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EVALUATING THE GROWTH AND INFLUENCE OF MAHATMA GANDHI UNIVERSITY'S RESEARCH: A BIBLIOMETRIC APPROACH

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ABSTRACT

Purpose
This bibliometric analysis aims to assess Mahatma Gandhi University, Kerala's research productivity, impact, and academic contributions by evaluating its publication trends, citation patterns, and global scholarly influence. The study provides a data-driven evaluation of the university's academic output from 1988 to 2025, utilizing established bibliometric indicators.

Methodology
A quantitative approach is employed, sourcing data from academic databases such as the Web of Science, using the search query "Mahatma Gandhi University, Kerala." The analysis covers vital bibliometric indicators, including publication counts, citations, h-index, and journal impact factors. Advanced techniques like keyword co-occurrence analysis, co-authorship network analysis, and bibliographic coupling are applied to explore research trends, academic collaborations, and global research networks. Statistical tools like R Studio and visualization tools like VOSviewer are used for data analysis and visualization.

Findings
The study reveals a significant increase in publication volume and global citation impact starting from the early 2000s, with a peak in 2019. The most prolific authors, including Thomas S and Kalarikkal N, show extensive publication output and high citation impact. Key research areas include polymer science, nanotechnology, and biocomposites. India and the United States are the central collaborators in the international research network, while the university's focus on cutting-edge materials science research is evident in its top keywords.

Originality/Value
This analysis offers a comprehensive, data-driven evaluation of Mahatma Gandhi University's research, highlighting its contributions to global scientific discourse, academic collaborations, and emerging research areas. The findings provide valuable insights for policymakers and researchers, guiding future academic strategies.

Social Implications
Mahatma Gandhi University's research, particularly in sustainability, nanotechnology, and material sciences, contributes to environmental sustainability and green technologies. Its growing international recognition fosters cross-cultural collaboration and knowledge-sharing, benefiting local and global communities.

Keywords: Mahatma Gandhi University, Bibliometric Analysis, Research Productivity, Global Collaboration, Citation Analysis

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1. INTRODUCTION

Mahatma Gandhi University (MGU), located in Kottayam, Kerala, is a prominent public institution of higher learning, established on October 2, 1983. Named after the iconic leader Mahatma Gandhi, the university is dedicated to promoting

values of social responsibility, non-violence, and community welfare, reflecting the essence of Gandhian philosophy. Over the years, MGU has evolved into a critical academic institution, catering to the higher education needs of central Kerala and beyond, significantly contributing to academic excellence, research, and community development (Chacko & Shaji, 2016). Situated on a 110-acre campus at Priyadarsini Hills, around 12 kilometres from Kottayam town, MGU's jurisdiction spans several districts, including Kottayam, Ernakulam, Idukki, and parts of Pathanamthitta and Alappuzha. The university offers a diverse range of undergraduate, postgraduate, M.Phil., and doctoral programs, with 30 academic departments covering disciplines such as science, technology, humanities, social sciences, and management, alongside professional fields like law and education. Additionally, MGU is home to specialized research centers focused on cutting-edge areas such as polymer science, nanotechnology, and environmental sustainability (Thottathil et al., 2018). MGU has consistently emphasized research excellence, fostering interdisciplinary collaboration and global partnerships. The university's faculty and research scholars have made significant contributions to various academic fields, as evidenced by a growing number of publications in high-impact journals and conferences (Thanuskodi & Nair, 2016; Sivankalai, 2020). Through its affiliations with over 260 colleges, MGU plays a critical role in shaping the higher education landscape in Kerala. As a result, the university has established itself as a leader in research, particularly in emerging areas like material science and sustainability, while enhancing its international presence through collaborations with global research institutions (Thomas et al., 2021; Kalarikkal & Thomas, 2020). This research paper aims to explore and evaluate MGU's academic performance, research output, and global integration. The primary objectives of this bibliometric analysis are: (1) to assess the total number of publications from Mahatma Gandhi University, Kerala, from 1988 to 2025; (2) to measure citation counts and the h-index of the university's publications, determining their academic influence and reach; (3) to assess the impact factor of journals where university research is published, evaluating the visibility and quality of academic output; (4) to use keyword co-occurrence analysis to identify prominent research topics and evolving trends within the university's publications; (5) to apply co-authorship network analysis to map collaborations, both within the university and with external institutions, highlighting key academic partnerships; (6) to apply descriptive statistics and trend analysis to monitor changes in publication patterns, including shifts in research focus over time; and (7) to utilize tools like VOSviewer, HistCite, and R Studio for the visualization of bibliometric data, illustrating research networks, authorship, and thematic development. This analysis aims to provide valuable insights into MGU's scholarly contributions and global academic presence.

