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Indian Journal of Plant Sciences: A Scientometric Approach

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Abstract

The paper deals with the scientometric study of the journal titled 'Indian Journal of Plant Sciences'. It is an online journal, very productive in the field of plant and agriculture sciences. The study covers a period of three years; it deals mainly with the average number of citations, average length of the articles, authorship patterns, core journals of the field, and forms of documents cited by research scholars and scientists. The most productive journals and their citation counts are also analysed to improve the study pattern in the field of plant and agricultural sciences. A total of 70 articles are analysed; it is revealed that the pattern of multiple authorship is a trend in the field of plant sciences, and journals are the most cited documents by research scholars and scientists.

Keywords: Scientometrics, Bibliometrics, Citation, Journal Ranking, Authorship Pattern, Plant Science, Price Escalation

Introduction

Scientometric study is one of the major assessment and measuring techniques of scientific production. Scientometrics is a sub-field of bibliometrics, which is concerned with the quantitative and qualitative measuring and analysis of scientific literature, science communication, and science policy. The term scientometrics originated as a Russian term for the application of the quantitative method of the history of science. The term scientometrics was introduced and came into existence with the founding of a journal, by T. Braun in 1977, named 'Scientometrics'. This journal was originally published in Hungary. The term scientometrics has overlapping interests in bibliometrics and informetrics. According to Van Rann, "Scientometric research is devoted to the quantitative studies of science and technology". The main objective of scientometrics is the advancement of knowledge, and development of science and technology. Further, he stated that there was some degree of relation with social and political sciences.

Scientometrics has the following objectives:

- To develop science indicators.
- To measure the impact of science on society.
- To compare the output and the impact of science at national and international levels.

In general, we can say that scientometrics is a science in which we apply the quantitative methods and techniques to the study of science and information process. Various statistical, mathematical, and other indicators are involved in scientometric analysis. In scientometrics, we observe various authorship patterns, trends in published literature, forms of literature, collaboration research patterns, chronological use of literature, area-wise contributions, and so on, by analysing the citations.

For this study, the Indian Journal of Plant Sciences (IJPS) is selected for scientometric analysis. The Indian Journal of Plant Sciences (IJPS) is an open-access, popular, and significant online international journal. It is an online publication of original research work, review, and views in all areas of plant sciences, botany, and agricultural sciences, beginning from classical to the applied branches. This journal is published by the Centre for Info Bio Technology (CIBTech) with an objective to promote speedy publication of research work, fulfilling the general criteria of significance and scientific excellence. All the articles published in IJPS are rigorously peer-reviewed. The journal is published quarterly (four issues per year), at the end of March, June, September, and December, respectively.

Review of Related Literature

Mahendra Kumar (2014) analysed the Library Herald Journal during the period 2011-2014 to observe

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authorship patterns, forms of documents, subject-wise distributions, references per article, and so on. In 2003, Hazarika. Goswami and Das studied publication patterns and coverage of journal papers in terms of geographical, organisational, and other related parameters. Tanuskodi discussed the research output performance of social scientists on the subject of social sciences. The analysis covered authorship patterns, subject distributions, average number of references, forms of documents, chronological distribution of cited papers, and so on. Sangam, Meera and Megeri (2008)analysed the growth pattern of chemical science literature in Indian journals in 80 sub-fields. Naguchi (1988) studied the Japanese style of management, and the dispersion pattern in management, using bibliometrics. B S Birader and T Vijyalaxmi (1997) discussed the pattern of information used by researchers in the field of neurology as indicated by DM (Neurology) dissertation submitted to the National Institute of Mental Health (NIMHANS), Bangalore, during 1979-1997. J N Gautam and A K Sharma (2005) analysed price trends in foreign journals. It is a case study of the Indian Institute of Soil Science and investigated price escalation in foreign journals subscribed by the IISc Library. In 2015, K N Madhu observed research and publishing trends of Agricultural Scientists during the period 2002-2014. Gururaj S Hadagali, B D Kumbar, and Amrut Benahal (2009) studied the citation analysis of Ph.D. physics theses submitted to Karnataka University, Dharwad. P Rajendran, Y S Pariahar, Indu Bhushan, and J K Pattnaik studied the price escalation of e-journals in the field of science and technology in 2019.

