

A Scientometric Analysis of Research Productivity of Karnatak University, Dharwad

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ABSTRACT

The paper deals with a scientometric analysis that evaluates the research productivity of Karnatak University, Dharwad, a significant institution in India. A total of 3522 publications were retrieved from the Web of Science database during 1993 to 2022. The scientometric indices serve as essential instruments for assessing the scientific research output of institutions, groups, and individuals. The study reveals the outcomes of Karnatak University through qualitative & quantitative methods. The result shows that the Council of Scientific Industrial Research, India has produced the maximum number of publications (10.42 %). The study examines the university's research output, citation impact, and trends in scientific productivity over a specific period. By analysing authorship patterns, levels of collaboration, co-authorship indices, collaborative indices, the most productive institutions, authors, and preferred types of publications, this study aims to assess the university's research performance, identify areas of strength and weakness, and provide insights into its academic excellence.

Keywords: Scientific productivity; Karnatak university; Research output; Web of science; Growth rate; Scientometric analysis

1. INTRODUCTION

The assessment of scientific output emerged in the late 1960s as a pragmatic necessity for informed policy-making in scientific research¹. The significant demand for an objective approach to assessing scientific activity arose from the competitive funding pressures across several research streams. Additional viewpoints that endorsed the objective method included the emergence of more structured scientific research, the substantial impact of science on the economy and society, and the growing necessity for significant governmental investment in scientific research²⁻³. Thus, from the 1960s to evidence-based securement of scientific activities- authentic data collected on scientific activities and analysed regularly started playing an important role in formulating science policy⁴.

The research productivity of Karnatak University, Dharwad, studies have shown the significance of evaluation and enhancement of research performance in universities. The study reveals that evaluating research output in academic institutions serves different purposes *i.e.*, Evaluate Research Performance, identify the university's strengths and weaknesses in research, including areas of high productivity and impact, Provide policymakers, researchers, and legislators with

information to assist stakeholders in making decisions regarding resource allocation, research funding, and strategic planning and Enhance the university's research output and impact while enhancing excellence in research.

The study focuses on prior research assessment and scientometrics studies like, the context for the evaluation was provided by previous scientometric studies that assessed research fulfilment throughout various disciplines and institutions. Research productivity and impacts on universities need to be evaluated in research productivity and impact in universities. Salma and Prakasan⁵ indicated that evaluating research output in academic institutions serves various purposes, such as recruitment, appreciation, advancement, professional recognition, allocation of resources, and institutional ranking. Assessment is fundamental for analysing and progressing within a particular subject or field. The present research analyses the Web of Science database to evaluate the research productivity of Karnatak University, Dharwad during the years of 1993 to 2022.

1.1 About Karnatak University

Karnatak University is the second antiquated state university in Karnataka, established under the initial years of the "Bombay Presidency through the Karnatak University Act of 1949" were used in the Bombay Legislature. On March 1, 1950, it was established as a statutory university.

The university covers the districts of Dharwad, Gadag, Haveri, and Uttara Kannada. The university has served as a vital center for the dissemination of knowledge in many different types of fields throughout South Central India, fulfilling the educational needs of millions of students. The vision is to strengthen the multidisciplinary, technology-enabled, and value-added education among students to make them responsible future citizens of the country. The university has 54 Postgraduate Departments in Science, Social Science, Arts and Humanities, three postgraduate centers, five constituent colleges, and more than 250 affiliated colleges⁶. Karnatak University has received the prestigious 'University with Potential for Excellence' (UPE) designation from the University Grants Commission (UGC). The university has encouraged research and academic activities among teachers, research scholars, and students by facilitating various infrastructures and collaborations with other institutions. The university offers a supportive environment conducive to higher education and professional development. The institution received an 'A' grade on the three-tier rating scale⁶.

2. LITERATURE REVIEW

Various bibliometric and scientometric assessments have been accomplished over the years to assess the outcomes of research of organisations, subjects, countries, authors, and sources. Critical elements were recognised, the intricacies of differences were delineated, and methods were proposed for resolution.

