

# Mapping the Research Productivity of Assam University during 2000-2021: A Scientometrics Assessment

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**Abstract**—This study is intended to make comparison among various areas of research output of Assam University as per the publications indexed in Scopus database; to analyze and collect data for different areas, such as publication distribution over 2000-2021; document by subject area; document type analysis; source analysis; year wise citations; h-index of the university; open access journals; cite score of journals; top authors and their production; top funding agencies and collaborating countries, top collaborative institutions, etc. The results indicate that there has been a constant growth in the publications of the university. Most of the articles have been published in the subject of Biochemistry, Genetics and Molecular Biology in the form of research articles. The results also indicate the h-index of the university, which is 63 and Chakraborty, S. is the most prolific author and UGC has funded maximum as funding agency and significantly contributed towards the research output of the university.

**Keywords**— *Bibliometrics, Research Productivity, Research Output, Research Performance, Scintometrics, Assam University, etc.*

## I. INTRODUCTION

This study is based on the work carried out by the Scientometrics study of the Research Productivity of Assam University based on the Scopus Database from 2000-2021. Scientometrics is also known as scientific communication. It has gained significance for the simple reason that it is not merely a theoretical discipline but has extensive applications. It helped to identify the pattern of publications, authorship, citations, and behavior of a particular subject, journal, groups, and organizations in a given period. It helps to monitor the growth of literature and patterns of research enabling monitoring a particular research institute.

Scientometrics is the science of measuring the quality of science. It is often done using bibliometric which is a measurement of the impact of scientific publications. The term Scientometrics originated as a Russian term for the application of quantitative methods to the history of science. This term was introduced and came into prominence with the founding of the journal named 'Scientometrics'. It deals with analysis, evaluation, and graphic representation of science and technology. Modern Scientometrics is mostly based on the work of Derek J. de Solla Price and Eugene Garfield (Scientometrics)<sup>5</sup>.

### About the Assam University

Assam University, Silchar, is a Central University established by an Act of the Indian Parliament (Act XXIII of 1989) and came into existence in 1994. Situated in the Barak Valley of southern Assam, the University is nestled in a sprawling 600-acre campus at Dargakona, about 23 km from Silchar town. In 2007, Assam University opened a 90-acre satellite campus at Diphu in the Karbi Anglong Hills District of Assam, thereby making quality higher education accessible to a wider section of society. With students' strength about 4089 in the Silchar campus and 824 on the Diphu campus, the University is a veritable melting pot of diverse communities, ideas, and creativity. Apart from the two campuses of the University, there are 73 affiliated and permitted colleges in the five districts of south Assam, which together constitute the jurisdiction of Assam University and there are more than 36,000 students enrolled in the affiliated colleges (*Twenty-Seventh Annual Report 2019-20, 2019*)<sup>7</sup>.

## II. SCOPE AND LIMITATIONS OF THE STUDY

The scope of the present study is limited to analyze the research output of Assam University, indexed in Scopus database based on bibliometric parameters. The study was further limited to the period of 2000-2021 and only papers indexed in the Scopus database were considered for this study.

### III. OBJECTIVES OF THE STUDY

The specific research objectives of the study are to know:

- Yearly growth of literature and to calculate the cumulative publication of established journals.
- Subject wise distribution of publications.
- Top productive authors and their publications, citations, h-index etc.
- Highly cited journals.
- Preferred document types of publications.
- Important funding agencies of the organization.
- Source/journal analysis.
- Preferred collaborating institutions and preferred collaborating country, etc.

### IV. REVIEW OF LITERATURE

The review of literature helps to adopt the theory mechanism and identifying the tools to develop a suitable research methodology for better performance of the research topic. There are various bibliometric studies that have been reported to assess the research output of research institutions and universities of India. The researcher has selected only some of the very relevant articles which have been published recently.

Ashraf, (2021)<sup>1</sup> did a quantitative analysis of the research output of Jamia Millia Islamia and analyzed the growth of the publications along with the type of publication and the main research areas in which the authors have produced their work from 1971- 2010. He founded that the most yielding decade in terms of research output in the University was 2001-2010.

Bid & Mandal, (2021)<sup>2</sup> analyzed the research productivity of the National Institute of Technology, Kurukshetra during 2012-16 as indexed in Web of Science and found that authors preferred to publish their papers in the conference proceeding,

engineering, computer science, and energy fuels are the most highly productive subject areas.

Kumar R., Vijaya & Palaniappan, M. (2021)<sup>3</sup> did a comparative study of research output of the Periyar University and Bharathiar University as per the data available in Web of Science for the period of 2005 to 2014. The results indicated that highest number of articles were published by the Bharathiar University (1851) whereas the Periyar University published 680 articles. It can be seen that there has been a progressive trend in the growth of publications of both the universities during the period of study. The results also indicated that the trends towards collaborative research are gaining currency day-by-day. Every work of researchers depends purely on the library because it contains more source information.

Pandya et al., (2021)<sup>4</sup> conducted the bibliometric study to find out the authorship pattern, collaboration, year-wise, and designation-wise distributions for the three universities namely University of Kerala, Mahatma Gandhi University, and the University of Calicut. The analysis of authorship showed that collaborative research work is high as compared to solo authorship in all three universities. The study considered leading innovation research journals to identify the most productive universities for each journal and analyzed bibliometric parameters such as co-citation and bibliographic coupling to find out the most influential universities in innovation research.