Need for the Study

Periodicals are the primary source of publication of research in the respective field of knowledge. They provide information about the growth of literature. Nowadays, prices of journals are rising and the budget of libraries are shrinking. It is said that the "Library of Congress" is the biggest library in the world, whose budget of several cores still cannot procure published material from all over the world. So the library administration is forced to reduce the number of periodicals procured. Therefore, scientometric analysis is used. It is an application used to identify research trends, core journals, authorship patterns, average citations, core areas of research, and so on. On the basis of this analysis, library authorities can design a subscription policy for effective utilisation of economic resources. These type of studies are also very useful for the collective development plan for the library and information centre.

Objectives of the Study

The main objectives of the study are as follows:

- To identify the pattern of articles published in the Indian Journal of Plant Sciences.
- To observe the average length of articles.
- To observe the authorship patterns of the collaboration research trends.
- To identify the average number of citations used by the contributors of an article.
- To identify the number and forms of publications used for the collection of data and information.
- To compile a rank list of the core periodicals in the field of plant and botanical sciences.

Methodology

Scientometric analysis is used as an investigation technique in the present study. In this study, the detailed bibliography and references added at the end of each and every article are used for the analysis. Articles published during 2017 to 2019 are used as the source data for interpretation. The articles published in the *Indian Journal of Plant Sciences*, from volume 6 (No. 1-4) 2017 to volume 8 (No. 1-4) 2019, are used for the data analysis. Each and every citation is recorded and categorised under various sub-fields, such as the number of articles per volume, authorship patterns, average number of citations, forms of documents, journal names, number of citations, and so on.

Data Analysis and Interpretation

Distribution of Contributions

The Indian Journal of Plant Sciences is a regular quarterly journal; there are four issues published every year. In 2017, the four issues contained a total of 39 articles; 19 articles were published in 2018; and 12 in 2019. The number of research publications for the period 2017-19 is presented in Table 1.

Table 1: Research Article Contributions to the Indian Journal of Plant Sciences

Year	Issues	Articles	Percentage
2017	4	39	55.71
2018	4	19	27.15
2019	4	12	17.14
Total	12	70	100

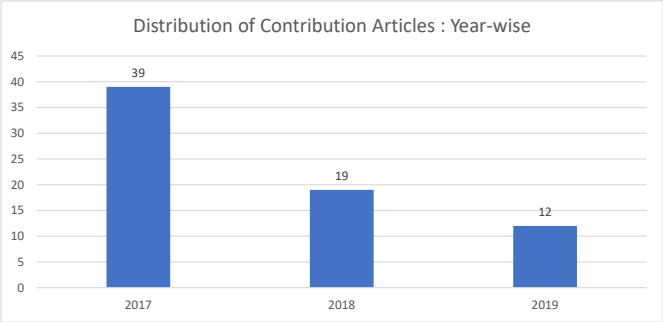

Fig. 1: Distribution of Contributions

Average Number of Citations

Table 2 shows that the maximum average citations are observed in volume 4 of the 2017 issue (40.33), followed by volume 3 of the 2017 issue (22.33). In 2018, the maximum average citations are observed as 28, 25, and 16.88, in volumes 1, 2, and 4, respectively. In 2019, maximum citations were observed in volume 3 (18.00), followed by volume 4 (16.00).

Table 2: Average Number of Citations

Year		Articles	Total Citations	Average
2017	2017 – 1	9	140	15.56
	2017 – 2	15	348	23.20
	2017 – 3	9	201	22.33
	2017 – 4	6	242	40.33
2018	2018 – 1	6	168	28.00
	2018 – 2	3	75	25.00
	2018 – 3	2	32	16.00
	2018 – 4	8	135	16.88
2019	2019 – 1	2	27	13.50
	2019 – 2	3	44	14.66
	2019 – 3	3	54	18.00
	2019 – 4	4	64	16.00