Nagarkar⁷ studied the research contributions of faculty members from the Department of Chemistry, University of Pune, reflected from Web of Science database during 1999 to 2012. A total of 811 publications were contributed by thirty faculty members in 258 journals and received 8948 citations. Continuous growth in publications can be noticed as about 30 % of the articles were published from the year of 2010 to 2012. National Chemical Laboratory, Pune has contributed the highest number i.e. 113 publications⁷. Khanna⁸, *et al.* explained the research output in physics and astronomy by the Guru Nanak Dev University, Amritsar, covering the Scopus database from 2006 to 2015. The university has published total of 652 papers in these two subjects and ranked at 23rd among the Indian universities with a 29 h-index. Six publications received 51 to 100 citations, and ACPP was 7.01. University 18th ranked share of highly cited articles and ranked 19th in international collaboration (27.45 %)⁸. Kumar and Senthilkumar⁹ evaluated the research performance of India's top-ranked NIRF institution, the Indian Institute of Science (IISc), Bangalore, from 2014 to 2018, referring the WoS database, as well as the research productivity of the NIRF 2020 Top Indian Law Institutions from 2009 to 2019 using the SCOPUS database⁹.

Kaur¹⁰, *et al.* analysed the scientometric dimensions of Chandigarh's Government Medical College & Hospital, referring the Scopus database during 2000 to 2009. In medical institutions of Himachal Pradesh, Punjab, and

Haryana, Government Medical College & Hospital has ranked 2nd with 854 papers, an annual growth rate of 16.22 %, 1.32 citations per paper, and an h-index of 17. GMCH's 16.58 % of publications were results of national collaboration, whereas 3.98 % of publications were the results of international collaboration. The United Kingdom has collaborated for the highest i.e. 11 publications with Government medical college & hospital research¹⁰.

The practice of assessing individuals are growing more cognisant of and exploiting the research output of universities as well as other institutions. Therefore, Studies on university research output from the perspectives of scientometrics and visualisation are inadequate. Furthermore, a comprehensive literature evaluation is crucial to guarantee high-quality research outcomes, particularly in the first phase of university research productivity studies. This research seeks to investigate the bibliometric analysis and visualisation of Karnatak University, Dharwad, to examine the unique features of this field.

3. OBJECTIVES

The major objectives of the study are as follows:

- To study the growth of publications and doubling time;
- To find out the authorship pattern in the Karnatak University;
- To ascertain the highly collaborated institutions;
- To identify the most prolific authors in terms of publications;
- To recognize the highly productive journals;
- To identify the country's collaboration;
- To study the highly cited papers;

4. METHODOLOGY

The present study is find to research productivity of Karnatak University, Dharwad, during the period of 1993 to 2022 (30 years), referring the Web of Science database by using the keywords "OO=Karnatak University". A total of 3522 publications have been found retrieved in CSV format. The data was Microsoft Excel was employed for initial data organisation, and further analysis was carried out using SPSS, and VOS viewer software, a scientometric analysis tool to explore into publication trends, authorship patterns, and citation impact. The study encompassed statistical analysis, including descriptive statistics to present key findings effectively.

5. SCIENTOMETRIC INDICATORS

Several scientometric indicators have been used to analyse the Web of Science database data.

5.1 Relative Growth Rate

Relative growth rate is the increase in the number of publications per unit time. The formula for calculating the mean R and following equation suggested by Mahapatra¹¹.

$$RGR = (1 - 2^r) = \frac{\ln(W2) - \ln(W1)}{T2 - T1} \times 100$$

Where,

R = mean relative growth rate over the specific period of intervals;

W1 = Log W1 (natural log of initial number of publication);

W2 = Log W2 (natural log of final number of publication);

T2 – T1 = the unit difference between the initial and final time

5.2 Doubling Time (DT)

The doubling time is the given period required for quantity to double in size or value.

This can be calculated by using the following formula suggested by Mahapatra¹¹:

$$DT = \frac{0.693}{R}$$

5.3 Degree of Collaboration (DC)

The degree of collaboration measure is used for the authorship pattern¹².

$$C = \frac{NM}{(NS + NM)}$$

Where,

DC = Degree of Collaboration

Nm = Number of multi-authored papers

Ns = Number of single-authored papers

5.4 Collaborative Index (CI)

The collaborative Index is defined as the mean number of authors per joint authored publications¹³.

$$CI = \frac{\sum j^{A-1} j f_j}{N}$$

Where,

j = the number authors in an paper i.e. 1, 2, 3..

fj = the number of j authored papers published in discipline during a certain period of time

N = the total number of papers published in discipline during a certain period of time

A = the total number of authors per papers

6 DATA ANALYSIS AND INTERPRETATION

6.1 Year-wise Growth of Karnatak University

Table 1 depicts the research productivity in Karnatak University by the authors is accounted for 3522. The publications on Karnatak University gradually increased from 75 in 1993 to 179 in 2018. The publications contributed in 2006 received the highest citations, i.e., 6282. The consistent upward trend in total publications, associated with a constant or increasing H-Index signifies that despite recent dips in per-paper citations, both quantity and significance will be asserted.

