International Journal of Academic Research and Development
www.allstudiesjournal.com
ISSN: 2455-4197
Received: 09-06-2025, Accepted: 09-07-2025, Published: 24-07-2025
Volume 10, Issue 4, 2025, Page No. 39-45

Research output of Scientometrics: A Scientometric study

Kale Asha Kishor[1], Dr. Vaishali Khaparde[2]
[1] Research Scholar, Department of Library & Information Science, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar, Maharashtra, India
[2] Senior Professor and Head, Department of Library & Information Science, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar, Maharashtra, India

Abstract
The Study Is Based on The Scientometrics Analysis Of 1962 Research Articles Published During the Periods Of 2018 - 2022. This Study Will Review on Year Wise AGR AND Arog Distribution, Year- Wise Degree of Collaboration of Articles, Authorship Per-Capita Analysis, To Identify Type Document -Wise Distribution of Articles, Co-Author Pattern Wise, Country-Wise Distribution, Collaborative Index, Collaborative Coefficient, Year Wise Relative Growth Rate and Doubling Timing Etc. And Further It Reveals Majorities 1962 Articles Are Published by Indian Countries and Alternative Countries.

Keywords: Scientometrics, springer link, authorship.

Introduction

Scientometrics is a monthly peer-reviewed academic journal covering the field of scientometrics It publishes original studies, short communications, review papers, letters to the editor, and book reviews. It is published by Akadémiai Kiadó and Springer. Science+Business Media and was established in 1978. Its founder and first editor-in-chief was Tibor Braun.

The (Scientrometrics) search engine (which indexes all scientometrics journal material published from 1978 to present) is freely available to all users.

Definational Analysis

1. Scientometric analysis

The term Scientometrics was widely recognized for the publication of the journal "Scientometrics" by Tibor Braun in Hungary in 1978. It is the study of measurement and innovation. The main research topics include impact measurement, series of reference articles to investigate the impact of journals and institutions, the understanding of scientific citations, the mapping of scientific fields and the production of indicators to be used in political contexts and management. In practice, there is a significant overlap between scientometry and other scientific fields, such as bibliometry.

According to bankapur, M.B. and Kumabar, (1993) [2] "Scientometrics is a more general that Bibliometrics. It is interesting to know, that both disciplines have a large overlap. It is surprised to learn certain comments stating that both disciplines have a large overlap. It is surprised to learn certain comments stating that Scientometrics, using Bibliometrics techniques id a part of Bibliometrics"

2. Scientometrics journal

Scientometrics is a monthly peer-reviewed academic journal covering the field of scientometrics. It is published by Akadémiai Kiadó and Springer Science+Business Media and was established in 1978. Its founder and first editor-in-chief was Tibor Braun scientometrics Journal imapact factor is (3.238) 2020.

Scientometrics is the field of study which concerns itself with measuring and analysing scholarly literature. Scientometrics is a sub-field of informetrics. Major research issues include the measurement of the impact of research papers and academic journals, the understanding of scientific citations, and the use of such measurements in policy and management contexts. In practice there is a significant overlap between scientometrics and other scientific fields such as information systems, information science, science of science policy, sociology of science, and meta science. Critics have argued that over-reliance on scientometrics has created a system of perverse incentives, producing a publish or perish environment that leads to low-quality research.

Modern scientometrics is mostly based on the work of Derek J. de Solla Price and Eugene Garfield. The latter created the Science Citation Index and founded the Institute for Scientific Information which is heavily used for scientometric analysis. A dedicated academic journal, Scientometrics, was established in 1978. The industrialization of science increased the number of publications and research outcomes and the rise of the computers allowed effective analysis of this data. While the sociology of science focused on the behavior of scientists, scientometrics focused on the analysis of publications. Accordingly, scientometrics is also referred to as the scientific and empirical study of science and its outcomes. Scientometrics is published by Springer Netherlands. It's publishing house is located in Netherlands. Coverage history of this journal is as following:1978-2022.

Springer Link (Publisher)

Springer is one of the world's major suppliers of scientific and professional information. It is the highest publisher of journals in the science, technology, and medicine (STM), the largest publisher of STM books. Springer Link publishes around 2,000 journals and more than 7,000 new book titles every year, in 6 main publishing fields, namely science, technology, medicine, business, transport and architecture.

