Research Quality of Tumkur University Publications: An analysis

B Raviivvenkat[a*], Subhash Reddy B[b]
[a]*Deputy Librarian, Tumkur University, Tumakuru Karnataka, India*
[b] *Librarian PES University, Bengaluru Karnataka, India*
**Corresponding authors: basralravi@gmail.com (B Raviivvenkat), subhashreddy@pes.edu (Subhash Reddy B)*

Abstract. *The present study is on the research contribution of faculty and researchers of Tumkur University from 2005 to 2019. The university was established in the year 2004; the academic and research activities started in the year 2005, and the comprehensive study was done by considering the contribution. The study covers the number of articles published, growth in this period, collaboration pattern, and highly cited papers. More collaboration is found with science and the technology-related institution at the national level, and Taiwan and Canada are the most preferred collaborative destinations. Highly cited papers are located in the Journal of Alloys and Compounds. The contribution of Social Science and Humanities is less than the Science Faculty.*

Keywords: Tumkur University; Research Output; Higher Education; Scopus; NIRF.

Received: 21 July 2021, Revised 1 September 2021, Accepted 14 September 2021

DOI: 10.6025/stm/2021/3/148-155

1. Introduction

There are yardsticks in every field in this competitive world, and the education sector is no exception. Higher E-education plays a vital role in the performance of human resources in research, technology, and industry. MHRD of Govt. of India is putting more impetus on the contribution of the institutions, where it also funds the institutions for academic and research purposes; it also expects each institution's contribution to the country/society. The National Institution of Ranking Framework was established by MHRD, which came into force on 29th September 2015. This framework outlines a methodology to rank institutions across the country. The parameters broadly cover "Teaching, Learning and Resources," "Research and Professional Practices," "Graduation Outcomes," "Outreach and Inclusivity," and "Perception."

Since 2016 the ranking has been done. The latest is the 2020 rankings. In 2016 among 100 Universities ranked, only five universities from Karnataka were ranked. One from the Govt. sector was the Indian Institute of Science. In 2017, among ten institutions, 03 were from Govt.; in 2018, among 13 institutions, 05 were from Govt. In 2019 among 13 institutions, 06 were from Government, and in 2020, among 16 institutions, 06 were from the Government. This shows an increase in recognition of Govt. funded institutions in the framework reciprocally; this indicates an increase in research parameters related to the quality of publications, combined metric of publications, patents, and projects. Tumkur University, which is 15 years old started in the year 2004, is young among state-run universities in

Karnataka. But the researchers and faculty are proactive in their contribution by publishing research in reputed and more impact factor indicating journals. The present study attempts to trace the contribution from 2004 to2019 cited in the Scopus database. Six hundred ninety-nine documents showing the affiliation to Tumkur University were mapped.

2. Review of Literature

Numerous scientific publications are available in Scientometrics to determine the research trends and growth rate of scientific publications and identify collaboration patterns and research areas. Among them, few relevant publications in scientific production in universities are identified and reviewed. To identify the growth rate of scientific production [14] analyzed research publications from 1971 to 2010 of Jawaharlal Nehru University and found that the publication rate dipped from

