



A SCIENTOMETRIC STUDY OF JOURNAL OF PHYTOLOGICAL RESEARCH FOR THE DECADE 2011 TO 2021

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Scientometric is an interdisciplinary research which covers all the discipline of sciences. It is a mode of measurements of scientific statistics indexed in different database. According to scientometric, technology enhancement has increased the quality as well as quantity of publication and also there is productive research outcome. This paper focuses on quantitative study of "Journal of Phytological Research" and then results are tabulated by applying simple scientometric techniques. The present study deals with study of year-wise distribution of Articles, Pattern of Length of Articles, Authorship Pattern, Author Productivity, Relative Growth Rate of Articles & Doubling Time, Degree of Collaboration, Ranked List of Prolific Authors, Distribution of Intellectual output by Indian States of the Journal of Phytological Research during the year 2011 to 2021. In these eleven years a total 248 articles are published in the journal. Eighty percent articles are of less than ten pages. A few authors (3.62%) had published article of pages more than 20. The average productivity per author is 0.40 in period of 2011-2021. According to RGR and doubling time model, the growth rate of publication has been calculated and it is highest in 2019 and it is 1.98, followed by 2017 (1.27). The highest doubling time was identified in the year 2012(2.26), followed by 1.06 in the year 2013. The degree of collaborations is 0.84. Out of 611 articles 97.88 percentages are published by India, followed by 1.30 per cent contributed by the Bangladesh. In India state-wise Rajasthan is at top with publishing (57.02%), followed by Kerla(12.37%), Maharashtra (8.36%), Uttar Pradesh (5.18%). K. Murugan is at rank first by publishing maximum eight articles. In this way Scientriometric study is very important tool to analyse and access a Journal.

Keywords: Authorship Pattern, Doubling Time, Degree of Collaboration, Journal of Phytological Research, Scientometric.

Introduction

Scientometric is an interdisciplinary research which covers all the discipline of sciences. It is a mode of measurements of scientific statistics indexed in different database. According to Scientometric, technology enhancement has increased the quality as well as quantity of publication and also there is productive research outcome. scientometric is a self-monitoring and examining research papers and it is a projection of quality research

work done by the any individual, institution, state, country.

This paper focuses on quantitative study of "Journal of Phytological Research" and then results are tabulated by applying simple scientometric techniques. For this research, a total no of 248 articles from "Journal of Phytological Research" published during the year 2011 to 2021 have been taken up for the analysis of different indexes. It is a single blind peer

reviewed, journal and publishes quality papers with no charges.

Degree of collaboration has been used to find out the degree of collaboration. Collaborative endeavour is a milestone in a scientific research. Thinking skills of multitalented brainstogether are much more productive than a single brain¹.

A scientometric study on the research publications output of Audiology research from 1989 to 2016 took place. "International Journal of Audiology" had contributed 8538 articles in the research of audiology and rank first in this field. USA is at the top with 507 papers and 32 papers were contributed from university of Pretoria. In 2016, highest research work was taken place and with highest citations (1739) for 144 papers².

As scientific journals are producing latest and authentic information and this information's are not free and costs are very high. It creates difficulty for the libraries to subscribe all the journals in a particular field. As a result, Scientometric studies play a vital role in providing and selecting appropriate journals for the libraries³.

Scientometric analysis and research journal output of chemistry and environment from the period 2005-2019, a total of 1470 documents were considered. The number of contributions, authorship pattern, author productivity, average citations and collaborative papers are studied. The journal has been published regularly from the year indexed and abstracted in SCOPUS and Chemical Abstracts. The Research Journal of Chemistry and Environment is the highest number of publications were published in the 2019 (14.55%) and the lowest number of publications (3.26%) was published in the year 2005. Single author contributions were 147 in number, followed by double author (442), triple authors (397) and multi authored contributions is the highest number (482). The degree of collaborations lies between 0.83 and 0.97⁴.

A quantitative study of research productivity and analysed aspects of global publication in the field of library and information science for the period 2000–2004 was analysed. A total of 894 contributions published in 56 LIS journals indexed in SSCI. In these years 1361 authors had contributed their publications. 89.93% have written one paper only. 70% are collaborative research output of the authors from USA and UK .48% papers are self cited⁵.