This is a better data source for researchers in academic and corporate institutions and other vital knowledge centers. It provides information with fast, reliable, and powerful access 24 hours a day. Members of UGC-INFONET Digital Library Consortium Programme can access of more than 1,763 e-journals for Springer.

Julius Springer founded Springer-Verlag in Berlin in 1842 and his son Ferdinand Springer grew it from a small firm of 4 employees into Germany's then second largest academic publisher with 65 staff in 1872.

Methodology

Methodology means study of method or a system of methods and rule applicant to research or work. It is connected basically with what principles and technique to be follow for collecting data information and material for a given research project. (Kothari, 1990). For the present study quantitative research method is used.

Review of Literature

Khaparde V S (2011) [7, 8] she studied the pattern of information use by researcher in the field of library and information science. It is based on the references. appended to International Journal of "Library Hi Tech" during 2005-2009. The present study is based on 3876 references appended to 247 articles contributed by the authors in Library Hi Tech. In Authorship pattern it was found that Solo Research is Predominant than Collaborative Research. The degree of research collaboration was calculated and it was found that the single authorship trend increased gradually in Library Hi Tech.

Pranali S. Waghmare Dr. Vaishali Khaparde (June 2016) The present study attempts on the Scientometric analysis of Journal Collection Building. It is based on the references appended to International Journal of "Collection building" during 2010-2014. The present study is based on 1665 references appended to 105 articles contributed by the authors in Collection Building. It was found that journals citations are more in number than the other citations. In authorship pattern it was found that solo research is predominant then collaborative research. The study shows the period of Collection building is 5 years approximately

Kale Asha Kishor, Khaparde Vaishali (2022) [9] The study is based on the Scientometrics analysis of 532 research articles published during the period of 2017-2021. This Study will review on Reletive growth rate, Collabrative Index in Stem Cell and regenerative medicine, Co - Authorship Pattern of contribution, no of Author wise distribution, Author Producvity, degree of collaboration, country-wise distribution, document type distribution, the findings must reveal various aspects of the characteristics and patterns of contributions of the study.

Objectives of Study

The present study main aim is to find the output of Scientometrics research publications which is available in Springer link Database during the period 2018 to 2022. Following are the specific objectives of this study:

1. To study the Annual Growth Rate (AGR) And (AROG) of Articles with Year- Wise Distribution of Articles.
2. To examine the Relative Growth Rate (RT) and Doubling Time (DT) of Articles.
3. To determine the Year- Wise Degree of Collaboration of Articles.
   3.1 To distributing Authorship Per capita Productivity.
   3.2 To find out Co - Authorship Pattern of contribution
   3.3 To analyze the Authorship Pattern and assess the Collaborative Index (CI) of Articles.
   3.4 To analyze the Authorship Pattern and assess the Collaborative Co-efficient (CC).
4. To examine the Document Type- Wise Distribution of Articles.
5. To find out country-wise distribution of publication.

Scope and Limitation of the Study

The present study is based on Scientometric Study.The scope of the present study is limited to the 1962 articles covered on 'Research Output of Scientometrics: A Scientometric Study on Springer link Database during the year (2018-2022).

Analysis of Data

A study analyzed the output of scientometric, including 1962 articles,6679 countries, organizations from the years 2018 to 2022. The main findings of the study are summarized in the accompanying tables, figures, and graphs. The analysis will be done as per the parameters laid down in the objectives of the study.

Data Collection

A Scientometric study of total 1962 articles where collected & was analyzed as per the objective laid down as well as by using various statistical tools.

Annual Growth Rate (AGR) and Year- Wise Distribution of Articles

Table No.1 and Figure No.1 shows the year- wise distribution of articles and their annual growth rate of publications on "Scientometrics" collected from Springer link (database) during the year 2018 to 2022.The highest number of contributions 445 (22.68%) was published in 2020 while the lowest number 307 (15.65%) of research contributions in the year of 2019. The second highest number of research contributions 409 (20.85%) was published in 2021. It reflects the growth of publication increasing from 2018 to 2022.On the other side it has been seen that the maximum AGR (44.95) recorded in the Year 2020 and the Minimum AGR (-23.44) recorded in the Year 2021. The formula proposed by Kumar and Kaliyaperumal (2015) is utilized to calculate the Annual Growth Rate (AGR). $\underline{AGR} = \underline{\text{End Value} - \text{First Value}}$

$First\ Value\ X\ 100$

Table also depict the ARoG (Annual Ratio of Growth) of publications. In the Year 2021 (1.31) maximum ARoG recorded and minimum in the Year 2022 (1.02).