1991 to 2010, while the preference for joint authorship gradually increased between 1971 to 2011. They also found that international collaboration was higher, but failed to show the duration. [5] studied the impact of Guru Nanak Dev University research publications in Physics and astronomy from 2006-to 15 and found an annual average growth rate of 9.6 %. [13] studied the growth of publication of Haryana Agricultural University and found that the growth rate of publication was gradually increased, but the average citation fluctuated and showed a declining trend. A high level of authors' collaboration was found at national and international levels. During the same time, [8] analyzed the research performance of Khalifa University, Abu Dhabi, and found the lower rate of growth during 2016 & 2017 and recommended identifying the reason for less scientific production. Further, it was identified that the majority of literature internationally collaborated. Citation patterns were also highlighted and compared with other universities in the region. [6] Compared to the scientific production of Karnatak University with that of the other university of Karnataka. The study used the ten years of publications output from the Scopus database from1999-2008. Karnatak University's H-Index was higher despite lower scientific production. Using the survey method [1] compared the scientific production of library and information science faculty of Punjab University and Guru Nanak Dev University. It found that the Relative Growth Rate (RGR) of publication was inconsistent and proved that the higher the RGR lower the Doubling Time (Dt) for publications. Additionally, I analyzed the degree of collaboration and authorship pattern. Further, to analyze the growth pattern of the scientific production of the six universities of Tamil Nadu (Batcha, 2018), the publication from 2000 – to 2017 and observed the constant growth of literature and citation rate. The study revealed that universities had a good collaboration with the USA and South Korea. Articles with international collaboration were highly cited. (Ranjbar-Pirmousa, 2019) compared the scientific output of the medical university published from 2012 to 2016 using SciVal and found that Mazandaran University has the highest scientific output with the highest citation rate and inferred that the citation rate is directly related Field-Weighted Citation Impact. [6] analyzed the subject area of research output of Karnatak University and found that contribution to- wards physical Science, especially in the subject area of Physics and chemistry, is higher among all universities. Research by [14] revealed that at Jawaharlal Nehru University, publications on Science and technology were higher. Research by (Noruzi & Ad-dekhoda, 2013) revealed that major research areas at the universities of Kurdistan, Iraqi Region is Medicine and Engineering. Further, [7] identified the main areas of research in the universities under the jurisdiction of Tamil Nadu and found that state-funded universities researched pure sciences. In contrast, deemed universities were increasingly concentrated on engineering and pharmacology. They also identified three papers with more than 1000 citations each. They concluded that, although deemed universities establishment in the recent past, the scientific production is equal to decades-old state universities. Intending to identify research areas [8] analyzed the scientific production of Khalifa University, Abu Dhabi. They identified the major research areas and sub-areas using the subject category in the Scopus database however did not represent the keyword analysis. [4] Finnish universities' research output identified more citations in OA: Social Sciences but fewer in Medicine and Health Sciences. [2] analyzed paper on the Scientific production of 189 countries, the result was how research performance measures are associated with the wealth of countries and territories. [12] A Study of collaboration effects across the Chinese region indicated that Scientifically vulnerable regions benefit from more concentrated collaborations. [3] A Study on ranking based on the multidimensional prestige of influential fields of Spanish universities indicates that human and social Science is important to research profile. [10] A Case study of five US universities' input-output analysis showed increased citation and academic impact due to international research collaboration. [11] A Metric study of Michigan University's engagement with Africa showed strong quantitative evidence of scholarly success in Science, technology, engineering, and math-related disciplines.

3. Objectives of the Study

The study has been designed to address productivity-based issues.

The form or type of documents used for communication enables us to understand the process behind the research work and how the publications show the trend of increase/decrease of papers over a given time. We also intend to know the collaboration trend and the extent of such collaboration at the institutional. Regional and international level. How the researchers form the collaboration network is interesting to observe, and this kind of focus enables the study. Authorship studies have an impact on understanding collaboration and productivity of them. The platform preferred by researchers is significant to know. Identifying authors who contribute to the development of science is a part of the scientometric analysis, and such an analysis will contribute to the literature. Institutional contribution assessment helps to rank the institutions promoting science in a country. We thus planned to carry out the above exercises in this work.

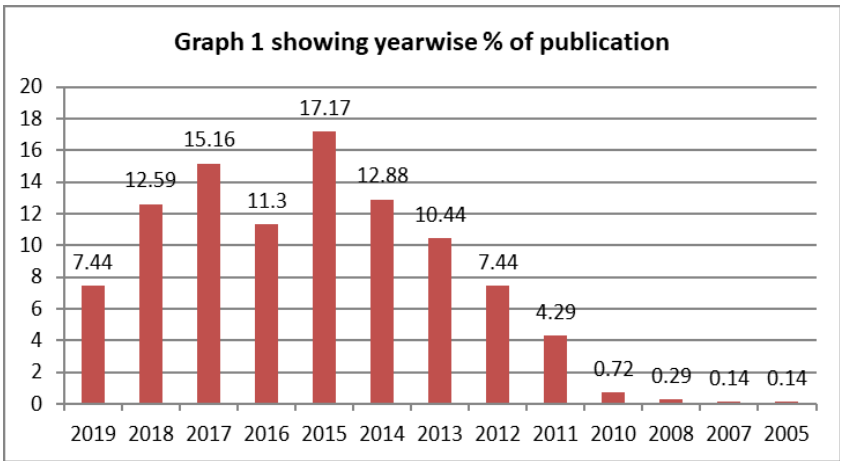
4. Methodology:

The methodology consisted of downloading data from the Scopus database for 2005-2019. The search strategy consisted of entering the keyword Tumkur University under the name of the University and the Address tag. The bibliographic structure consisted of the author, Author(s) ID, document title, year, Source title, Volume, issue, pages, Article Number, DOI, link, Source, and EID.

