
JOURNAL CITATIONS IN HORTICULTURE DOCTORAL DISSERTATIONS (1991-2010) : A CASE STUDY

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ABSTRACT

Presents results of a citation study comprising 545 journals containing 8437 references collected from 80 doctoral dissertations accepted and awarded by Bidhan Chandra Krishi Viswavidyalaya (BCKV) and Uttar Banga Krishi Vswavidyalaya (UBKV), West Bengal, India during 1991-2010. It was observed that journals are the most frequently cited bibliographic form of citations. Two authors (37.039%) were the highest in the cited journals followed by three authors (25.116%) and single authors (20.896%). 49.733% of journal citations were in the period of 1980 to 1999. The mean year of cited articles was found to be 28.703 years and the half-life of journal articles cited by the horticulture scientists were calculated as (Median Year) 24 years.

KEYWORDS: Citation Analysis, Doctoral Dissertations, Half-Life, Horticulture

Introduction

Citations are the key elements of citation analysis. Citation analysis is one of the important tools among other informetric techniques to find out the important journals in a particular field and is becoming popular in their practical application in libraries and information centres (Pillai, 2007). In every subject there are some journals which are frequently referred by the researchers because of the close relation between the subject of the journal articles and the areas of research work (Sudhier, 2010). The analysis of citations has been established as a method of studying the journals as well as the people and the work of science. The citation links provide a quantitative picture of the journal article utility and relationships that are useful in many ways. Here, the study is mainly based on what scientists say about the utility and relationships in their choice of journal articles (Devarajan, 1997).

Objectives of the Study

The specific objectives of the present study are:

- To determine the bibliographic forms used by the researchers.
- To identify the rank list of journals.
- To prepare the authorship patterns of journal articles.
- To study the subject and language distribution of journal articles.
- To find out the obsolescence / age of horticulture journal articles.

Review of Literature

A number of studies on journal citations in various subjects exist particularly in the Indian context. Edwards (1993) determined which journal titles were used by Polymer Science and Polymer engineering graduate students. Sangam (1993) assessed the core journals in Geography after analyzing the citations of Ph.D. dissertations accepted by Karnataka University, Dharward. There were 49 periodicals cited in the Geography theses and it is interesting to note that only 10 periodicals account for 67.69% of the total citations. Lal and Panda (1996) created a ranked list of the 100 most frequently cited core periodicals in Plant Pathology after examining 20 dissertations from the Department of Plant Pathology at Rajasthan Agriculture University during 1980-1993. Chudamani and Sandhya (1999) analyzed journals subscribed by the JRD Tata Memorial Library of Indian Institute of science (IISc) which were covered in the JCR and a ranked list of journals based on the impact factor was prepared 800 journals out of the 1500 journals subscribed by the library were covered in the JCR. Kherde (2003) analyzed the citations appended to articles that appeared in popular Indian journals in Library and Information Science (LIS) during the period 1996-2001 and attempted to identify the core periodicals in the field of LIS. Waugh and Ruppel (2004) in their citation analysis of 265 workforce education and development dissertation at Southern Illinois University, Carbondale determined core serials in the discipline. Lariviere et al (2006) addressed the importance of journal literature in the various scientific fields by providing a systematic measurement of the role played by journal literature in the building of knowledge in both the natural sciences and engineering and the social sciences and humanities. Pillai (2010) studied on 690 journals containing 11412 references collected from 71 doctoral theses awarded by the Indian Institute of Science, Bangalore during 1999-2003. It was observed that journals are the most frequently cited bibliographic form of citations. Half-life of journal citations was found to be 10 years and the mean year of journals was 14.19. Nandi and Bandyopadhyaya (2011) studied 73 theses

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submitted in the Mathematics Department of the University of Burdwan during 1960-2000 for finding the trend of research; article productivity, choice of journals, authorship pattern and most prolific authors with their credit and impact.

Dhawan and Yadav (1972) in Physics, Elisha and Kavitha (1985) in Organic Chemistry, Karanjai and Mujoo-Munshi (1987) in Science and Technology, Lal (1990) in Social Sciences, Ambia (1991) in Physics, Gupta (1991) in Medical Science, Lahiri (1996) in Library Science, Abdoulaye (2002) in Library and Information Science, Ahmad and Haridasam (2006) in veterinary Science, Pillai (2010) in Biochemistry and Singh Barman (2011) in Law have also studied the ranking of journals in different subjects.

