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Research Performance of Central University of Haryana: A Bibliometric Analysis

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Abstract - **This study aims to conduct a bibliometric analysis of Central University of Haryana (CUH) research publications over a seven-year period between 2015 to 2021 and intends to assess the university's research performance based on documents published in journals that Scopus have indexed. A total of 778 publications were found and further analysed. In this paper, the author attempts to identify current trends of CUH's research output, such as the most prolific authors, co-authored publications, highly cited papers, most chosen sources, etc. In the year 2021, the most research publications were published. This study's findings also show that *'3 Biotech'* is the most preferred source, and Devendra Kumar from department of statistics is the prolific researcher, has the most papers.**
Keywords: **Central University of Haryana, Bibliometric Study, CUH, Scopus, VOS Viewer**

I. INTRODUCTION

The evaluation and rating of research outputs and education systems aid in increasing the quality of discussions within India's higher education community. Academic achievement has been benchmarked across multiple platforms by assessing academic research papers. Research is essential for the success of institutions and their country. It is critical for increasing scientific understanding. In order to uncover answers to problems, the research process must be scientific, utilising simple and legitimate research techniques, instruments, and methods. Reviewing and evaluating the volume of research papers published by an institution over time is vital as part of measuring the research and research outputs.

The Central University of Haryana was founded by the Government of India under the Central Universities Act (2009).The university has its campus in Jant-Pali villages, nearly 10 kilometres from Haryana's Mahendergarh district, on the Mahendergarh-Bhiwani highway. The University has eight academic schools, including the School of Humanities and Social Sciences, the School of Interdisciplinary and Applied Sciences, the School of Basic Sciences, the School of Law, and others, through various courses viz. graduate, postgraduate, and PhD are offered. The admissions process is solely based on the Common University Entrance Test or CUET. The university received an *A* rating from the National Assessment and Accreditation Council. Prof. Tankeshwar Kumar is the current vice-chancellor of the university.

Many departments frequently organise seminars, conferences, lectures, and orientation courses to benefit academia. Researchers from national and international research institutes, as well as prominent universities, have actively engaged with university departments. As a result, this report seeks to appraise the research performance of Central University of Haryana researchers by analysing their scholarly publications.

II. LITERATURE REVIEW

A study by Siwach and Kumar [1] analysed Maharshi Dayanand University, Rohtak's 14-year research contributions using Scopus to analyse year-wise research productivity, its citation influence, papers distribution by discipline, most preferred sources, and most productive authors. Kumar *et al.,* [2] used the Scopus database to examine Kurukshetra University research publications from 2006 to 2015. They analysed 2361 documents using multiple variables, focusing on their development, citation quality, subject-wise contribution and effect of prominent researchers, and contribution to the most prolific journals. Siwach and Parmar [3] utilised Scopus to study the research of Chaudhary Charan Singh Haryana Agricultural University's faculty and researchers. They surveyed 2649 publications with 15282 citations, averaging 5.77 per paper. Using Scopus, Kumar [4] has overseen a bibliometric study of Guru Jambheshwar University's publications from 1999 to 2018. The author noted a constant record increase and a growth rate of 31.72% annually.

Priya and Rao [5] used Scopus to look at the Himachal Pradesh Central University's research documents from 2011 to 2020. According to their findings, the university published 442 articles and garnered 5,531 citations. Rahman and Sofik [6] used data from the Web of Science to visualise Jadavpur University's research literature between 2012 and 2021. The study's findings show that scholarly research practices changed dramatically during the preceding decade. Rohit [7] attempted to determine the pattern of authorship at Deenbandhu Chhotu Ram University using Scopus. The study findings reveal that 1502 papers were published during 2011-2021, and *AIP Conference Proceedings* was the most preferred source by researchers.

III. OBJECTIVES OF THE STUDY

The research aims to examine the Central University of Haryana's research output from 2015 to 2021. Following are the objectives.

1. To find out the types of research publications and year-wise research productivity.
2. To discover the most prolific authors.
3. To find out the most cited papers and citation profile.
4. To identify the institutional collaboration.
5. To identify the most preferred sources.

