

Citation Analysis of Doctoral Research in Botany Submitted to Annamalai University

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Abstract 19735 citations in the doctoral dissertations submitted between 1990-2010 in the Department of Botany, Annamalai University, India were analyzed for identifying their document types, authorship pattern, ranking of cited journals and subject wise distribution of citations. The finding reveals that nearly 69.09% citations were from journals and 14% from books. The subject wise distribution of these reveals that Genetics, Microbiology, Eco-Toxicity, Plant Physiology, Remote Sensing, Agriculture, Air Pollution and Climate Change forms more than half of the total theses submitted during the period. USA, UK and India contributes 9062 (45.91%) of total citations. The authorship pattern study reveals that the highest number of journal citations from multi authors around 74.24% percent of total journal citations.

Keywords Botany, Authorship Pattern, Core Journals, Patents, Reports, Monographs

1. Introduction

The development of citation analysis has been marked by the invention of new techniques and measures, the exploitation of new tools and the study of different units of analysis. These trends have led to a rapid growth in both the number and types of studies using citation analysis. Diadoto (1994) defines citation analysis as "a wide ranging area of bibliometrics that studies the citations to and from documents. Such studies may focus on the documents themselves or on such matters as: their authors; the journals (if the documents are journal articles) in which the articles appear." Strohl's (1999) definition of citation checking is also on point for the current study: "a sample of citations from textbook bibliographies, journal articles, student dissertations or other sources are checked against holdings to see what proportion is owned."

Citation analysis is one of the popular methods employed in recent years for identification of core documents and complex relationship between citing and cited documents for a particular scientific community in a geographical proximity. The purpose of the present study is to investigate the use pattern of literature as revealed through the citation analysis of the doctoral dissertations submitted between 1990 and 2010 in the Department of Botany, Annamalai University, India.

Literature review

Slutz (1997) did a citation analysis of 16 Master's theses.

Each citation from the 16 theses was analyzed along the following criteria: gender of citation author; format of citation (book, article within book, journal article, thesis, dissertation); and place of publication. Findings indicated that more male authored citations were utilized; most sources were books, articles within books, and journal articles. Gooden (2001) performed citation analysis of dissertations. The 30 dissertations studied generated a total of 3,704 citations. It was found that Journal articles were cited more frequently than monographs: 85.8% of the citations were journal articles and 8.4% of the citations were monographs. A total of 4,012 citations in 70 postgraduate dissertations in education were studied by Okiy (2003). Most students in education used more textbooks (60.3 per cent), than other forms of library materials. Megnigbeto (2006) studied the citations of dissertations of library and information science undergraduate students and found that the number of citations to Internet resources was very low.

Buttlar (1999) did a citation analysis of 61 LIS dissertations and found some interesting publication patterns. About 80% of the citations were of single authors. He also found that journal articles were cited more than books, book chapters, proceedings, theses, and other print resources. The most cited journals were College & Research Libraries and Journal of the American Society for Information Science. Over half of the works cited were published within the last 10 years and originated from USA and UK.

Shokeen and Kaushik (2004) in their study entitled "Indian Journal of Plant Physiology: A Citation Analysis", covered the issues published between January to December 2002, issue number 1 to 4 of volume 7, 61 articles published in these issues. 1149 citations featuring 2770 authors during that period. 39% cited articles are three authored. The ratio of

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author self-citation to total citations was 1:16.65 and the ratio of author self-citation of total citation was 1:31.91. The average number of articles published in each issue was 15.25, which were higher than others.

Leiding (2005) conducted a study on the James Madison University Library's collection needs and found that the proportion of journal citations in relation to books has increased slightly over the period of 1993-2002. Though her intention was to examine the pattern of use of electronic journals, it could not be accomplished as there was no indication in the citations whether a journal article was accessed in print or electronic format.

Tonta and Al (2006) studied on the scatter and obsolescence of journals cited in theses and dissertations of librarianship. They analysed bibliometric features such as the number of pages, completion years, the fields of subject, the number of citations and their distribution by types of sources and year of 100 theses and dissertations completed at the Department of Librarianship of Hacettepe University between 1974 and 2002. They found that monographs received more citations than journal articles. The more recently theses and dissertations were completed, the more citations of electronic publications they contain.

Hart (2007) did a study on the collaboration and article quality in the literature of academic librarianship. He utilized citation counts of 543 articles from College & Research Libraries and The Journal of Academic Librarianship over a ten-year period and found no evidence to support the hypothesis that co-authored articles are of a higher quality. In both journals, the majority of articles have one author.

Jan (2009) in her work done Citation Analysis of Library Trends from 1994-2007 comprises 593 articles and each articles published during that period were examined and highest number (52) of articles were published in 2004. The journal contained 15662 references 13783 were p-citations and 1879 were e-citations. Jan (2009) examined 44.51% print books were consulted by the authors and 0% e-books were accessed. Findings indicated that authors consulted 44.04% p-journals and 11.82% e-journals. It was found that female contribution (52.34%) accounted more than male contribution (47.66%).