Methodology of the Study

Doctoral dissertations awarded in the field of Horticulture were analyzed during 1991-2010. There were 80 dissertations (75 from BCKV and 5 from UBKV) awarded during the study period and 10,845 citations were appended. Of the citations, 545 journals occupy the first position with 8437 (77.796%) citations. Title pages and reference sections were photocopied from each of the 80 dissertations. Information extracted from each dissertation for determining the bibliographic forms, authorship patterns of journals, rank list and age studies of journal articles. Data about bibliographic entries listed in the dissertations were collected on a worksheet designed for this purpose.

Data Analysis and Interpretation

Journals are the carriers of the latest information and are the most important components of the information resources used by researchers. It is also considered as an important vehicle for scholarly communication. In this regard an attempt is made for the analysis of citations on journal articles only.

Bibliographic Forms Used by the Researchers

The following table presents data on different types of documents cited by the researchers in their doctoral dissertations.

Table 1: Form wise Distribution of Citation

Bibliographic Forms	No of Citations	% of Citations	Cum. Citations	% of Cum. Citations
Journal Articles	8437	77.796	8437	77.796
Books	1327	12.236	9764	90.032
Conference Proceedings	512	4.721	10276	94.753
Theses and Dissertations	158	1.458	10434	96.211
Bulletins	122	1.125	10556	97.336
Reports	120	1.107	10676	98.443
Yearbooks	42	0.387	10718	98.830
News Letters	39	0.360	10757	99.190
Web Resources	16	0.147	10773	99.337
Handbooks	14	0.129	10787	99.466
Monographs	11	0.103	10798	99.569
Other 11 Bibliographic forms having less than 9 citations	47	0.047	10845	100.000
Total	10845	100.000	10845	100.000

The analysis of data in Table 1 shows that both journal articles (77.796%) and books (12.236%) dominated the list as source of information for researchers in Horticulture. Together, both journal articles and books constituted nearly 90 percent of the total items cited. Conference Proceedings and Theses & Dissertations occupied the third and fourth places with 4.721 percent and 1.458 percent respectively. Citations to bibliographic forms that are accounted for less than 0.100 percent are grouped under 'Others' category. This category includes citation to Course Materials, Manuals, Leaflets, Working Papers, Abstracts, Magazines, Reviews, Souvenir, Pamphlets, Patents, and Standards. This category constitutes only 0.047 percent of the total citations cited by the researchers.

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Rank List of Journals

Journals are essential for research but their increasing cost demands that librarians study their quality, usefulness and suitability to a particular group of users. The ranking list is a particular tool to help select journals of maximum utility in relation to their coverage of new and important list in a particular subject area. The ranked list of journals in the field of Horticulture is presented in Table 2. Journals cited more than 3 times appear in the Table. Journal titles are arranged in their decreasing order.

Table 2: Ranking of the Most Cited Journals

Rank	Name of Cited Journals	Year	OC	NJ	PNJ	CNJ	PCJ
1	Hort science	1966	USA	441	5.227	441	5.227
2	Journal of American Society for Horticulture Science	1903	USA	405	4.801	846	10.028
3	South Indian Horticulture	1953	India	397	4.706	1243	14.734
4	Haryana Journal of Horticulture Science	1973	India	364	4.314	1607	19.048
4	Journal of Root Crops	1975	India	364	4.314	1971	23.362
5	Acta Horticulturae	1971	Netherland	350	4.148	2321	27.510
6	Indian Journal of Agricultural Science	1931	India	315	3.734	2636	31.244
6	Indian Horticulture	1956	India	315	3.734	2951	34.978
7	Journal of Ornamental Horticulture new series	1993	India	294	3.485	3245	38.463
8	Plant physiology	1926	USA	283	3.354	3528	41.817
9	Foliage Digest	1978	USA	272	3.224	3800	45.041
10	Journal of Agricultural Research	1963	Pakistan	258	3.058	4058	48.099
11	Tropical Agriculture Trinidad	1924	USA	247	2.928	4305	51.027
11	Vegetable Science	1973	India	247	2.927	4552	53.954
12	Journal of Agricultural Science Society of North East India	1985	India	201	2.382	4753	56.336
13	Annals of Applied Biology	1914	UK	184	2.181	4937	58.517
14	Colture Protette	1937	Italy	160	1.896	5097	60.413
14	Experimental Agriculture	1973	Kenya	160	1.896	5257	62.309
15	Bangladesh Journal of Agricultural Research	1975	Bangladesh	121	1.434	5378	63.743
15	American Journal of Botany	1914	USA	121	1.434	5499	65.177

