

Citation analysis of Post Graduate Theses submitted to Department of Post Harvest Management of Post Harvest Engineering in Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, and Maharashtra

Mr. Mukhedkar Mataprasad Venkatrao.¹ [0000-0001-9992-3654]

Assistant Librarian

Post Graduate Institute of Post Harvest Management, A/p Killa Tal. Roha, Dist. Raigad
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, M.S.

Dr. (Mrs.) Waikar Geetanjali Anant²

Assistant Professor (FHQC) & Library In charge

Post Graduate Institute of Post Harvest Management, A/p Killa Tal. Roha, Dist. Raigad
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, M.S.

Prof. Patange SB³

Professor (Department of MPF) and In Charge Associate Dean

Post Graduate Institute of Post Harvest Management, A/p Killa Tal. Roha, Dist. Raigad
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, M.S.

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Abstract:

Citation analysis aids in determining how users seek out content for various purposes. The obsolescence rate can be calculated via citation analysis. The goal of this study is to determine the rate of obsolescence of publications in the field of Post Harvest Management of Post Harvest Engineering. Citation analysis of Master degree theses submitted to the department of Post Harvest Management of Post Harvest Engineering of the Post Graduate Institute of Post Harvest Management, Killa-Roha, Dist. Raigad, a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra is being carried out. Theses submitted during the years 2018 to 2020 are taken for the study. There are total 14 theses, yielding 2155 citations. Analysis is also done to find out the Forms of the Information sources referred by the researchers in their theses, Chronological distribution of citations and Authorship Pattern

Key Words: Citation Analysis, Obsolescence study, Authorship study

Introduction

The study of citations is a worthy endeavour. "Citation analysis" refers to references in one text to another text, as well as information on where to find that text. Understanding subject relationships, author effectiveness, publication trends, and so on can all be aided by citation analysis. Gross and Gross (1927) were the first to use citation analysis to identify which publications should be subscribed to and which back volumes should be purchased for Pomona College's library. They looked examined the frequency of citations in the references in the Journal of the American Chemical Society (Amudhavalli 1997). Citation analysis allows you to analyse and interpret the citations that articles, authors, institutions, and other indicators of scientific activity have received (Ravichandra Rao 1993).

Citation analysis can also help you learn more about your users. Examining the types of sources most typically used and appreciated locally in your faculty's publications or your students' papers reveals the types of sources most commonly used and valued in their specialties (Curtis 2005). Bibliographic references are used, which are an important aspect of scientific communication (Encyclopedia of Library and Information Science, 1998). Citation analysis (Ane's Encyclopedic Dictionary of Library and Information Science, 2006) is a prominent topic of bibliometric research that uses various methods of citation analysis to determine linkages between authors or their work. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra was established on 18.05.1972 and Post Graduate Institute of Post Harvest Management, a constituent college was established in the year 2010. Here onwards following abbreviations will be used alternatively:

DBSKKV : Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth

PGIPHM : Post Graduate Institute of Post Harvest Management

PHM : Post Harvest Management

PHM of PHE : Post Harvest Management of Post Harvest Engineering

Objectives:

- 1) To know the research output of Department of Post Harvest Management of Post Harvest Engineering of Post Graduate Institute of Post Harvest Management, Killa-Roha, Dist. Raigad, a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra.
- 2) To study various forms of information sources approached by researchers of PHM of PHE, PGIPHM, Killa-Roha, Dist. Raigad of DBSKKV, Dapoli
- 3) To study age of the sources approached by the researchers of PHM of PHE, PGIPHM, Killa-Roha, Dist. Raigad of DBSKKV, Dapoli
- 4) To study the authorship pattern of the sources approached by the researchers of PHM of PHE, PGIPHM, Killa-Roha, Dist. Raigad of DBSKKV, Dapoli
- 5) To study the Obsolescence rate of PHM of PHE Journals and Books.

Scope:

The present study is to derive the obsolescence rate of publications in the field of Post Harvest Management of Post Harvest Engineering. The methodology opted is Citation Analysis of Master degree theses submitted to the Department of Post Harvest Management of Post Harvest Engineering of Post Graduate Institute of Post Harvest Management, Killa-Roha, Dist. Raigad, a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra. The duration is from 2018 to 2020 and the total number of theses is 14, having 2155 citations.

