Measuring the Research Productivity of Mangalore University: A Scientometric and Altmetric Approach

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Abstract

The study assesses the academic and societal impact of research at Mangalore University through scientometric and altmetric methods, analyzing 3,062 documents from the Scopus database, with 501 mentioned in altmetric sources. Findings indicate a significant increase in publication productivity, particularly post-2019, with Manjunath, J. G. being the top contributor. Dominant research themes include molecular docking and antioxidant studies, primarily affiliated with India, showing strong collaboration with Saudi Arabia. A strong correlation exists between Scopus Citations and Dimensions citations, with journal articles being the primary contributors to citations. The study also highlights that hybrid, bronze, and green Open Access types achieve higher citation ranks, with Mendeley and X identified as key altmetric sources. The top-cited article was 'An online resource for marine fungi' from the 'Journal of Molecular Structure' published by Elsevier.

Citation analysis, Scientometrics, Altmetrics, Mangalore University, Research productivity

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INTRODUCTION

Research productivity is a crucial indicator to measure the performance and academic strength of a university (Jalal, 2020). It is commonly assessed through bibliometric and scientometric measures. In recent years, altmetrics have been used as a supplementary metric to gauge the broader societal and online impact of scholarly outputs (Weller, 2015). Scientometrics and altmetrics are both quantitative methods used to evaluate research impact; however, they differ in scope and the data sources they utilize. Scientometrics focuses on traditional academic indicators, such as citation counts, journal impact factor, and H-index to measure the influence of research within the scholarly community (Ningayya & Kumar, 2025). Publications tend to receive citations at a rising pace during the first 24 months following their publication, after which the rate of citations begins to decline (Yang et al., 2024). To address this lag and provide a broader perspective, alternative indicators have been developed to complement traditional metrics. Altmetric evaluates the attention a scholarly article receives across various online platforms. These newer measures aim to capture the immediate attention and reach of scientific work, particularly through social media and online platforms (Patthi et al., 2017; Sud & Thelwall, 2014). They have emerged in response to the growing use of digital media by researchers, readers, and the general public. AAS aggregates mentions from sources such as Twitter, Facebook, Mendeley, etc. It provides a weighted score that reflects the overall level of online engagement with a particular article (Bornmann, 2014; Williams, 2017).

Mangalore University, a state university in Karnataka, India, was established in 1980. It is a prominent institution in southern India that has witnessed substantial growth in its academic and research activities over the past few decades. As a state university catering to a diverse range of disciplines, it is essential to evaluate the university's research output in terms of publication patterns, citation impact, collaboration trends, and societal impact. Therefore, the study aims to trace the academic and societal reach of publications through the scientometric and altmetric measures.

REVIEW OF LITERATURE

Scientometric analysis

Several scientometric studies have been carried out to measure the scholarly output of universities in India. The findings reveal that the science faculty accounted for 95.89% of the total research publications, indicating its predominant role in the university's scholarly output (Mamdapur et al., 2021), and the USA emerged as the most frequently collaborated country, followed by South Korea (Mamdapur et al., 2021; Mahala & Singh, 2021; Muruli & Harinarayana, 2023). The study also reflects that multi-authored papers are predominant (Rohit, 2023; Mahala & Singh, 2021; Keshava et al., 2020; Kumar, 2018), and the primary channels of scholarly communication are journals and conference proceedings (Rohit, 2023). The results also indicate that open access is not a prerequisite for achieving higher citation counts. In most cases examined, toll-access articles garnered a higher number of citations compared to open-access articles across several impact factor zones in the Biological and Physical Sciences (Wani & Shah, 2023).

Altmetric analysis

In recent years, altmetrics have been used as a supplement to traditional metrics (Melero, 2015). Costas et al. (2014) revealed that the presence and social media density of scientific papers are still very low and infrequent, with a greater focus on recent publications. Altmetrics are most prevalent in publications from the humanities, social sciences, and the medical and biological sciences. Lamba et al. (2020) evaluated the altmetric scores of computer science publications from Central Universities in India. The results revealed that Jawaharlal Nehru University achieved the highest AAS, while Banaras Hindu University recorded the highest number of citations in Dimensions. The University of Hyderabad had the greatest number of Mendeley readers. Among the sources contributing to Altmetric coverage, Twitter emerged as the most prominent platform, followed by Google+, Patents, and Facebook. Haseena and Azeez (2021) and Batcha (2018) revealed that scholarly data are primarily disseminated through Mendeley and Twitter, with Twitter users largely based in the USA and the UK. The coverage of physics journal articles on Twitter is high (22.68%) compared to Facebook (3.62%) and Blog (2.18%) (Srivastava & Mahajan, 2023).

