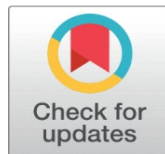


CITATION ANALYSIS OF POST-GRADUATE THESE OF DEPARTMENT OF AGRONOMY ACCEPTED BY COLLEGE OF AGRICULTURE, CENTRAL AGRICULTURE UNIVERSITY, MANIPUR (2010-2017)

Laithangbam Nepolean Singh ¹, Dr. Bobby Phuritsabam ²

¹ Research Scholar, Department of Library and Information Science Manipur University, Imphal-795003 India

² Associate Professor, Department of Library and Information Science, Manipur University, Imphal-795003 India



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ABSTRACT

Citation analysis is an effective tool to identify the core references in a subject by counting the citations appended at the end of each scientific article. It is basically a technique, which involves the process of collection, counting, analysis and interpretation of citations given in research writing and thereby helping in identification of significant sources of information. The study is based on the 32 post graduate theses accepted by Dept. of Agronomy, college of Agriculture, Central Agriculture University, Manipur 2010-2017. 3037 citations were found appended in the present study. The study revealed that journals were the most preferred sources of information used by the researchers in the field of Agronomy for 73.96 % of total citations, followed by proceeding with 9.15 % citations. The Indian Journal of Agronomy has ranked the first with 101 citations accounting for 4.49% of the total journal citations. Authorship pattern for journal citations shows that most of the citations were contributed by three authors. (28.71%) The findings of the study also revealed that out of the total number of 2246 journal citation, 44.30% are from India. The highest year were 2001-210; its citation was 697 i.e.31.3%.

Keywords: Citation Analysis Bibliometric Study, Authorship Pattern, Journals Ranking, Bradford Law of Scattering, Agronomy, College of Agriculture, Central Agriculture University

1. INTRODUCTION

Information has been a component of growth and improvement in living standards of people from the beginning of human civilization to the present day, Today's modern societies are closely interlocked with growth and development of economic, political, social, occupational, cultural and other areas. But the concept of information has to be understood in its relation to many other related concepts to perceive the impact of information on modern societies. Application of information and knowledge for development and information technology with all its spectacular advances has been in fact the chief instrument of these revolutionary changes leading societies to an information age. Creation of new knowledge and information, their processing, storage and retrieval, dissemination has become critical in the age of information explosion. The increasing needs of the user communities, substantial increase in the cost of documents and the constraints of limited financial resources make it necessary for the librarians to design and develop need-based information systems and services to meet the information requirements of users. A thorough knowledge of the characteristics of the subject literature required by the users is very important in planning and designing such information systems and services.

2. CITATION ANALYSIS

Citation pattern or the analysis of citation pattern is one of the major and popular branches of bibliometrics. Citations are the formal explicit linkages between publications that have particular points in common. Citation analysis is a branch of bibliometrics that examines the citations found in publications such as journal articles and books (Georgas and Cullars, 2005). Citation analysis is a way of measuring the relative importance or impact of an author, an article or a publication by counting the number of times that author, article, or publication has been cited by other works. It is largely used for putting things in order. The things can be journals, articles, books, authors' organizations, etc. Citation Analysis has been largely confined to the production of raw citation count for the purpose of determining core journals. Its use has now been extended to study the scope and structure of the subjects and to cluster the documents to prepare a bibliography on subjects, etc.

Citation analysis is the examination of the frequency, patterns, and graphs of citations in documents. It uses the pattern of citations, links from one document to another document, to reveal properties of the documents. A typical aim would be to identify the most important documents in a collection and to measure quantitatively the value of document through arranging the citations in some kind of rank or order. Citation analysis can act as a tool for selecting and de selecting materials as it provides insight into the materials that are selected by various user groups. It can be a useful technique for identifying potential collection development weaknesses also (Rethiefsen, 2007). It further helps for the librarian to identify unique information that was not found from other library statistics.