OC=Origin of Country, NJ=Number of journals, PNJ=Percentage of Number of Journals, CNJ=Cumulative Number of Journals, PCJ=Percentage of Cumulative Number of Journals.

The ranked list of the most used cited journals in the field of Horticulture is presented in Table 24. It is observed that researchers in horticulture have cited a total of 545 journals. 'Horticulture Science' occupies the first rank with 5.227 percent of the total cited journal citations, followed by 'Journal of the American Society for Horticulture Science' with 4.801 percent, 'South Indian Horticulture' with 4.706 percent, 'Haryana Journal of Horticulture Science' with 4.314 percent, 'Journal of Root Crops' with 4.314 percent, 'Acta Horticultuae' with 4.148, 'Indian Journal of Agriculture Science' with 3.734 percent, and 'Indian Horticulture' with 3.734 percent. The first 6 journals cover 27.510 percent of the total cited journals. The first 13 journals in the ranked list contribute 51.027 percent of the total journal citations. Among them, 7 journals are devoted to Horticulture, 3 journals are devoted to Agriculture, and one journal each, is devoted to Root Crops, Plant Physiology, Foliage. The first 32 journals contributed 75.393 percent of total cited journal citations and remaining nearly 25 percent of cited are distributed among 513 other journals.

Authorship Pattern of Articles

Table 3 gives the distribution of the cited articles with respect to the number of authors. Out of 8437 references cited 1763 (20.695%) are single authored journals.

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Table 3: Year wise Distribution of Authorship Pattern

Year	1 Authors	2 Authors	3 Authors	4 Authors	5 Authors	6 Authors	7 Authors	8 Authors	9 &> Authors	An.	No of Authors	No of D	Average Authors per D
1991	154	277	179	78	17	7	2	1	2	8	725	5	145.00
1992	58	116	42	15	3	-	-	-	-	-	234	2	117.00
1993	80	94	73	18	4	-	1	-	1	-	271	3	90.340
1994	27	44	35	11	1	1	-	-	-	-	119	3	39.670
1995	66	93	50	9	2	-	-	-	-	-	220	2	110.000
1996	24	32	12	2	-	-	-	-	-	-	70	1	70.000
1997	65	91	71	21	10	3	1	-	-	-	262	3	87.340
1998	30	28	4	2	4	-	-	-	-	-	68	1	68.000
1999	25	62	44	11	5	1	-	1	-	-	149	2	74.500
2000	146	274	175	59	9	6	2	4	1	-	676	7	96.570
2001	118	146	108	43	13	2	-	-	1	-	431	5	86.200
2002	145	267	163	75	11	10	-	2	1	-	674	6	112.340
2003	47	86	52	14	7	6	2	1	2	-	217	2	108.500
2004	35	54	37	28	4	3	-	1	-	-	162	1	162.000
2005	200	348	224	108	36	16	3	7	5	1	948	10	94.800
2006	101	271	204	104	32	4	4	1	1	-	722	6	120.340
2007	147	226	190	101	30	9	3	1	3	-	710	6	118.340
2008	125	234	159	88	29	12	5	4	3	-	659	6	109.840
2009	109	230	181	95	30	17	7	1	1	-	671	5	134.200
2010	61	152	116	74	26	11	7	1	1	-	449	4	112.250
Total	1763	3125	2119	956	273	108	37	25	22	9	8437	80	105.460

An= Anonymous, D= Dissertations

6691(79.305%) are multi-authored journals. Citations to single author contributions are more in number in the year 2005 with 200 citations followed by 154 citations in 1991 and 147 citations in 2007. The lowest citations to single author publications are 27 in 1994. Among the multi-author articles, the share of two author contributions is found to be more i.e. 3125 citations (37.039%), followed by 2119 citations (25.116%) of three author contributions and 956 citations (11.331%) of four author contributions. The study reveals that team research is on the increase in the field of Horticulture.

