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*Bibliometric analysis on 4,253 citations collected from doctoral dissertations submitted to various universities by the S&T workers working in the area of organic chemistry during 1977 to 1997 has been carried out to determine the use pattern of literature in the area. It is observed that major citations are from journal literature although citations from books, proceedings, patents, reports and thesis are also found. Among the citations from journal literature majority are from foreign journals. Journals from USA, UK occupies premier positions while journals from other countries are also cited. Among, the journal citations, more than 85% are from libraries' own collection of primary journals while secondary sources like Chemical Abstracts provided the rest of the citations. The half life of literature in the field of organic chemistry is found to be 27 years.*

#### INTRODUCTION

The importance of bibliometric study to see the effectiveness of a system is already well accepted as it is a distinctive research technique for measurement of science based on citation data. Citation analysis is one of the most important bibliometric techniques involving analysis of the references forming part of primary communication as citations are the formal explicit linkage between scientific communications that have particular points in common. The doctoral dissertations which are products of research activity form an important source of information because apart from giving the experimental evidences, it also records a thorough review of works that have already been done in a particular field to show that the proposed work is not done elsewhere. In this process, to establish their claim, the researcher

cites a large number of references in the theses. Studies of these citations may be useful in decision making process of a library [ 1-7 ] regarding acquisition of reading materials, and provision of better service to its users. One of the authors earlier made a study and suggested a way to find out highly used titles so as to help decision making process of the library towards renewal of subscription to journals based on their use factors [8]. The part of literature which is cited most and in which part of the globe such relevant works are going on can be judged through citation study which provides helpful guidance in the process of collection development of the library. Further, the shelving space of a library does not grow along with the growth of the collection. Hence, citation study ascertains the half life of literature which helps in deciding how long these documents are useful and should be preserved in the library.

#### OBJECTIVE

The objectives of the study are :

- to identify the forms of documents mostly used
- to find out a ranked list of highly cited titles of journals
- to derive the authorship pattern in the field of organic chemistry
- to calculate the half life of the organic chemistry literature, and
- to find out the percentage of satisfaction of the information users based on the stock of primary and secondary sources of information found in the library.

## MATERIALS AND METHODS

A total of 4,253 numbers of citations were found in all the nineteen theses. The collected information was tabulated suitably with the help of a simple application program developed using FOXBASE utility in the computer to analyse the information.

## ANALYSIS

### Forms of documents used

Out of 4,253 citations, 85.42% are from journal literature. Further, only 5.2% of the journal citations are from Indian journals. Detailed breakup of reference materials cited in the sample theses is shown in Table 1.

Table 1

*Types of Documents Cited*

Sl.No.	Type of document	No. of citations	Percentage of citations
1.	Books	353	8.30
2.	Journals	3633	85.42
3.	Patents	136	3.20
4.	Proceedings	38	0.90
5.	Reports	42	0.98
6.	Theses	51	1.20
Total		4253	100.00

Since citations from journal literature are dominating over the other forms, it was subjected to further analysis and found that 190 citations out of 3633 from journals are from 8 Indian journals. Of these, *Indian Journal of Chemistry* and *Journal of Indian Chemical Society* occupy the first and second positions respectively. Rest of the Indian titles are not much cited.

Among the citations from foreign journals, *Tetrahedron Letters* published by Paragomon Press, UK has received 569 citations. The journals are grouped according to the number of citations

they received as shown in Table 2 below. It is seen that by subscribing to only 27 journals, the library can satisfy more than 80% information needs of organic chemists. For the rest 20%, the users can depend on secondary and tertiary services available in the library or elsewhere. On an average, 48 titles are cited by the researchers with a minimum of 19 and maximum of 114 titles. It is also observed that on an average 24 titles were cited once and 8 titles got only two citations each. Among these least cited titles, some are very popular titles like *Nature*, *Science* and *Science and Culture*.

## BIBLIOMETRIC STUDY OF DOCTORAL DISSERTATIONS IN ORGANIC CHEMISTRY

Table 2

*Citation scenerio of journal titles*

Sl. No.	No. of journal titles	No. of citations received	Cumulative percentage of citation
1.	1	569	15.70
2.	4	200-400	51.00
3.	3	101-200	61.00
4.	7	51-100	71.60
5.	12	21-50	83.60
6.	11	11-20	94.50
7.	9	6-10	97.80
8.	19	1-5	100.00

### Rank list of highly cited journals

On analyzing the journal citations it is observed that more than 85 percent of citations are from 30

titles only, of which only 2 are Indian journals. Further, among these 30 titles, the library does not posses 8 titles in its stock.