Annual Ratio of Growth (ARoG) calculated with the formula,

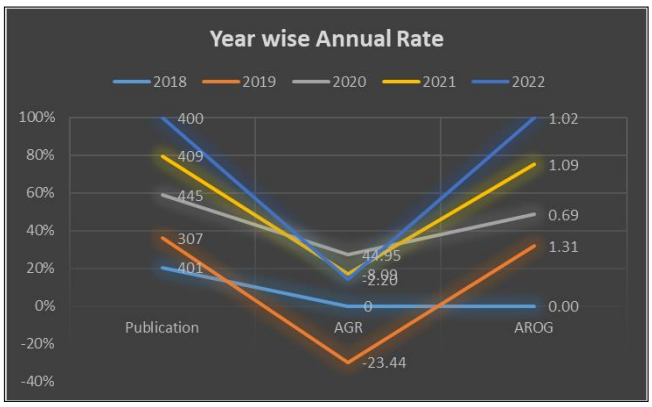
$ARoG = \underline{\text{Last Year Output}}$

$Current\ Year\ Output$

Table 1: Year- Wise Distribution &Annual Growth of Publications

Sr. No.	Year	Publication	Percent	AGR	AROG
1	2018	401	20.44	0	0.00
2	2019	307	15.65	-23.44	1.31

3	2020	445	22.68	44.95	0.69
4	2021	409	20.85	-8.09	1.09
5	2022	400	20.39	-2.20	1.02
Total		1962	100.00		



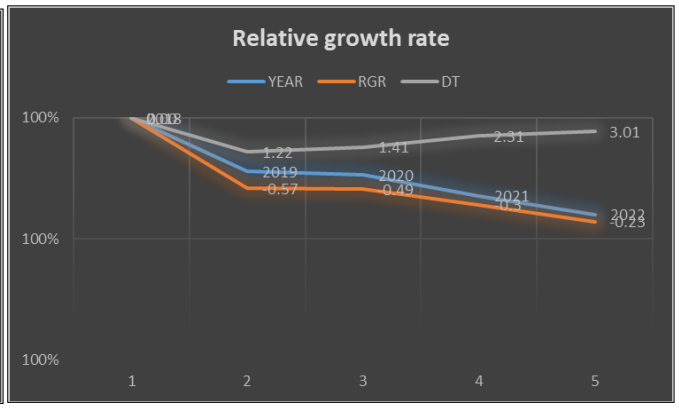


Table 2: Relative growth rate & Doubling timing of articles

Year	Article	Cumulative	W1	W2	Rgr	Mean	Dt	Mean Dt
2018	401	401	0	5.99	0		0.00	
2019	307	708	5.99	6.56	-0.57		1.22	
2020	445	1153	6.56	7.05	-0.49	-0.35	1.41	0.88
2021	409	1562	7.05	7.35	-0.3		2.31	
2022	400	1962	7.35	7.58	-0.23	-0.27	3.01	2.66

Table No.06 & Figure no.4 It noticed that the mean relative growth for the first three years 2018 to 2020 is (0.35), and the mean relative growth rate for the last two years 2021 to 2022 reduced to (0.27). While the Doubling time for different years [Dt (p)] gradually increased from (2018-2022). The mean doubling time for the first three years (i.e. 2018 to 2020) is only (0.88) which is increased to (2.66) during the last two years (2021 to 2022).

Thus, as the rate of growth of publications was decreased, the corresponding Doubling Time was increased.

Table 3: Year- Wise Degree of Collaboration of Articles

Year	Article	Single author	%	Multi author	%	Degree of collabration
2018	401	807	19.98	114	19.86	0.284
2019	307	499	12.35	266	46.34	0.866
2020	445	1177	29.14	54	9.41	0.121
2021	409	653	16.17	47	8.19	0.115
2022	400	903	22.36	93	16.20	0.233
	1962	4039		574		0.12(mean)

Different methods have been used in research studies to determine the degree of research collaboration. The formula suggested by Subramanyam (1983) has been used in this research.

The formula is where

The degree of collaboration C =Nm/ (Nm+Ns)

C = Degree of collaboration

Nm = Number of multiple authors

Ns= Number of single authors

Here, Nm = 574

=Ns =4039

= C=574/ (574+4039) = 0.12

Thus, result show the average degree of author collaboration is 0.12 which is clearly indicates its dominance upon multi - authored articles.