IV. METHODOLOGY

The current research paper is a quantitative analysis of many elements of literature based on bibliographic data. The bibliographic data of Central University of Haryana authors was acquired from the Scopus database, a widely used source of information that deals with abstracts and indexes of publications on a global scale. To assess the university's research output, publications from 2015 to 2021 were evaluated. The data for this study was gathered by searching for the Central University of Haryana in the Scopus database. The data first downloaded in csv format analysed in bibliometrix package [8] for further investigation. The current study aims to analyse CUH's research productivity and is limited to a single database. The data was compiled using the phrase shown below.

AF-ID ("Central University of Haryana" 60107367) AND (LIMIT-TO (PUBYEAR, 2015-2021))

V. DATA ANALYSIS

A. Form of Publications

Central University of Haryana's authors produced a wide range of scientific material, including journal articles, conference papers, reviews, books, notes etc. Table I data shows that most records were journal articles, with 549 (70.57%) of the total 778 publications. Review papers come in second with 80 (10.28%), followed by conference papers (62), book chapters (57).

TABLE I PUBLICATION TYPE

Sl. No.	Type	Number of Publications	Percentage
1	Article	549	70.57
2	Review Papers	80	10.28
3	Conference Papers	62	7.97
4	Book Chapters	57	7.33
5	Books	8	1.03
6	Data Papers	8	1.03
7	Editorials	5	0.64
8	Erratum	5	0.64
9	Others	4	0.51

B. Annual Research Growth

Fig. 1 illustrates Central University of Haryana records mapped by the Scopus database between 2015 and 2021. A total of 778 publications have been written by university faculty and research scholars. The most articles (225) were published in 2021, while the least (16) were published in 2015. A shifting trend was observed in research publications.

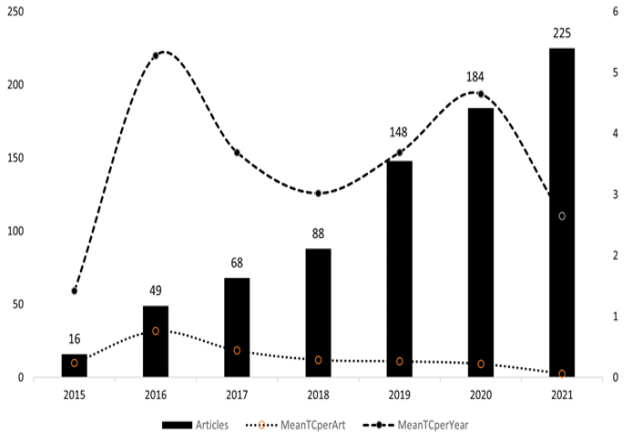


Fig. 1 Annual research growth

C. Most Prolific Authors

According to data collected from the Scopus database, 1378 authors have contributed 778 publications. The data were arranged by the number of publications by each author, and a ranking list of the top authors was constructed in descending order in Table II. Kumar D has the most published papers (*NP*=49), followed by Dubey KK (*NP*=33), Kajla A (*NP*=33), Dey S (*NP*=30) and Kuhad RC (*NP*=30). The author Maurya PK was ranked eighth in terms of quantity of publications but first in per paper citation rate. Furthermore, about 39.97% of all university publications between 2015 and 2021 were authored by just these academics. A co-authorship graph is depicted in Fig. 2.

TABLE II MOST PRODUCTIVE AUTHORS

Rank	Name	NP	TC	*h*-index	*g*-index	CPP
1	Kumar D	49	351	9	17	7.16
2	Dubey KK	33	338	11	17	10.24
3	Kajla A	33	184	8	12	5.58
4	Dey S	30	287	9	16	9.57
5	Kuhad RC	30	389	11	19	12.97
6	Singh P	29	171	9	12	5.90
7	Saxena S	28	249	9	14	8.89
8	Maurya PK	27	451	11	21	16.70
9	Gupta RK	26	79	7	8	3.04
10	Singh B	26	285	10	16	10.96