### V. METHODOLOGY

The data was retrieved from the SCOPUS database in the month of January 2022 for the publication of Assam University for the period of 2000-2021 (Scopus)<sup>6</sup>. The keyword "ASSAM UNIVERSITY" was searched in the affiliation field in the SCOPUS database which brought out 2925 results. Then data was analysed using different indicators like year-wise publications, subject wise distribution of publications, top productive authors, highly cited journals, preferred document types of publications, important funding agency, collaboration institutions and countries, etc.

#### Data Analysis

Data were downloaded from Scopus in ".txt" format and imported to MS Excel and organized for

statistical purposes. All the available data collected from the database were analyzed and processed with the help of MS-Excel.

Year Wise Growth

Table 1: Research Output of Assam University (Year Wise Growth)

| Year  | No. of Articles | Percentage % of 2925 | Cumulative Sum of Articles | Cumulative Sum of Articles % |
|-------|-----------------|----------------------|----------------------------|------------------------------|
| 2021  | 365             | 12.47                | 365                        | 6.24                         |
| 2020  | 322             | 11.00                | 687                        | 11.75                        |
| 2019  | 295             | 10.08                | 617                        | 10.55                        |
| 2018  | 271             | 9.26                 | 566                        | 9.68                         |
| 2017  | 243             | 8.30                 | 514                        | 8.79                         |
| 2016  | 243             | 8.30                 | 486                        | 8.31                         |
| 2015  | 226             | 7.72                 | 469                        | 8.02                         |
| 2014  | 242             | 8.27                 | 468                        | 8.00                         |
| 2013  | 178             | 6.08                 | 420                        | 7.18                         |
| 2012  | 147             | 5.02                 | 325                        | 5.56                         |
| 2011  | 116             | 3.96                 | 263                        | 4.49                         |
| 2010  | 93              | 3.17                 | 209                        | 3.57                         |
| 2009  | 48              | 1.64                 | 141                        | 2.41                         |
| 2008  | 31              | 0.78                 | 79                         | 1.35                         |
| 2007  | 23              | 0.86                 | 54                         | 0.92                         |
| 2006  | 18              | 0.61                 | 41                         | 0.70                         |
| 2005  | 11              | 0.37                 | 29                         | 0.49                         |
| 2004  | 15              | 0.51                 | 26                         | 0.44                         |
| 2003  | 13              | 0.44                 | 28                         | 0.47                         |
| 2002  | 14              | 0.47                 | 27                         | 0.46                         |
| 2001  | 6               | 0.20                 | 20                         | 0.34                         |
| 2000  | 5               | 0.17                 | 11                         | 0.18                         |
| Total | 2925            |                      | 5845                       |                              |

Fig. 1: Year Wise Growth

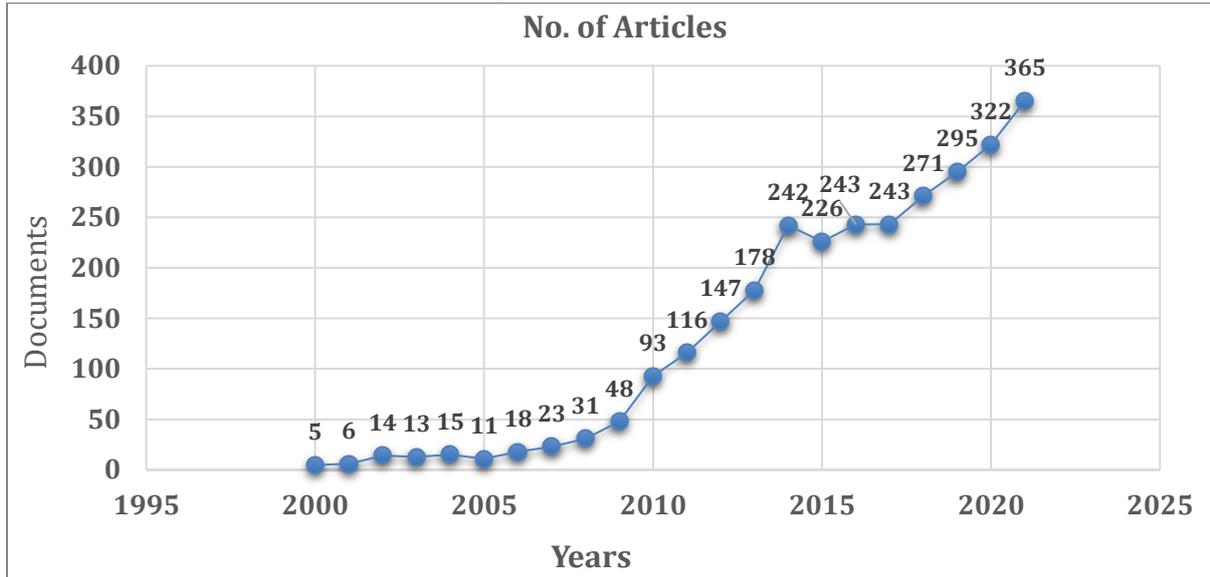


Table 1 shows the total research output of Assam University from (2000-2021), which is in total 2925 articles. On the observation of the table, the maximum 365 documents were published in the

year i.e. 2021, followed by 322 in 2020 while the minimum 5 documents were published in the year 2000.