2. LITERATURE REVIEW

Bibliometric analysis has emerged as an essential tool for evaluating academic institutions' research output and impact (Sivankalai, S., & Yemane, K. 2017). It offers a quantitative approach to assess scholarly productivity, citation patterns, and research collaboration, providing valuable insights into the academic landscape and global research reach (Chithiraivel, S., Jeyshankar, R., & Sivasekaran, K. 2020). Over the years, bibliometric methods have been increasingly utilized to measure and track the performance of universities and research institutions worldwide (Gopikuttan, A. 2014), allowing for comparisons and identification of trends in academic research (Saravanan, K. et al. 2024). One of the key concepts in bibliometric analysis is the measurement of academic productivity through publication counts (Sivasekaran, K., & Srinivasaragavan, S. 2013), citation indices, and the h-index. Hirsch (2005) introduced the h-index, a widely recognized metric that assesses the quantity and quality of academic publications. The h-index combines the number of publications and their citation impact, with higher values indicating significant contributions to the scientific community (Sivasekaran, K., Sivankalai, S., & Stanley, P. 2021). Several studies have applied the h-index at both individual and institutional levels to evaluate the research output of scholars and universities (Stanley, P., Nagarajan, M., & Sivankalai, S. 2021). The balanced nature of the h-index makes it a valuable tool for bibliometric studies, offering insights into both the breadth and depth of an institution's research impact 9 (Anbukkarasi, S., Sivasekaran, K., & Rethi, M. 2023). Citation counts and impact factors are also crucial indicators of academic influence (Karthika, S., Balachandran, S., & Sivankalai, S. 2023). Sivankalai, S. (2021) emphasized the role of journal impact factors in assessing the visibility and scholarly impact of academic work. For example, researchers from Mahatma Gandhi University (MGU) have published in high-impact journals within fields like polymer science, nanotechnology, and materials science, suggesting that MGU's research has significant global influence. Goldberg, S. R., Anthony, H., & Evans, T. S. (2015). also highlighted the importance of citation networks, noting that high-impact publications attract attention and often shape subsequent research in the field, bolstering individual and institutional reputations. Co-authorship networks and collaboration patterns are key areas of bibliometric analysis (Sivankalai, S. 2016), providing insight into global research networks and

institutional partnerships. Sivankalai, S., Sivasekaran, K., & Virumandi, A. (2021) argued that international collaborations enhance the visibility and impact of research. This view is supported by studies on co-authorship patterns, which demonstrate that institutions involved in international research partnerships produce more highly cited and influential work (Chithiraivel, S., Jeyshankar, R., & Sivasekaran, K. 2020). At MGU, there has been a growing trend of international co-authorship, particularly in areas such as advanced materials and environmental sustainability. Collaborative research with institutions in the United States, China, and Germany reflects MGU's integration into global academic networks, contributing to its expanding research output. (Anupam, K., 2021). Keyword co-occurrence analysis has also become an important tool for identifying emerging research trends. According to Poornakala T. et al. (2023), keyword analysis reveals the intellectual structure of academic disciplines by tracking the frequency and co-occurrence of keywords in research papers (Sivankalai, S., & Virumandi, A. 2021). This method helps to identify the thematic shifts and evolution of research topics over time. In the case of MGU, keywords like "nanoparticles," "composites," and "biodegradation" have been increasingly featured in recent publications, reflecting the university's focus on advanced materials and environmental sustainability. These topics align with global trends in materials science, indicating MGU's research output is in sync with international scientific priorities. Furthermore, bibliometric studies have examined citation patterns based on document types. Kumar, P. A., Manoranjitham, R., & Sivasekaran, K. (2020) highlighted that research articles and reviews tend to receive the highest citation counts as they significantly advance knowledge in their fields. At MGU, articles and reviews dominate the publication landscape, with strong citation impact locally and globally (Aswathy S., & Gopikuttan, A. 2013). Publications in prestigious journals like *the Journal of Applied Polymer Science* and *RSC Advances* underscore MGU's *significant co*ntributions to polymer and material science. Bibliometric analysis plays a vital role in evaluating the research performance of academic institutions, providing insights into productivity, collaboration, and global academic impact (Lakshman, D. 2017). The growing body of research using bibliometric techniques underscores their relevance in understanding academic trends and disseminating scientific knowledge (Aswathy, S., & Gopikuttan, A. 2015). For Mahatma Gandhi University, bibliometric methodologies are important for analyzing its research output, highlighting areas of strength, and identifying emerging research themes that align with global academic priorities (Anupam, K., 2021).

3. RESEARCH METHODS

The bibliometric analysis at Mahatma Gandhi University (MGU), Kerala, employs a quantitative approach to evaluate its academic output, productivity, and impact on global research. The study analyses 4,378 publications from 1988 to 2025 using databases like Web of Science. Key bibliometric indicators, such as total publications, citation counts, h-index, and journal impact factors, assess research performance and scholarly influence. Advanced techniques like keyword co-occurrence and co-authorship network analysis identify research trends and academic collaborations, while statistical methods track shifts in publication patterns. Tools like R Studio, VoSviewer, and HistCite generate visual representations of data, offering insights into the university's research focus and global influence. This methodology objectively evaluates MGU's research contributions, highlighting its academic strengths and role in the global scientific community while offering a roadmap for future growth and collaboration.

Table 1. Yearly output at Mahatma Gandhi University, Kerala

S. No	Years	Records	LCS	GCS	Authors
1	1988	1	3	34	2
2	1990	3	4	39	6
3	1991	1	0	2	2
4	1993	1	4	15	2
5	1994	4	34	94	11
6	1995	4	12	56	11
7	1996	5	17	45	12
8	1997	56	230	2219	149
9	1998	47	192	1187	141