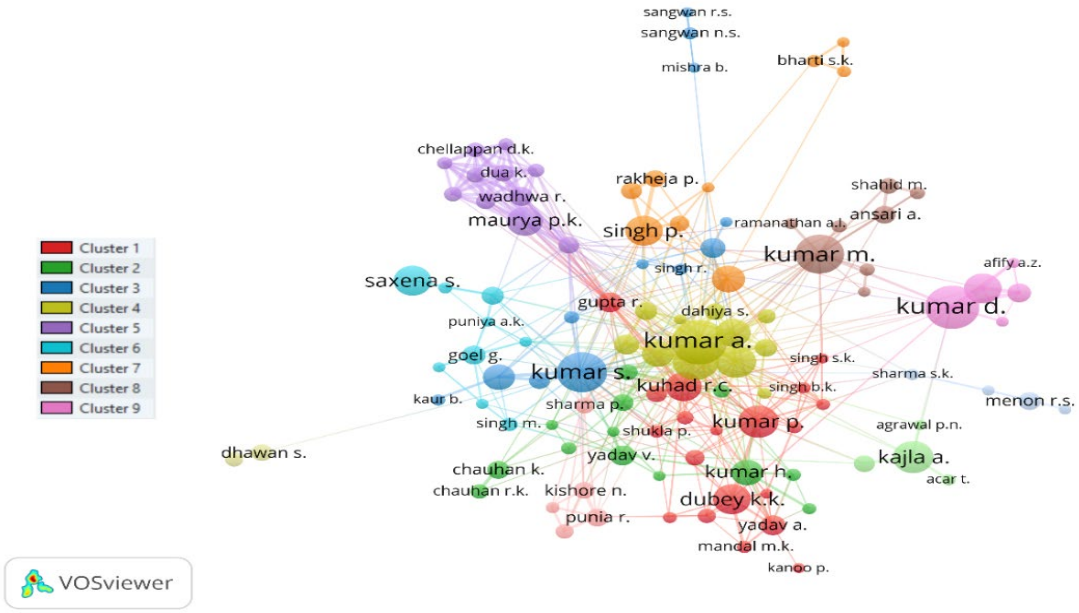


Fig. 2 Co-authorship between authors

D. Highly Cited Papers and Citation Profile

Table III shows the list of most cited papers. The article entitled "Mechanistic Basis of Antimicrobial Actions of Silver Nanoparticles" by Dakal *et al.,* got the maximum citations of 709, and this paper was published in the *Frontiers in Microbiology*. The next paper is "Recent developments in pre-treatment technologies on lignocellulosic biomass: Effect of key parameters, technological improvements, and challenges" by Bhatia *et al.,* with 223 citations published in *Bioresource Technology*.

TABLE III HIGHLY CITED PAPERS

Rank	First Author	Year	DOIs	TC	TCpY
1	Dakal TC	2016	10.3389/fmicb.2016.01831	709	101.29
2	Bhatia SK	2020	10.1016/j.biortech.2019.122724	223	74.33
3	Jaiswal D	2018	10.1016/j.jretconser.2017.11.008	218	43.60
4	Menon RS	2016	10.3762/bjoc.12.47	193	27.57
5	Dahiya DK	2017	10.3389/fmicb.2017.00563	183	30.50
6	Sharma KM	2017	10.1016/j.jgeb.2017.02.001	130	21.67
7	Kumar A	2020	10.1016/j.jbusres.2019.09.030	128	42.67
8	Samtiya M	2020	10.1186/s43014-020-0020-5	113	37.67
9	Kuhad RC	2016	10.1016/j.rser.2015.10.132	112	16.00
10	Nirmale TC	2017	10.1016/j.ijbiomac.2017.05.155	88	14.67

TABLE IV CITATION IMPACT

Citation Range	Publication	%	Citation	%
Uncited	152	19.54	0	0
1-5	283	36.38	709	7.91
6-10	121	15.55	933	10.41
11-20	128	16.45	1790	19.97
21-30	38	4.88	956	10.66
31-40	17	2.19	585	6.53
41-50	11	1.41	505	5.63
51-100	19	2.44	1273	14.20
100	9	1.16	2213	24.69
Total	778			

Table IV shows the citation profile of 778 publications. It was discovered that 80.46 percent of total publications were cited by other researchers, while 19.54 percent remained uncited. Furthermore, nine papers (1.16%) received more than one hundred citations, 19 (2.44%) scales between 51-100, and 283 documents (36.38%) received citations between 1 to 5.