Documents by Subject Area

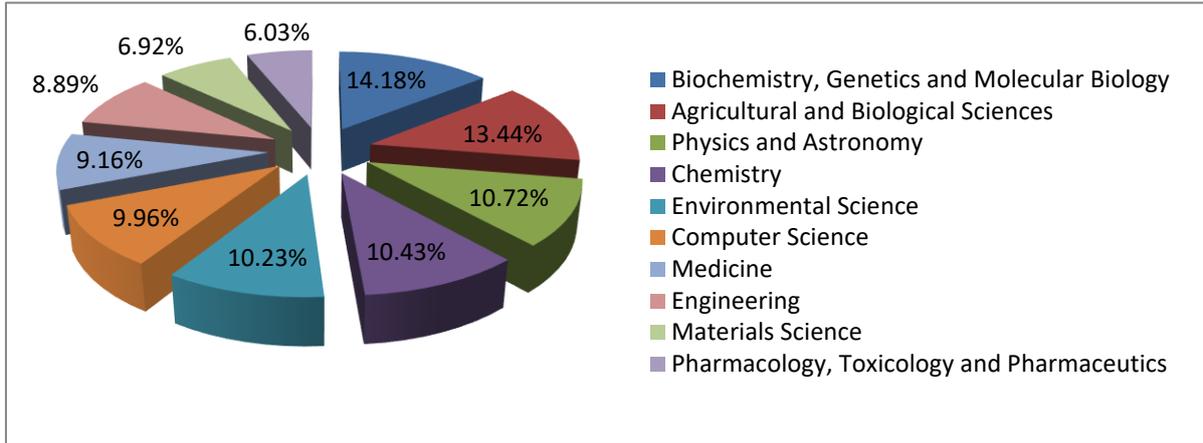
Table 2: Documents by Subject Area

| Sl. No. | Subject Area                                 | Publication | Percentage% |
|---------|--|-------------|-------------|
| 1       | Biochemistry, Genetics and Molecular Biology | 574         | 14.18       |
| 2       | Agricultural and Biological Sciences         | 544         | 13.44       |
| 3       | Physics and Astronomy                        | 434         | 10.72       |
| 4       | Chemistry                                    | 422         | 10.43       |
| 5       | Environmental Science                        | 414         | 10.23       |
| 6       | Computer Science                             | 403         | 9.96        |
| 7       | Medicine                                     | 371         | 9.16        |
| 8       | Engineering                                  | 360         | 8.89        |
| 9       | Materials Science                            | 280         | 6.92        |
| 10      | Pharmacology, Toxicology and Pharmaceutics   | 244         | 6.03        |
|         | Total  | 4,046       | 99.96       |

Table 2 shows the documents by subject area of publications by Assam university from (2000-2021). The highest 574 documents were published in the field of Biochemistry, Genetics and Molecular

Biology subject, followed by Agricultural and Biological Sciences with 544 publications, and 434 documents were published in the physics and Astronomy subject area.

Fig. 2: Documents by Subject Area



Document Type Analysis

Table 3: Top 10 Document Type

| Sl. No | Document Type    | No. of Articles |
|--------|------------------|-----------------|
| 1      | Article          | 2216            |
| 2      | Conference Paper | 293             |
| 3      | Review           | 185             |
| 4      | Book Chapter     | 131             |
| 5      | Letter           | 33              |
| 6      | Editorial        | 30              |
| 7      | Note             | 14              |
| 8      | Book             | 11              |
| 9      | Erratum          | 11              |
| 10     | Short Survey     | 131             |
|        | Total            | 3055            |