10	1999	59	226	1955	168
11	2000	66	260	2636	233
12	2001	65	185	3155	191
13	2002	60	95	2411	220
14	2003	79	117	4033	302
15	2004	52	167	2265	194
16	2005	69	195	2510	252
17	2006	70	208	2319	266
18	2007	76	181	2511	285
19	2008	93	248	4835	350
20	2009	83	115	1896	329
21	2010	115	170	2803	493
22	2011	114	149	2450	480
23	2012	115	201	2228	459
24	2013	126	367	3461	521
25	2014	214	596	8041	858
26	2015	181	545	4835	821
27	2016	209	489	4663	991
28	2017	267	527	7090	1226
29	2018	275	611	9114	1317
30	2019	345	385	7210	1682
31	2020	335	253	5897	1767
32	2021	324	164	5232	1666
33	2022	306	81	3545	1679
34	2023	285	28	1917	1467
35	2024	265	23	351	1412
36	2025	8	0		46
		4378	7082	103054	20011

LCS – Local Citation Scores; GCS – Global Citation Scores; NA – Number of Authors

Table 1 shows a significant increase in publication volume starting from the early 2000s. The number of publications in the 1980s and 1990s could have been higher, with only 1-5 yearly records. However, by the 2000s, particularly in 2014, there was a sharp rise, with 214 records in 2014 marking the highest output of the period. This upward trend continued into the 2020s, with 345 records in 2019, the highest recorded value. Citation impact also grew over time. Both Local Citation Scores (LCS) and Global Citation Scores (GCS) started low but rose sharply from the mid-2000s onward. The most notable global impact occurred in 2014, with the highest GCS recorded at 8041. This suggests that publications in the later years had greater international reach and influence. However, there has been a slight decline in LCS in recent years, possibly reflecting a broader, more global distribution of citations, where research might be cited less intensely within specific local contexts. The number of authors per publication has also risen significantly, indicating more significant and more collaborative research efforts. Overall, the data highlights a trend of growing research productivity, increasing global collaboration, and a broader international impact in recent decades.

Table 2. Prolific publications by Authors (Top 25) on Mahatma Gandhi University

S. No	Authors	Affiliation	Records	LCS	GCS	h-index
1	Thomas S	School of Chemical Sciences	1499	3543	58249	109
2	Kalarikkal N	School of Pure and Applied Physics	377	679	8485	48
3	Unnikrishnan NV	School of Pure and Applied Physics	211	495	4441	33
4	Anilkumar G	School of Chemical Sciences	180	433	3426	32
5	Mathew B	School of Chemical Sciences	165	311	3718	30
6	Joseph C	School of Pure and Applied Physics	149	341	2260	26
7	Biju PR	School of Pure and Applied Physics	143	323	2178	27
8	Mathew S	School of Pure and Applied Physics	133	154	2734	29
9	Aravindakumar CT	School of Chemical Sciences	122	301	2662	27
10	Radhakrishnan EK	School of Biosciences	122	315	3097	30
11	Menon CS	School of Pure and Applied Physics	116	151	1377	20
12	Joseph K	School of Chemical Sciences	102	367	5899	37
13	Mathew J	School of Chemical Sciences	96	167	1781	22
14	Joseph S	School of Chemical Sciences	89	257	3104	28
15	Aravind UK	School of Chemical Sciences	86	230	1690	23
16	Sudarsanakumar C	School of Pure and Applied Physics	74	186	1141	18
17	George SC	School of Chemical Sciences	71	294	2353	25
18	Grohens Y	Univ Bretagne Sud, L2PIC, Lab Polymers, Lorient, France	59	190	2800	26
19	Gopi S	Gandhi Gram Rural University, Tamilnadu	56	160	2330	29
20	Jisha MS	School of Biosciences	56	82	1932	21
21	Maria HJ	School of Chemical Sciences	56	122	1278	19
22	Pothan LA	Bishop Moore Coll, Post Grad Dept Chem, Kerala	56	186	4306	26
23	Jose J	School of Chemical Sciences	54	49	946	18
24	Mohan M	School of Environmental Sciences	54	56	994	16
25	Sreekala MS	School of Chemical Sciences	51	146	4290	26

LCS – Local Citation Scores; GCS – Global Citation Scores

Table 2 provides insights into the most prolific authors at Mahatma Gandhi University, Kerala. Thomas S is the top contributor with an outstanding 1499 publications, a remarkable TLCS of 3543, and an impressive GCS of 58,249. His h-index of 109 indicates not only extensive publication output but also a high citation level across his work, positioning him as the most influential researcher at the university. Kalarikkal N, with 377 publications, also demonstrates significant scholarly impact with a GCS of 8485 and a solid h-index of 48. These numbers highlight these top authors' strong citation influence and sustained academic output. Other authors, such as Anilkumar G, Mathew B, and Joseph K, also show notable productivity, contributing significantly to local and global research communities. However, while their publication numbers are smaller compared to the leaders, they still demonstrate considerable international influence, evidenced by GCS scores ranging from 2178 to 5899. Overall, the table reflects the dynamic and impactful research environment at Mahatma Gandhi University, with authors exhibiting high productivity and citation impact. It also reveals a balance between publication volume and global academic reach, as seen in the impressive citation metrics, especially among the top authors. The h-index values further underline the quality and lasting influence of their scholarly contributions.