5. Results and Discussion

The following analysis of the researchers' publications from 2005 to 2019 shows that the total output of research is 699, including journal articles, proceedings, book chapters, etc. The total No of documents published in this period is 699. Table 1 shows the overall publications from 2005 to 2019; in this, it has been found that the maximum number of publications in 2015 is 120 (17.17%), followed by 106 in 2017 (15.16%), 90 (12.88%) in the year 2014, 90(12.59%), in 2018, 88 (12.59%). This shows that research was higher in 2015, and at least 01(0.14%) were published in 2005 and 2007 when the university was in the initial stage. There was an increase from 2010 to 2015, but the decrease happened in 2016, but it increased in 2017. More than a 10% increase was found between 2013 to 2018. During this period, more P.hDs have been awarded by the university.

Sl.No.	Year of Publication	No. of Articles	Percentage (%)
1	2019	52	7.44
2	2018	88	12.59
3	2017	106	15.16
4	2016	79	11.30
5	2015	120	17.17
6	2014	90	12.88
7	2013	73	10.44
8	2012	52	7.44
9	2011	30	4.29
10	2010	05	0.72
11	2008	02	0.29
12	2007	01	0.14
13	2005	01	0.14
Total		**699**	**100**



Publications in Journal articles constitute 83. 12% Followed by conference proceedings, review articles, and books. This reflects that the researchers preferred to disseminate their research through journals that contribute more than 80% compared to the others.

Researchers frequently attend seminars/conferences to update their knowledge. During this period, they like to showcase their research to their fraternity. The researchers' contributions are found more in the Subscribed based Journals.

Table 2:

Sl.No.	Type of Access	No.	Percentage (%)
1.	Subscription based Journals	548	78.40
2.	Open Access	151	21.60
Total		**699**	**100**

The study of Table 2 shows that University research contributions are found in subscription-based journals 548(78.40%), in open access 151(21.60%). The trend today is on open access, but still, the researchers prefer to publish in the paid publication, in which the majority are from reputed publishers. Today there is a trend in collaborative research; the researchers like to collaborate with premier institutions where the research contribution gets more recognition than the individual level.

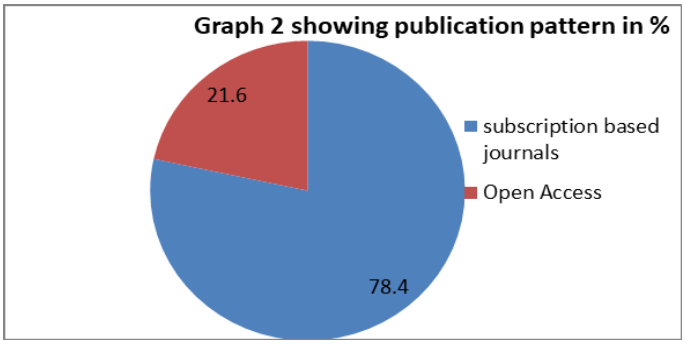


Table 3: Collaboration- Indian Institutions

Sl. No.	Institution	No.	Percentage
1	B.M.S. Institute of Technology,	141	12.42
2	University of Mysore	137	12.07
3	M.S. Ramaiah University	126	11.10
4	East West Institute of Technology,	103	9.07
5	Indian Institute of Science	103	9.07
6	Dayananda Sagar University,	83	7.31
7	Bangalore University	70	6.17
8	National Aerospace Laboratories(NAL) Bengaluru	52	4.58
9	Acharya Institute of Technology	50	4.41
10	Jain University	50	4.41
11	Bharathiar University	43	3.79
12	Siddaganga Institute of Technology	39	3.44
13	Chattisgarh Swami Vivekananda Technical University,	38	3.35
14	LalBahadurShastri First Grade Govt College, Bengaluru	33	2.91
15	R.V. College of Engineering-	31	2.73
16	Sri Venkateshwara University	21	1.85
17	JNTUAnanthapur, AP	15	1.32
Total	**1135**		**100**