Fig. 3: Document Type

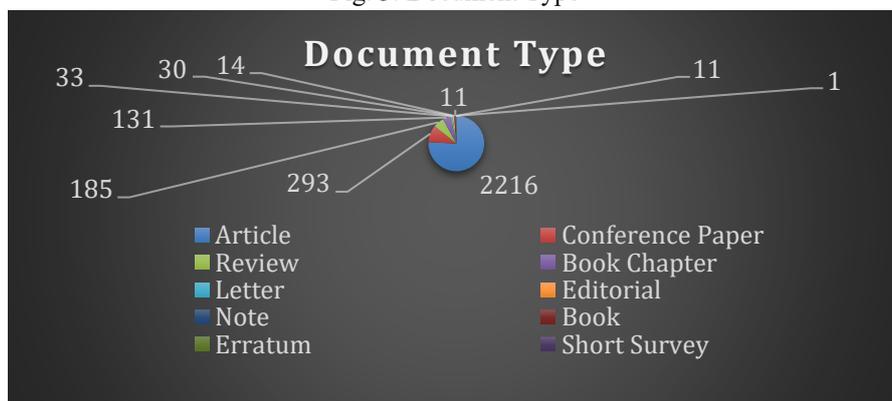


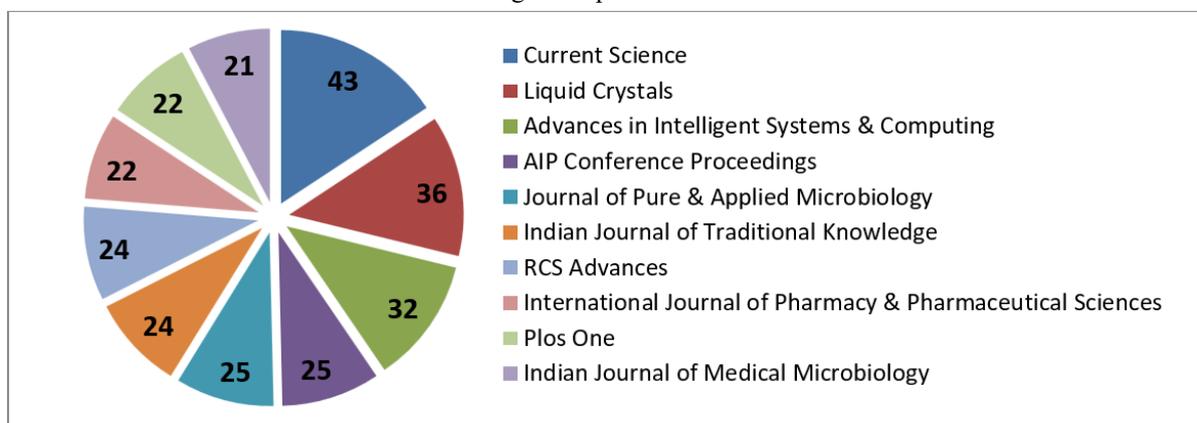
Table 3 shows different type of documents which have been included in Scopus database in last 22 years of the Assam University. Documents that may be used for systematic evaluation as part of a study take a variety of forms. They include articles, Source Analysis

conference papers, reviews, book chapters, letters, editorial notes, etc. From the Table, maximum number of articles (2216) have been published in document type, 'Article', followed by 'Conference Paper' (293) and Review (185).

Table 4: Top 10 Journal

| Sl. No. | Source Title  | No. of Publication |
|---------|---|--------------------|
| 1       | Current Science   | 43                 |
| 2       | Liquid Crystals   | 36                 |
| 3       | Advances in Intelligent Systems & Computing                 | 32                 |
| 4       | AIP Conference Proceedings                                  | 25                 |
| 5       | Journal of Pure & Applied Microbiology                      | 25                 |
| 6       | Indian Journal of Traditional Knowledge                     | 24                 |
| 7       | RCS Advances  | 24                 |
| 8       | International Journal of Pharmacy & Pharmaceutical Sciences | 22                 |
| 9       | Plos One  | 22                 |
| 10      | Indian Journal of Medical Microbiology                      | 21                 |

Fig. 4: Top 10 Journal



Source means journal here, a journal is a collection of articles (like a magazine) that is published regularly throughout the year in a particular subject or discipline. Journal presents the most recent research which is written by experts working in that area. In Table 4 we can see the top 10 journals or sources where universities have published the articles. The highest no. of papers is published in Current Science (43 papers), followed by Liquid crystals (36 Papers) and Advances in Intelligent Systems and Computing (32).

Year Wise Citations

Table 5: Year Wise Citations 2000-2021

| Year  | No. of Citations |
|-------|------------------|
| >2000 | 1                |

|      |     |
|------|-----|
| 2000 | 0   |
| 2001 | 0   |
| 2002 | 8   |
| 2003 | 16  |
| 2004 | 28  |
| 2005 | 37  |
| 2006 | 65  |
| 2007 | 88  |
| 2008 | 127 |
| 2009 | 258 |
| 2010 | 338 |

|      |      |       |       |
|------|------|-------|-------|
| 2011 | 434  | 2017  | 2422  |
| 2012 | 716  | 2018  | 2906  |
| 2013 | 1017 | 2019  | 3580  |
| 2014 | 1174 | 2020  | 4436  |
| 2015 | 1514 | 2021  | 6263  |
| 2016 | 1935 | Total | 27363 |

Fig.5: Year Wise Citations

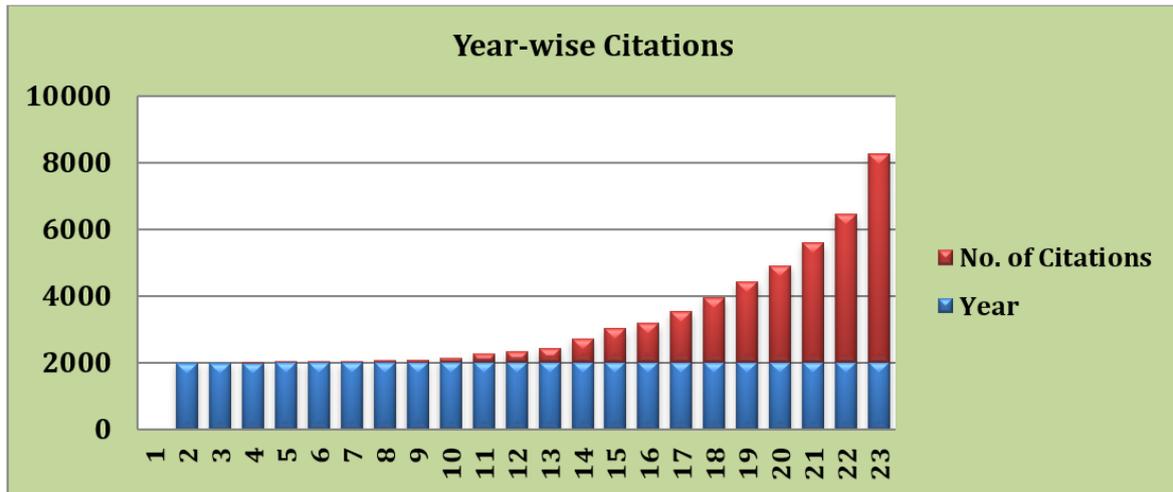


Table 5 indicates that the number of citations has steadily gone up in absolute terms. The highest number of citations i.e 6263, has taken place in the year 2021 constituting 22.88 percent of total citations 27363, followed by 4436 in 2020 and 3580 in 2019.