Productive Patterns of Authors in Cited Articles

The study has also analyzed the citations by number of authors to assess the pattern of authorship in the literature of Horticulture in Table 4.

Table 4: Productive Pattern of Authors of Cited Articles

No. of Authors Per Papers	No. of Cited Papers	% of Cited Papers	Cum. Cited Papers	% of Cum. Cited Papers
One	1763	20.896	1763	20.896
Two	3125	37.039	4888	57.935
Three	2119	25.116	7007	83.051
Four	956	11.332	7963	94.383
Five	273	3.236	8236	97.619
Six	108	1.28	8344	98.899
Seven	37	0.438	8381	99.337
Eight	25	0.296	8406	99.633
Nine	1	0.012	8407	99.645
Ten	10	0.118	8417	99.763
Eleven	2	0.023	8419	99.786
Twelve	4	0.047	8423	99.833
Thirteen	1	0.012	8424	99.845
Fourteen	3	0.036	8427	99.881
Fifteen	1	0.012	8428	99.893
Anonymous	9	0.107	8437	100
Total	8437	100	8437	100

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It is clear from table that two authors (37.039%) are highest in the cited journals followed by three authors (25.116%), single author (20.896%) and four authors (11.332%).

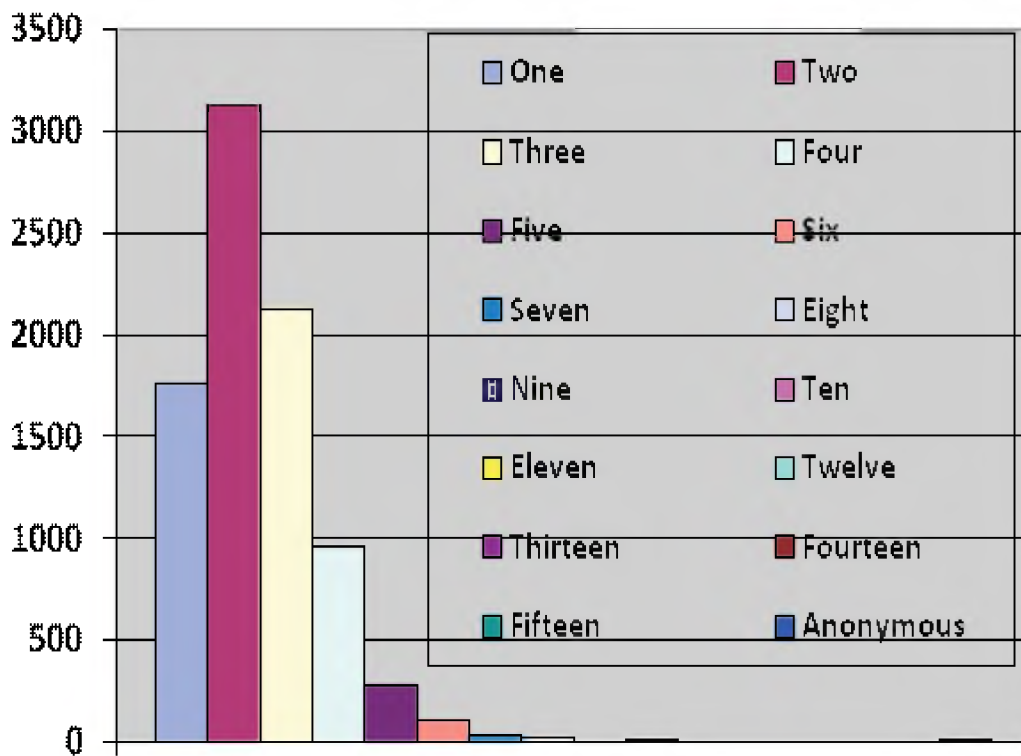


Figure 1 : Productive Pattern of Authors of Cited Articles

Collaborative Research pattern of Cited Authors

During the twenty years from 1991 to 2010, horticulture scientists have produced a total of 8437 cited journal articles. Table 5 presents the year wise cited journal productivity, authorship patterns (single and multi-authored journals), collaboration trend among scientists and cumulative growth of cited journals.