Association between citations, altmetrics, and open access

Many studies have shown that the strength and direction of the association between citation and altmetrics vary depending on the population studied, with each method yielding distinct outcomes. A positive but weak correlation among multidisciplinary subjects was reported by Costas et al. (2014), while a strong and significant positive correlation was found between Dimensions citations and Mendeley readership counts (Lamba et al., 2020). Haseena and Azeez (2021) observed that the AAS is not significantly correlated with citations from the Dimension, Google Scholar, and Web of Science. Statistically significant correlations were observed between citation-Twitter mentions and citations-Facebook mentions, but were weak and positive in Physics journal articles (Srivastava & Mahajan, 2023). A comparison of altmetric scores and citation counts reveals that open access status has no impact on an article's performance (Poplase & Grgic, 2016). The Open Access Advantages (OAA) for citations generally decline for more recent publications, while the OAA for news, blogs, and Twitter remains steady over time and shows no connection to the number of OA publications. In contrast, the OAAs for Wikipedia, patents, and policy citations display more complex patterns (Taylor, 2024).

OBJECTIVES

- To examine the distribution of citations and altmetric scores for the publications;
- To analyse the co-authorship pattern and keyword network of publications;
- To identify the correlation between citations and AAS; and
- To find the most predominant altmetric data source that gathers the maximum altmetric scores;

METHODOLOGY

The bibliographic data required for the analysis were retrieved from the Scopus database, which offers wide coverage, high-quality data, and enriched metadata suitable for large-scale research assessments (Baas et al., 2019). An affiliation search query ("Mangalore University" OR "Mangalore Uni") was formulated and executed using the 'Advanced Search' option. A total of 3,062 documents were retrieved after limiting the search to the years 2015–2024 and the English language. The data from both the 'Scopus Database' and the 'Altmetric Explorer' were retrieved on June 23, 2025. Among these, 2,831

articles had a Digital Object Identifier (DOI), which were used to retrieve altmetric data from 'Altmetric Explorer'. A total of 663 documents were tracked with altmetric outputs, of which 501 documents had mentions in various social media platforms and were included in the analysis. The data obtained from the search were exported to Microsoft Excel for detailed analysis. A total of 3062 articles were considered for scientometric analysis, and 501 documents were considered for altmetric analysis. SPSS was used to test the correlation between citations and AAS. Since the data were not normally distributed, Spearman's correlation test was employed to examine the relationship between citation counts and the AAS. A Kruskal-Wallis H test was used to determine whether SC, DC, and AAS varied significantly across different OA types.

SCOPE AND LIMITATION

The scope of the present study is to examine the academic and societal impact of scholarly publications of Mangalore University through a scientometric and altmetric approach. It involves the analysis of citation and altmetric scores accumulated by the publications. The study exclusively focuses on Mangalore University publications indexed in the Scopus database from 2015-2024, providing a longitudinal view of research output and impact.

RESULTS AND DISCUSSION

Overview of publications, citations, and altmetric scores

Table 1: Overview of publications, citations, and altmetric scores

Year of Publication	No. of publication (N) (%)	No. of cited publications (%)	No. of Scopus citations (%)	Mean citations	No. of articles with	
					Altmetric output (%)	Altmetric mentions (%)
2015	189 (6.17)	165 (6.37)	2731 (7.19)	14.45	27 (4.98)	23 (4.59)
2016	204 (6.66)	183 (7.07)	3339 (8.79)	16.37	33 (4.99)	25 (4.99)
2017	215 (7.02)	196 (7.57)	3437 (9.05)	15.99	56 (8.47)	46 (9.18)
2018	307 (10.03)	272 (10.51)	4097 (10.79)	13.35	72 (10.89)	51 (10.18)
2019	339 (11.07)	306 (11.82)	5242 (13.81)	15.46	65 (9.83)	45 (8.98)
2020	393 (12.83)	354 (13.67)	7566 (19.93)	19.25	59 (8.93)	49 (9.78)
2021	367 (11.99)	340 (13.13)	5409 (14.25)	14.74	94 (14.22)	74 (14.77)
2022	364 (11.89)	315 (12.17)	3599 (9.48)	9.89	114 (17.25)	80 (15.97)
2023	334 (10.91)	235 (9.08)	1537 (4.05)	4.60	80 (12.10)	64 (12.77)
2024	350 (11.43)	223 (8.61)	1009 (2.66)	2.88	61 (9.23)	44 (8.78)
Total	**3062 (100)**	**2589 (100)**	**37966 (100)**	**12.40**	**661 (100)**	**501 (100)**