Table 1. Year-wise distribution of publications

Year	TP*	TC*	ACPP*	h-Index
1993	75	946	12.61	14
1994	66	1130	17.12	15
1995	57	1227	21.53	16
1996	65	922	14.18	16
1997	51	600	11.76	13
1998	53	1013	19.11	15
1999	72	1232	17.11	19
2000	68	1209	17.78	19
2001	68	4236	62.29	23
2002	95	2641	27.80	26
2003	101	2000	19.80	25
2004	111	4224	38.05	25
2005	109	3273	30.03	30
2006	173	6282	36.31	43
2007	153	5065	33.10	42
2008	136	3230	23.75	31
2009	152	3910	25.72	35
2010	158	3897	24.66	33
2011	143	2367	16.55	26
2012	116	2169	18.70	26
2013	108	1753	16.23	23
2014	129	3029	23.48	28
2015	131	2167	16.54	27
2016	154	1969	12.79	23
2017	147	2470	16.80	26
2018	165	2327	14.10	25
2019	147	2055	13.90	24
2020	162	2528	15.60	28
2021	178	1811	10.17	23
2022	179	395	02.21	10
Total	3522		20.46	
Avg. pub. per year	117.4			

TP=Total papers; TC=Total citations; ACPP=Average Citation per Paper

6.2 Relative Growth Rate and Doubling Time of Publications in Karnatak University, Dharwad

Table 2 shows the value of the RGR of publications decreased from 0.63 (1994) to 0.05 (2022). On the other hand, Doubling time has increased from 1.10 (1994) to 13.29 (2022). The average RGR and Dt. for Karnatak University output are 0.13 and 7.79, respectively. The publication trend began with exponential growth, came to steady linear growth, and now appears to be increasing. RGR & Dt. are reaching saturation or stabilisation, perhaps indicating an evolution toward consolidation rather than expansion.

Table 2. Relative growth rate and doubling time

Year	TP*	Cumulative	W1	W2	RGR*	Dt*
1993	75	75		4.32		
1994	66	141	4.32	4.95	0.63	1.10
1995	57	198	4.95	5.29	0.34	2.04
1996	65	263	5.29	5.57	0.28	2.44
1997	51	314	5.57	5.75	0.18	3.91
1998	53	367	5.75	5.91	0.16	4.44
1999	72	439	5.91	6.08	0.18	3.87
2000	68	507	6.08	6.23	0.14	4.81
2001	68	575	6.23	6.35	0.13	5.51
2002	95	670	6.35	6.51	0.15	4.53
2003	101	771	6.51	6.65	0.14	4.94
2004	111	882	6.65	6.78	0.13	5.15
2005	109	991	6.78	6.90	0.12	5.95
2006	173	1164	6.90	7.06	0.16	4.31
2007	153	1317	7.06	7.18	0.12	5.61
2008	136	1453	7.18	7.28	0.10	7.05
2009	152	1605	7.28	7.38	0.10	6.97
2010	158	1763	7.38	7.47	0.09	7.38
2011	143	1906	7.47	7.55	0.08	8.89
2012	116	2022	7.55	7.61	0.06	11.73
2013	108	2130	7.61	7.66	0.05	13.32
2014	129	2259	7.66	7.72	0.06	11.79
2015	131	2390	7.72	7.78	0.06	12.29
2016	154	2544	7.78	7.84	0.06	11.10
2017	147	2691	7.84	7.90	0.06	12.34
2018	165	2856	7.90	7.96	0.06	11.65
2019	147	3003	7.96	8.01	0.05	13.81
2020	162	3165	8.01	8.06	0.05	13.19
2021	178	3343	8.06	8.11	0.05	12.67
2022	179	3522	8.11	8.17	0.05	13.29
Total	3522	Mean value			0.13	7.79

TP = Total Publications, RGR = Relative Growth Rate, Dt=Doubling Time

6.3 Time Series Analysis of Research Publications in Karnatak University, Dharwad

Time series analysis is the statistical and mathematical method used to evaluate the data and examine trend patterns. A time series analysis is undertaken to study the future projections of the probable growth or decline in the quantum of publications in Karnatak University research by means of statistical applications¹⁴. For the total number of 3522 publications in Karnatak University research from the years of 1993 to 2022.