In the context of postgraduate theses, citation analysis helps to assess the scholarly value, relevance, and academic reach of student research. By analyzing citations within and to postgraduate theses, one can understand the trends in research topics, preferred sources, and the degree of integration with the broader scientific community. This type of analysis not only highlights influential works and authors but also uncovers the academic networks and disciplinary structures that shape research output at the postgraduate level.

3. CENTRAL AGRICULTURAL UNIVERSITY

The Central Agricultural University has been established by an act of Parliament, the Central Agricultural University Act, 1992. The jurisdiction of the University extends to seven North-Eastern Hill States viz., Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Nagaland and Tripura, with headquarters at Imphal in Manipur. Like other Agricultural Universities, Central Agricultural University, Imphal has integrated programmes of teaching, research and extension education. College of Agriculture, Iroisemba a consistent college of central Agricultural University has 13 different departments of which Department of Agronomy is among them. The department offered Postgraduate and PhD programmes to B.Sc. Agriculture and other allied subject Students.

4. LITERATUE REVIEW

To know about the latest development and the previous study on the topic, different types of articles were collected from journals e-based resources. Article from the year 2000 to November, 11, 2018 are being taken as appropriate for the study. Many studies on citation analysis have been conducted globally as well as in national level. Some of the relevant studies are being chosen and further reviewed for the further studies. Many of the paper are being studied on dissertation and theses.

Ahmadih, D. Nalbandian, S. and Noubani, K. (2016) in their study "A comparative citation analysis study of master's theses at the American University of Beirut, Lebanon" and confirm that serials are of paramount importance to all graduate students, which would justify spending in the region of 90 per cent of the budget on subscriptions of periodicals and journals.

Rosenberg, Z. (2015) "Citation Analysis of M.A. Theses and Ph.D. Dissertations in Sociology and Anthropology: An Assessment of Library Resource Usage" The finding revealed that a larger percentage of citations to books than to journals, with predominant usage of books in print format and predominant usage of journals in print & electronic format, with English being the predominant language for all resources cited.

Fasae, J.K. (2012) "Citation Analysis of Dissertations and Theses Submitted to the Department of Agricultural Economics And Extension, Federal University of Technology Akure, Nigeria" this study identified the information materials mostly consulted by master's and doctoral students of the Department of Agricultural Economics and Extension (AEE) in Federal University of Technology, Akure (FUTA). It was discovered from this study that journals were the most consulted information materials, closely followed by books while resources from the web/Internet was least utilized by AEE students.

Kaur, A and Rattan, G.K (2018) "Citation Analysis of Theses in Economics Submitted to Punjabi University, Patiala during 2000-2014" The study is based on 9053 citations appended to 92 doctoral theses submitted to the Department of Economics, Punjabi University, Patiala, during 2000-2014. The main objective of the study is to investigate authorship pattern of the citations, format of literature cited, electronic/print form of citations, chronological distribution of citations, geographical distribution of book and core journal citations. A ranked list of journals in economics is also compiled in order to find out the most referred journal.

Banshal, S.K. & Singh V. (2018). "Research performance of the National Institutes of Technology in India". This article presents a bibliometric assessment of research performance of the National Institutes of Technology (NITs) in India.

Mahajan, P. and Kumar, A. (2017). "Citation analysis of doctoral theses references as a tool for collection management in history: a study of Panjab University, Chandigarh (India)" this study was carried out on the citations appended in the end of History discipline Ph.D. dissertations to ascertain what types of documents are the most frequently used in the research process, the most commonly consulted core journals and obsolescence rate of the journals and books. The study analysed 8488 citations appended in the 36 Ph.D. theses of History discipline submitted to Panjab University, Chandigarh, for the award of doctoral degree during 2002-2012.