Jadhav Vandana, Khaparde, and Shelke Santosh (2011) did Citation Analysis of University News Journal. The articles published in the journal from January 2004 to December 2008 in which 5 volumes and 261 issues were covered. Total citations were 5968 and maximum referred citations were in 2007 and 2008 that is 2950 (50-60%). Books were most cited document, i.e. 1549 (29.39%) and maximum numbers of citations were taken from indie that is 3675 (62.61%). English language predominant that is 5968 and single authored citations dominant than others that is 3011 (51.30%).

2. Objectives

The objectives of the study are to:

- To know the distribution of citations in different bibliographic forms

liographic forms

- To examine the subject wise break up of citations
- To know the country-wise scattering of citations
- To examine the authorship pattern
- To identify the core journals

3. Methodology and Sample

References from 84 doctoral dissertations in the Department of Botany, Annamalai University, India between 1990 and 2010 were consulted. A total of 19,735 citations were collected averaging 235 citations per thesis. Citations belonging to journals, books, conferences, dissertations, reports, reference books, monographs, standards, patents, newspapers and unpublished citations were recorded and studied by bibliometric analysis. Further, Ulrich's for knowing the country and the subject of the cited journals. The data was tabulated in Microsoft Excel, and analyzed.

4. Results and Discussion

Analysis of data is the ultimate step in research process. It is the link between raw data and significant results leading to conclusions. This process of analysis has to be result oriented.

Types of Documents

The following table presents data on difference types of documents cited by the botany researchers in their doctoral dissertations:

Table 1. Type of Documents

Sl. No.	Types of Documents	No. of Citations	Percentage
1	Journals	13635	69.09
2	Books	2763	14.00
3	Conference – Proceedings	2214	11.21
4	Theses	418	2.12
5	Reports	308	1.57
6	Reference Books	178	0.90
7	Monographs	68	0.35
8	Standards	53	0.26
9	Patents	46	0.24
10	Newspapers / Magazines	37	0.19
11	Unpublished	15	0.07
	Total	19735	100.00

The analysis of data in table 1 shows that journals are most used bibliographic form account 13635 citations (69.09%) of the total citations 19735. The total number of citations from books were 2763 citations (14.00%), conference proceedings with 2214 citations (11.21%), theses with 418 citations (2.12%), reports with 308 citations (1.57%), reference books with 178 citations (0.90%), monographs with 68 citations (0.35%), standards with 53 citations (0.26%), patents with 46 citations (0.24%), newspapers with 37 citations (0.19%) and unpublished with 15 citations (0.07%). It can be concluded from the table that research scholars in botany use journals mostly for their research work.

Subject wise distribution of citations

The table 2 is observed that botany literature is scattered various subject areas. Genetics account for 2562 citations (12.98%), Microbiology with 1964 citations (9.96%), Eco-toxicity with 1725 citations (8.75%), Plant Physiology 1643 citations (8.33%), Remote Sensing with 1565 citations (7.94%), Agriculture with 1454 citations (7.37%), Air Pollution with 1312 citations (6.65%), Climate Change with 1253 citations (6.34%), Seed Science with 956 citations (4.84%), Taxonomy 843 with citations (4.27%), Natural Resource Management with 757 citations (3.84%), Wet land technology with 546 citations (2.76%), Weed Management with 452 citations (2.29%), Water Pollution with 410 citations (2.07%) Waste water treatment with 386 citations (1.95%) and other subjects with 1906 citations (9.66%).

Country wise distribution of citations

It is evident from table 3 that USA with 3354 citations (16.99%), UK with 2932 citations (14.86%), India with 2776 citations (14.07%), Germany with 1942 citations (9.85%), Japan with 1775 citations (8.99%), Canada with 1543 citations (7.82%), France with 1320 citations (6.68%), Australia with 1056 citations (5.35%), Norway with 952 citations (4.83%), Malaysia with 757 citations (3.84%) and other

countries with 1328 citations (6.72%) .

Authorship Pattern

The study has also analysed the citations by number of authors to assess the pattern of authorship in the literature of botany.

It is clear from Table 4 that single author (48.06%) are highest percentage in book, two authors (46.38%) have maximum percentage in journals. The single author (36.91%) are highest percentage in conference proceedings. It can be inferred from data that multi-authored papers are maximum in number accounting for 74.24% percent of total journal citations.

Ranking of Cited Journals

Ranking of the journals has been prepared on the basis of total citation frequency received by each journal. The titles have been arranged in decreasing order of the number of citations. It is given in the Table-5 with their rank and percentage of citations of contribution. The rest of the journals having less than 40 citations (6794) are given as the last rank as single group. In the rank list of journal Indian Journal of Genetics occupies the first rank, accounting to 6.98% of total citations followed by Indian Journal of Forestry (5.33%) and Journal of Industrial Pollution control (3.91%).