Table 1 presents the year-wise publication statistics of Mangalore University. The data indicate a consistent increase in publication productivity up to 2020, with a notable surge during the COVID-19 period (2020–2022). A similar increase in publications during the COVID-19 period has been reported by Rousseau et al. (2023) and Kim (2024). The year 2020 has marked the highest number of publications, with 393 (12.83%) articles published and 7566 (19.93%) citations, with 19.25 mean citations per article. The year 2022 emerged as a peak year in terms of altmetric attention, with 114 (17.25%) articles and an altmetric score of 80 (15.97%).

Network analysis of co-authorship

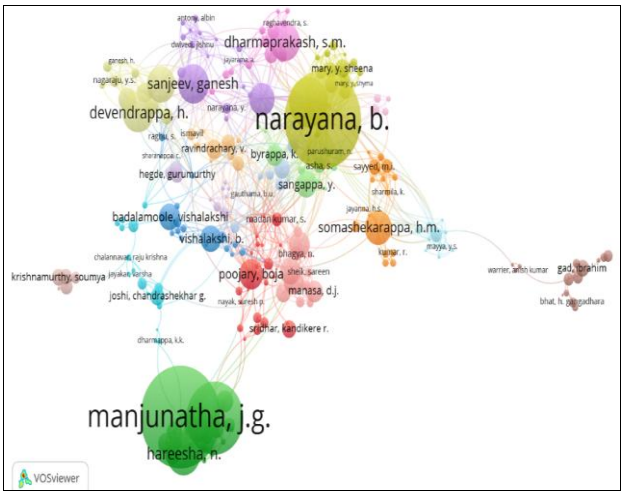


Figure 1: Co-authorship network of authors

The co-authorship network represents the collaboration patterns among authors within a dataset (Figure 1). The authors with a minimum of 5 documents and a minimum of 100 citations were considered for mapping the network. Thus, out of 5508 authors, 279 authors were finally considered for the analysis. There are 35 clusters represented in different colors. Manjunath, J. G. (green cluster) emerged as highest contributing author with respect to citations received, with 89 documents and 2674 citations, followed by the author Narayana, B. (yellow cluster), with 143 documents and 2583 citations.

Authorship trend and degree of collaboration

Figure 2 illustrates the authorship pattern of publications affiliated with Mangalore University. The data clearly highlight the collaborative nature of research output, with two-authored publications constituting the largest share (22.63%). In contrast, single-authored contributions are relatively minimal, accounting for only 1.99% of the total. It is also clear that the number of publications decreases as the number of author collaborations increases. The predominance of multi-authored papers is also evident in studies conducted by Rohit (2023), Mahala & Singh (2021), Keshava et al. (2020), and Kumar (2018).

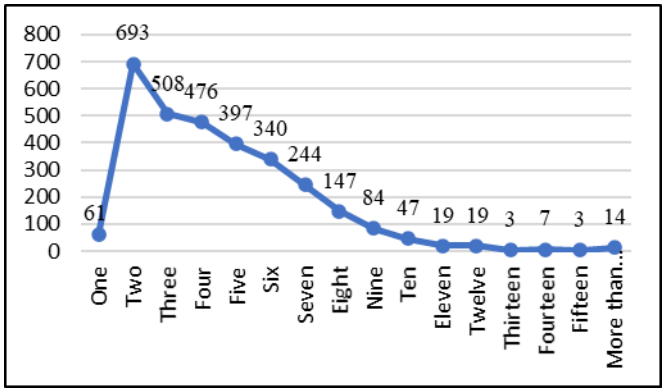


Figure 2: Authorship trends

The formula given by Subramanyam (1983) to calculate the Degree of Collaboration (DC) is the ratio between the number of multi-authored papers (N_M) to the sum of multi-authored papers (N_M) and single-author papers (N_S). Thus,

$$DC = 3001/(61+3001) = 0.98$$

Given that the DC value exceeds 0.5, it is clear that the authors prefer to publish in a collaborative mode rather than individually.