Rani, A. and Sharma, S. (2017) citation analysis of PhD Management theses submitted to Guru Jambheshwar University of Science and technology, Hissar, this paper investigate authorship pattern of the citations, type and form of literature cited, and compiled a rank list of core journals in the Management field. The study revealed that journals were the most preferred sources of information used by the researchers in the field of Management accounting for 49.51% of total citations, followed by books with 31.82 % citations

5. OBJECTIVE OF THE STUDY

- To study the significance sources of information used in Agronomy and to determine the principal form of literature used in the theses by Agronomy Researcher;
- To create a ranked list of periodicals based on the frequency of use by the researcher;
- To determine the distribution of literature used by the researcher by country;
- To study authorship patterns in the citation;
- To determine the gender of the researcher;
- To study the chronological distribution of journal citation and applicability of Bradford's law of scattering to the pattern used in the department of Agronomy.

6. METHODOLOGY

Keeping in view the objective of the present study necessary data was collected and gathered from 32 (Thirty-two) postgraduate theses submitted in the college of Agriculture, Central Agricultural University, Imphal, Manipur, India between the years 2010-2017. The data sources for the study were the bibliographical reference used by the researcher to complete the theses at the end of each chapter. Each book journal technical report, and seminar/conference proceeding was examined for this purpose. Tables were used to categorize, tabulate, present, analyze, and interpret the collected data. Several parameters, such as authorship pattern and literacy forms are examined in the study. A list of core journals was compiled and prepared based on the journal's highly cited article. The total no. of citation is 3037. The research study process to three levels; the first level is identifying the data source, determining the data and procedure followed for analyzing the data.

7. FINDING AND ANALYSIS

The bibliography cited was sorted out according to their format, i.e. books, journals Govt. publication, proceeding, report, theses, misc., etc. Journals have the highest ranking to be cited by the researcher. The data collected were presented in tables; figures and percentages.

7.1. YEAR-WISE DISTRIBUTION OF THE THESES

Table 1 shows the year-wise distribution of theses submitted to the department of Agronomy, College of Agriculture, Central Agricultural University. A maximum number of 37.5 % (12) theses were submitted in the year 2014-2015, and this period was the most producing post-graduate theses and followed by the year 2012-2013, 2016-2017 and 2010-2011, respectively. Fig 1 represents the table no 1 in graphical representations.

Table 1 Year-wise distribution of the theses

Sl.No.	Year	Rank	Theses	Percentages %
1	2010-2011	3 rd	2	6.2 %
2	2012-2013	2 nd	9	28.1%
3	2014-2015	1 st	12	37.5%
4	2016-2017	2 nd	9	28.2%
			Total=32	100%

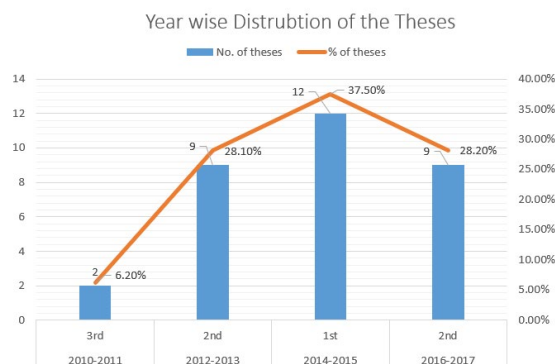


Figure1 Year wise distribution of theses

7.2. AVERAGE NO OF CITATION PER THESES

Table 2 shows the average citation per post-graduate theses submitted to department of Agronomy College of Agriculture, Central Agricultural University. A total no of 3037 citations have been analyzed for the study. An average of 94.906285 citations per these is observed.