Table 3. Time series analysis of research publications in Karnatak university, Dharwad

Year	Y	X	X ²	XY
1993	75	-15	225	-1125
1994	66	-14	196	-924
1995	57	-13	169	-741
1996	65	-12	144	-780
1997	51	-11	121	-561
1998	53	-10	100	-530
1999	72	-9	81	-648
2000	68	-8	64	-544
2001	68	-7	49	-476
2002	95	-6	36	-570
2003	101	-5	25	-505
2004	111	-4	16	-444
2005	109	-3	9	-327
2006	173	-2	4	-346
2007	153	-1	1	-153
2008	136	1	1	136
2009	152	2	4	304
2010	158	3	9	474
2011	143	4	16	572
2012	116	5	25	580
2013	108	6	36	648
2014	129	7	49	903
2015	131	8	64	1048
2016	154	9	81	1386
2017	147	10	100	1470
2018	165	11	121	1815
2019	147	12	144	1764
2020	162	13	169	2106
2021	178	14	196	2492
2022	179	15	225	2685
Total	3522	0	2480	9709

A straight-line equation is applied to estimate the future growth of Karnatak University, Dharwad Time Series analysis.

Straight line equation is $Y_c = a + bX$, Since $\Sigma x = 0$
 $a = \Sigma Y/N = 9709/30 = 323.63$

$b = \Sigma XY/\Sigma x^2 = 9709/2480 = 3.91$

The estimated literature in 2032 is when

$X = 2032 - 2007 = 25$

$= 323.63 + 3.91 \times 25$

$= 323.63 + 97.75$

$= 421.38$

Table 3 determine the Karnatak University faculty members of research output shown an increasing trend and predictable year 2032. Hence; it is identified that the estimated future growth of Karnatak University research increased from 323.63 in 2022 to 421.38 in 2032 (Table 3 & Fig. 1). The same increase continued up to the estimated year.

Times Series Analysis of KU Research Publications



Figure 1. Time series analysis (TSA) of Karnatak university research publications.

6.4 Form-wise Distribution of Publications in Karnatak University, Dharwad

Table 4 analyses the different types of publications of Karnatak University, Dharwad. It is found from the table during the years 2018 to 2022 highest number of papers include journal articles i.e. 3238 (91.94 %), followed by Review articles 84 (2.39 %), Meeting abstracts 47 (1.33 %), Notes 45 (1.28 %), and Proceedings Paper 43 (1.22 %). The increasing number of research and review articles suggests a growing discipline with continuous convergence and innovative study. The diversity of document types, though minor in proportion, reflects a healthy academic communication ecosystem.

6.5 Authorship Pattern of Karnatak University, Dharwad

Table 5 indicates the authorship pattern of 3,522 publications from 1993 to 2022. The data is categorised into six blocks are single, two, three, four five and more than five authored publications. The study reveals the three authored publications were the highest i.e. 1,023 publications. Followed by two authored with 751 publications, Four authored publications constituting 643 of total publications. More than five authored with 582 total publications, while documents with five authored with 440 total publications. Research is increasingly

collaborative, shifting from solo authorship to multiple authorship. The dominance of three-author papers has moved to larger author groups.

6.6 Degree of Collaboration

Table 6 illustrates the annual distribution of collaboration degree, indicating a fluctuating pattern from 0.947 in 1993 to 0.966 in 2022. The mean cooperation coefficient is 0.971. Collaboration levels were elevated in 2002, 2005, and 2013, while 1999 exhibited poor collaboration, with single authorship output at 8.24 % and multiple authorship at 5.03 %. The study indicates a clear and consistent trend toward increased collaboration in scholarly publications. The proportion of multi-author works has grown significantly, showing the collaborative nature of modern research. The average Degree of Collaboration of 0.976 underscores the dominance of team-based research efforts in this period.

6.7 Collaborative Index

Table 7 examines the Collaborative Index (CI) values, calculated by dividing the total number of authors by the total number of publications. The Collaboration Index was computed during 1993 to 2022. The highest collaboration index value is 4.36 in 2020 followed by 4.25 in 2022. The mean CI value is 3.50 and the CI for universal value is 3.66. Hence, the results shows that the collaboration index value increased throughout the period.