E. Factorial Map

The cited documents are grouped into two clusters across two dimensions, as shown in Fig.3. Five papers from Cluster 1 and six documents from Cluster 2 are listed with the highest contributions because Cluster 1 is in the negative quadrant, and Cluster 2 is in the positive quadrant.

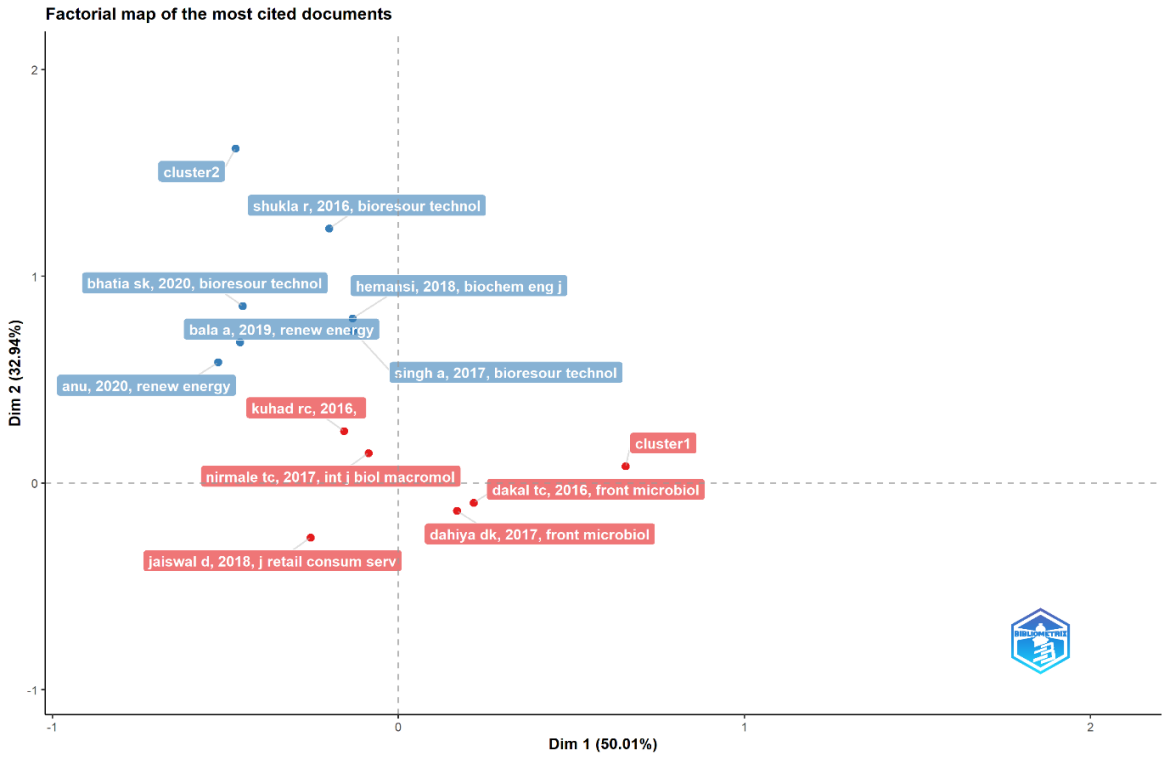


Fig. 3 Factorial Map of the documents

F. Research Collaboration

The publications made by Central University of Haryana researchers and other institutions were analysed. It can be seen that CUH authors have collaborated in cooperative research with other domestic institutions. The Maharshi Dayanand University ranked first with 78 documents, then came the University of Delhi with 61 papers, followed by Amity University, Jawaharlal Nehru University, Central University of Punjab, Guru Jambheshwar University and Indian Agricultural Research Institute. These top ten institutions collaborate with the Central University of Haryana and publish papers in more than 47% of the total publication output. Table V contains the comprehensive data of the highest institution collaboration as well Fig. 4 shows the county-wise research collaboration with CUH authors.