Methodology:

The data for the study were collected from the theses submitted to M.Sc. (PHM) in Post Harvest Engineering department of Post Graduate Institute of Post Harvest Management, Killa-Roha, Dist. Raigad of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. The title page and the references given at the end of the theses were photocopied. The demographic details of M.Sc. theses and the citations were entered in MS-Excel. Unique identification number was given to each thesis and its corresponding citations. The data entered in MS-Excel was analyzed by the structure of the subject, distribution of documents by author characteristics and document characteristics to meet the objectives of the study. The interpretation of data findings of study is recorded.

Results and Analysis:**Research output from Department of Post Harvest Management of Post Harvest Engineering in PGIPHM, Killa-Roha, Dist. Raigad of Dr. BSKKV, Dapoli:**

The following Table 1 reveals the rate of Master Degree Awards or research output from Department of Post Harvest Management of Post Harvest Engineering in PGIPHM, Killa-Roha, Dist. Raigad of Dr. BSKKV, Dapoli. The whole time span is from 2018 to 2020. The highest Master degrees are awarded in the year 2018 and 2020 and it is 5 each out of total 14 i.e., 35.71% ranking the first. In the year 2019, 4 Theses are submitted which is 28.57% standing on the 2nd rank.

The table 1 also contains data of number of citations added to the theses and average number of citations per thesis. The average number of citations added in the year 2018 per thesis is $817 / 2155$ i.e., 37.91%, the first rank. In the year 2020, average number of citations added is $763 / 2155$ i.e., 35.41% posing the 2nd rank. The average number of citations added per thesis in the year 2019 is $575 / 2155$ i.e., 26.68%, which is in the 3rd rank.

Table 1 Year wise Distribution of M.Sc. Theses in Post Harvest Engineering (PHE)						
S. N.	Year	No. of Theses	Percentage	Ranking	No. of Citations	Average No. of Citations per Thesis
1	2018	5	35.71	1	817	37.91
2	2019	4	28.57	2	575	26.68
3	2020	5	35.71	1	763	35.41
		14	100.00		2155	100.00

Form wise distribution of citations:

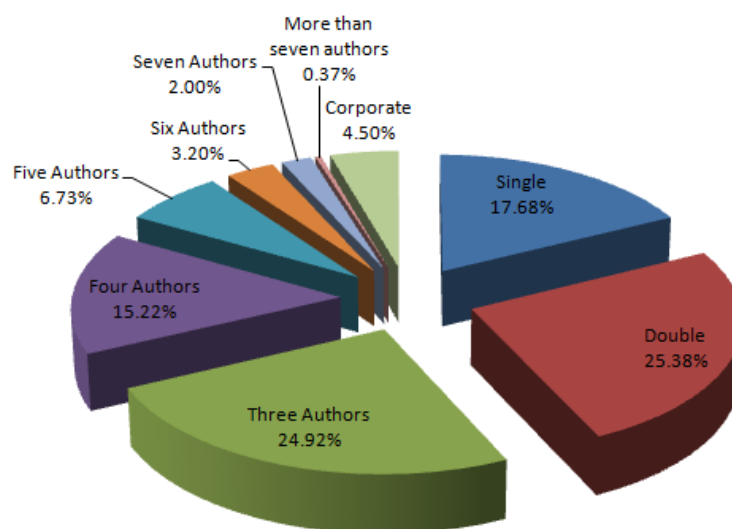
M.Sc. students of Post Harvest Management of Post Harvest Engineering department approached wide variety of information sources for their research. The various types of resources and number of citations are given in the following Table 2. The data reveals that researchers cited the journal / periodical articles most frequently. There are 1813 journal article citations among 2155 – the 1st rank and 129 Book citations – the 2nd rank and , 45 Manual citations among 2155 citations – the 3rd rank.