6.8 Highly Collaborative Institutions with Karnatak University, Dharwad

Table 8 reveals a collaborative landscape of research publications associated with the Karnatak University from 1993 to 2022. The Council of Scientific Industrial Research (CSIR), India has produced the maximum number of publications i.e. 111 (10.42 %), followed by The Indian Institute of Science (IISC), Bangalore has contributed 91 (8.54 %) publications, Bangalore University, Bangalore, has produced 78 (7.32%), University of Mysore (UoM), Mysore, has produced 72 (6.76%) and other institutions.

Table 4. Form-wise distribution of publications in Karnatak University, Dharwad

S. No.	Document types	1993-1997	1998-2002	2003-2007	2008-2012	2013-2017	2018-2022	Total	%
1	Article	298	330	482	654	680	794	3238	91.94
2	Review articles	12	6	12	16	15	23	84	2.39
3	Meeting abstract	6	5	5	12	9	10	47	1.33
4	Proceedings paper	3	6	12	14	6	2	43	1.22
5	Notes	20	10	0	0	5	10	45	1.28
6	Letter	5	1	1	5	2	2	16	0.45
7	Book review	4	9	2	2	0	0	17	0.48
8	Correction	3	1	1	4	2	5	16	0.45
9	Editorial material	2	0	2	0	2	6	12	0.34
10	Bibliographic item	0	0	0	1	2	1	4	0.11
Total		353	368	517	708	723	853	3522	100

Table 5. Authorship pattern of Karnatak University, Dharwad

Year	Single author	Two authors	Three authors	Four authors	Five authors	More than five authors	Total
1993	4	28	30	10	1	2	75
1994	5	26	21	8	5	1	66
1995	1	20	18	9	9	0	57
1996	3	14	29	15	3	1	65
1997	2	22	19	2	2	4	51
1998	4	24	16	5	2	2	53
1999	6	26	27	6	2	5	72
2000	5	24	26	5	8	0	68
2001	1	17	34	8	5	3	68
2002	0	26	44	12	8	5	95
2003	7	21	40	17	12	4	101
2004	3	33	46	18	3	8	111
2005	0	23	37	12	24	13	109
2006	2	25	45	39	34	28	173
2007	1	27	39	51	21	14	153
2008	2	30	38	30	20	16	136
2009	6	24	64	33	14	11	152
2010	3	23	54	40	18	20	158
2011	3	22	41	29	25	23	143
2012	1	24	26	28	18	19	116
2013	0	32	30	18	13	15	108
2014	1	29	38	31	11	19	129
2015	2	25	39	21	20	24	131
2016	5	34	26	24	21	44	154
2017	1	26	30	29	17	44	147
2018	1	30	32	31	20	51	165
2019	3	26	35	29	18	36	147
2020	2	22	30	24	30	54	162
2021	5	26	34	27	30	56	178
2022	6	22	35	32	26	58	179
Total	85	751	1023	643	440	580	3522

Table 6. Single versus multi-authored and degree of collaboration (annual distribution of degree of collaboration in authorship)

Year	Single author (Ns)		Multi-author (Nm)		Total	Degree of collaboration
	No. of publication	%	No. of publication	%		
1993	4	0.11	71	2.02	75	0.947
1994	5	0.14	61	1.73	66	0.924
1995	1	0.03	56	1.59	57	0.982
1996	3	0.09	62	1.76	65	0.954
1997	2	0.06	49	1.39	51	0.961
1998	4	0.11	49	1.39	53	0.925
1999	6	0.17	66	1.87	72	0.917
2000	5	0.14	63	1.79	68	0.926
2001	1	0.03	67	1.90	68	0.985
2002	0	0.00	95	2.70	95	1.000
2003	7	0.20	94	2.67	101	0.931
2004	3	0.09	108	3.07	111	0.973
2005	0	0.00	109	3.09	109	1.000