TABLE V COLLABORATIVE AFFILIATIONS

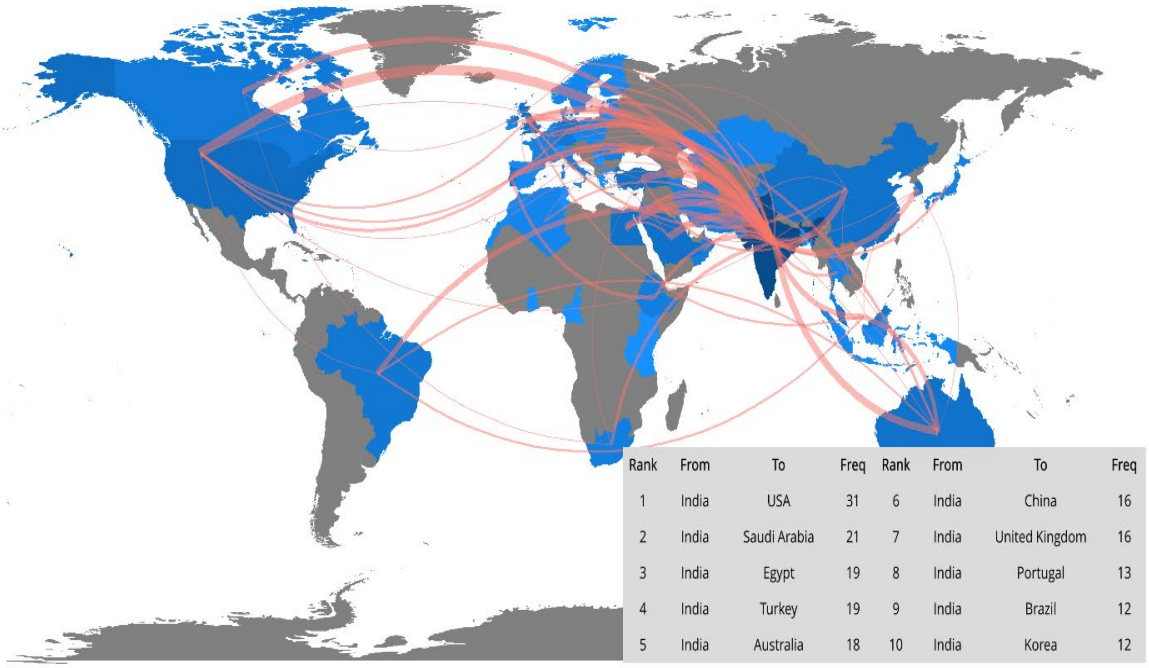
Sl. No.	Affiliation	Documents	*h*-index
1	Maharshi Dayanand University	78	14
2	University of Delhi	61	12
3	Amity University	45	11
4	Jawaharlal Nehru University	37	11
5	Central University of Punjab	34	8
6	Guru Jambheshwar University	29	6
7	Indian Agricultural Research Institute	25	6
8	Indian Institute of Technology Roorkee	24	4
9	The North Cap University	20	9
10	Thapar Institute of Engineering & Technology	16	4

A map of country-wise research collaboration is also sketched in Fig. 4. The authors of Central University of Haryana have shared publications with many countries over the world. The United States is in the first position in this list with 31 documents. Next are the Saudi Arabia (*NP*=21), Egypt and Turkey (*NP*=19 each).

G. Most Preferred Sources

As a result, the data obtained for the study is shown in Table VI, which ranks the top ten sources most preferred for publishing. Out of the total 778 publications of the university, 645 (82.90%) were published in different journals. *3 Biotech*

was the most chosen among these sources, with 18 publications and 261 citations. *Advances in Intelligent Systems and Computing* came in second with 17 publications. With 16 publications, the *AIP Conference Proceedings* ranked third. *Annals of Data Science* was in fourth place with 14 articles, while *Bio-resource Technology* was in fifth place with 12 publications.