Table 3

*Rank list of organic chemistry journals*

Rank	Title of Journals	Citation Received	Cumulative Citation	Cumulative Percentage
1	2	3	4	5
1.	TETRAHEDRON	569	569	15.70
2.	TETRAHEDRON LETT	399	968	26.60
3.	JOURNAL ORG CHEM	313	1,281	35.30
4.	PHYTOCHEMISTRY	295	1,576	43.40
5.	J AMER CHEM SOC	267	1,843	50.70
6.	J CHEM SOC	138	1,981	54.50
7.	CHEM COMM	134	2,115	58.20
8.	SYNTHESIS	103	2,218	61.00
9.	INDIAN J CHEM	93	2,311	63.60
10.	ANGEW CHEM	65	2,376	65.40
11.	CHEM BER	61	2,437	67.00
12.	PERKIN TRAN I	58	2,495	68.70
13.	KHIM PRIR SODIN	54	2,549	70.20
14.	J INDIAN CHEM SOC	53	2,602	71.60

contd.

table 3 (contn.)

Rank 1	Title of Journals 2	Citation Received 3	Cumulative Citation 4	Cumulative Percentage 5
15.	J MED CHEM	50	2,652	73.00
16.	HELV CHEM ACTA	43	2,695	74.20
17.	HETEROCYCLE	42	2,737	75.30
18.	CHEM PHARM BULL	38	2,775	76.40
19.	CHEM LETT	37	2,812	77.40
20.	CHEM & IND	35	2,847	78.40
21.	J HET CHEM	33	2,880	79.30
22.	CHEM REV	30	2,910	80.10
23.	COLL CZECH CHEM COMM	28	2,938	80.90
24.	AUST J CHEM	27	2,965	81.60
25.	BULL CHEM SOC JAPAN	25	2,990	82.30
26.	BER	23	3,013	83.00
26.	SYNTH COMM	23	3,036	83.60
27.	J PHARM SCI	20	3,056	84.10
28.	ORG SYNTH	18	3,072	84.60
29.	AGR BIOL CHEM	17	3,089	85.00
30.	J BIOL CHEM	16	3,105	85.50
31.	Others (36 titles with less than 15 citations)	528	3,633	100.00

Table 4

*Authorship pattern of cited literature from journals*

No.of authors	No.of citation	Cumulative citation	Cumulative percentage
1	490	490	13.50
2	1,214	1,704	47.00
3	945	2,649	73.00
4	550	3,199	88.00
5	237	3,436	94.60
6	127	3,563	98.00
more than 6	70	3,633	100.00

## BIBLIOMETRIC STUDY OF DOCTORAL DISSERTATIONS IN ORGANIC CHEMISTRY

### Authorship pattern

Authorship pattern (Table 4) depicts that majority of the work reported is done by small group of 2-3 workers whereas 13.50% work reported is by single authors and only 2% is done by very large groups (above 6 authors). Research workers generally publish papers during the period of their study. Altogether 55 papers were published by these 19 workers during their study which has come as self citations in their theses.

### Half life of organic chemistry literature

The citations arranged chronologically (Table 5) show that in the field of organic chemistry, maximum references used are 20-30 years old. It is in conformity with the Bradford's law of scattering and the half life of literature is found to be 27 years. Therefore, volumes older than 27-30 years can be shifted from the main library if need for more space is felt. The libraries in developing countries abroad preserve these older and less used

Table 5

*Year-wise distribution journal citations*

Cited years	No. of Citations	Cumulative citations	Cumulative percentage
1991-1997	658	658	15.50
1981-1990	838	1,495	35.00
1971-1980	1,398	2,893	68.00
1961-1970	709	3,602	84.70
1951-1960	392	3,994	93.90
1941-1950	122	4,116	96.80
1931-1940	59	4,175	98.20
1921-1930	21	4,196	98.70
1901-1920	26	4,222	99.30
1881-1900	24	4,246	99.80
1840-1880	6	4,253	100.00

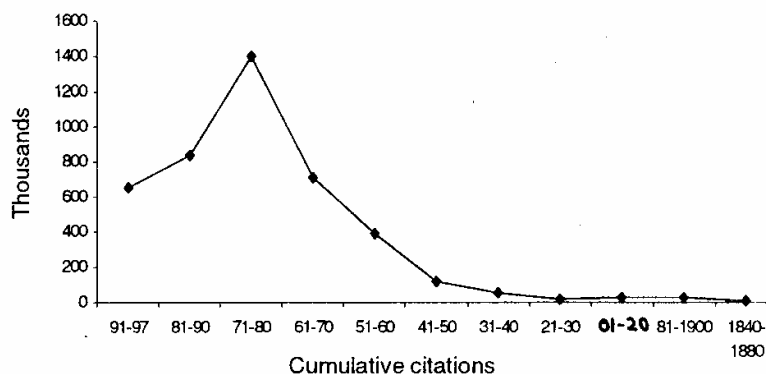


Fig. 1 Break up of citation - 10 year blocks (1900-97)

