among researchers of the University of Jammu.

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