Co-authorship - Countries

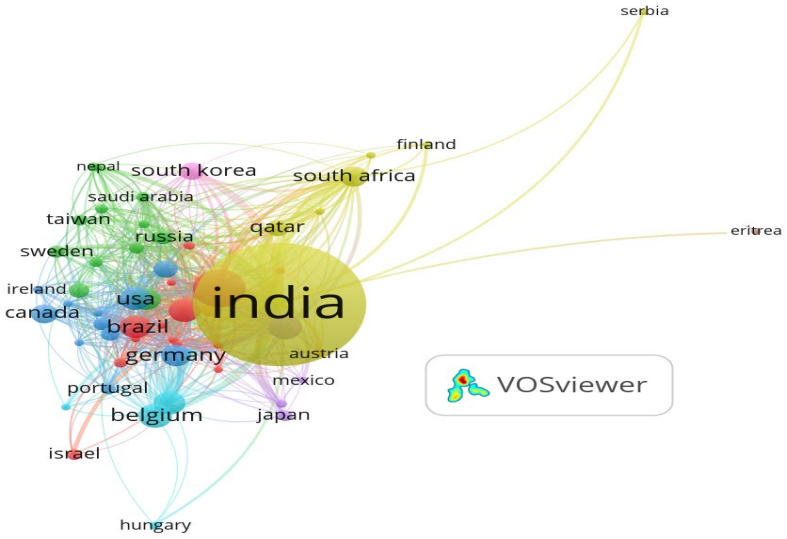

Fig. 1 Co-Authorship Wise Country at Mahatma Gandhi University

Figure 1 presents a bibliometric analysis of 57 countries that meet the thresholds for co-authorship links in a scientific dataset. The study is based on documents, citations, and the total strength of co-authorship links with other countries, focusing on countries with at least five documents and five citations. The data includes a diverse set of nations, ranging from Argentina (with six documents, 58 citations, and a link strength of 13) to the United States (with 127 documents, 3,651 citations, and a link strength of 262). The most prominent country, regarding both documents and citation impact, is India, with an overwhelming 4,368 documents, 102,958 citations, and a total link strength of 2,013, far surpassing other countries. Countries like the United States (127 documents, 3,651 citations, 262 link strength), China (66 documents, 3,325 citations, 163 link strength), and Germany (93 documents, 3,128 citations, 186 link strength) are also highly influential in the network, as indicated by their substantial number of citations and total link strength values. Smaller or less-represented nations, such as Eritrea (5 documents, 67 citations, five-link strengths), exhibit lower total link strength, indicating minimal international collaboration or co-authorship ties. The varying link strengths reflect the degree of collaboration between countries, where larger nations often demonstrate stronger global connections. This bibliometric table highlights the unequal distribution of scientific output and cooperation, with certain countries, particularly India and the United States, playing a central role in the international research network.

Keyword Co-occurrence Network

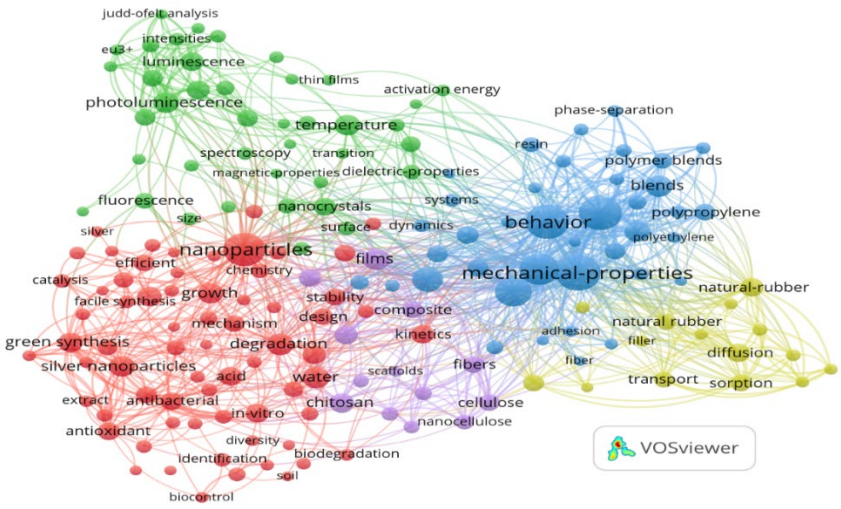

Fig. 2 Keyword Co-occurrence Network Based on Link Strength at Mahatma Gandhi University

The co-occurrence analysis in the context of the 16,212 keywords identified for Mahatma Gandhi University highlights the importance of studying keyword linkages in scientific research. For this analysis, a threshold of 25 occurrences was chosen, narrowing the selection to 1,480 keywords that met this criterion. The total link strength for each keyword was then calculated based on its co-occurrence with other keywords, representing its relative influence in the research landscape. The results show that keywords such as "composites" (238 occurrences, total link strength of 902), "nanoparticles" (258 occurrences, total link strength of 823), and "polymer" (65 occurrences, total link strength of 226) hold strong linkages within the broader scientific network. Keywords like "nanocomposites" (201 occurrences, total link strength of 787) and "nanocellulose" (54 occurrences, total link strength of 193) demonstrate the increasing focus on advanced materials, particularly those involved in nanotechnology. This co-occurrence analysis also highlights keywords tied to specific research topics, such as "antibacterial activity" (65 occurrences, total link strength of 217) and "biodegradation" (37 occurrences, total link strength of 90), which reflect growing areas of research in bio-based materials and environmental sustainability. Meanwhile, more specialized terms like "oxidative stress" (38 occurrences, total link strength of 62) and "crystal structure" (32 occurrences, total link strength of 89) reveal targeted research within specific scientific phenomena. Figure 2 visually represents the co-occurrence network of the selected 175 keywords, mapping their total link strengths. By focusing on the total link strength of each keyword, the analysis effectively maps the most influential terms in the academic work conducted at Mahatma Gandhi University. Based on their high total link strength, the selected keywords further emphasize the critical areas of scientific contribution, confirming the university's extensive involvement in advanced materials, biocomposites, and nanotechnology research.