2006	2	0.06	171	4.86	173	0.988
2007	1	0.03	152	4.32	153	0.993
2008	2	0.06	134	3.80	136	0.985
2009	6	0.17	146	4.15	152	0.961
2010	3	0.09	155	4.40	158	0.981
2011	3	0.09	140	3.98	143	0.979
2012	1	0.03	115	3.27	116	0.991
2013	0	0.00	108	3.07	108	1.000
2014	1	0.03	128	3.63	129	0.992
2015	2	0.06	129	3.66	131	0.985
2016	5	0.14	149	4.23	154	0.968
2017	1	0.03	146	4.15	147	0.993
2018	1	0.03	164	4.66	165	0.994
2019	3	0.09	144	4.09	147	0.98
2020	2	0.06	160	4.54	162	0.988
2021	5	0.14	173	4.91	178	0.972
2022	6	0.17	173	4.91	179	0.966
85		2.41	3437	97.59	3522	0.976

Table 7. Collaborative index

Year	No. of publication	No. of authors	Collaborative index	Year	No. of publication	No. of author	Collaborative index
1993	75	207	2.76	2008	136	492	3.62
1994	66	183	2.77	2009	152	514	3.38
1995	57	176	3.09	2010	158	581	3.68
1996	65	199	3.06	2011	143	549	3.84
1997	51	145	2.84	2012	116	443	3.82
1998	53	142	2.68	2013	108	381	3.53
1999	72	203	2.82	2014	129	466	3.61
2000	68	191	2.81	2015	131	497	3.79
2001	68	212	3.12	2016	154	616	4.00
2002	95	302	3.18	2017	147	608	4.14
2003	101	321	3.18	2018	165	687	4.16
2004	111	342	3.08	2019	147	582	3.96
2005	109	403	3.70	2020	162	706	4.36
2006	173	681	3.94	2021	178	753	4.23
2007	153	565	3.69	2022	179	761	4.25
				Total	3522	12908	3.66

Table 8. Highly collaborative institutions with Karnatak University, Dharwad

S. No.	Organisation name	TP	TC	ACPP
1	Council of Scientific Industrial Research (CSIR), India	111	3836	34.56
2	Indian Institute of Science (IISC), Bangalore	91	1772	19.47
3	Bangalore University, Bangalore	78	880	11.28
4	University of Mysore (UoM), Mysore	72	1076	14.94
5	Soniya Education Trust's College of Pharmacy, Dharwad, Karnataka	69	907	13.14
6	KLE Technological University, Hubli, Karnataka	68	914	13.44
7	Davangere University, Davangere	54	545	28.61
8	Mangalore University, Mangalore, Karnataka	53	700	13.21

9	K L E Academy of Higher Education Research, Belgaum, Karnataka	44	1013	23.02
10	CSIR Indian Institute of Chemical Technology (IICT), Technology, Hyderabad	42	2066	49.19
11	Bhabha Atomic Research Center (BARC), Mumbai, Maharashtra	41	503	12.27
12	Nuclear Power Corporation of India (NPCIL), Mumbai, Maharashtra	39	1127	28.9
13	Kuvempu University, Shimoga, Karnataka,	36	758	21.06
14	Gulbarga University, Gulbarga	31	575	18.55
15	Shri Dharmasthala Manjunatheshwara College of Engineering and Technology (SDMCET), Dharwad, Karnataka	28	390	13.93
16	Govindram Seksaria Science College, Belgaum, Karnataka	28	303	18.64
17	Inter University Accelerator Centre, New Delhi	23	255	11.09
18	Indian Institute of Technology (IIT), Bombay	22	410	18.64
19	Shri Sharnbasveshwar College of Science, Gulbarga	21	995	47.38
20	Central University, Kerala	21	201	9.57

Table 9. Highly productive authors of Karnatak University

Rank No.	Author	Department	TP	TC	ACPP	H-Index
1	Aminabhavi, Tejraj M	Chemistry	387	20816	56.89	74
2	Nandibewoor, Sharanappa T	Chemistry	362	5340	14.75	37
3	Murthy, Hosakatte Niranjana	Botany	139	4028	28.98	35
4	Inamdar, Sanjeev R	Physics	131	1621	12.37	22
5	Kulkarni, Manohar V	Chemistry	114	1577	13.83	21
6	Seetharamappa, J	Chemistry	106	3061	28.88	27
7	Badiger, Nagappa M	Physics	97	1581	16.3	20
8	Patil, Sangamesh A	Chemistry	95	3444	36.25	32
9	Revankar, Vidyanand K	Chemistry	95	1388	14.61	21
10	Gudasi, Kalagouda B	Chemistry	94	1688	17.96	24
11	Chimatadar, Shivamurti A	Chemistry	94	1106	11.77	17
12	Kariduraganavar, Mahadevappa Y	Chemistry	91	2412	26.51	27
13	Kamble, Shanmukh V	Psychology	77	1607	20.87	22
14	Saidapur, Srinivas K	Zoology	76	887	11.67	17
15	Hosamani, Kallappa M	Chemistry	66	1998	30.27	23
16	Mulimani, Basavaraj G	Physics	63	1086	17.24	18
17	Kamble, Ravindra R	Chemistry	60	825	13.75	15
18	Gadaginamath Guru S	Polymer Science	59	707	11.98	14
19	Shanbhag, bhagyashri A	Zoology	59	604	10.24	15
20	Kahazi, Imtiyaz Ahmed M	Chemistry	55	788	14.33	14