Table 3.1 Authorship Per-capita Analysis

Year	Authors	Publication	Per Capita
2018	921	401	0.44
2019	765	307	0.40
2020	1231	445	0.36
2021	700	409	0.58
2022	996	400	0.40
Total	4613	1962	0.43

The analysis revealed that 4613 authors contributed 1962 items during the period between 2018 and 2022. From this data, the per capita authorship could be calculated as…

Per Capita Authorship = number of items / Number of authors

1962/4613 = 0.43 the per capita authorship is 0.43

Table 3.2 Co - Authorship Pattern of contribution

Year	Author Nature	Frequency	Total	Percentage	Cumulative
2018	Single Author	807	921	88	88
	Co - Authors	114		12	100
2019	Single Author	499	765	65	65
	Co - Authors	266		35	100
2020	Single Author	1177	1231	96	96
	Co - Authors	54		4	100
2021	Single Author	653	700	93	93
	Co - Authors	47		7	100
2022	Single Author	903	996	91	91
	Co - Authors	93		9	100
	Total		4613		

It is observed from the Table No -3.2 that the value of Co-Authorship Pattern for Single authored papers during 2018-2022.From this table Observed that the highest Single authored papers with 1177 publications (96%) in the year 2020 &in that same year Multi author papers are 54 publications (4%). And in the 2019 Co - Authorship Pattern for multi authored papers highest with 266 publications (35%) which indicated that the collaborative research is increasing over the study of "scientometric".

Table 3.3 Collaborative index

Year	Single	Two	Three	Four	Five & Above	Total Article	CI
2018	807	89	12	4	9	921	1.17
2019	499	225	20	13	8	765	1.44
2020	1177	48	2	2	2	1231	1.05
2021	653	41	4	NA	2	700	1.07
2022	903	69	14	6	4	996	1.13
Total	4039	472	52	25	25	4613	1.16

This is one of the early measures of degree of collaboration derived by Lawani (1980).

CI = ∑Aj=1jfi N

It is a measure of mean number of authors. Although it is easily computable, it is not easily interpretable as a degree, for it has no upper limit. Moreover; it gives a non-zero weight to single-authored papers, which in volve no collaboration.

CI = [(f1) 1 + (f2) 2 + (f3) 3 + … (fk) k] / N

Using data in the Table 3.5, during 2018-2022,

CI = (807 + 89 X 2 + 12X 3 + 4X 4+9X5) / 921

807+178+36+16+45=1082

1082/921 1.17

Table 3.3 shows the variation in the CI. It varies from 1.44 in 2019 lowest CI in the year 2020 i.e. 1.05 a highest Collaboration we can notices in 2019 i.e 1.44 this may be due to the geographical or environmental factors of the organization. Final total Collaborative Index is 1.16

Table 3.4 –Collaborative Coefficient

Year	Single	Two	Three	Four	Five & Above	Total Article	CC
2018	807	89	12	4	9	921	0.068
2019	499	225	20	13	8	765	0.186
2020	1177	48	2	2	2	1231	0.023
2021	653	41	4	NA	2	700	0.035
2022	903	69	14	6	4	996	0.052
Total	4039	472	52	25	25	4613	0.067

According to Ajiferuke *et al.* (1988) who have shown the mean number of authors per paper, the proportion of multiple authorship as a measure of degree of collaboration in a discipline, is inadequate. There fore, they have proposed a measure combining some of the merits of both measures into what is known as Collaborative Coefficient.

Suppose, if a paper has a single author, the author receives one credit; if two, each receives ½ credits. In general, if we have 'n' authors each receive 1/n credits. Hence, the average credit awarded to each author of a random paper is E [1/n], a value which lies between 0 and 1. If '0' is to correspond to single authorship,

then the CC is defined as:

CC = 1-E [1/n]

= 1- (1/j) p (N=j) and its sum ∑ rate = 1-f1+ (1/2) f2+ (1/2) f3+… (1/k) fk/N

Where: Fjis the number of j-authors research papers published in a discipline during a certain period of time, Nis the total number of research papers published in a discipline during a certain period of time (excluding anonymous authors) and K is the greatest number of authors per paper in a discipline. Ajiferuke *et al* were of the opinion that the CC in corporates the sum of the merits of both CI and DC. It lies between 0 and 1 (0<=cc>1). It tends to zero as single authored papers dominate and differentiates among levels of multiple authorship.