Table 3. Types of Documents on Mahatma Gandhi University

S. No	Type of Documents	Records	Per cent	LCS	GCS	CR
1	Articles	3361	76.8	6451	80806	139154
2	Reviews	351	8.0	442	17774	46748
3	Proceedings Papers	265	6.1	60	1032	4931
4	Article; Book Chapters	187	4.3	60	2151	14495
5	Article; Proceedings Papers	44	1.0	53	870	1334
6	Article: Early Access	42	1.0	0	49	2418
7	Editorial Materials	37	0.8	1	83	230
8	Editorial Material; Book Chapters	30	0.7	6	205	630
9	Meeting Abstracts	22	0.5	0	4	18
10	Others	39	0.8	9	80	650
	Total	4378	100	7082	103054	210608

LCS – Local Citation Scores; GCS – Global Citation Scores; CR – Cited References

Table 3 reflects the types of documents published at Mahatma Gandhi University, Kerala, along with their respective citation metrics. The data includes a variety of academic document types, including articles, reviews, proceedings papers, and more, across different citation indicators: Local Citation Scores (LCS), Global Citation Scores (GCS), and Cited References (CR). Articles dominate the dataset, comprising 76.8% (3361) of the total documents, and are associated with high citation scores: 6451 LCS, 80806 GCS, and 139154 CR. This suggests that articles are the most widely cited and influential within the academic community at the university. Reviews account for 8% (351) of the documents, with a notably high GCS of 17774 and CR of 46748, indicating their substantial impact and scholarly reach, albeit with fewer local citations (442). Proceedings papers, contributing 6.1% (265) of the documents, exhibit lower citation scores, reflecting their more niche or specific academic audience. Other document types, such as article-book chapters (4.3%), article-proceedings papers (1.0%), and editorial materials (0.8%), appear less frequently but still contribute to the citation landscape, albeit with lower citation metrics. Editorial materials and meeting abstracts have minimal representation, indicating their more specialized or transient nature in academic publishing. In conclusion, articles and reviews represent the core of academic output at Mahatma Gandhi University, Kerala, with a precise concentration of

citations in these categories. The overall citation scores suggest a robust global presence and local recognition of the university's scholarly work.

Table 4. publications output on Mahatma Gandhi University

S. No	Journals	Records	LCS	GCS	IF
1	Journal of Applied Polymer Science	159	324	4162	2.7
2	RSC Advances	62	298	2048	3.9
3	Chemistryselect	57	119	669	2.3
4	Polymer	45	282	3287	2.3
5	International Journal of Biological Macromolecules	42	81	2069	7.7
6	Polymer Composites	42	94	1306	5.2
7	Materials Today-Proceedings	40	24	254	2.4
8	Journal of Materials Science	38	112	1016	3.5
9	Materials Letters	38	79	981	2.7
10	Journal of Materials Science-Materials in Electronics	35	77	339	2.8
11	Journal of Polymer Research	33	20	778	2.6
12	New Journal of Chemistry	33	120	691	2.7
13	Optical Materials	31	89	636	3.5
14	Polymer Engineering and Science	30	88	1405	3.2
15	Journal of Molecular Structure	27	36	723	4.0

LCS – Local Citation Scores; GCS – Global Citation Scores; IF – Impact Factor

The data in Table 4 outlines the journals associated with research output at Mahatma Gandhi University, Kerala, highlighting the number of records (publications), Local Citation Scores (LCS), and Global Citation Scores (GCS) for each journal. The Journal of Applied Polymer Science is the leading journal, with the highest number of records (159) and the highest LCS (324) and GCS (4162), indicating that it is the most widely recognized journal for researchers at the university in terms of both local and global citation impact. RSC Advances follows with 62 records and a strong GCS of 2048, suggesting a solid international presence despite having fewer local citations (298). With 45 records, Polymer shows a notable LCS of 282 and a GCS of 3287, reflecting its local and global impact. Chemistry Select and the International Journal of Biological Macromolecules show lower numbers of records (57 and 42, respectively) but maintain good citation scores, particularly in global reach (GCS of 669 and 2069). Several other journals like Polymer Composites and Materials Today-Proceedings have more specialized focuses, as seen in their relatively low publication counts (42 and 40). However, some maintain reasonable GCS values (1306 and 254, respectively). The journals with more records tend to exhibit higher LCS and GCS, indicating that a more significant number of publications contributes to a more substantial citation impact. Journals such as Materials Today-Proceedings, Journal of Molecular Structure, and Polymer Engineering and Science have fewer records but still contribute meaningfully to the citation landscape, particularly globally. The distribution of publications across these journals highlights various academic interests within Mahatma Gandhi University, with a strong emphasis on polymer science and materials science journals, both locally and internationally.