Network analysis of keywords

The density visualisation of keywords highlights the core themes within the analysed set of research publications (Figure 3). In the current visualization, the highest-density areas (yellow zones) center around keywords such as "molecular docking," "crystal structure," "cyclic voltametry," and “antioxidant,” indicating these are dominant topics in the research corpus. Surrounding these are moderately dense areas (green), where terms like "adsorption," "antimicrobial," and "antibacterial activity" appear, suggesting they are related but slightly less central. Peripheral keywords in blue indicate emerging or niche areas with lower frequencies or newer research interest. The density map thus reveals both well-established and developing research themes within the publication set.

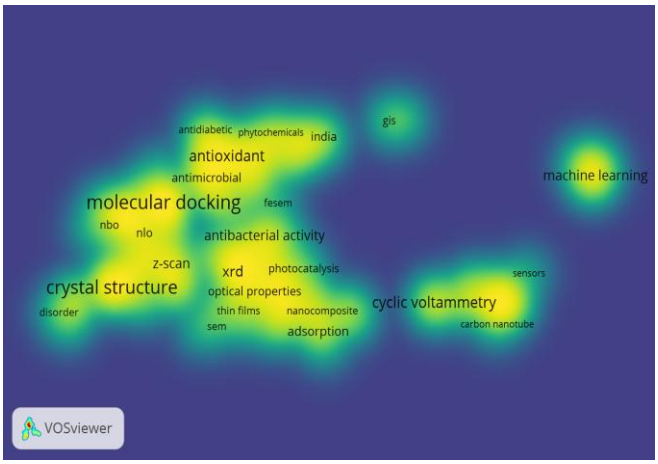


Figure 3: Density visualization of keywords

Country-wise citation analysis

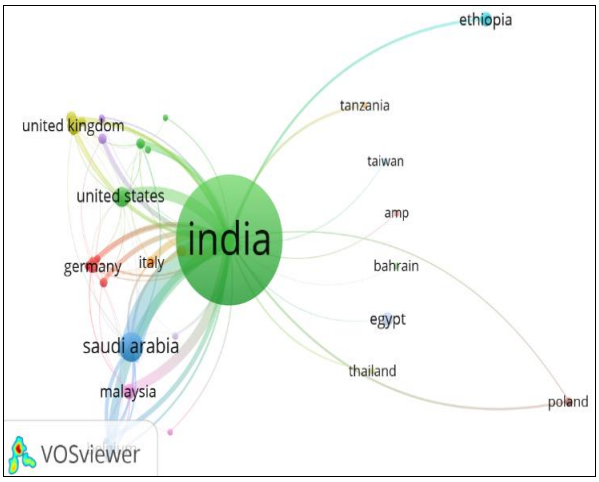
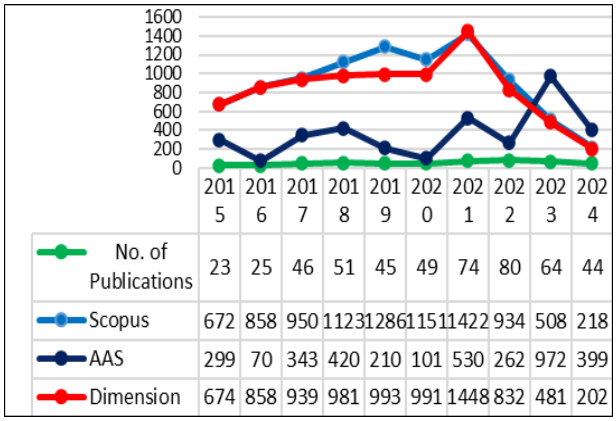


Figure 4: Country-wise citation analysis

The country-wise citation visualized in Figure 4 illustrates the international collaboration and citation patterns in the research publications. India, as the primary contributor, accounts for the highest share of publications and citations, underscoring its central role in the research network. Collaborative works with countries such as Saudi Arabia, the USA, and the UK have attracted comparatively higher citation counts.