Table 3.4 shows the CC has increased from 0.0.68 in 2018 to 0.052 in 2022 indicating that research among scientists is fairly collaborative with an average CC is 0.067.

CC = 1 – [f1 + (1/2) f2 + (1/3) f3 +… + (1/k) fk] / N

Based on the data in the 3.5, using the values for f1, f2, and f3, CC for the year 2001

CC = 1 – {[903 + (1/2) 69+ (1/3) 14 + (1/4) 6+ (1/5)4] / 996 N}

=1 – {[903+ 34.5 + 4.66+ 1.5+0.8] / 996}

=1 – [944.46/996]

=1 – 0.948

=CC = 0.052

Table 4: Type of Document -Wise Distribution of Articles

Sr. No	Publication Type	Records	Percentage	Cumulative	%
1	Original Paper	1723	87.82	1723	87.82
2	Letter	141	7.19	1864	95.01
3	Correction	35	1.78	1899	96.79
4	Brief Communication	26	1.33	1925	98.11
5	Editorial Notes	16	0.82	1941	98.93
6	Events	8	0.41	1949	99.34
7	Announcement	7	0.36	1956	99.69
8	Book Review	3	0.15	1959	99.85
9	Retraction Note	2	0.10	1961	99.95
10	Publisher Correction	1	0.05	1962	100.00
		1962	100.00		

Table No. 4 & Figure no.4 gives the publications were divided in to 10 document types, the Original Paper distribution of publications out of the total 1962 publications, 1723 (87.82%) publications were in Original Paper. Followed by other document type such as Research Letter141 (7.19%) Correction 35 (1.78%), Book Review 3(0.15) &Retraction note 2(0.10).

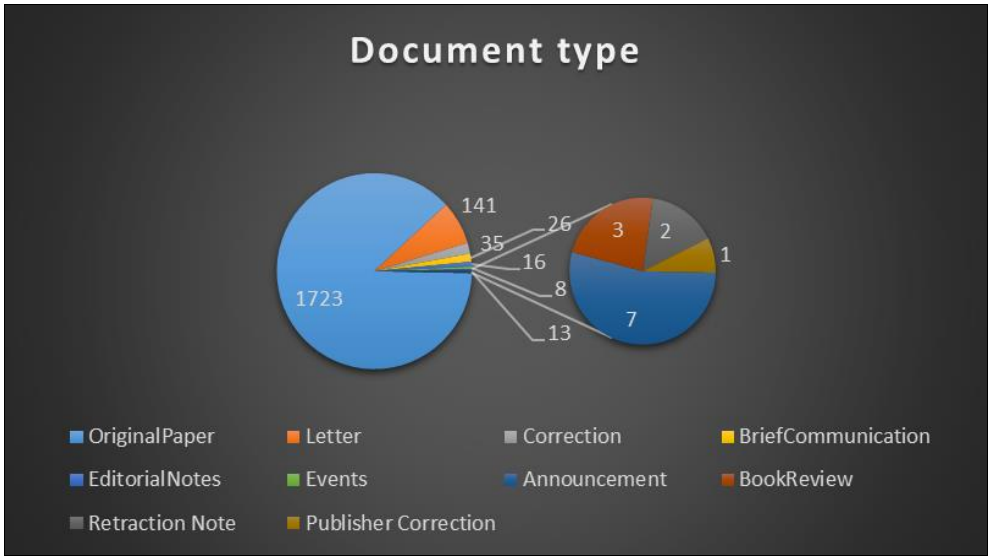


Table 5: Country Wise Distribution of publication

Sr.no	Country name	Records	%
1	China	1744	26.11
2	USA	488	7.31
3	Spain	412	6.17
4	Germany	394	5.90
5	Brazil	296	4.43
6	Italy	279	4.18
7	UK	198	2.96
8	Australia	174	2.61
9	India	161	2.41
10	Canada	160	2.40
11	Republic of Korea	153	2.29
12	Belgium	149	2.23
13	Pakistan	121	1.81
14	Netherland	113	1.69
15	France	113	1.69
16	Iran	103	1.54
17	Japan	101	1.51
18	Russia	98	1.47