In scientriometric analysis of "Flavour and Fragrance Journal" indexed in scopus during 2000-2019, a total of 1511 documents were examined. Relative Growth Rate, Doubling Time , Annual Growth Rate, Lotka's Law of Scientific Productivity, Authorship patternetc are the basic parameters to study research output. 96.98% papers are of multiple-authored research papers. The Central Institute of Medicinal and Aromatic Plants, Lucknow has published the highest publications (152). France is at I position with 224 publications, followed by Italy (138) and India (118)⁶.

In the study of Indian research productivity of Food Science and Technology for the period from 1998 to 2000, a total of 1060 publications were analysed. The data retrieved from the Web of Science database. This study concluded that the Centre of Food Technology and Research Institute, Bhabha Atomic Research Centre, Indian Institute of Technologies and Defence Food Research Lab are highly productive institutions. In these papers multi-authored papers were found⁷.

A scientometric analyses of DESIDOC Journal of Library & Information Technology from the period 2010 to 2014 was take place. Total 30 issues with 307 publications were analysed. Maximum, 70 research papers were found to be published in the year 2012 and the minimum 50 the year 2010. Maximum papers (61.2%) are multi-authored papers. India is at top position with 88.9 % publications⁸.

A scientometric research was performed on the data output of Malaysian Journal of Library and Information Science from 2008 to 2014. In 2011 publication were maximum (19.71%) and in 2014 the lowest number 9.86% of research articles published. 75.36% papers are multiple authors and the average number of authors per paper that is, 2.36. Malaysia is at the first position (31.84%), followed by Iran (11.31%), India (11.01%) and China (7.15%). The maximum number of citations 19.25% in the year 2010 and the minimum number of citations 9.20% in the year 2008⁹.

In scientometric study of authorship and collaborative pattern of DESIDOC Journal of Library & Information Technology from 2012-2020, a total of 531 articles in the various forms like research articles, notes, review and editorial are published by the researchers. Fiji and Indonesia has highest rate of international collaboration (16.67). The keywords "Scientometric assessment" has highly documented. Co-Authorship Index shows that more focussing are given to three authors articles. The indicator Citation per Paper which find out the impact of the articles in year 2012-2014 has total articles 198, citation per paper is 4.21. In the block 2015-2017 has total articles 165 and citation per paper is 4.45. The overall mean of citations of paper is 3.77¹⁰.

Present study was designed keeping in mind the following objectives:

The objectives of this study under the given period (2011 – 2021) are:

1. To identify the year wise distribution of articles during the studied period
2. To find annual growth rate of research articles.
3. To examine the authorship pattern of articles.
4. To find out the degree of collaboration.
5. To find Relative Growth Rate of Articles & Doubling Time.
6. To find out the author productivity of the Journal.
7. To examine the geographical distribution of articles.

8. To examine the length of articles and number of references in an article.

9. To identify and prepare the ranked list of authors.

Material and Methods

The Journal of Phytological Research is a peer reviewed and refereed journal published by the Phytological Society, India. It produces two volumes per year. This journal provides an excellent platform for researchers for presenting their research in different fields of Plant Sciences since 1988. It is an open access journal and don't have any processing/publishing fees. Journal of Phytological Research is Indexed/Abstracted in WOS, Science Citation Index, UGC-CARE and Indian Science Abstracts, India etc.

The data required for the study was collected from the website of 'Journal of Phytological Research' (<<https://jphytolres.org/>>) which is published by Phytological Society, India. Present study has taken for evaluation of 11 issues containing 22 volumes of the JPR published during the year 2011 to 2021. This research data has been collected, organised, analysed and calculated using Microsoft Excel software. Scientometrics apparatus and techniques have also been used to generate tables, charts and graphs for final study.

Results and Discussion

Table 1 depicts that a total 248 articles were published in these eleven years. Maximum 52 articles were noted in 2011 and 2012. Minimum publication is in 2014, 2016, 2018 and 2019. Annual growth rate shows drastic changes. For 2016 to 2017 a positive change of 110 but in next year it shows a sudden downfall. AGR (Annual growth rate) represents change in the value of a measurement over the period of one year. It is a parameter to identify the trend of growth annually. Annual Growth Rate = $(\text{End value} - \text{Starting Value}) / \text{Starting value}$.