#### h- Index of Assam University

The h-index of Assam University is 63 (Of the 2925 documents considered for the h-index, 63 have been cited at least 63 times).

#### Open Access Journals

There are four types of Open Access Journals:

1. Gold Open- Journals that only publish open access.
2. Hybrid Gold- Journals that provide authors the choice of publishing open access.
3. Bronze- The published version of the record or manuscript is accepted for publication. The publisher has the choice to provide temporary or permanent free access.

4. Green- The published version of a manuscript accepted for publication, available at the repository.

Table 6: Open Access Journals

| Types of Open Access Journals | No. of Journals |
|-------------------------------|-----------------|
| Gold                          | 338             |
| Hybrid Gold                   | 35              |
| Bronze                        | 205             |
| Green                         | 376             |

It can be seen from table 6 that the highest number of Open Access Journals which was published is in the category of Green (376), followed by Gold (338), Bronze (205) and Hybrid Gold (35) which constitute the lowest number of publications.

Cite Score of Journals

Table 7: Cite Score of Top 10 Journals

| Source  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|------|------|------|------|------|------|------|------|------|------|
| Journal of Pure and Applied Microbiology                      | 0.2  | 0.1  | 0.2  | 0.2  | 0.3  | 0.4  | 0.4  | 0.3  | 0.3  | 0.7  |
| Current Science   | 1.4  | 1.6  | 1.5  | 1.4  | 1.3  | 1.3  | 1.4  | 1.4  | 1.2  | 1.5  |
| Advances in Intelligent Systems and Computing                 | 0.2  | 0.2  | 0.3  | 0.4  | 0.6  | 0.7  | 0.8  | 0.8  | 0.9  |      |
| Liquid Crystals   | 2.7  | 3.1  | 3.3  | 3.8  | 3.8  | 4    | 4.3  | 4.5  | 4.8  | 5.4  |
| AIP Conference Proceedings                                    | 0.3  | 0.4  | 0.4  | 0.4  | 0.6  | 0.4  | 0.4  | 0.5  | 0.6  | 0.7  |
| Indian Journal of Traditional Knowledge                       | 0.9  | 1.3  | 1.6  | 1.2  | 1    | 1.4  | 1.8  | 1.8  | 1.5  | 1.1  |
| International Journal of Pharmacy and Pharmaceutical Sciences | 0.7  | 1.4  | 1.7  | 1.3  | 1.2  |      |      |      |      |      |
| RSC Advances  | 0.1  | 0.9  | 2.2  | 2.7  | 3.5  | 4.1  | 5.5  | 6.5  | 6.5  | 5.9  |
| PLoS ONE  | 4.5  | 4.1  | 4.4  | 5.1  | 5.6  | 5.9  | 5.7  | 5.4  | 5.2  | 5.3  |
| Journal of Environmental Biology                              | 1.4  | 1.5  | 1.4  | 1.3  | 1.2  | 1.2  | 1.2  | 1.3  | 1.3  | 1.3  |

Cite Score is a simple way of measuring the citation impact of sources, such as journals in which research papers have been published, Cite Score establishes the quality of journals in terms of the number of citations. As per 2020 data for the top 10 Journals, Table 7 indicates that RSC Advances has the highest Cite score of 5.9, followed by Liquid Crystals with 5.4 and PLoS ONE with 5.3 CiteScore.

Author Analysis

Table 8: Top 10 Authors

| S. No. | Author Name | No. of |
|--------|-------------|--------|
|--------|-------------|--------|

|       |                   | Articles |
|-------|-------------------|----------|
| 1     | Chakraborty, S.   | 92       |
| 2     | Bhattacharjee, A. | 88       |
| 3     | Das, A.K.         | 86       |
| 4     | Panda, S.K.       | 86       |
| 5     | Roy, S.           | 85       |
| 6     | Roychoudhury, S.  | 85       |
| 7     | Ghosh, S.K.       | 74       |
| 8     | Sarkar, U.        | 74       |
| 9     | Choudhury, M.D.   | 72       |
| 10    | Borah, A.         | 70       |
| Total |                   | 812      |