Many factors influence collaboration at the National and Regional levels. Table 3 indicates the list of collaborations with 15 top Indian institutions from 2005 to2019. The research profile of the University includes 62 Research projects from various funding agencies such as the Indian Space Research Organization (ISRO), Department of Science and Technology (DST), Science and Engineering Research Board (SERB), UGC, ICSSR, ICHR, Vision Group on Science and Technology (VGST), Government of Karnataka, and the British Council, etc. The authors of the research projects are mainly from Physics, Chemistry, Bio-Chemistry, and Material Science, collaborating with like-minded researchers. BMS Institute of Technology, MS Ramaiah University, East-West Inst. Tech. (Physics). The University has established Prof. C.N. R Rao Centre of Advanced Materials, which has influenced collaboration with National Level Research Institutions like the Indian Institute of Science and the National Aeronautical Laboratory. The research exchange program influenced collaboration with Bharathiar University, University of Hyderabad (Tamil Nadu, Andhra).

Table 3A Collaboration-Foreign Institutions

Sl. No.	Institution	No.	Percentage
1	National Dong Hwa University, Hualien, Taiwan	11	20.4
2	University of Manitoba, Winnipeg R3E 3P4, Canada	11	20.4
3	University of Novi Sad, Faculty of Sciences, , Serbia	6	11.11
4	Gyeongnam National University of Science and Technology, , Korea	4	7.40
5	Darmstadt University of Technology,Germany	4	7.40
6	Petersenstrasse 23, D-64287 Darmstadt, Germany,	4	7.40
7	University of Cambridge, United Kingdom,	4	7.40
8	University of Western Australia, Australia	4	7.40
9	Institute of Chemistry, UFRGS, Brasil	3	5.55
10	University of Parma, Italy	3	5.55
Total	**54**		**100**

National Dong Hwa University in Taiwan and the University of Manitoba, Canada have equally contributed with 11(20.37%), followed by the University of Novi Sad, Serbia, 6 (11.11%), Gyenognam National University, Korea, 4(5.71%). The analysis of the collaboration of authors indicated that out of 699 articles, 52 are contributed by more than one author, who is 7.43% of the remaining are contributed by more than two authors.

The visit of Noble Laureates (Chemistry, Physics) to the University has opened up more gateway for International collaboration, mainly in the area of Chemistry and Physics, the University of Novi Sad, Serbia Gyeongnam National University of Science and Technology, Korea, Darmstadt University of Technology, Germany, Petersenstrasse 23, D-64287 Darmstadt, Germany, Institute of Chemistry, UFRGS, Brasil. (Chemistry), National Dong Hwa University, Hualien, Taiwan. (Physics), the University of Manitoba, Winnipeg R3E 3P4, Canada, & University of Cambridge, United Kingdom(Biochemistry-faculty with individual patent), Mathematics department has collaborated with the University of Parma, Italy.

The analysis of the collaboration of authors indicated that out of 699 articles, 52 are contributed by more than one author, who is 7.43% of the remaining are contributed by more than two authors. This shows that there is a trend of more collaboration with more authors and institutions s mapped for the top-cited journals, where the total cited by ten journal articles is 919.

Acta-Crystallographica Section E: Structure Reports Online (Open Access) tops the ranking with 63(18.37%) is the most preferred by the researchers, followed by *Spectrochimica Acta - Part A: Molecular* and *Biomolecular Spectroscopy* 50(14.58). The mapping of the journal ranking indicates that out of 15 top-ranking journals, 09 are from Elsevier, and 06 are from the Academic & Research Society. Interestingly, one social science-related journal, *Economic and Political Weekly*, is ranked among the 15 journals. This shows that if a researcher contributes to a reputed journal, it will be cited in the premier databases.

The mapping showed that the majority of the journals are related to Chemistry, Material Science, and Optics related, and more number of articles 80(23.3%) are published in *Acta Crystallographica Section E: Structure Reports Online* and *Acta Crystallographica Section E: Crystallographic Communications* are published by International Union of Crystallography, England.