6.9 Highly Productive Authors of Karnatak University

Table 9 identifies the highly productive authors of KUD. The author Aminabhavi, Tejraj M of the department of chemistry is the highly productive author with 387 papers and 20816 citations, (ACPP 56.89 and h-index 79), followed by Nandibewoor, Sharanappa T of the department of chemistry, has contributed 362 publications and 5340 citations, (ACPP 14.75 and h-index 37), Murthy, Hosakatte Niranjana of department of botany, has published 139 publications and 4028 citations (ACPP 28.98 and h- index 35), Inamdar and others.

6.10 Highly Productive Journal of Karnatak University, Dharwad

Table 10 examines the highly productive journals in the Karnatak University, Dharwad in different subject areas. Journal of Applied Polymer Science from the USA has published the maximum number of 118 publications followed by Transition Metal Chemistry from the Netherlands has contributed 69 publications, Indian Journal of Chemistry Section B Organic Chemistry Including Medicinal Chemistry from India has contributed 62 publications and other journals and Spectrochimica Acta Part A Molecular and

Table 10. Highly productive journal of Karnatak University, Dharwad

S. No.	Journal title	TP	TC	ACPP	Impact factor	Origin of country
1	Journal of applied polymer science	118	3329	28.21	3.125	USA
2	Transition metal chemistry	69	1211	17.55	1.588	Netherlands
3	Indian journal of chemistry section b organic chemistry including medicinal chemistry	62	544	8.77	0.388	India
4	Spectrochimica acta part a molecular and biomolecular spectroscopy	62	1418	22.87	4.098	Netherlands
5	Indian journal of chemistry section a inorganic bio-inorganic physical theoretical analytical chemistry	54	547	10.13	0.491	India
6	Journal of molecular structure	54	771	14.28	3.196	Netherlands
7	Journal of the indian chemical society	53	254	4.79	0.45	India
8	Journal of chemical and engineering data	45	2826	62.8	2.694	USA
9	Current science	44	283	6.43	1.102	India
10	Chemistry select	43	278	6.47	2.307	Germany
11	European journal of medicinal chemistry	39	2939	75.36	6.51	Netherlands
12	Indian journal of heterocyclic chemistry	38	221	5.82	0.32	India
13	Journal of fluorescence	35	329	9.4	2.217	USA
14	Journal of molecular liquids	32	282	8.81	6.165	Netherlands
15	Synthetic communications	32	200	6.25	2.007	United Kingdom
16	Industrial engineering chemistry research	30	640	21.33	3.72	USA
17	Oxidation communications	29	114	3.93	0.541	Sofia, Bulgaria
18	International journal of agricultural and statistical sciences	27	11	0.41	0.28	India
19	Journal of membrane science	27	1996	73.93	8.743	United Kingdom
20	Journal of herpetology	23	166	7.22	1.47	USA

Biomolecular Spectroscopy from the Netherlands has contributed 62 publications.

6.11 Highly Cited Papers

Table 11 reveals the highly top 10 cited publications from Karnatak University research output for the year of 1993 to 2022. A total number of 7195 citations were

received with 719.5 average citations per paper. The top 10 highly cited papers were published in 7 journals including 3 papers published in the Journal of Controlled Release, 2 papers published in the European Journal of Medicinal Chemistry 1 paper each in Journal of Pharmaceutical and Biomedical Analysis; Journal of Chemical & Engineering Data; Carbohydrate Polymers; Drug Development and