Bibliographic coupling of sources

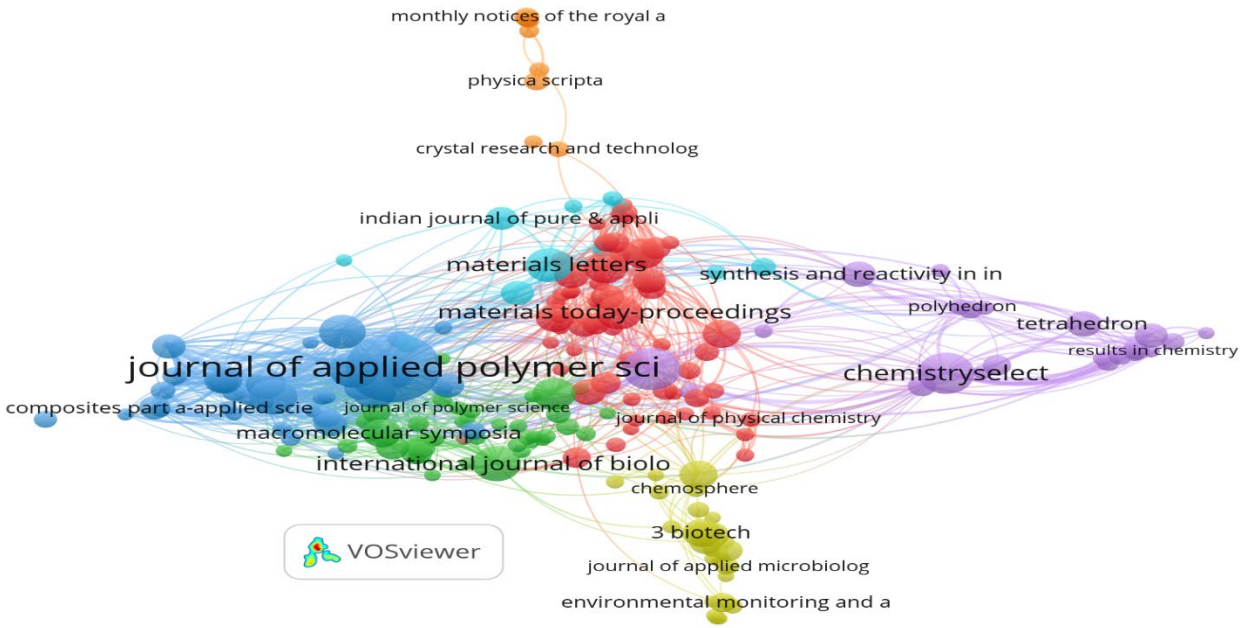

Fig. 3 Bibliographic coupling wise Sources

The bibliographic coupling analysis conducted on 773 authors, based on the thresholds of at least five documents and five citations, offers an insightful understanding of the interconnectedness between academic sources in various research fields. This method, which uses complete counting to evaluate shared references among authors, reveals the strength of academic relationships between documents and helps identify the most influential publications in a given research domain. As shown in Figure 3, the analysis covers a broad range of journals and conference proceedings, with each source demonstrating significant bibliographic coupling links. For example, 3 Biotech stands out as one of the key sources in the biotechnology field, with 27 documents and 723 citations, contributing a total link strength of 591. This high link strength is pivotal in the ongoing scientific discourse around biotechnological advancements. Similarly, journals like ACS Applied Materials & Interfaces and ACS Omega substantially contribute to the material science sector. ACS Omega records 23 documents, 371 citations, and a link strength of 672, underlining its importance in the research landscape. Other influential sources include Advanced Synthesis & Catalysis, with a link strength of 596, emphasizing its significance in chemical and catalytic processes. Moreover, Composites Science and Technology and Polymer Degradation and Stability strongly focus on materials science and polymer research, reflecting the growing interest in developing advanced materials for various applications. The variety of sources in this analysis also includes journals like Biomacromolecules, with a link strength of 639, and Polymer Bulletin, which recorded 20 documents, 300 citations, and a link strength of 1173, highlighting the expansive reach of polymer research. The results of this bibliographic coupling analysis, as presented in Figure 3, shed light on the intricate web of academic collaboration and the interconnectedness of research efforts across disciplines. By calculating the total link strength of each author's shared references, this analysis effectively captures the collaborative nature of scientific work, illustrating the essential role of these critical sources in advancing research in biotechnology, materials science, and polymer science.

Table 5. Highly Cited Articles at Mahatma Gandhi University

S. No	Author / Title	Date / Journal	Citations	CR
1	John MJ, Thomas S; Biofibres and biocomposites	Carbohydrate Polymers. 2008 FEB 8;71(3):343-364	1579	127
2	Bindu P, Thomas S Estimation of lattice strain in ZnO nanoparticles: X-ray peak profile analysis	Journal of Theoretical and Applied Physics. 2014 DEC; 8 (4): 123-134	1154	34
3	Thomas B, Raj MC, Athira KB, Rubiyah MH, Joy J, et al. Nanocellulose, a Versatile Green Platform: From Biosources to Materials and Their Applications	Chemical Reviews. 2018 DEC 26; 118 (24): 11575-11625	1033	477