Table 5: Collaborative Research of Cited Authors

Year	Single Authored (NS)	% of NS	Multiple Authored (NM)	% of NM	Degree of Collaboration (NM/NS+NM)	Total No of Journals	% of Journals
1991	154	8.735	563	8.447	0.785	717	8.507
1992	58	3.29	176	2.641	0.752	234	2.776
1993	80	4.538	191	2.866	0.705	271	3.215
1994	27	1.531	92	1.38	0.773	119	1.412
1995	66	3.744	154	2.311	0.7	220	2.61
1996	24	1.361	46	0.69	0.657	70	0.831
1997	65	3.687	197	2.956	0.752	262	3.108
1998	30	1.702	38	0.57	0.559	68	0.807
1999	25	1.418	124	1.861	0.832	149	1.768
2000	146	8.281	530	7.952	0.784	676	8.021
2001	118	6.693	313	4.696	0.726	431	5.114
2002	145	8.225	529	7.937	0.785	674	7.998
2003	47	2.666	170	2.551	0.783	217	2.575
2004	35	1.985	127	1.905	0.784	162	1.923
2005	200	11.344	747	11.208	0.788	947	11.236
2006	101	5.729	621	9.317	0.86	722	8.567
2007	147	8.338	563	8.447	0.793	710	8.424
2008	125	7.09	534	8.012	0.81	659	7.819
2009	109	6.183	562	8.432	0.837	671	7.962
2010	61	3.46	288	4.321	0.641	449	5.327
Total	1763	100	6665	100	0.755	8428	100

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The highest number of cited journals is in the year 2005 with 947 (11.236%) and the average number of cited journals per year is 421.5. The least number of cited journals are made in 1998 with 68 (0.807%) citations.

Subject wise Distribution of Articles

The subject heading categorization is done according to the 18th edition of the Sears List of Subject Headings (SLSH). The subject classification gives some idea of the relative importance of the traditional branches as well as the newly-developed specialized branches of Horticulture. Table 6 shows the distribution of the subject areas of cited articles, ranked in the order of their scores from the highest to the lowest.

Table 6: Subject wise Distribution of Cited articles

Rank	Subject Coverage	No. of Articles	% of Articles	Cum. Articles	% of Cum. Articles
1	Mango-Growth	277	3.284	277	3.284
2	Litchi-Production	268	3.177	545	6.461
2	Pointed gourd -Genetic diversity	268	3.176	813	9.637
3	Chilli- Fertilizers	255	3.022	1068	12.659
4	Banana-Chemical compositions	246	2.916	1314	15.575
5	Okra- Nutrient contents	239	2.833	1553	18.408
6	Mango-Physico-chemical studies	213	2.525	1766	20.933
7	Jackfruit-Genetic resources	207	2.454	1973	23.387
8	Cowpea-Yield components	195	2.311	2168	25.698
9	Yam - Growth	180	2.133	2348	27.831
10	Orange-Nitrogen effects	162	1.920	2510	29.751
11	Litchi-Growth	149	1.766	2659	31.517
12	Tomato cultivations	146	1.731	2805	33.248
12	Onion-Preservations	146	1.731	2951	34.979
13	Okra-Growth	140	1.659	3091	36.638

14	Brinjal-Genetic diversity	132	1.565	3223	38.203
15	Taro-Growth	130	1.540	3353	39.743
15	Fruit crop-Growth	130	1.540	3483	41.283
16	Ber-Genetic studies	128	1.517	3611	42.800
17	Cashew-Fertilizers	125	1.482	3736	44.282
18	Mango-Floral biology	124	1.470	3860	45.752
19	Coconut-Production	120	1.422	3980	47.174
20	Citrus-Nutrition	115	1.363	4095	48.537
21	Tomato-Growth	113	1.340	4208	49.877
22	Cauliflower-Growth	112	1.327	4320	51.204
22	Arecanut-Fertilizers	112	1.327	4432	52.531
23	Soil conservations	109	1.292	4541	53.823
24	Banana-Postharvest treatments	106	1.256	4647	55.079
25	Bottle gourd-Growth	105	1.245	4752	56.324
26	Guava-Chemical analysis	103	1.221	4855	57.545
	Total	8437	100.000	8437	100.000

'Mango-growth' ranked highest with 277 scores representing 3.284 percent, 'Litchi production' and 'Pointed gourd-Genetic diversity' followed with 268 scores representing 3.177 percent each. 'Chilli-Fertilizers' recorded 255 scores representing 3.021 percent, and Banana-Chemical compositions' recorded 246 scores representing 2.916 percent.