Fig 8: Top 10 Authors

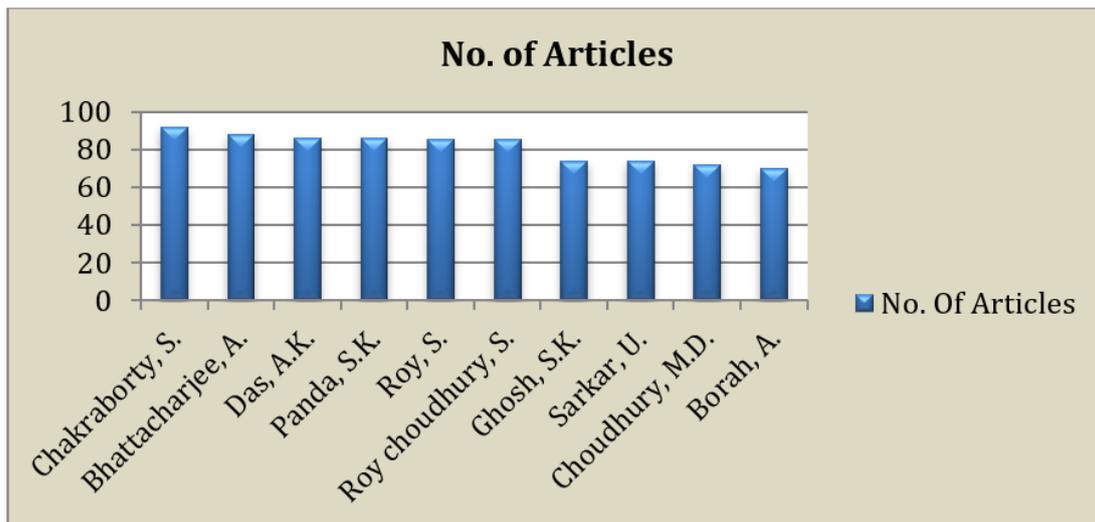


Table 8 indicates that the highest research paper in the university was contributed by Chakraborty, S. with total 92 papers. The second highest number was published by Bhattacharjee, A. with 88 papers, followed by Das, A.K. and Panda, S.K. both had published 86 articles.

Funding Agency

Table 9: Top 10 Funding Agency

| S. No. | Funding Agencies  | No. of Article |
|--------|---|----------------|
| 1      | University Grants Commission  | 178            |
| 2      | Department of Science and Technology, Ministry of Science and Technology, India | 175            |
| 3      | Assam University, Silchar   | 157            |
| 4      | Department of Biotechnology, Ministry of Science and Technology, India          | 123            |
| 5      | Department of Science and Technology, Government of Kerala                      | 88             |
| 6      | University Grants Committee   | 85             |
| 7      | Department of Biotechnology, Government of West Bengal                          | 70             |
| 8      | Science and Engineering Research Board  | 67             |
| 9      | Council of Scientific and Industrial Research, India                            | 55             |
| 10     | Indian Council of Agricultural Research   | 20             |
|        | Total   | 1018           |

Fig 9: Top 10 Funding Agencies

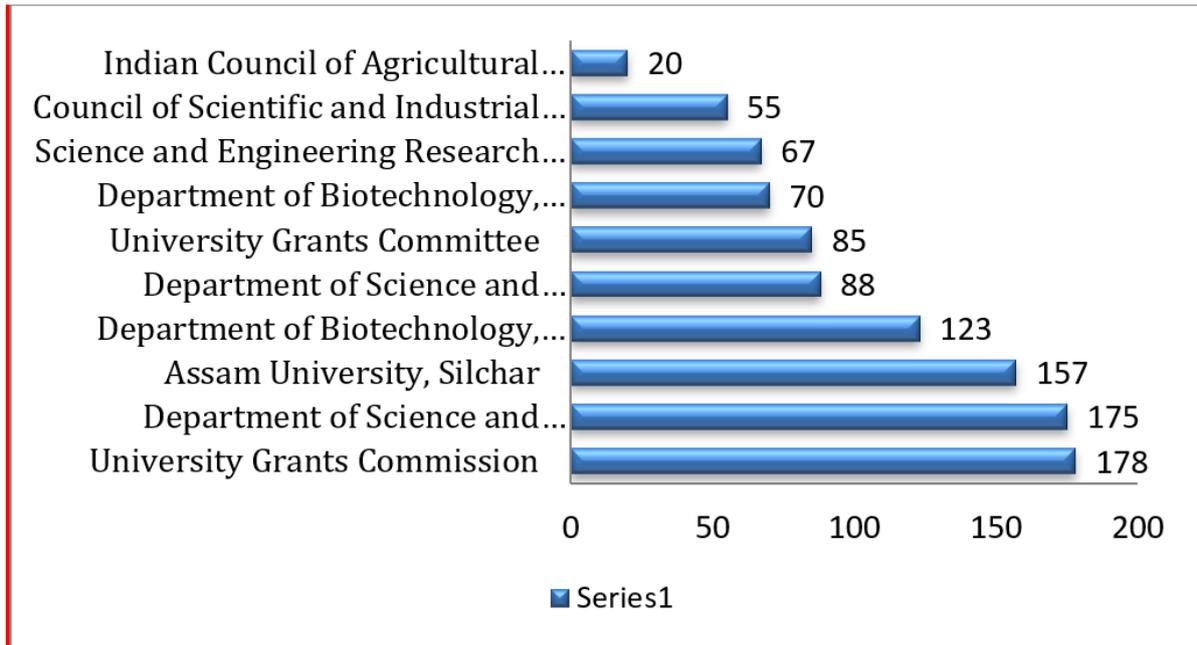


Table 10 shows the top 10 funding agency of the Assam University. The largest source of research funding is the University Grants Commission, India for 178 publications. The second most is the

Department of Science and Technology, Ministry of Science and Technology, India for 175 research papers, followed by Assam University, Silchar for 157 papers.

Collaborating Countries

Table 10: Top 10 Collaborating countries

| S. No. | Collaborating Countries | Collaborations |
|--------|-------------------------|----------------|
| 1      | India                   | 2922           |
| 2      | United States           | 155            |
| 3      | Japan                   | 49             |
| 4      | Slovakia                | 45             |
| 5      | United Kingdom          | 44             |
| 6      | Czech Republic          | 33             |
| 7      | Saudi Arabia            | 33             |
| 8      | South Africa            | 32             |
| 9      | China                   | 29             |
| 10     | France                  | 26             |