4	George J, Sreekala MS, Thomas S A review of interface modification and characterization of natural fiber reinforced plastic composites	Polymer Engineering and Science. 2001 SEP; 41 (9): 1471-1485	881	102
5	Paulose PI, Jose G, Thomas V, Unnikrishnan NV, Warrier MKR Sensitized fluorescence of Ce<SUP>3+SUP>/Mn<SUP>2+SUP> system in phosphate glass	Journal of Physics and Chemistry of Solids. 2003 MAY; 64 (5): Art. No. PII S0022-3697(02)00416-X	727	30
6	Pothan LA, Oommen Z, Thomas S Dynamic mechanical analysis of banana fiber reinforced polyester composites	Composites Science and Technology. 2003; 63 (2): Art. No. PII S0266-3538(02)00254-3	715	33
7	George SC, Thomas S Transport phenomena through polymeric systems	Progress in Polymer Science. 2001 AUG; 26 (6): 985-1017	600	186
8	Abraham E, Deepa B, Pothan LA, Jacob M, Thomas S, et al. Extraction of nanocellulose fibrils from lignocellulosic fibres: A novel approach	Carbohydrate Polymers. 2011 OCT 15; 86 (4): 1468-1475	543	33
9	Jacob M, Thomas S, Varughese KT Mechanical properties of sisal/oil palm hybrid fiber reinforced natural rubber composites	Composites Science and Technology. 2004 JUN; 64 (7-8): 955-965	537	28
10	Subramanian V, Luo C, Stephan AM, Nahm KS, Thomas S, et al. Supercapacitors from activated carbon derived from banana fibers	journal Of Physical Chemistry C. 2007 MAY 24; 111 (20): 7527-7531	516	22
11	Cherian BM, Leao AL, de Souza SF, Thomas S, Pothan LA, et al. Isolation of nanocellulose from pineapple leaf fibres by steam explosion	Carbohydrate Polymers. 2010 JUL 7; 81 (3): 720-725	463	14
12	Kargarzadeh H, Mariano M, Huang J, Lin N, Ahmad I, et al. Recent developments on nanocellulose reinforced polymer nanocomposites: A review	Polymer. 2017 DEC 6; 132: 368-393	455	333
13	Idicula M, Malhotra SK, Joseph K, Thomas S Dynamic mechanical analysis of randomly oriented intimately mixed short banana/sisal hybrid fibre reinforced polyester composites	Composites Science and Technology. 2005 JUN; 65 (7-8): 1077-1087	408	31
14	Joseph PV, Joseph K, Thomas S Effect of processing variables on the mechanical properties of sisal-fiber-reinforced polypropylene composites	Composites Science and Technology. 1999; 59 (11): 1625-1640	403	31
15	Joseph S, Sreekala MS, Oommen Z, Koshy P, Thomas S A comparison of the mechanical properties of phenol formaldehyde composites reinforced with banana fibres and glass fibres	Composites Science and Technology. 2002; 62 (14): Art. No. PII S0266-3538(02)00098-2	399	25

CR – Cited Reference

Table 5 showcases the most highly cited articles at Mahatma Gandhi University, Kerala, highlighting key research contributions across various fields, primarily centred around polymer science, nanocellulose, and composite materials. The articles listed in the table demonstrate significant impact, with citations ranging from 399 to 1579, underscoring their importance in local and global academic communities. The article *"Biofibres and Biocomposites"* by John MJ and Thomas S (2008), with 1579 citations, stands out as the most cited, indicating its broad influence in biocomposites, specifically in material science research. The relatively high number of cited references (127) suggests a well-established work that has contributed extensively to subsequent research. This article reflects the university's prominent role in advancing biocomposite research with a local and global citation footprint. Similarly, *"Estimation of lattice strain in ZnO nanoparticles"* by Bindu P and Thomas S (2014), with 1154 citations, is highly impactful in the field of nanotechnology. Despite having fewer cited references (34), it demonstrates a focused but influential contribution to nanomaterial research. This is an excellent example of a specialized study with significant citation impact, even within a narrower research scope. The article *"Nanocellulose, a Versatile Green Platform"* by Thomas B et al. (2018), with 1033 citations and 477 cited references, illustrates a comprehensive review of nanocellulose, a growing topic in green technology and material science. The many references indicate its broad influence across various research areas, making it a critical

reference in nanocellulose research. Other notable contributions, such as *"A review on interface modification and characterization of natural fiber reinforced plastic composites"* (George J, Sreekala MS, Thomas S, 2001) with 881 citations, further reflect the university's strength in materials engineering and composite research. Articles like this, with a balance of citations and cited references, highlight the long-term scholarly influence of Mahatma Gandhi University's work. The data confirms that Mahatma Gandhi University has produced highly influential articles with a consistent global reach, particularly in the advanced materials and polymer sciences. The citation counts and the number of cited references for each article underscores the university's significant contributions to these research domains.

Three-Field Plot - Author, Source and Countries

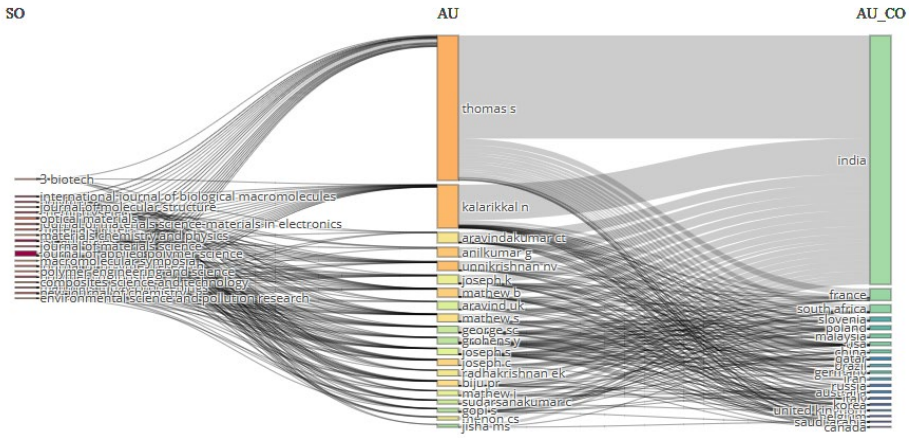

Fig. 4 Three-Field Plot author, source and countries at Mahatma Gandhi University