Table 2 depicts that 44.75% papers are of length less than five pages. 42.75% are of 6 to 10 pages. Only 3.62% are of longer

papers having length is more than 15 pages. It means in this study 87% articles less than 10 pages concluded that most of the authors prefers short length articles.

In early time authors prefer to publish their papers independently. But now day's trends are changing. For better research output authors are focussing out in partnership and two or more number of authors together. Authorship pattern is clearly defined in table 3. It clearly demonstrated that total no. of publications are 248 in 11 years, in which 15.72% are of single author publications, 45.96% are two authors, 23.79% are of three authors, 9.27% four authors. In these years maximum number of authors published their articles as two authors work.

Table 4 reveals the data of author productivity. 248 articles are retrieved and the overall average of authors per paper is 2.49 for 248 articles. The average productivity per author is 0.40 in period of 2011-2021. Formula to calculate

- Productivity per author = Number of articles / Number of Authors
- Average authors per-paper = Number of Authors / Number of articles

The study of author's productivity is a parameter which measures the research performance of a researcher in any field. It is determined in the present study on the basis of number of papers contributed by scientists.

Table 5 shows that the Relative growth rate and doubling time during the research. According to

RGR and doubling time model, the growth rate of publication has been calculated and it is highest in 2019 and it is 1.98, followed by 2017 (1.27). The highest doubling time was identified in the year 2012 (2.26), followed by 1.06 in the year 2013.

Formula for average growth rate

$$R = (\text{Log}W_2 - \text{Log}W_1) / (T_2 - T_1)$$

Where, R = Mean relative growth rate over the specific period

LogW₁ = Natural log of the initial number of articles

LogW₂ = Natural log of the final number of articles

$$T_2 - T_1 = \text{Time Interval}$$

Subramanyam (1983) formula has been used to find out the degree of collaboration for this study:

$$C = N_m / N_m + N_s$$

C Represents "Degree of collaboration"

N_m Represents Number of multiple authors

N_s Represents Number of single authors

In survey of this journal from the Table 6 the degree of collaborations is 0.84. In this research the degree of collaboration shows its influence on multi authorship.

Table 7 reveals that out of 611 articles 97.88 percentages are published by India only and hence India is at top position followed by 1.30 per cent contributed by the Bangladesh and 0.65 per cent of contributions came from the Nigeria which is at the third place. 0.17 per cent of contributions are from Colombia.

Table-1: Year-Wise Distribution of Articles

S. No.	Year	Volume No.	No. of Articles	%	Cumulative	AGR (%)
1	2011	I & II	52	20.97	52	-
2	2012	I & II	52	20.97	104	0.00
3	2013	I & II	23	9.27	127	-55.7
4	2014	I & II	10	4.03	137	-56.52
5	2015	I & II	11	4.43	148	10.00
6	2016	I & II	10	4.03	158	-10.00
7	2017	I & II	21	8.46	179	110.00
8	2018	I & II	10	4.03	189	-110.00
9	2019	I & II	10	4.03	199	0.00
10	2020	I & II	21	8.46	220	110.00
11	2021	I & II	28	11.29	248	33.33
Total			248	100		

Table-2: Pattern of Length of Articles

Article Length	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	%
01-05	40	30	18	3	2	2	3	2	3	4	4	111	44.75
06-10	12	20	5	4	9	6	12	6	6	8	17	105	42.33
11-15	-	1	-	2	-	1	6	1	1	4	7	23	9.27
> 15	-	1	-	1	-	1	-	1	-	5	-	9	3.62
Total	52	52	23	10	11	10	21	10	10	21	28	248	100

Table-3: Authorship Pattern

Number of Authors	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	%
Single	7	7	3	1	2	1	6	1	3	3	5	39	15.72
Two	23	28	8	4	6	6	10	7	4	7	11	114	45.96
Three	15	9	9	5	2	2	3	2	-	8	4	59	23.79
Four	6	7	1	-	-	-	1	-	1	1	6	23	9.27
Five	-	1	2	-	-	1	1	-	2	-	2	9	3.62
Six	-	-	-	-	1	-	-	-	-	2	-	3	1.20
> 6	1	-	-	-	-	-	-	-	-	-	-	1	0.40
Total	52	52	23	10	11	10	21	10	10	21	28	248	100