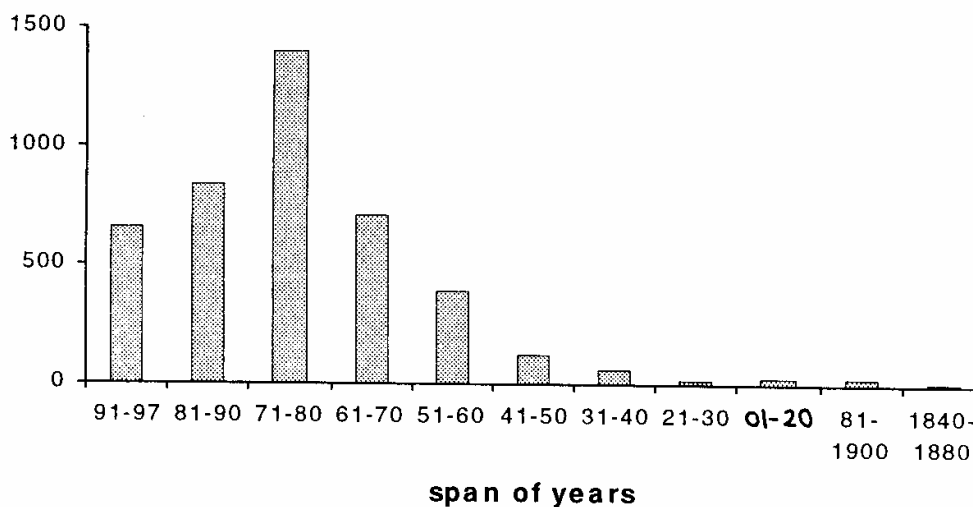


Fig. 2 Break-up of cumulative citations - 10 years blocks (1900-97)

materials in microform or on CD ROM for this reason. Figures 1 and 2 show the year wise break-up of number of citations and cumulative citations respectively.

#### Study on user satisfaction

Journal citations in the individual thesis are also studied thoroughly. It is seen that only 13.40% of citations from primary journals given by the authors are not available in the library. However, the library provides reprints of journals not available in the library from outside sources upon request. So there is a possibility that some such not available journal citations may be from the reprints procured by the library. Further, library subscribes to some secondary services like Chemical Abstracts. The Chemical Abstracts alone covers more than 7000 important primary source journals published throughout the world. Therefore, a researcher can not avoid search of such secondary services to

conceive an idea for research and also avoid duplication of his/her effort. To ease the situation the library also subscribes to cumulative indexes regularly. Therefore, some references cited by the researchers in their thesis may be directly quoted from such secondary sources. The researchers prefer to get review articles during their literature search because these give them a thorough idea of latest position of research in the particular area. In these review articles generally large number of citations are given. Therefore, it is probable that the author of the thesis may quote some reference as it appears in the review papers.

Therefore, although 86.40% satisfaction is recorded in terms of availability of primary journals in the library yet it is actually quite higher than that considering the availability of secondary sources and services of the library. Table - 6 shows details of availability of cited references from library's collection.

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Table 6

*Total Journal Citations Vs Journals Available at RRL Library*

Sample Thesis	Total Cited	Primary Journal available at RRL Library	From Chem Abstavailable at RRL Library	Percentage of availability in library
1	115	104	11	90.40
2	157	134	23	85.40
3	104	83	21	79.80
4	93	82	11	88.20
5	157	139	18	88.50
6	149	133	16	89.30
7	373	289	84	77.47
8	98	82	16	83.70
9	94	78	16	83.00
10	414	363	51	87.70
11	129	108	21	83.70
12	133	116	17	87.20
13	264	242	22	91.70
14	192	181	11	94.30
15	278	223	55	80.20
16	221	204	17	92.30
17	340	311	29	91.50
18	182	149	33	81.90
19	140	118	22	84.30
	3,633	3,139	494	86.40

**CONCLUSION**

It is seen from above that a major portion of information comes from journals and the library is in a position to supply 86% of users' needs from its own collection. Within the provision of budget, the library may subscribe to the following few journals which will improve the situation further.

1. J CHEM SOC
2. COLL CZECH CHEM COMM
3. SYNTH COMM
4. KHIM PRIR SODIN
5. BULL CHEM SOC JAPAN
6. ORG SYNTH

It is not possible to satisfy the needs of all the users of any library because of the information explosion and budget constraints. Still the library may judiciously use its resources by subscribing highly used titles and deleting less used titles. There should be a mechanism to review the current subscription list as the area of interest of users shifts from time to time. Further, preparation of a union catalogue of titles subscribed by the neighboring libraries and establishing a resource sharing link will be further helpful.

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