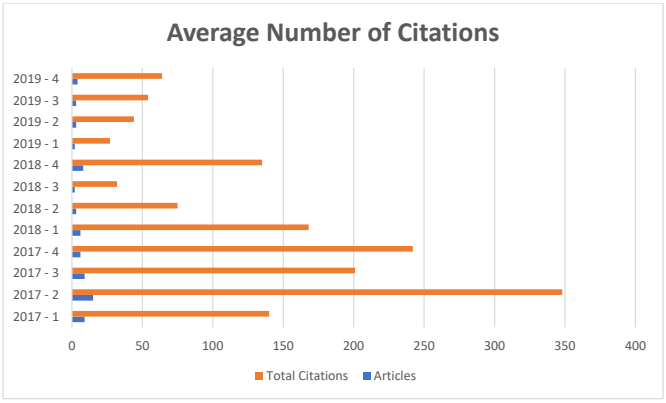

Fig. 2: Average Number of Citations

Average Length of Articles

Table 3 shows the results obtained on analysing the average length of the articles.

Table 3: No. of Pages (Length)

	Journal Year and Volume	No. of Pages (Length)	Average Pages (Length)
Average Length of Articles Average Length of Articles	2017 – 1	58	6
	2017 – 2	126	8
	2017 – 3	62	7
	2017 – 4	56	9
	2018 – 1	52	9
	2018 – 2	22	3
	2018 – 3	14	7
	2018 – 4	59	7
	2019 – 1	19	9
	2019 – 2	23	8
	2019 – 3	61	20
	2019 – 4	25	6

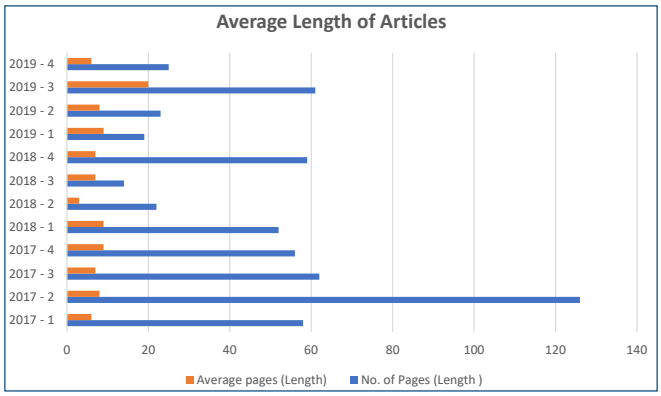

Fig. 3: Average Length of Articles

Table 3 clearly indicates that the maximum (20 pages) average length of the articles published were in volume 3 in the 2019 issue, volume 4 in 2017, and volume 1 in 2019 and 2018. Minimum (3 pages) average length of the articles published was in volume 2 in the year 2018.

Collaborative Author Trends

Table 4: Authorship Patterns

Year	Number of Authors				Total
	1	2	3	More than 3	
2017	5	13	14	7	39
2018	3	6	4	6	19
2019	3	3	1	3	10
Total	11	22	19	16	68
Percentage (%)	16.18	32.35	27.94	23.53	100

Collaborative research is an important feature of the plant and botanical sciences during the years 2017 to 2019. Multiple authorship provides different measures of collaboration in the subject. It is observed that in author collaboration in the articles published during the period of study, the percentage of maximum number of articles contributed under joint authorship (i.e. two authors) is 32.35. Contribution by three authors made up 27.94%, followed by contributions by more than three authors (23.53%). Single-author contributions was very low; only 16.18% of the total articles were contributed by single authors. Therefore, we can say that in the field of plant and botanical sciences, most articles are published by two authors.

Forms of Documents Cited

Table 5A and 5B envisage the form-wise contributions cited by research scholars, authors, and scientists in the field of plant and botanical sciences.

We can easily observe, by analysing Table 5A, that journal publications (56.71%) are the major source for research scholars and authors, followed by online publications (16.22%), research reports (8.27%), books (8.06%), and theses and dissertations (3.97%). The use of conference and seminar papers and presentations, and newsletters, are relatively low in the articles/papers published in 2017.