Table-4: Author Productivity

Year	Volume No.	Number of Authors	Number of Articles	APA	AAPP
2011	I & II	129	52	0.40	2.50
2012	I & II	123	52	0.42	2.38
2013	I & II	60	23	0.38	2.63
2014	I & II	24	10	0.41	2.43
2015	I & II	26	11	0.42	2.38
2016	I & II	24	10	0.41	2.43
2017	I & II	44	21	0.48	2.08
2018	I & II	21	10	0.47	2.12
2019	I & II	32	10	0.31	3.22
2020	I & II	56	21	0.37	2.70
2021	I & II	72	28	0.39	2.56
Total		611	248	0.41	2.43

Table-5: Relative Growth Rate of Articles & Doubling Time

S. No	Year	No. of Articles	Cum. Total	LogW ₁	Log W ₂	RGR	Doubling Time (DT=0.693/RGR)	Mean RGR= ΣR/N	Mean ΣDt/N
1	2011	52	52	1.71	1.71	-	-	0.919	0.745
2	2012	52	104	1.71	2.017	0.307	2.26		
3	2013	23	127	1.36	2.103	0.653	1.06		
4	2014	10	137	1.00	2.136	1.136	0.61		
5	2015	11	148	1.04	2.170	1.130	0.61		
6	2016	10	158	1.00	2.198	1.198	0.58		
7	2017	21	179	1.32	2.25	0.993	0.697		
8	2018	10	189	1.00	2.276	1.276	0.543		
9	2019	10	199	1.00	2.298	1.298	0.533		
10	2020	21	220	1.32	2.30	0.98	0.70		
11	2021	28	248	1.45	2.39	1.14	0.607		
Total		248				10.11	8.20		

Table 6: Degree of Collaboration

Year	Single Author Publications (Ns)	Multiple Author Publications (Nm)	Nm+Ns	Degree of Collaboration DC=Nm/(Nm+Ns)
2011	7	45	52	0.86
2012	7	45	52	0.86
2013	3	20	23	0.87
2014	1	9	10	0.90
2015	2	9	11	0.82
2016	1	9	10	0.90
2017	6	15	21	0.71
2018	1	9	10	0.90
2019	3	7	10	0.70
2020	3	18	21	0.86
2021	5	23	28	0.82
Total	39	209	248	9.2/11=0.84

Table-7: Distribution of Intellectual output by Country

Rank	Name of Country	Number of Authors	%
1	India	598	97.88
2	Bangladesh	8	1.30
3	Nigeria	4	0.65
4	Colombia	1	0.17
Total**		611	100

Table 8 shows that a total of 611 authors have contributed in this Journal. Degree of collaborations is 0.84 which indicate multiple authorship patterns. Above table represents ten states of India which published more than 80% articles. Rajasthan is at top with publishing (57.02%), followed by Kerala (12.37%), Maharashtra (8.36%), Uttar Pradesh (5.18%), Tamil Nadu (3.01%), Madhya Pradesh (2.84%), Bihar (1.67%) Andhra Pradesh (1.50%), Pondicherry (1.33%), Karnataka (1.17%). Remaining nearly 20% articles are published by others states.

Table 9 presents rank list of authors who have contributed four or more articles in the different issues of JFR during the period of study. Most of the fifth ranked authors have published four papers followed by 4th rank has published five papers, rank 3rd authors have six papers, 2nd have seven papers and K. Murugan is at rank first by publishing maximum eight articles.

Table 10 represents the Reference distribution pattern published in JFR for

Table-8: Distribution of Intellectual output by Indian States

Rank	Name of State	Total (Authors)	%
1	Rajasthan	341	57.02
2	Kerala	74	12.37
3	Maharashtra	50	8.36
4	Uttar Pradesh	31	5.18
5	Tamil Nadu	18	3.01
6	Madhya Pradesh	17	2.84
7	Bihar	10	1.67
8	Andhra Pradesh	9	1.50
9	Pondicherry	8	1.33
10	Karnataka	7	1.17

the period of the year 2011-2021. A total of 6293 references were cited by the researchers in 248 articles. An average of 27.11 references per article were recorded during the period of the year 2011-2021.