Mahatma Gandhi University, Kerala's three-field plot analysis highlights key research relationships between authors, journals, and countries. Authors like Thomas S and Kalarikkal N are highly productive, with Thomas S accumulating 5.72k citations, reflecting significant global impact. Kalarikkal N also shows academic solid activity, with 1.71k citations. Geographically, India is the primary focus, with 20 incoming citations and a total of 9.82k citations, though there needs to be more reciprocal international collaboration, as indicated by the 0 outgoing citation flow. France shows some international recognition with 12 incoming citations and a citation impact 465. The university publishes extensively in high-impact journals like the *Journal of Applied Polymer Science*, though with limited incoming citations (0 flow), indicating the potential for more global visibility. While Mahatma Gandhi University has substantial national influence, there is room for stronger international collaborations to boost its global academic stature.

Word-cloud for keywords

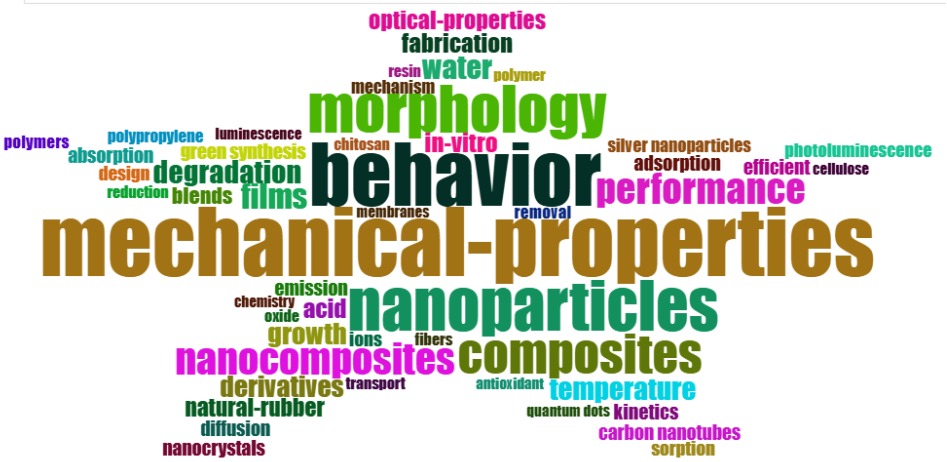

Fig. 5 Wordcloud for keywords plus

The word cloud for keywords at Mahatma Gandhi University, Kerala, reveals key research themes and focus areas. Nanotechnology is a dominant theme, with frequent keywords like nanoparticles, nanocomposites, and carbon nanotubes, indicating a strong emphasis on advanced materials research. Polymer science is also a significant focus, highlighted by terms such as polymer, composites, natural rubber, and polypropylene, reflecting the university's research in sustainable and composite materials. Environmental concerns are evident with keywords like degradation, water, removal, and green synthesis, suggesting research in eco-friendly material production and environmental sustainability. Additionally, terms like adsorption, sorption, and transport indicate studies on material interactions in environmental applications. The presence of in-vitro, antioxidant, photoluminescence, and quantum dots highlights research in biomedical and energy-related applications, focusing on optical properties and energy harvesting. Figure 5 The wordcloud illustrates the university's diverse nanotechnology, polymer science, and sustainability research.

4. CONCLUSION

Mahatma Gandhi University, Kerala's bibliometric analysis reveals significant growth in research productivity, impact, and international collaborations, particularly since the early 2000s. The university's scholarly output, as measured by publication counts, citation scores, h-index, and journal impact factors, demonstrates a growing global influence, especially in fields such as polymer science, nanotechnology, and advanced materials. Prolific authors like Thomas S and Kalarikkal N have made notable contributions to the academic community through their high productivity and global impact. The university's international research network highlights India as a critical player in the global research landscape. Furthermore, the focus on cutting-edge areas such as biocomposites, nanomaterials, and environmental sustainability reflects the university's research priorities. The analysis of high-impact journal publications, particularly in polymer science and nanocellulose, underscores the institution's contributions to advancing scientific knowledge. The study identifies critical research trends and collaborative efforts through bibliometric techniques, offering valuable insights into Mahatma Gandhi University's rising academic stature and growing influence in the global scientific community.

5. FUTURE STUDIES

Future studies in bibliometric analysis at Mahatma Gandhi University, Kerala, will likely explore several emerging trends that reflect the evolving dynamics of academic research. One significant area is the growth of interdisciplinary research, as scholars increasingly collaborate across traditional academic boundaries. Future studies could examine how this trend shapes university research and identify new areas of study. Additionally, global collaboration networks will be a key focus, with research analyzing the university's international partnerships and positioning them within broader academic trends. The rise of altmetrics, which track the broader impact of research through social media and public engagement, will also become an essential area of study, allowing for a more comprehensive evaluation of research visibility beyond traditional citation counts. Furthermore, artificial intelligence and machine learning can be leveraged to enhance bibliometric analysis, automating the identification of trends and collaborations. Future studies could also explore the sustainability of research efforts, aligning academic output with global sustainability goals. Lastly, research funding and its impact on productivity and collaboration will be another critical area for analysis, providing insights into how financial support influences scholarly work. These future directions will help refine research strategies, guide academic priorities, and enhance the global impact of Mahatma Gandhi University's research efforts.

CONFLICT OF INTERESTS

None.

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