Table 2 Average no of citation per theses

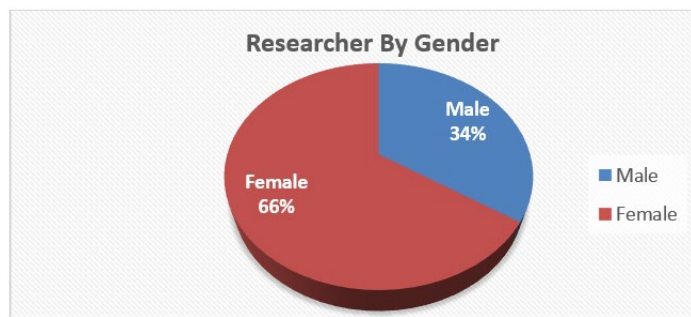
Number of theses	Total Citation	Average
32	3037	94.90625

7.3. DISTRIBUTION OF SCHOLARS BY GENDER

The above table i.e. table no 3 and fig 2 indicate the distribution of gender among the researcher, out of 32 total researchers 11, which is 33.37 % of the total are male and the rest, i.e. 21 number which is 65.63 % are females.

Table 3 Distribution of Scholars by Gender

Gender	No of Researcher	Percentage (%)
Male	11	34.37%
Female	21	65.63%
Total	32	100%

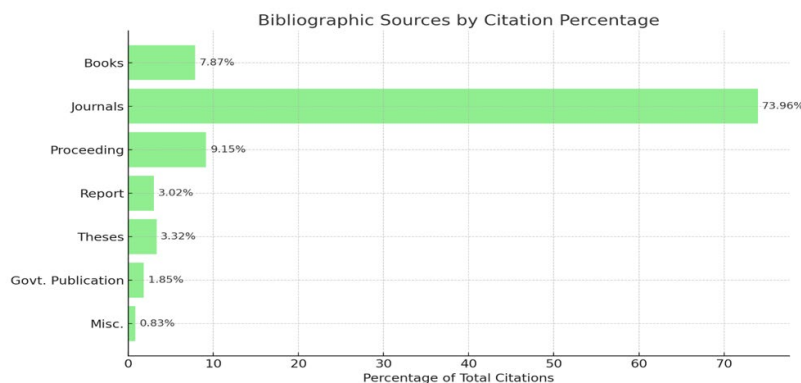
**Figure 2** Graphical representation of researcher by gender

7.4. BIBLIOGRAPHIC SOURCE CITED BY RESEARCHER

Table 4 and Fig 3 indicates the different sources cited by the scholars. It is observed that (73.96%) of sources cited by the researchers are journals, followed by proceeding (9.15%) book (7.87), report (3.02%), theses (3.32%) govt. publication (1.85%), misc. (0.83%) respectively.

Table 4 cited sources by Scholars

Bibliographic	No of Citation	Percentage %	Cumulative no. of citation	Cumulative %	Rank
Books	239	7.87	239	7.87	3 rd
Journals	2246	73.96	2485	81.83	1 st
Proceeding	278	9.15	2763	90.98	2 nd
Report	92	3.02	2855	94	5 th
Theses	101	3.32	2956	97.32	4 th
Govt. Publication	56	1.85	3012	99.17	6 th
Misc.	25	0.83	3037	100	7 th
Total	3037	100%	3037	100%	

**Figure 3** Bibliographic Source by citation percentage.

7.5. RANKING OF JOURNAL CITATION BY RESEARCHER

Journal ranking based on cites reference in post-graduate theses accepted by Central Agricultural University. Table 5 and fig. 4, clearly show the most prominent top twenty (20) journal cited by the researchers. it is found that Indian Journal of Agronomy is cited maximum with 101 numbers of citations, followed by Indian journal of Agricultural science by 97. A total number of different 236. (two hundred and thirty-six) is found during the studies.