Table 2 Form wise distribution of citations			
Type of Resource	No. of Citations	Percentage	Ranking
Journal Article	1813	84.13	1
Book	129	5.98	2
Manual	45	2.08	3
Book Chapter	40	1.85	4

Thesis (M.Sc.)	28	1.30	5
Conference Proceedings	20	0.93	6
Web page	20	0.93	6
Database	15	0.70	7
Doctoral Dissertation	10	0.46	8
Thesis (M.S.)	7	0.32	9
Handbook	5	0.23	10
Report	5	0.23	10
Thesis (Ph.D.)	4	0.19	11
Indian Standard	2	0.09	12
Market Report	2	0.09	12
Patent	2	0.09	12
Conference Paper	1	0.05	13
Directory Databook	1	0.05	13
Dissertation (M.Sc.)	1	0.05	13
Research Bulletin	1	0.05	13
Specifications	1	0.05	13
Symposium article	1	0.05	13
Thesis (PGD)	1	0.05	13
Workshop Paper	1	0.05	13
Total	2155	100.00	

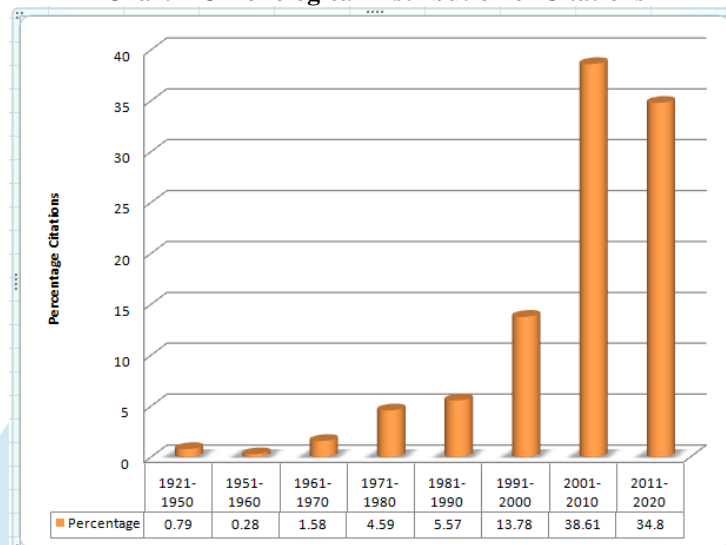
Authorship pattern is the study of cited publications is prepared by single authored? Or multiple authored? The following Chart 1 shows that the researchers believe in collaboration. Only 17.68% (381/2155) literature cited is single authored, which is third place of ranking. Double authored citations rank first. It shares 25.38% (547 /2155). Three authors is in second place of ranking which shares 24.92% (537/2155) of citations. Some publications found authored by more than eight, nine or ten, but they are counted in the 'More than Seven' authors category. The publications published by name of institution / organization / company is categorized as 'Corporate authorship'. There are 4.50% (97/2155) citations ranking 6th in the 'Corporate authorship' category.

Chart 1 Authorship Pattern



Chronological distribution of citations:

Chart 2 shows the chronological distribution of citations. The data reveals that the researchers referred recent publications for their research. From the data, the highest citations is 832/2155 i.e., 38.61% of citations are published in the duration 2001-2010. The usage of publications is declined as it becomes old. The publications which are published in the years 1951-1960 are rarely used, and their usage is 6/2155 i.e., 0.28% ranking 8th position.

Chart 2 Chronological Distribution of Citations**Obsolescence study:**

Obsolescence study or Age study of publications is one of the common observation in citation analysis. It describes the decline in usage of publication or citations over a period of time. Table 3 represents the obsolescence of journals and book citations. The complete 1803 Journal Article citations and 129 Book citations are divided into 11 time spans having 10 years of length.

S. N.	Age of citations	No. of citations	Journal Articles	Percentage	Books	Percentage
1	0 -9	889	814	44.89	12	9.3
2	10-19	745	634	34.96	50	38.76
3	20 - 29	267	193	10.64	19	14.72
4	30 - 39	108	71	3.92	17	13.18
5	40 - 49	94	61	3.37	27	20.92
6	50 - 59	29	28	1.55	1	0.78
7	60 - 69	10	6	0.34	1	0.78
8	70 - 79	7	1	0.06	1	0.78
9	80 - 89	0	0	0.00	0	0.00
10	90 - 99	6	5	0.27	1	0.78
11	100+	0	0	0.00	0	0.00
		2155	1813	100.00	129	100.00

Table 3 reveals that recent journals and books are approached by researchers. The citations of age 0 to 9 years are more for Journal Articles, i.e., $804 / 1803 = 44.59\%$ ranking the 1st. The citations of age 10 to 19 are more for Books i.e., $50/129 = 38.76\%$, ranking the 1st. The data gathered shows that $1901/2155 = 88.21\%$ of citations come under the age group 0 to 29. The remaining 11.79% of citations come under the age group 30 to 100+. This proves that there is considerable decline in usage of publication when it gets old.