Table 11. Top 10 highly cited papers

S. No.	Citations	Title	Author	Journal	Vol.& issue no.	Publisher	Page no.	Year
1	2664	Biodegradable polymeric nanoparticles as drug delivery devices	Soppimath, KS; Aminabhavi, TM; et.al.	Journal of controlled release	70 (1-2)	Elsevier, Netherlands	1-20	2001
2	1915	Recent advances on chitosan-based micro- and nanoparticles in drug delivery	Agnihotri, SA; Mallikarjuna, NN; et.al.	Journal of controlled release	100 & 1	Elsevier, Netherlands	5 – 28	2004
3	462	Study of the interaction of an anticancer drug with human and bovine serum albumin: Spectroscopic approach	Kandagal, P.B; Ashoka, S; Seetharamappa, J.; et.al.	Journal of pharmaceutical and biomedical analysis	41 & 2	Elsevier, Netherlands	393-399	2006
4	366	Production of secondary metabolites from cell and organ cultures: strategies and approaches for biomass improvement and metabolite accumulation	Murthy, H.S; Lee, Eun-Jung; Paek, Kee-Yoeup	Plant cell, tissue and organ culture (pctoc)	118 & 1	Springer Nature, London	1-16	2014
5	340	Density, viscosity, refractive index, and speed of sound in aqueous mixtures of n,n-dimethylformamide, dimethyl-sulfoxide, n,n-dimethylacetamide, acetonitrile, ethylene-glycol, diethylene glycol, 1,4-dioxane, tetrahydrofuran, 2-methoxy ethanol, and 2-ethoxyethanol at 298.15k	Aminabhavi, Tm; Gopalakrishna, B	Journal of chemical & engineering data	40 & 4	American Chemical Society, USA	856-861	1995
6	309	Synthesis, spectral characterization, in vitro antibacterial, antifungal and cytotoxic activities of Co (II), Ni(II) and Cu (II) complexes with 1,2,4-triazole Schiff bases	Bagihalli, Gangadhar B.; Avaji, Prakash Gouda; Patil, Sangamesh A.; et al	European journal of medicinal chemistry	43 & 12	Elsevier, Netherlands	2639-2649	2008
7	309	To Belong Is to Matter: Sense of Belonging Enhances Meaning in Life	Lambert, NM; Stillman, TF; Hicks, JA; Kamble, S; Baumeister, RF; Fincham, FD	European journal of medicinal chemistry	45 & 5	Elsevier, Netherlands	2048-2054	2010
8	280	Semi-interpenetrating polymer network microspheres of gelatin and sodium carboxymethyl cellulose for controlled release of ketorolac tromethamine	Rokhade, Ajit P.; Agnihotri, Sunil, A.; Patil, Sangamesh A.; et al.	Carbohydrate polymers	65 & 3	Elsevier, Netherlands	243-252	2006
9	277	Stimulus-responsive “smart” hydrogels as novel drug delivery systems	Soppimath, KS; Dave, AM; Aminabhavi, TM; Dave, et.al.	Drug development and industrial pharmacy	28 & 8	Informa Pharmaceutical Science, London	957-974	2002
10	273	Targeted nanoparticles for drug delivery through the blood-brain barrier for Alzheimer’s disease	Roney, C; Kulkarni, P; Aminabhavi, TM	Journal of controlled release	108 & 2-3	Elsevier, Netherlands	193-214	2005

Industrial Pharmacy; and Plant Cell, Tissue and Organ Culture (PCTOC). All multi-authored (three or more authors).

7. CONCLUSION

The study examine the growth and development of the research productivity of Karnatak University, Dharwad, covered the Web of Science during 1993-2022 (30 years). Research is the most remarkable phenomenon of development in any subject. The study indicates the valuable insights into research productivity, collaboration patterns, citation impact, strengths, trends and areas for improvement. The university's research productivity has shown a steady increase over the years with a notable number of publications in reputable journals. The study reveals a moderate citation impact, indicating a reasonable level of recognition and influence in the academic community. The study also provides insights into research excellence, enabling the university to promote high-quality research and enhance its reputation.

This study assists the authorities of Karnatak University, Dharwad, and the Government of Karnataka (GOK) policymakers in implementing appropriate initiatives and determining productive disciplines to develop an effective action plan to enhance productivity. The study scientometric analysis can help track the university's research performance and identify areas for improvement. The university can focus on areas of strength and emerging research areas to enhance its research productivity and impact. The university can explore opportunities for collaboration and partnerships to expand its research network and enhance its global visibility. The findings will inform research policy and strategic planning to promote research excellence and enhance the university's landscape.

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