conductorProcessing

Table 5. Top Cited Articles

Sl. No.	Author	Title	Year	Journal	Vol. No, Issue	Cited frequency
1	Reddy, A.J., Kokila, M.K., Nagabhu shana, H., Chakradhar, R.P.S., Shivakumara, C., Rao, J.L., Nagabhushana, B.M.	Structural, optical and EPR studies on ZnO:Cunano powders preparedvia low temperature solutioncombustion synthesis	2011	Journal ofAlloys and Compounds	50 9	165
2	Suresh, D., Nethravathi, P.C., Udayabhanu, Rajanaika, H.,Nagabhushana, H., Sharma,S.C.	Green synthesis of multifunctional zinc oxide (ZnO) nanoparticlesusing Cassia fistula plant extractand their photode gradative,antioxidant and antibacterial activities	2015	Materials Science inSemi conductor Processing	3, 1	98
3	Dhananjaya, N., Nagabhushana, H., Nagabhushana, B.M.,Rudraswamy, B., Shivakumara, C., Chakradhar,R.P.S.	Effect of Li+-ion on enhancement of photoluminescence in Gd :Eu3+nanophosphors prepared bycombustion technique	2011	Journal ofAlloys and Compounds	5, 9	96
4	Reddy, A.J., Kokila, M.K., Nagabhushana, H., Rao, J.L., Shivakumara, C., Nagabhushana, B.M.,Chakradhar, R.P.S.	Combustion synthesis, characterization and Ramanstudies of ZnOnanopowders Systems biology-based approaches toward understanding droughttolerance in food crops	2011	SpectrochimicaActa - PartA: MolecularAnd BiomolecularSpectroscopy	8, 1	88
5	Jogaiah, S., Govind, S.R., Tran, L.-S.P.	Systems biology-based approaches toward understanding drought tolerance in food crops	2013	Critical Reviews i n Biotechnology	33 85	
6	Hari Krishna, R., Nagabhushana, B.M., Nagabhushana, H., Murthy, N.S, Sharma, S.C., Shivakumara, C., Chakradhar, R.P.S.	Effect of calcination temperature on structural, photoluminescence,and thermoluminescence properties of Y203 :Eu 3+ nanophosphor	2013	Journal of Physical Chemistry C	11, 7	85
7	Naik, R., Prashantha, S.C., Nagabhushana, H., Sharma,S.C., Nagabhushana, B.M.,	Low temperature synthesis and photoluminescence properties ofred emitting Mg :Eu 3+	2014	Sensors and Actuators, B:Chemical	19 , 5	65

The article published in *Journal of Alloys and Compounds* 2011 cited is 165, *Materials Science in Semiconductor Processing* is 98, the third highly cited paper is also from Journal of Alloys and Compound 2011 cited is 98 (article title different), authors are common in 09 cited papers. The contribution of university faculty in the *Journal of Alloys and compounds* (2011) total cited is 261 common authors in these two papers are Nagabushana, Nagabushana. Chakradhar, and Shivakurmara. Nagabushana (Physics and Material Science), Sharma (Chemistry), and Girish (Bio-chemistry). Nagabushana contributed 52 papers to 699 articles; their single paper is cited 85 times. It is interesting to note that articles from the same journal and published in the year have been cited more by the faculty of the Dept. of Physics-related to Nanoparticles.

Subject Contribution:

The analysis of 699 documents showed that the research areas covered are Biochemistry, Biotechnology, Chemical Sciences, Library and Information Science, Material Science, Mathematics Nanoscience, Physics, Education, and English Literature. Physics and chemistry have collaborated in many research articles.

6. Findings:

It has been found that the maximum number of publications is in 2015 compared to the other years.
- a Maximum number of contributions is found in journal articles.
- B.M.S. Institute of Technology tops in ranking with collaboration compared to the other institutions at the national level.
- National Dong Hwa University, Taiwan, and University of Manitoba, Canada ranks at the top regarding collaboration at the International level.
- the Maximum number of articles is a collaboration of more than two authors.
- More articles are found in the paid publications than the open access.
- Highest number of articles contributed by the researchers are found in the open-access journal *Acta Crystallographica Section* E: Structure Reports Online
- Highly cited paper is found in the Journal of Alloys and Compounds.
- Among 15 Journals, more than 50% contributed to the Elsevier publications
- One Social Science related journal is ranked among the 15 top journals.

7. Suggestions

· The Tumkur University Research policy should adopt incentive schemes for faculty for publishing in high impact factor and quality journals.

· The open access publishing by the faculty to be recognized and encouraged and more awareness training programs related to open access, a social network for both science and social science faculty consistently be imparted.

8. Conclusion

The study has been carried out by analyzing a premier bibliographic database with comprehensive coverage of all disciplines. The science-related research is the university's contribution compared to social science and humanities. The growth was steady from 2010 to 2015, but it decreased in 2016 and increased in 2017. But in 2018 and 2019, there is a decreasing trend.