Ranked List of Journals

Journals are necessary for research but their rising costs necessitate a review of their quality, utility and suitability for specific group of users by librarians. The ranking list is a useful tool for determining which journals are most useful in terms of their coverage of fresh and important work in a given area. The ranked list of journals in the field of Post Harvest Management of Post Harvest Engineering is presented in Table No. 4. Journals cited more than twice appear in the table. Titles are arranged in their decreasing order of citations.

Table 4 Ranking List of Journals

Sr. No.	Journal name	Rank	Citations	Percent	Cumulative	
					Citations	Percent
1	Journal of Food Engineering	1	221	12.19	221	12.19
2	Journal of food science & technology	2	135	7.45	356	19.64
3	Drying Technology	3	31	1.71	387	21.35
4	Food Chemistry	3	31	1.71	418	23.06
5	International Journal of Food Science & Technology	4	30	1.65	448	24.71
6	Journal of Food Processing & Preservation	5	24	1.32	472	26.03
7	Journal of Food Science	5	24	1.32	496	27.36
8	Food Research International	5	24	1.32	520	28.68
9	Food & bioproducts processing	6	23	1.27	543	29.95
10	Journal of Agricultural Engineering Research	7	20	1.10	563	31.05
11	Journal of Agricultural and Food Chemistry	7	20	1.10	583	32.16
12	Journal of Food Process Engineering	8	16	0.88	599	33.04
13	LWT-Food Science & Technology	9	13	0.72	612	33.76
14	Transactions of the ASAE	9	13	0.72	625	34.47
15	International Food Research Journal	9	13	0.72	638	35.19
16	Energy conversion and management	9	13	0.72	651	35.91
17	Trends in Food Science & Technology	9	13	0.72	664	36.62
18	African Journal of Food Science	9	13	0.72	677	37.34
19	Food Technology	9	13	0.72	690	38.06
20	Indian food packer	9	13	0.72	703	38.78
21	Biosystems Engineering	9	13	0.72	716	39.49
22	Beverage & Food World	9	13	0.72	729	40.21
23	Cereal Chemistry	9	13	0.72	742	40.93
24	Energy	9	13	0.72	755	41.64
25	Food & bioprocess technology	9	13	0.72	768	42.36
26	Food & Nutrition Sciences	9	13	0.72	781	43.08
27	Journal of food processing & technology	10	12	0.66	793	43.74
28	Agricultural engineering international: CIGR journal	10	12	0.66	805	44.40
29	International Journal of current microbiology and applied sciences	10	12	0.66	817	45.06
30	Plant foods for human nutrition	10	12	0.66	829	45.73
31	Asian Journal of Dairy & Food Research	10	12	0.66	841	46.39
32	European Food Research & Technology	10	12	0.66	853	47.05
33	Journal of the Science of Food and Agriculture	10	12	0.66	865	47.71
34	International journal of food sciences & nutrition	10	12	0.66	877	48.37
35	Journal of texture studies	10	12	0.66	889	49.03