Rank	From	To	Freq	Rank	From	To	Freq
1	India	USA	31	6	India	China	16
2	India	Saudi Arabia	21	7	India	United Kingdom	16
3	India	Egypt	19	8	India	Portugal	13
4	India	Turkey	19	9	India	Brazil	12
5	India	Australia	18	10	India	Korea	12

Fig. 4 Country-Wise Research Collaboration

TABLE VI PREFERRED SOURCES FOR PUBLICATION

Source Name	NP	TC	*h*-index	*g*-index	*m*-index
3 Biotech	18	261	9	16	1.286
Advances in Intelligent Systems and Computing	17	8	1	1	0.167
AIP Conference Proceedings	16	13	3	3	0.429
Annals of Data Science	14	78	5	8	0.833
Bioresource Technology	12	397	8	8	1.143
Foresight	10	113	6	9	1.000
Journal of Molecular Structure	10	111	4	7	0.667
Aptamers	9	7	1	2	0.250
Biomass Conversion and Biorefinery	8	19	2	4	0.333
Chemical Data Collections	8	35	4	5	1.333

H. Discipline-Wise Distribution

The discipline-wise research production analysis aims to examine the research trends in specialised areas of subject interest. The discipline-wise distribution of publications in Table VII shows the key areas where scholars from the Central University of Haryana published their work. These data also emphasised the university's strength in a particular subject area. Engineering had the most research papers, with 17.48 per cent (136), followed by Biochemistry, Genetics and Molecular Biology with 17.10 percent (133), Mathematics with 15.81 per cent (123), Chemistry and Physics & Astronomy with 13.75 per cent (107).

The other major subject areas are Computer Science (105), Environmental Science (88) and Agricultural and Biological Sciences (82). The discipline with the fewest publications, such as social sciences and others, accounts for only 5.66 percent of total research output.

TABLE VII DISCIPLINE-WISE DISTRIBUTION OF DOCUMENTS

Sl. No.	Discipline	Publications	Percentage
1	Engineering	136	17.48
2	Biochemistry, Genetics and Molecular Biology	133	17.10
3	Mathematics	123	15.81
4	Chemistry	107	13.75
5	Physics and Astronomy	107	13.75
6	Computer Science	105	13.50
7	Environmental Science	88	11.31
8	Agricultural and Biological Sciences	82	10.54
9	Chemical Engineering	81	10.41
10	Business, Management and Accounting	72	9.25
11	Materials Science	69	8.87
12	Energy	56	7.20
13	Immunology and Microbiology	55	7.07
14	Medicine	55	7.07
15	Social Sciences	44	5.66

VI. CONCLUSION

The current study's assessment of the Central University of Haryana's research output demonstrates a broad development trend in publications for seven years (2015-2021). During this time period, 778 documents were published by Central University of Haryana authors. This analysis shows that, according to the university's research output, 70.57 per cent of all literature is published in journals. The survey also highlighted which sources of research communication the university's researchers preferred for publishing their research outcomes. Out of these, the *3 Biotech, Advances in Intelligent Systems and Computing, and AIP Conference Proceedings* were the most chosen sources by authors. The university's highest productive research areas are specific disciplines like *Engineering, Biochemistry, Mathematics and Chemistry*.

This data reveals the strengths and weaknesses of the university's research output. Citation data indicated that nine out of the top ten research papers received more than three hundred citations, and all received more than one hundred in each publication. The following data clearly shows that Devendra Kumar from the Department of Statistics is the most prolific author, with 49 publications and the highest citation received by Pawan Kumar Maurya from the Department of Biochemistry. The Central University of Haryana collaborates on research with various universities on a national level, likewise Maharshi Dayanand University, University of Delhi and Amity University. Bibliometrics and scientometrics have recently gained prominence in library and information science. These analysis tools may discover new research fields and evaluate research performance.

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