Year-wise distribution of citations and AAS

Figure 5 shows the year-wise analysis of citations and AAS of publications. The data reveal that citations from Scopus and Dimensions generally increase with the number of publications, reaching their highest point in 2021, while AAS exhibits a more irregular pattern. Particularly, 2023 records the highest AAS (972) despite significantly lower citation counts. Similarly, in 2024, a moderate publication count is accompanied by relatively high AAS (399) but low citation counts, which shows a time lag between social media attention and academic impact.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. of Publications	23	25	46	51	45	49	74	80	64	44
Scopus	672	858	950	1123	1286	1151	1422	934	508	218
AAS	299	70	343	420	210	101	530	262	972	399
Dimension	674	858	939	981	993	991	1448	832	481	202

Figure 5: Year-wise distribution of citations and AAS

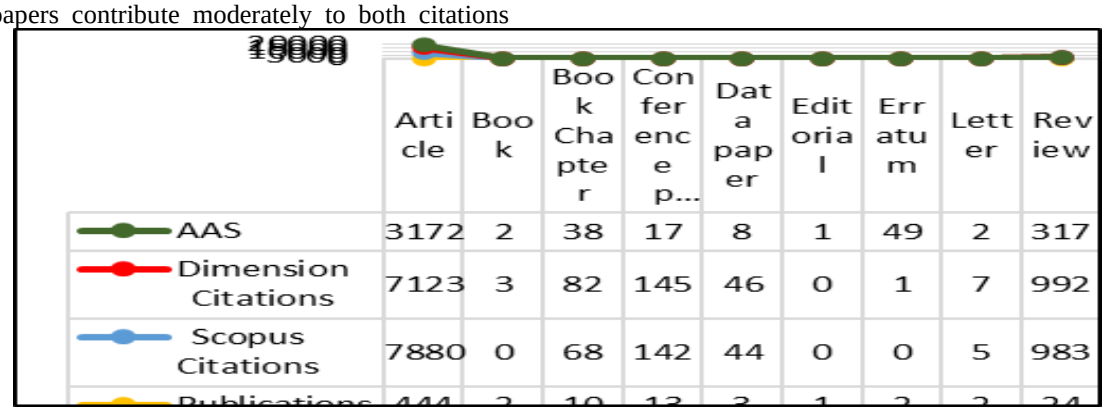
Correlation between Scopus citations, Dimension citations, and AAS

Since the data were not normally distributed, Spearman's correlation test was employed. The test revealed a very strong and significant positive correlation between SC and DC (r_s = .800, p < .001), indicating a strong association between these two citation databases. A weak but significant positive correlation was found between DC and AAS (r_s = .143, p = .001). However, the correlation between SC and AAS was very weak and not statistically significant (r_s = .032, p = .479), suggesting no meaningful relationship between traditional citation counts and AAS.

Document type-wise distribution of citations and AAS

Figure 6 shows the citation and AAS distribution of different publication types. It shows that journal articles dominate in volume (444 publications) and impact, receiving the highest number of SC (7880), DC (7123), and AAS (3172), indicating both strong academic influence and online attention. Review articles (24) show high citation counts in Scopus (983) and Dimensions (992) and also AAS (317), highlighting their substantial value and reach. Other

formats like conference papers, book chapters, and data papers contribute moderately to both citations and altmetric engagement.



	Article	Book	Book Chapter	Conference p...	Data paper	Editorial	Erratum	Letter	Review
AAS	3172	2	38	17	8	1	49	2	317
Dimension Citations	7123	3	82	145	46	0	1	7	992
Scopus Citations	7880	0	68	142	44	0	0	5	983
Publications	444	2	10	13	3	1	2	2	24

Figure 6: Document type-wise distribution of citations and AAS

Access type-based distribution of citations and AAS

Table 4: Citation and AAS distribution across different open access types

Access type	N (%)	SC	MR*	DC	MR*	AAS	MR*
Closed	292 (58.28)	5834	264.60	5015	246.26	1500	247.80
Gold	157 (31.34)	2206	214.00	2284	244.38	1169	248.56
Green	31 (6.19)	689	282.97	763	300.85	757	277.53
Bronze	15 (2.99)	255	289.57	237	289.73	104	282.43
Hybrid	6 (1.20)	138	295.67	100	300.50	77	254.58
Kruskal-Wallis H test		$\chi^2(4) = 16.017$, p = .003		$\chi^2(4) = 6.142$, p = .189		$\chi^2(4) = 2.498$, p = .645	