36	Acta Horticulturae	10	12	0.66	901	49.70
37	American journal of Food Technology	10	12	0.66	913	50.36
38	Food Reviews International	10	12	0.66	925	51.02
39	Food science & technology	10	12	0.66	937	51.68
40	International Journal of Agricultural & Biological Engineering	10	12	0.66	949	52.34
41	International Journal of Food & Nutritional Science	11	11	0.61	960	52.95
42	International journal of heat & mass transfer	11	11	0.61	971	53.56
43	Journal of Agricultural Science	11	11	0.61	982	54.16
44	Journal of food technology	12	10	0.55	992	54.72
45	Carbohydrate Polymers	12	10	0.55	1002	55.27
46	Critical Reviews in Food Science & Nutrition	12	10	0.55	1012	55.82
47	Current science international journal	13	9	0.50	1021	56.32
48	Food science research journal	13	9	0.50	1030	56.81
49	Journal of Scientific and Industrial Research	14	8	0.44	1038	57.25
50	Powder technology	14	8	0.44	1046	57.69
51	African Journal of Agricultural Research	14	8	0.44	1054	58.14
52	Food processing & technology	15	7	0.39	1061	58.52
53	Food science & nutrition	15	7	0.39	1068	58.91
54	Industrial Crops & Products	15	7	0.39	1075	59.29
55	Innovative food science & emerging technologies	15	7	0.39	1082	59.68
56	International Journal of Food Engineering	15	7	0.39	1089	60.07
57	IOSR journal of environmental science, toxicology & food technology	15	7	0.39	1096	60.45
58	Journal of Agricultural Science & Technology	16	6	0.33	1102	60.78
59	Nutrition	16	6	0.33	1108	61.11
60	Postharvest biology & technology	16	6	0.33	1114	61.45
61	Advance journal of food science & technology	16	6	0.33	1120	61.78
62	African Journal of Biotechnology	16	6	0.33	1126	62.11
63	African journal of food science & technology	16	6	0.33	1132	62.44
64	American Journal of Biochemistry and Molecular Biology	17	5	0.28	1137	62.71
65	Comprehensive reviews in food science & food safety	17	5	0.28	1142	62.99
66	Indian Dairyman	17	5	0.28	1147	63.27
67	Industrial and Engineering Chemistry Research	17	5	0.28	1152	63.54
68	International journal of agricultural science & research	17	5	0.28	1157	63.82
69	International Journal of Food Properties	17	5	0.28	1162	64.09
70	International journal of food science	17	5	0.28	1167	64.37
71	Journal of food & nutrition science	17	5	0.28	1172	64.64
72	Journal of Food Quality	17	5	0.28	1177	64.92

73	Journal of Nutrition	17	5	0.28	1182	65.20
74	Journal of pharmacognosy & phytochemistry	17	5	0.28	1187	65.47
75	Renewable energy	17	5	0.28	1192	65.75
76	Journal of Food Research & Technology	17	5	0.28	1197	66.02
77	Applied Thermal Engineering	17	5	0.28	1202	66.30
78	Brazilian Journal of Chemical Engineering	17	5	0.28	1207	66.57
79	Canadian institute of food technology journal	17	5	0.28	1212	66.85
80	Cancer Letters	17	5	0.28	1217	67.13
81	Chemical engineering & processing	17	5	0.28	1222	67.40
82	Confectionery production	17	5	0.28	1227	67.68
83	Current research in nutrition & food science	17	5	0.28	1232	67.95
84	Heat & mass transfer	18	4	0.22	1236	68.17
85	Indian journal of nutrition & dietetics	18	4	0.22	1240	68.39
86	Indian journal of science & technology	18	4	0.22	1244	68.62
87	International journal of agricultural engineering	18	4	0.22	1248	68.84
88	International journal of agriculture & food science technology	18	4	0.22	1252	69.06
89	International journal of current trends in research	18	4	0.22	1256	69.28
90	International journal of food safety, nutrition & public health	18	4	0.22	1260	69.50
91	International journal of nutrition & food sciences	18	4	0.22	1264	69.72
92	International journal of science & research	18	4	0.22	1268	69.94
93	International journal of scientific & research publications	18	4	0.22	1272	70.16
94	Journal of agriculture and food technology	18	4	0.22	1276	70.38
95	Journal of cereal science	18	4	0.22	1280	70.60
96	Journal of Dairy Science	18	4	0.22	1284	70.82
97	Journal of food composition & analysis	18	4	0.22	1288	71.04
98	Journal of food processing	18	4	0.22	1292	71.26
99	Journal of Functional Foods	18	4	0.22	1296	71.48
100	Journal of human ecology	18	4	0.22	1300	71.70
101	Journal of plantation crops	18	4	0.22	1304	71.92
102	Journal of the Saudi society of agricultural sciences	18	4	0.22	1308	72.15
103	Karnataka journal of agricultural sciences	18	4	0.22	1312	72.37
104	Middle East journal of applied sciences	19	3	0.17	1315	72.53
105	Pakistan Journal of Nutrition	19	3	0.17	1318	72.70
106	Photochemistry	19	3	0.17	1321	72.86
107	Solar energy	19	3	0.17	1324	73.03
108	World applied sciences journal	19	3	0.17	1327	73.19
109	American Journal of Clinical Nutrition	19	3	0.17	1330	73.36
110	Dysphaga.	19	3	0.17	1333	73.52