The research contributes to being maintained consistently, as there is a trend of ranking of institutions. The faculty and researchers of social science and humanities should put more effort into publishing in reputed journals with more impact factors indexed in premier databases. This leads to more research output and balanced research visibility of the institution at the ranking level. Today the trend is open-access publishing, so the role of the information professionals is to bring awareness for the faculty to publish in indexed journals, available in the Directory of Open Access Journals, and also bring them aware of the predatory journals which have mushroomed in the academic scenario, even though the number is important but in the end the quality matters.

References

1] Chakravarty, R., Sharma, J. (2016). Comparing Research Output in Library & Information Science: A Bibliometric Study of Panjab University and Guru Nanak Dev University. *International Journal of Knowledge Management and Practices*. 4(1), 2016. url: https://dx.doi.org/10. 21863/ijkmp/2016.4.1.015, doi: 10.21863/ijkmp/ 2016.4.1.015.

[2] Docampo, D., Bessoule, JJ.(2019) A new approach to the analysis and evaluation of the research output of countries and institutions. *Scientometrics*. 119, 1207–1225 (2019). https://doi.org/10.1007/s11192-019-03089-w

[3] García, J.A., Rodriguez-Sánchez, R., Fdez-Valdivia, J. et al. Ranking of research output of universities on the basis of the multidimensional prestige of influential fields: Spanish universities as a case of study. *Scientometrics.* 93, 1081–1099 (2012). https://doi.org/10.1007/s11192-012-0740-7

[4] Holmberg, K., Hedman, J., Bowman, T.D. et al.)2020) Do articles in open access journals have more frequent altmetric activity than articles in subscription-based journals? An investigation of the research output of Finnish universities. *Scientometrics.* 122, 645–659 (2020). https://doi.org/10.1007/s11192-019-03301-x

[5] Khanna, S., Singh, N.K., Tewari, D., Saini, H.S. Scientometric analysis of the research output of physics and astronomy of Guru Nanak Dev University during 2006-15. *DESIDOC Journal of Library and Information Technology.* 37(5), 2017, 337–345.

6] Kumbar, B.D., Gupta, B.M. (2013). Contribution of Karnataka University in science & technology: Research output and citation impact during 2001-10. *DESIDOC Journal of Library and Information Technology.* 33 (2) 114–124.

[7] Mathew, K.S., Sheeja, N.K., Cherukodan, S. Research output of universities in Tamil Nadu: An analysis based on scopus database. *International Journal of Information Dissemination and Technology.* 8(1), 2018, 1–1. url: https://dx.doi. org/10.5958/2249-5576.2018.00001.8, doi: 10. 5958/2249-5576.2018.00001.8.

[8] Moradimoghadam, H., Khademi, R., Keshavarz, H. 2019. url: https://doi.org/10.22055/ slis.2017.21535.1325.
Mukundan, R.,Narayanan, N. Research performance of Khalifa University of Science and Technology, Abu Dhabi. *Performance Measurement and Metrics.* 21(1), 2019, 52–64. https://dx.doi.org/10.1108/pmm-06-2019- 0022, doi: 10.1108/pmm-06-2019-0022.

10] Payumo, J., Sutton, T., Brown, D. et al. Input–output analysis of international research collaborations: a case study of five U.S. universities. *Scientometrics* 111, 1657–1671 (2017). https://doi.org/10.1007/s11192-017-2313-2

11] Payumo, J.G., Monson, J., Jamison, A. et al. Metrics-based profiling of university research engagement with Africa: research management, gender, and internationalization perspective. *Scientometrics.* 121, 675–698 (2019). https://doi.org/

12] Scarazzati, S., Wang, L. The effect of collaborations on scientific research output: the case of nanoscience in Chinese regions. *Scientometrics.* 121, 839–868 (2019). https://doi.org/10.1007/s11192-019-03220-x

13] Siwach, A.K., Parmar, S. Research Contributions of CCS Haryana Agricultural University, Hisar : A Bibliometric Analysis. *DESIDOC Journal of Library & Information Technology.* 3 8(5)2018, 334–334. https://dx.doi.org/10.14429/ djlit.38.5.13188, doi: 10.14429/djlit.38.5.13188.

14] Tripathi, M.,Kumar, S. A Quantitative Analysis of Research Output of Jawaharlal Nehru University. *International Information and Library Review*. 47(1-2), 2015, 39–51.