19	México	94	1.41
20	Europe	78	1.17
21	Sweden	73	1.09
22	Portugal	67	1.00
23	Poland	63	0.94
24	Austria	58	0.87
25	Switzerland	57	0.85
26	Turkey	53	0.79
27	Slovenia	53	0.79
28	Malaysia	51	0.76
29	Denmark	50	0.75
30	Finland	49	0.73
31	South Africa	41	0.61
32	Israel	38	0.57
33	Saudi Arabia	35	0.52
34	Greece	31	0.46
35	Colombia	30	0.45
36	Chile	30	0.45
37	Singapore	29	0.43
38	Norway	28	0.42
39	Cuba	28	0.42
40	Croatia	26	0.39
41	Tunisia	25	0.37
42	Argentina	24	0.36
43	Czech Republic	22	0.33
44	Romania	17	0.25
45	Serbia	16	0.24
46	Hungary	15	0.22
47	Ukraine	14	0.21
48	Ireland	14	0.21
49	New Zealand	11	0.16
50	Norway	10	0.15
51	Indonesia	10	0.15
52	Egypt	10	0.15
53	Jordan	9	0.13
54	Nigeria	9	0.13
55	Denmark	8	0.12
56	Ghana	8	0.12
57	Israel	8	0.12
58	Kazakhstan	7	0.10
59	Bosnia and Herzegovina	6	0.09
60	Peru	6	0.09
61	Luxembourg	6	0.09
62	Armenia	5	0.07
63	England	5	0.07
64	Thailand	4	0.06
65	United Arab Emirates	4	0.06
66	Vietnam	4	0.06
67	Iraq	3	0.04
68	South America	3	0.04
69	Two-time publication 2x7	14	0.21
70	Single time publication 1x9	9	0.13
71	NA	54	0.81
	Total	6679	100.00

It can be observed from Table No. 05 the country wise distribution of contributors, the table reveals that out of the total 6679 contributors has contributed during 2018-2022, majority of Original Paper 1723(87.82 %) have been contributed China country form. 488 contributors have been contributed form USA, 412 contributors have been contributed form Spain Like that followed by 9 countries contributed with One Publication.

Conclusions

Scientometric analysis is the major techniques of Bibliometrics which is used in the Further study. Considering published literature present study has used quantitative method. Scientometric is relatively new subject of information. It helps to evaluate information & to handle the information in libraries and information centers by the quantitative analyzed information. It deals with the mathematical and statistical analysis. This is an umbrella term used for many studies where quantitative method or techniques are used to investigate various aspect of written document.

Scientometrics may yield indispensable data and indicators for the science policy of each hierarchical level (individuals, teams, institutes, countries, topics, disciplines, etc).

References

1. Agrawal, Aruna, The reference frequency relation I Physical science. Scientometrics,1982:49(3):443-451.
2. Bankapur, MB, Kumabar Job satisfaction publication output among librarians in Nigerian Universities. Library Management,1993:20(1):39-48.
3. Derek De Solla, A study of learning retention with a web-based IR interface journal of librarianship information science,2000:37(1):7-16.
4. Eugene, Garfield, Scientometric indicator data files. A multidimensional machine-readable database for evaluative purposes. Scientometrics,1993-2002:28:137-150
5. Eva Rodents, Advanced bibliometrics method as quantitative core of peer review-based evaluation foresight exercises, Scientometrics,2001:36(1):397-420.
6. Fasibs off Dely Federal research impact assessment: Axioms, approaches, applications, Scientometrics,1990:34(1):163-206.
7. Khaparde VS, E-journals in library information science: A Bibliometric study. International journal of Humanities Social Sciences.Center for promoting Ideas, USA, 2011, 1(S11).
8. Khaparde VS, Use of Internet by Research Scholars of Social Science Departments of Dr Babasaheb Ambedkar Marathwada University, Aurangabad. International Journal of Humanities Social Sciences. Center for promoting Ideas, USA, 2011, 1(10).
9. Kale Asha Kishor, Khaparde Vaishali "A scientometric study of tularemia disease; Web of science" International Journal of Academic Research Development www.academicjournal.in ISSN, 2022, 2455-4197.
10. Rajendran P, Jeyshankar R, Elango B, Scientometric Analysis of Contributions to Journal of Scientific Industrial Research International Journal of Digital Library Services,2011:2(1):1-11.
11. Wasudevan KT, Datc sources for performing citation Analysis; an overview. Journal of Documentation,1995:64(20):193-210.
12. Yadav, Jaisi Ram, The J-shaped distribution of citednes. Journal of
13. Documentation,1984:58(4):383-395.
14. Wikipedia, Accessed, 2022.from: https://en.wikipedia.org/wiki/Scientometrics (journal)