Apart from above 110 journals other 106 Journals have two citations (Separate names not included in this list)	20	$106 \times 2 = 212$	$((212 \times 100) / 1813) = 11.69$	1545	85.22
Apart from above 110 + 106 = 216, 268 Journals have one citation (Separate names not included in this list)	21	$268 \times 1 = 268$	$((268 \times 100) / 1813) = 14.78$	1813	100.00
Total no. of journals = 110 + 106 + 268 = 484		1813	100.00		

Table 4 reveals that the most cited journal by Post Harvest Engineering scholars is *Journal of Food Engineering*, which was cited 221 times, more than 12.19% of the total percentage of citations, followed by *Journal of food science & technology*, at 135 (7.45%), *Drying Technology*, 31 (1.71%), *Food Chemistry*, 31 (1.71%), *International Journal of Food Science & Technology*, 30 (1.65%), *Journal of Food Processing & Preservation*, 24 (1.32%), *Journal of Food Science*, 24 (1.32%), *Food Research International*, 24 (1.32%), *Food & Bioproducts Processing*, 23 (1.27%), *Journal of Agricultural Engineering Research*, 20 (1.10%), *Journal of Agricultural and Food Chemistry*, 20 (1.10%), *Journal of Food Process Engineering*, 16 (0.88%), *LWT-Food Science & Technology*, 13 (0.72%), *Transactions of the ASAE*, 13 (0.72%).

Bradford's Law of Scattering

Bradford (1934): "If scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several other groups or zones containing the same number of articles as the nucleus when the number of periodicals in the nucleus - and succeeding zones will be as 1:n:n², where 1 represents the number of journals in the nucleus and 'n' is a multiplier."

In the present study, 14 journals covered 625 articles, the next 70 journals covered 611 articles, and the next 399 journals covered 577 articles. That is, 14 journals covered one-third of the total citations, the next 70 journals accounted for another one-third, and the final 399 covered the remaining third.

Thus, the first zone or 'nucleus' contains 14 journals, followed by the second zone with 70, and the third with 399 journals. The zones form an approximately geometric series in the form.

14 : 70 : 399

Here, 70 = 14 X 5 and 350 = 14 X 5 X 5

i.e. 14 : 14 X 5 : 14 X 5 X 5

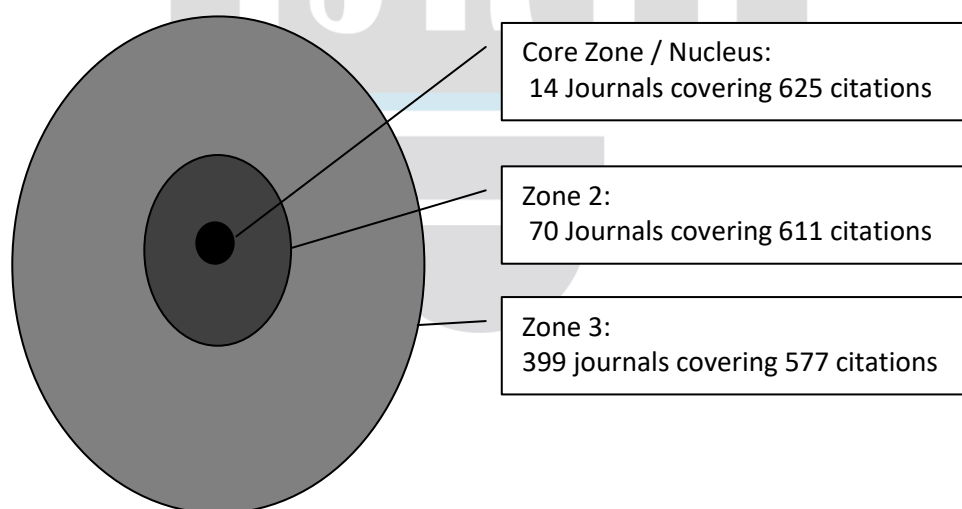
or 14 : 14 X 5 : 14 X 5²

Substituting 5 = n

14 : 14 X n : 14 X n²

i.e. 1 : n : n²

Where 14 represents the number of journals in the nucleus and n=5 is a multiplier.



Geographic Distribution

Citation analysis by country provides data on the countries that are active in a subject field and their respective contribution. Table 5 shows the geographical distribution of ranked journals.