Fig 10: Collaborating Countries

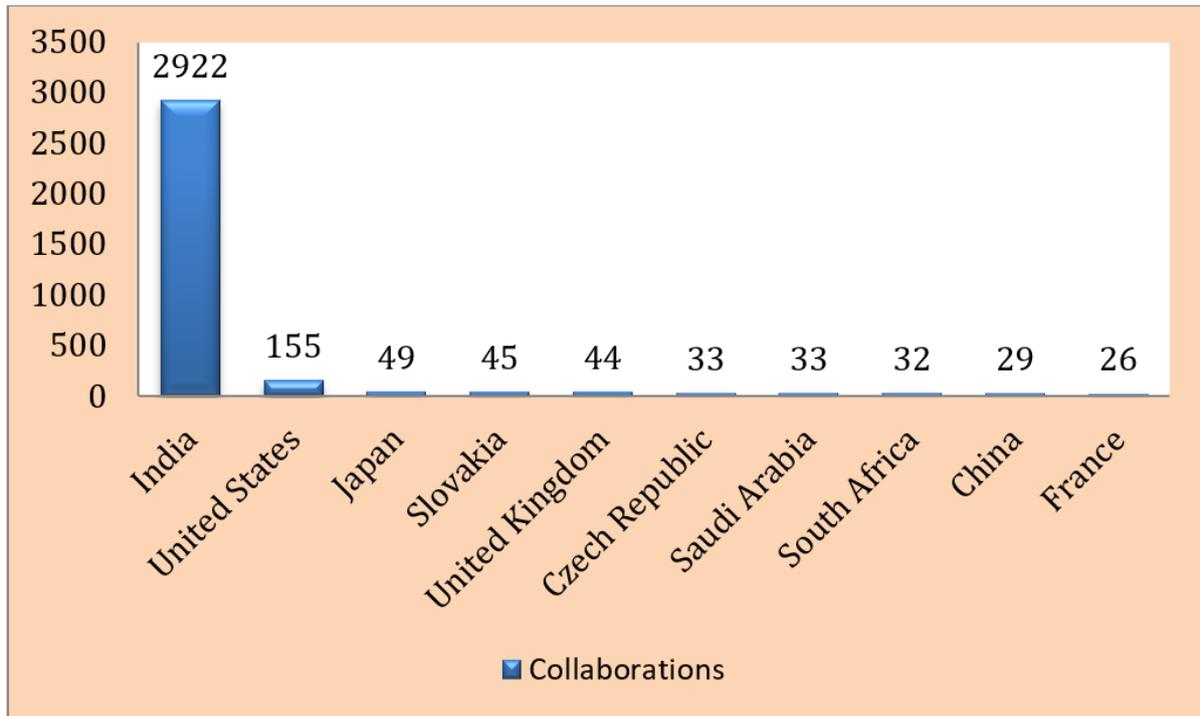


Table 10 shows that the highest no. of research had collaboration with India (2922) because the university is located in India, followed by United States with the 155 research paper being second highest and Japan with 49 research papers out of a total of 2,925 research papers.

Documents by Affiliation/Institutions

Table 11: Top 10 Collaborating Institutions

| Sl. No. | Institutions                              | No. of Articles |
|---------|---|-----------------|
| 1       | Assam University                          | 2925            |
| 2       | Silchar Medical College                   | 77              |
| 3       | National Institute of Technology, Silchar | 59              |
| 4       | Karimganj College                         | 49              |
| 5       | North-Eastern Hill University             | 49              |
| 6       | Assam University, School of Life Sciences | 46              |
| 7       | University of Calcutta                    | 45              |
| 8       | Mizoram University                        | 45              |
| 9       | Gauhati University                        | 43              |
| 10      | Slovak University of Agriculture in Nitra | 42              |

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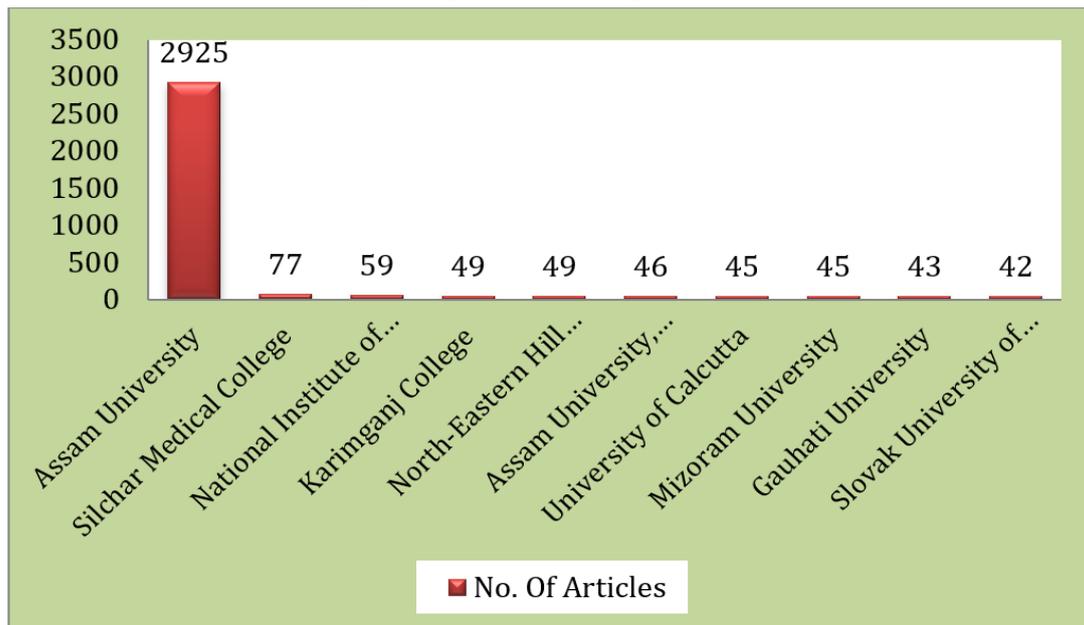


Table 11 indicates that apart from Assam University for which the study was conducted, Silchar Medical College has the highest number of documents with 77 papers, followed by National Institute of Technology, Silchar and Karimganj College as 59 and 49 papers. The total number of collaborating institutions is 160 with Tripura Institute of Technology at the bottom with 4 papers.