Table 5A: Forms of Documents Cited

Forms of Documents	Year 2017	Percentage
Books	75	8.06
Journals	528	56.71
Research Reports	77	8.27
Online Publications	151	16.22
Conference/Seminar and Symposia	28	3.01
Thesis and Dissertations	37	3.97
Newsletters	13	1.40
Others	22	2.36
Total	931	100.00

Table 5B: Forms of Documents used during 2018

Forms of Documents	Year 2018	Percentage
Books	44	10.73
Journals	245	59.76
Research Reports	42	10.24
Online Publications	26	6.34
Conference/Seminar and Symposia	18	4.39
Thesis and Dissertations	14	3.41
Newsletters	8	1.95
Others	13	3.17
Total	410	100

The same publication pattern continues in the Indian Journal of Plant Sciences in 2018. Investigation shows that in 59.76% cases, journals were used as a chief source of information and resource, followed by 10.73% using books, 10.24% research reports, and 6.34% using online publication citations as information sources. Approximately, 15% of the sources are from conference and seminar papers and presentations, theses and dissertations, newsletters, and so on. Therefore, the majority of citations were from journals and other online sources.

As per Table 5C, maximum citations were from journals (40.21%), followed by online publications (16.93%), and books (11.64%), respectively. About 8.99% were from theses and dissertations and 7.94% from research reports. Conference and seminar materials, and newsletters, were used less often by the authors. The pattern clearly indicates that journals were the chief information resource used by research scholars in the field of plant sciences in 2019.

Table 5C: Forms of Documents used during 2019

Forms of Documents	*Year 2019*	*Percentage*
Books	22	11.64
Journals	76	40.21
Research Reports	15	7.94
Online Publications	32	16.93
Conference/Seminar and Symposia	05	2.65
Thesis and Dissertations	17	8.99
Newsletters	03	1.59
Others	19	10.05
Total	189	100

Ranking List of Core Journals

The rank list of core periodicals cited in the articles published in the Indian Journal of Plant Sciences was prepared by actual counting of citations. The rank list of periodicals containing research literature in the field of botany and plant sciences are as follows.

- Applied and Pure Biology
- Journal of Plant Science
- Journal of Theoretical Biology
- FEMS Microbiology Ecology
- Canadian Journal of Microbiology
- Crop Protection
- Annals of Botany
- Plant Physiology and Biochemistry
- Biochimica et Biophysica (BBA)
- Plant Cell
- International J of Pharmaceutical Science and Research
- Phytochemistry
- American Journal of Botany
- Current Biology
- Indian Journal of Plant Science
- Plant and Soil
- International Journal of Applied Life Science
- Analytical Biochemistry
- Indian Forester
- Annals of Microbiology
- Tropical Journal of Pharmaceutical Research
- Asian Journal of Conservative Biology
- Taxon
- Journal of Biochemistry
- Critical Review of Plant Science
- DNA Research
- Bionature
- Agricultural and Biological Chemistry
- Applied Environmental Microbiology
- Applied and Pure Biology
- Journal of Pharmacy Research
- Plant and Cell Report
- Plant Science Letters
- Planta
- Functional Biology
- International Journal of Recent Biotechnology
- National Journal of Life Sciences
- Bioinfolet
- International Journal of Bioessays
- Geobios
- Journal of Experimental Science
- Indian Journal of Microbiology
- New Phytologist
- Environmental and Experimental Biology
- Field Crop

The list of periodicals shows that Applied and Pure Biology, Journal of Plant Science, Journal of Theoretical Biology, FEMS Microbiology Ecology, and the Canadian Journal of Microbiology are the top core journals used by the researchers in the field of botany, plant sciences, and agricultural sciences. According to the list, the top 45 journals, out of 212 cited journals, were observed to be the key source of information used for the botanical and plant sciences research. The 45 journals were cited more than five times in the articles published in the Indian Journal of Plant Sciences.

Conclusion

Scientometric study has developed a body of theoretical knowledge and group of techniques and applications based on the distribution of the bibliographic data element. Today, scientometric study is focusing on the development of new and more precise techniques for greater economical and efficient management of libraries and selection of journals, even forecasting the potential of a particular field. The present study focuses on the Indian Journal of Plant Sciences, where over 70 articles were published during the period of study. The average number of citations are highest in 2017 and the average length of an article is about seven pages. Nowadays, we can see collaborative research trends, where more than 63% research articles are a result of collaborative research; single-author contributions are very low in the field of botanical and plant sciences. Journals are used as a chief source of information and knowledge sharing by a majority of the authors, followed by online resources and books. The Indian Journal of Plant Sciences is a highly preferred peer-reviewed journal for plant and botanical science researchers.

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