Table 5 Geographic Distribution

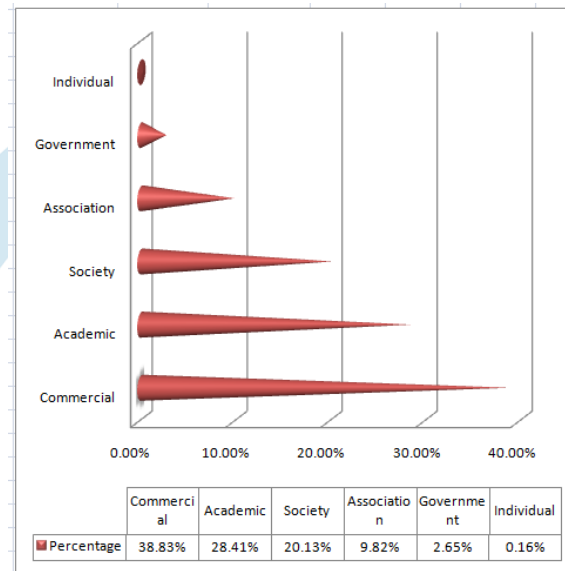
Country	Journals	Percentage
India	103	21.28
USA	102	21.07
UK	85	17.56
Netherlands	82	16.94
Pakistan	11	2.27
Germany	10	2.07
Africa	8	1.65
Switzerland	7	1.45
Nigeria	6	1.24
Belgium	5	1.03
Egypt	5	1.03
Thailand	5	1.03
Bangladesh	4	0.83
Brazil	4	0.83
Iran	4	0.83
South Korea	4	0.83
China	3	0.62
France	3	0.62
Ireland	3	0.62
Malaysia	3	0.62
Hungary	2	0.41
Italy	2	0.41
NewZealand	2	0.41
Singapore	2	0.41
Sri Lanka	2	0.41
Turkey	2	0.41
Amman	1	0.21
Australia	1	0.21
Chile	1	0.21
Czech	1	0.21
Finland	1	0.21
Ghana	1	0.21
Indonesia	1	0.21
Japan	1	0.21
Poland	1	0.21
Russia	1	0.21
Saudi Arabia	1	0.21
Serbia	1	0.21
Spain	1	0.21
Taiwan	1	0.21
UAE	1	0.21
Total	484	100.00

More than one fifth i.e., 103 (21.28%) journals were from India. The USA ranks first among foreign countries with 102 (21.07%) journals followed by UK 85 (17.56%) and Netherlands 82 (16.56%).

Publisher Distribution

The sort of organization that publishes information can influence the decision to acquire the library materials. To learn more about the publishers cited in Post Harvest Management of Post Harvest Engineering theses, publishers were categorized as commercial, academic, association, societies, individuals, and government. Chart 3 shows the publisher distribution of 1,813 journal article citations.

Chart 3: Publisher Distribution



Other Resources frequently referred by the researchers:

- 1) A.O.A.C. International. Official Methods of Analysis.
- 2) Crank (1975). Mathematics of diffusion, second edition, London: Oxford University Press.
- 3) USDA (2019) Foreign Agricultural Services (FAS). United states Department of Agriculture (USDA). Office of the Global Analysis (OGA) Database
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Findings and Conclusion:

Citation Analysis is one of the tools bibliometric / scientometric / informetrics studies. The application of citation analysis in libraries will be used in collection management. The citation counting will help in procuring the books, periodicals and also in weeding process. It is found from the study that

1. Researchers of Post Harvest Management of Post Harvest Engineering cited Journal articles most frequently. The 84.13% of total citation i.e., 1813 / 2155 are the Journal Articles. The Books are ranked the 2nd with 129 / 2155 = 5.98% of citations. And The Manuals are ranked the 3rd with 45 / 2155 = 2.08% of citations. Researchers also cited Manuals, Patents, Standards, Conference Proceedings, Doctoral Dissertations, Master degree, different types of Reports (Annual Report, Commission Report) Theses etc. for their study.
2. From citations cited in PHM of PHE research scholar theses, it's observed that the studies or literary work is done with collaboration. The 381 / 2155 = 17.68% citations are single authored. While, 97/2155 = 4.50 % citations are corporate authored. The remaining 77.82% of citations are multiple authored i.e., two or more number of authors.
3. Obsolescence studies aid in the weeding out of obsolete, outdated materials which makes the place for the new purchases and avoids noise in the information retrieval.

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