**MR= Mean Rank*

Table 4 reveals that most of the publications were published in closed access (58.28%), followed by gold access (31.34%). A Kruskal-Wallis H test was conducted to examine whether SC, DC, and AAS varied significantly across different OA types. The results revealed a statistically significant difference in SC among OA types, $\chi^2(4) = 16.017$, p = .003, with hybrid, bronze, and green OA articles showing higher mean citation ranks. However, no statistically significant differences were found in DC ($\chi^2(4) = 6.142$, p = .189) and AAS ($\chi^2(4) = 2.498$, p = .645) across different OA types.

Mentions in altmetric data sources

Figure 7 presents the distribution of altmetric mentions in 20 different sources. The most frequent occurrence occurred in Mendely, with a total of 15,745 reads across 501 articles. X (formerly Twitter) emerged as the second most prominent source, acquiring a total of 2618 mentions. The altmetric data sources like Weibo, LinkedIn, Pinterest, Q&A, Clinical guidelines, and Syllabi have no mention.

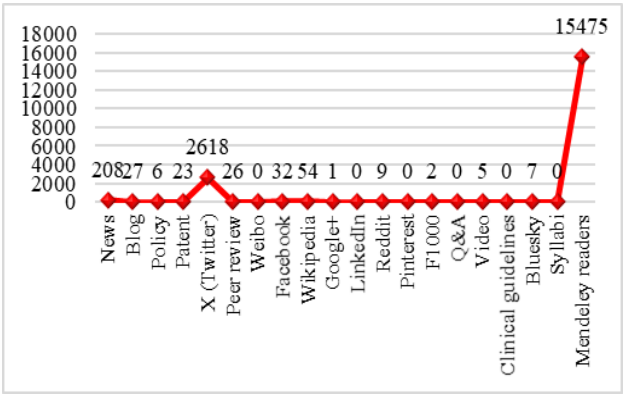


Figure 7: Mentions in altmetric data sources

Top ten research publications by citation count

Table 5: Top ten highly cited research publications

Rank	Publication title	Year	Journal title	Publisher	SC	DC	AAS
1	An online resource for marine fungi	2019	Fungal Diversity	Springer	199	172	20
2	Tetrandrine - A molecule of wide bioactivity	2016	Phytochemistry	Elsevier	198	190	7
3	Deep learning approach for microarray cancer data classification	2020	CAAI Transactions on Intelligent Technology	Institution of Engineering and Technology	184	173	1
4	A review on detection methods used for foodborne pathogens	2016	Indian Journal of Medical Research	Indian Council of Medical Research	182	194	13
5	Biodegradation of gamma irradiated low-density polyethene and polypropylene by endophytic fungi	2015	International Biodeterioration and Biodegradation	Elsevier	169	182	6
6	GC–MS analysis of phytoconstituents from 7Amomum nilgiricum and molecular docking interactions of bioactive serverogenin acetate with target proteins	2020	Scientific Reports	Nature Research	168	168	1
7	A global analysis of terrestrial plant litter dynamics in non-perennial waterways	2018	Nature Geoscience	Nature Publishing Group	129	143	215
8	The promise of discovering population-specific disease-associated genes in South Asia	2017	Nature Genetics	Nature Publishing Group	109	157	253
9	Low-cost, catalyst-free, high-performance supercapacitors based on porous nano carbon derived from agricultural waste	2020	Journal of Energy Storage	Elsevier	103	116	1
10	Electro-oxidation of formoterol fumarate on the surface of novel poly(thiazole yellow-G) layered multi-walled carbon nanotube paste electrode	2021	Scientific Reports	Nature Research	101	110	2

Data in Table 5 ranks the top ten articles that received the highest citations in Scopus. The article 'An online resource for marine fungi', published in 2019, got the highest 199 citations in SC, followed by 172 Dimension citations and 20 AAS. Among the top ten cited articles, the highest AAS was obtained by the article ranked 8th, with 109 Scopus and 157 Dimensions citations. The tenth position was held by the article 'Electro-oxidation of formoterol fumarate on the surface of novel poly (thiazole yellow-G) layered multi-walled carbon nanotube paste electrode' published in the year 2021 in the journal 'Scientific Reports'.