The first 9 subject areas cover 25.698 percent of the total journal citations. The first 25 subject areas contributed 51.204 percent and remaining 48.796 percent of cited are distributed among 315 other subject coverage.

Chronological Distribution of Articles

The chronological distributions of journal citations are given in Table 7. The citations from journals are divided into 11 periods of years having periodicity of 10 years each.

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Table 7: Chronological Distribution of Articles

Periods	No. of Citations	% of Citations	Cum. Citations	% of Cum. Citations
Up to 1900	40	0.474	40	0.474
1910-1919	64	0.758	104	1.232
1920-1929	122	1.446	226	2.678
1930-1939	161	1.908	387	4.586
1940-1949	250	2.963	637	7.549
1950-1959	482	5.714	1119	13.263
1960-1969	646	7.657	1765	20.920
1970-1979	1195	14.164	2960	35.084
1980-1989	2070	24.535	5030	59.619
1990-1999	2126	25.198	7156	84.817
2000-2009	1281	15.183	8437	100.000
Total	8437	100.000	8437	100.000

The journal citations before 1909 are included in the group up to 1909. Most of the citations of the researchers prefer the period 1990-1999 (25.198%) and followed by 1980-1989 (24.535%), i.e. 49.733% of journal citations are in the period of 1980-1949.

Currency of Articles and its Obsolescence

A total of 8437 journal citations are grouped into 11 time span, each having time duration of ten years. The Table 8 represents the obsolescence of journals cited in the Horticulture Doctoral Dissertations.

Table 8: Currency of Cited Articles and its Obsolescence

Time Span (In Years)	No of Citations	% of Citations	Cum. Citations	% of Cum. Citations
< 09	1008	11.947	1008	11.947
10-19	2215	26.253	3223	38.200
20-29	2160	25.602	5383	63.802
30-39	1175	13.927	6558	77.729
40-49	660	7.823	7218	85.552
50-59	486	5.760	7704	91.312
60-69	285	3.378	7989	94.690
70-79	172	2.039	8161	96.729
80-89	150	1.778	8311	98.507
90-99	84	0.996	8395	99.503
100 <	42	0.497	8437	100.000
Total	8437	100.000	8437	100.000

The Horticulture Scientists cite more current journals with time span of 00-09 (11.947%), 10-19 (26.253%) and 20-29 (25.602%) in their theses. They quote a much lower percentage of older literature and a much larger percentage (38.2%) of recent literature i.e. less than 20 years old. The Mean year of cited articles is found to be 28.703 and the half-life of journal citations by the horticulture scientists are calculated as (Median year) 24 years.

Findings of the Study

- The horticulture scientists mainly used journal articles 8437 (77.79 %) for collecting the required information.
- Both journal articles and books constitute 90.03 percent of total resources cited.

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- The study reveals that team research is on the increase in the field of horticulture.
- It is observed that two authors 37.03 percent are the highest in the cited journal articles followed by three authors 25.11 percent and single author 20.896 percent.
- The average number of cited journal articles per year is 421.5.
- The first 9 subject areas cover 25.69 percent of the total journal citations and the first 25 subject areas contributed 51.20 percent.
- Most of the citations of the scientists prefer the period 1990-1999.
- The mean year of cited articles is found to be 28.70 and the half-life of journal citations by scientists are calculated as (Median year) 24 years.

Conclusion

Dissertation citation analysis has frequently been proposed as an in-house means to identify journals most important for the research collection. A number of studies have been reported on the use of citation analysis not only as a means for eliminating less-used journals, but also for purchasing needed ones. Journals are the carriers of the latest information and are the most important component of the information resource used by researchers. It is also considered to be an important vehicle for scholarly communication. Most of the research output and original findings or new application of existing knowledge are reported in journals. The ranked list is essentially a practical tool designed to help the librarians and horticulture scientists to select the journals of maximum utility in relation to their coverage of new and important literature in horticulture subject.

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