Table 2. Subject wise distribution of citations

Sl. No.	Subject	No. of Citations	Percentage
1	Genetics	2562	12.98
2	Microbiology	1964	9.96
3	Eco-Toxicity	1725	8.75
4	Plant Physiology	1643	8.33
5	Remote Sensing	1565	7.94
6	Agriculture	1454	7.37
7	Air Pollution	1312	6.65
8	Climate Change	1253	6.34
9	Seed Science	956	4.84
10	Taxonomy	843	4.27
11	Natural Resource Management	758	3.84
12	Wet Land Technology	546	2.76
13	Weed Management	452	2.29
14	Water Pollution	410	2.07
15	Waste Water Treatment	386	1.95
16	Others	1906	9.66
	Total	19735	100.00

Table 3. Country wise distribution of citations

Sl. No.	Country	No. of Citations	Percentage
1	USA	3354	16.99
2	UK	2932	14.86
3	India	2776	14.07
4	Germany	1942	9.85
5	Japan	1775	8.99
6	Canada	1543	7.82
7	France	1320	6.68
8	Australia	1056	5.35
9	Norway	952	4.83
10	Malaysia	757	3.84
11	Others	1328	6.72
	Total	19735	100.00

Table 4. Authorship Pattern

Author	Citation of Books	Citation of Journals	Citation of Proceedings
Single Author	1328 (48.06)	3513 (25.76)	817 (36.91)
Two Authors	856 (30.98)	6324 (46.38)	674 (30.45)
Three Authors	372 (13.46)	1860 (13.64)	309 (13.96)
Four Authors	136 (4.93)	1218 (8.93)	238 (10.74)
More than Four Authors	71 (2.57)	720 (5.29)	176 (7.94)
Total	2763 (100.00)	13635 (100.00)	2214 (100.00)

Table 5. Ranking of Cited Journals

S. No.	Rank No.	Name of the Journal	No. of Citation	Cumu. Citation	%
1	1	Indian Journal of Genetics	953	953	6.98
2	2	Indian Journal of Forestry	728	1681	5.33
3	3	Journal of Industrial Pollution control	534	2215	3.91
4	4	Journal of Hazardous Materials	436	2651	3.19
5	5	Canadian Journal of Botany	412	3063	3.02
6	6	Journal of Biological Science	354	3417	2.59
7	7	Indian Journal of Environmental Protection	322	3739	2.36
8	8	Journal of Indian Society of Soil Science	296	4035	2.17
9	9	Journal of Soil and Crops	254	4289	1.86
10	10	Indian Journal of Agronomy	236	4525	1.73
11	11	Journal of Plant Disease and Protection	216	4741	1.58
12	12	International Journal of Environmental Studies	186	4927	1.36
13	13	Canadian Journal of Remote Sensing	174	5101	1.27
14	14	New Zealand Journal of Agricultural Research	153	5254	1.12
15	15	Indian Journal of Biochemistry and Biophysics	142	5396	1.04
16	16	Indian Journal of Air Pollution control	135	5531	0.99
17	17	Native Orchid Journal	128	5659	0.94
18	18	Indian Journal of Experimental Botany	124	5783	0.91
19	19	Journal of Agricultural and Food Chemistry	120	5903	0.88
20	20	Journal of Scientific and Industrial Research	118	6021	0.87
21	21	Bangladesh Journal of Agricultural Research	114	6135	0.84
22	22	Indian Journal of Agricultural Food	108	6243	0.79
23	23	Canadian Journal of Genetics	102	6345	0.75
24	24	Israeli Journal of Botany	96	6441	0.71
25	25	Journal of Environment Management	94	6535	0.68
26	26	Indian Journal of Environmental Health	86	6621	0.64
27	27	Indian Journal of plant physical	78	6699	0.57
28	28	Journal of American Society of Horticultural Science	74	6773	0.54
29	29	International Journal of Remote Sensing	68	6841	0.49
30	30	Others (less than 40 citations)		6794	49.83
		Total		13635	100.00

5. Conclusions

The present paper has undertaken to trace the development of botany research at doctoral level. Out of 19735 citations from 84 theses were analysed by using citation analysis techniques and following conclusions are drawn:

- Citations cited in the theses are not in the standard format. Researchers have not adopted the uniform pattern and sequence while cited document.

- Highest number of citations recorded are from journal articles i.e. 13635 (69.09%) citations. Books source is the next favoured category of the researchers i.e. 2763 (14.00%) citations followed by Conference proceedings i.e. 2214 (11.21%) citations.

- USA, UK and India are contributes 9062 (45.91%) of total citations.

- It is concluded from the authorship pattern study that works of multi authors citations have frequently in journal.

- In the rank list of journal Indian Journal of Genetics occupies the first rank, accounting to 6.98% of total citations followed by Indian Journal of Forestry (5.33%).

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