In Year 2021 (Vol. I&II) has the highest number of 1326 (21.07%) references with an average of 47.36 references per article, followed by 2012 with second-highest 1107 (17.59%) references with an average reference per article 21.29, followed by 2011 (Vol. I&II) of 912 (14.49%) with an average reference per article 17.54, the

Table 9: Ranked List of Prolific Authors

Name	Number of Papers	Rank
K. Murugan	8	1
Arvind Pareek	7	2
Anuradha Dubey	7	2
Gautam Kumar Meghwanshi	7	2
P.C. Trivedi	7	2
AbhayChowdhary	6	3
Karuna S. Verma	6	3
PratibhaChaturvedi	6	3
Usha Jain	6	3
Abhishek Vashishtha	5	4
EktaMenghani	5	4
NishaKhatik	5	4
Ameeta Sharma	4	5
AnkitaSaxena	4	5
Hardik Pathak	4	5
LeenaChoubisa	4	5
Manish Kumar Singh	4	5
R.P. Ahrodia	4	5
Ramesh Joshi	4	5
Satish Kumar	4	5
Saurabh Dave	4	5
Sudhir Kumar	4	5
Swati Sharma	4	5
T.S. Swapna	4	5

year 2017 (Vol. I&II) of 671 (10.66%) with an average reference per article 31.95. The lowest number of references recorded in the year 2018 (Vol. I&II) of 245 (3.89%) with an average reference per article of 24.5.

During years 2011 to 2021 a total of 248 articles were published in the Journal of Phytological Research. After analysis of articles it was observed that quality papers were published in this journal at free of cost. AGR for the years 2012 and 2019 is nil which implies that rate of publications of papers was steady for two consecutive years. It has been observed that the multiple authors' research approach (two and three authors) is preferred in the scienriometric study. From the Findings and Data Interpretation of Phytological Research APA index is small but Average author per paper is high that is 2.49. Nearly one paper is written by on an average three papers. The doubling time and the relative growth rate are directly related to each other. If the research output of a specific study becomes doubles during a given period, then that specific is calculated by the formula $=0.693/R$ RGR

Table10: Reference Distribution Pattern

Year	Volume No.	No. of Articles	Total No. of Reference	%age	Average references per article
2011	I & II	52	912	14.49	17.54
2012	I & II	52	1107	17.59	21.29
2013	I & II	23	431	6.85	18.74
2014	I & II	10	358	5.69	35.8
2015	I & II	11	300	4.77	27.27
2016	I & II	10	295	4.69	29.5
2017	I & II	21	671	10.66	31.95
2018	I & II	10	245	3.89	24.5
2019	I & II	10	252	4.00	25.5
2020	I & II	21	396	6.29	18.85
2021	I & II	28	1326	21.07	47.36
Total		248	6293	100	27.11

means rate of publication per unit time (year). For the years 2012,2013,2017,2020 it is less than one. For the years 2014, 2015, 2018, 2019 and 2021 RGR is greater than 100%. It is clear from the formula if degree of collaboration comes out to be less than 0.5 then single authors were more contributed than multiple authors and if it is greater than 0.5 then multiple authors were more contributed than single authors. Its practical value is always less than 1. If it comes out to be 1 then it means $N_s=0$ (Represents Number of single authors), it is not possible. Because a single article is contributed by more than one author that's why total number of the country is more than the actual number of papers published. The authors having same number of contributions have been given the same rank. Ranking of authors has great importance in scientometric research. From the above discussion it is cleared that an author in the journal of Phytological Research cite on an average 27% articles.

Conclusion

Publications are the broad form of communication by the researchers. Scientometricis used by the researchers to identify and access scientific potentials. The main findings of this study are:

- A total of 248 articles were published from 2011 to 2021. Maximum number of articles (20.97%) were published in 2011 & 2012 •
- 87% researchers wrote their articles having pages less than ten.
- 45.96% articles were written by two authors per article.
- Average author productivity per author is 0.40 and average author per paper is 2.49.
- Doubling time was highest in the year 2012 (2.26).
- Degree of collaboration in this period is 0.84.
- India is at top position by publishing 97.88% articles.
- In India Rajasthan is at top position and 341 authors are from Rajasthan followed by Kerala.
- K. Murugan has written maximum number of articles and hence he is at rank first and most prolific author.

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