Table 5 Most cited 20 Journals

Journal Title	No of citation	Cumulative citation	Percentage %	Cumulative %	Rank
Indian Journal of Agronomy	101	101	4.49	4.49	1 st
Indian Journal of Agricultural Science	97	198	4.31	8.8	2 nd
Forage Research	49	247	2.18	10.98	3 rd
Crop Research	47	294	2.09	13.07	4 th
Oryza	39	333	1.73	14.8	5 th
Pakistan Journal of Agricultural science	35	368	1.55	16.35	6 th
Annals of Agricultural Research	31	399	1.38	17.73	7 th
Legume Research	29	428	1.29	19.02	8 th
Asian Journal of Agricultural & Rural Development	26	454	1.15	20.17	9 th
Soil Chemistry Analysis	25	479	1.11	21.28	10 th
Soil & plant Analysis	23	502	1.02	22.3	11 th
Journal of Maharashtra Agricultural University	23	525	1.02	23.32	11 th
IRRN	21	546	0.93	24.25	12 th
Indian Journal of Weed Science	21	567	0.93	25.18	12 th
Indian Agriculturist	20	607	0.89	26.07	13 th
Advance in Agronomy	20	627	0.89	26.96	13 th
Agronomy Journal	20	627	0.89	27.85	14 th
Agricultural system	19	646	0.84	28.69	14 th
Journal of Science & Crops	19	665	0.84	29.53	14 th
Bangladesh Journal of Science & Industrial Research	19	684	0.84	30.37	14 th
Other remaining (216 Journals)	1562	2246	30.41	100	
Total	2246	2246	100	100	

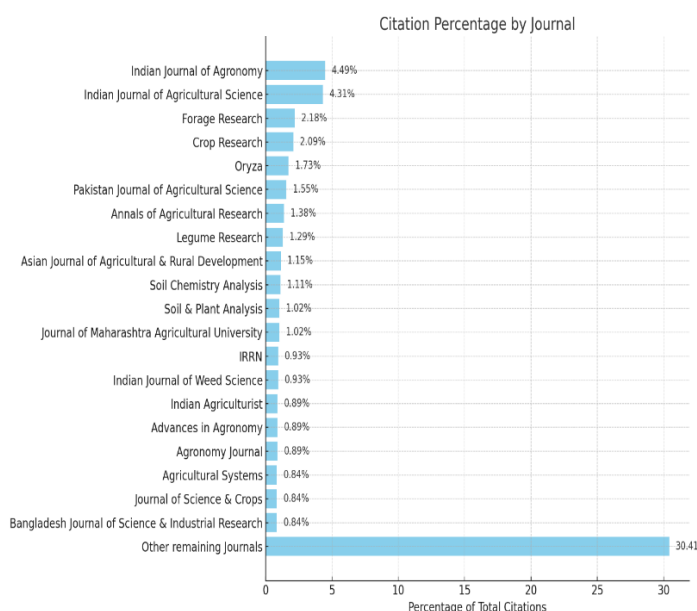


Figure 4 percentages of most cited 20 Journals

7.6. AUTHORSHIP PATTERN

Table 6 Authorship patterns

Authorship	Journal	Total	Frequency %
Single	336	336	14.95
Two	536	536	23.856
Three	645	645	28.71
Four	301	301	13.40
More than four	428	428	19.05
Total	2246	2246	100%

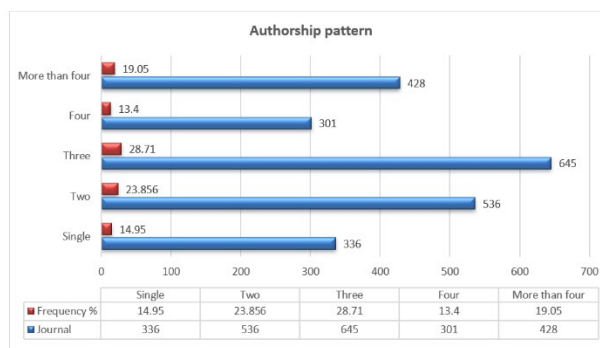


Figure 5 Authorship Pattern

The above table 6 and fig. 4, shows the Authorship pattern. The study of authorship is an essential factor in citation analysis. Generally, the authorship of a paper or document has become necessary for scientist and researcher. In order to make out the authorship pattern, the analysis of the nature of research collaboration in research activity is the primary factor