## VI. FINDINGS & OBSERVATIONS

### Year-wise growth

A total of 2,925 research output of Assam University can be seen in the Scopus database during the period 2000-2021. It is seen that a maximum of 322 documents was published in the year i.e. 2020 and a minimum of 5 documents was published in the beginning year of the study i.e. 2000.

There has been a constant increase in the number of publications during the period of study.

### Subject wise distribution of the Publication

The highest 574 documents were published in the field of Biochemistry, Genetics and Molecular Biology subject, followed by Agricultural and Biological Sciences with 544 publications, and 434 documents were published in the physics and Astronomy subject area.

### Document type-wise distribution

It was observed out of 2,925 documents, maximum 2216 publications were published in the form of Articles, followed by conference papers with 293 publications and 185 as Review.

### Source Analysis

The total number of journals or sources in which 2925 papers have been published is 149. The results indicate the top 10 journals or sources where universities have published the articles. The highest no. of papers is published in Current Science (43 papers), followed by Liquid crystals (36 Papers) and Advances in Intelligent Systems and Computing (32).

### Year-wise citation

The result indicates that the number of citations has constantly increased during the period of study. The highest number of citations i.e. 6263, has taken place in the year 2021 constituting 22.88 percent of total citations 27363, followed by 4436 in 2020 and 3580 in 2019.

### h- Index of the University

The h-index of Assam University is 63 (Meaning out of 2925 documents considered for the h-index, 63 have been cited at least 63 times).

### Open Access Journals

The highest number of open access journals has been published in the category of Green, followed by Gold, Bronze and Hybrid Gold.

#### Cite Score of journals

CiteScore establishes the quality of journals in terms of the number of citations. As per 2020 data for the top 10 Journals, Table 7 indicates that RSC Advances has the highest Cite score of 5.9, followed by Liquid Crystals with 5.4 and PLoS ONE with 5.3 CiteScore.

#### Author Analysis

Author wise analysis was done to know the eminent authors who have published the maximum number of papers. It was found that the maximum 92 documents were contributed by Chakraborty, S. The second highest number was published by Bhattacharjee, A. with 88 papers, followed by Das, A.K. and Panda, S.K. both had published 86 articles.

#### Funding Agency

An analysis of funding data of Assam University revealed a total of 159 funding agencies have been involved in providing research funds to the total number of 1441 papers of total research output. The largest source of research funding is the University Grants Commission, India which has funded for 178 publications. The second most is the Department of Science and Technology, Ministry of Science and Technology, India for 175 research papers, followed by Assam University, Silchar for 157 papers.

Funding is an important issue for research, and its generous availability is essential for producing quality research. A Funding Agency is an external organization, public or private, which undertakes a contractual agreement with the University to sponsor research or entrepreneurial activity. The funding agency often dictates how their funds may be used, what deliverables are expected, and what reports are required.

#### Collaborating countries

The number of total collaborating countries for the entire Assam University research output is 81 which cover a large part of the globe. It shows that the highest no. of Research were collaborated with India (2922) because the university is located in India but apart from this, there are so many countries which take part in the research paper like the United States with the 157 research paper and followed by Japan with 48 Research paper total of 2925 research papers.

Collaboration in research is an important process and most of the research takes place in collaboration with peers and professional friends across the countries.

#### Collaborating Institutions

In terms of analysis of institutional affiliation apart from Assam University for which the study was conducted, Silchar Medical College has the highest number of documents with 77 papers, followed by National Institute of Technology, Silchar and Karimganj College as 59 and 49 papers. The total number of collaborating institutions is 160 with Tripura Institute of Technology at the bottom with 4 papers.

## VII. CONCLUSION

The purpose of this study was to analyze the research performance of Assam University publications as per the records available in Scopus database for the period of 2000-2021. A total 2,925 records were downloaded from the Scopus database. The study reported the findings to determine the research trends and the year wise growth of literature, document by subject area, document type analysis; source analysis; year wise citations; h-index of the university; open access journals; cite score of journals; top authors and their production; top funding agencies and collaborating countries, top collaborative institutions, etc. The results indicate that there has been a constant growth in the publications of the university. Most of the articles have been published in the subject of Biochemistry, Genetics and Molecular Biology in the form of research articles. The results also indicate the h-index of the university, which is 63 and Chakraborty, S. is the most prolific author and UGC has funded maximum as funding agency towards the research output of the university. It was also found that maximum number of research had collaboration with India and Silchar Medical College had been found as top most collaborating institutions for the research output of Assam University.

Based on the data analysis and findings, it can be concluded that the research profile of Assam University has improved substantially during the last 3 years which has eventually improved its national and international ranking.

Yet another inference that could be drawn from the analysis is that a large amount of research

contributions is merely restricted to few areas and that the remaining faculties and departments have to strengthen their research contributions reasonably in coming years.

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