Top ten cited journal sources

Table 6: Top ten cited journal sources

Rank	Source title	N	SC	DC	AAS
1	Journal of Molecular Structure	84	1480	195	11
2	International Journal of Biological Macromolecules	36	1292	475	10
3	Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy	19	697	103	02
4	Ceramics International	24	614	7	1
5	Chemistryselect	34	572	482	31
6	Materials Chemistry and Physics	19	537	251	6
7	RSC Advances	16	519	42	4
8	Materials Today: Proceedings	69	490	34	1
9	Optics and Laser Technology	12	472	87	1
10	Journal of Materials Science: Materials in Electronics	24	430	81	8

The analysis of the top ten highly cited journals presented in Table 6 reveals that the Journal of Molecular Structure is the most productive, with 84 publications and 1,480 Scopus citations, indicating a strong academic influence. The International Journal of Biological Macromolecules, with fewer publications (36), exhibits a high impact, as evidenced by 1292 Scopus and 475 Dimensions citations. ChemistrySelect stands out with the highest AAS (31) and substantial citation counts across both databases, reflecting both scholarly and online visibility. In contrast, journals like Ceramics International and Materials Today: Proceedings exhibit high publication output but comparatively lower online attention and citation counts.

Top ten cited publishers

Table 7: Top ten cited publishers

Rank	Publisher	N	SC	DC	AAS
1	Elsevier	129	3561	3685	802
2	Wiley	56	953	66	93
3	Springer	50	838	861	610
4	Nature Research	13	358	374	73
5	Taylor and Francis	23	305	333	75
6	MDPI	20	291	324	21
7	Royal Society of Chemistry	18	216	218	218
8	Frontiers Media S.A.	15	125	137	60
9	International Union of Crystallography	36	116	117	47
10	Magnolia Press	8	47	39	129

An analysis of publication metrics by the publisher presented in Table 7 reveals notable differences in both traditional and alternative impact indicators. Elsevier stands out as the most prolific and impactful publisher, with 129 publications receiving 3561 citations in Scopus and 3685 in Dimensions. It also recorded the highest AAS total of 802. Springer received a significantly higher number of SC (838), DC (861), and AAS (610) than Wiley. Magnolia Press has received the least number of citations and AAS and placed in 10th rank.

FINDINGS AND CONCLUSIONS

The scientometric and altmetric analysis of Mangalore University's research output highlights its growing scholarly contributions and online engagement. The findings reveal that the publication productivity has increased significantly over the years, with a notable rise after 2019. The year 2022 emerged as a peak year in terms of altmetric attention, with 114 articles and an altmetric score of 80 (12.10%). Manjunath, J. G. emerged as the predominant author with 190 documents. Molecular docking, crystal structure, cyclic voltametry, and antioxidant are dominant topics in the research corpus. India emerged as a key contributor, having frequent collaboration with Saudi Arabia. Citation metrics from Scopus and Dimensions generally increase with the number of publications, reaching their highest point in 2021, while AAS exhibits a more irregular pattern. The Spearman's correlation test revealed a very strong and significant positive correlation between SC and DC. A weak but significant positive correlation was found between

DC and AAS. However, the correlation between SC and AAS was very weak and not statistically significant. The journal articles dominate in volume and impact, receiving the highest number of SC, DC, and Altmetric scores, indicating both strong academic influence and online attention. The Kruskal-Wallis test results revealed a statistically significant difference in SC among hybrid, bronze, and green OA articles, showing higher mean citation ranks. However, no statistically significant differences were found in DC and AAS across different OA types. The top-most social occurrence occurred in Mendely, and X (formerly Twitter) emerged as the second most prominent source. The article with closed access, 'An online resource for marine fungi,' received the highest number of SC. The Journal of Molecular Structure is the most productive, indicating a strong academic influence. Thus, the disparity between citation-based impact and altmetric attention suggests the need for strategic dissemination practices to enhance both academic and public engagement. Strengthening collaborative networks, promoting open access, and leveraging social media channels could further augment the global visibility, accessibility, and influence of research.

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