7.6.1. DEGREE OF COLLABORATION (DC)

The ratio of multi-authored paper published during a year and that year is the degree of collaboration concerning a discipline or an organization. Formula given by K. Subarmayum (1989),

$$Dc = \frac{Nm}{(Nm + Ns)}$$

Where Dc = Degree of Collaboration in a discipline

Nm = Number of Multi authored papers in a discipline

Ns = Number of Single Authored Papers

$$Dc = 1910 / (1910 + 336) = 0.085404$$

The degree of collaboration in the present paper is 0.085404

7.6.2. SINGLE V/S MULTIPLE AUTHORSHIP PATTERN

The authorship pattern is scattered in single and collaboration authorship pattern, table 7 and fig 6 indicate that multiple authorship citation for 1910 and single-authorship citation account for 336 of the total citation.

Table 7 Journal (Single V/s Multiple Authorship Pattern)

Journals citation		
Authorship Pattern	Citation	Percentage (%)
Single	336	14.95
Multiple	1910	85.05

Total	2246	100%
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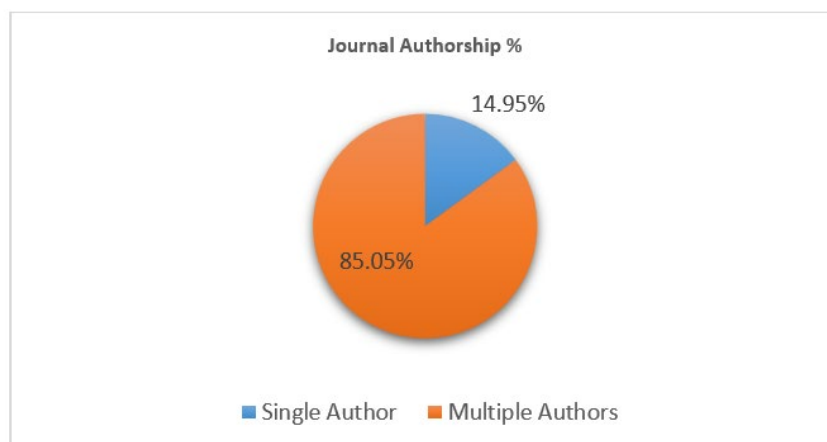


Figure 5 Journal Authorship %

7.7. COUNTRY-WISE DISTRIBUTION OF JOURNAL

Almost every country in the world publishes international characteristics of scientific research literature, in this study all citations are classified according to their country of origin in order to identify the most productive countries in the literature. Table :6 and fig:5 clearly indicate the most cited top twenty (20) journal in respect to counties of origin. The cited documents were analyzed according to their country of origin. 44.30% of the cited documents were from India, the rest were from United State 8.50 % and 7.74 % from United Kingdom respectively, a list of twenty (20) countries has been shown in the table above.

Table 8 Top 20 Country-wise Distribution of Journals

Country's Name	No of citation	Cumulative Citation	Percentage %	Cumulative %
India	995	995	44.30	44.30
United Sates	191	1186	8.50	52.8
United Kingdom	174	1360	7.74	60.54
Pakistan	151	1511	6.72	67.26
Germany	92	1603	4.09	71.35
Indonesia	63	1666	2.4	73.75
Spain	53	1719	2.35	76.1
Nigeria	52	1771	2.31	78.41
Italy	36	1807	1.61	80.02
Nepal	35	1842	1.56	81.63
Netherland	33	1875	1.56	82.29
France	30	1905	1.33	83.79
Egypt	29	1934	1.25	85.13
Philippines	28	1962	1.3	86.38
Brazil	27	1989	1.20	87.68
Sri Lanka	21	2010	0.93	88.88
Poland	19	2029	0.84	89.81
South Africa	17	2046	0.75	90.65
Japan	16	2062	0.71	91.4
Thailand	15	2077	0.66	92.11
Remaining (17 Counties)	169	2246	7.52	100
Grand Total	2246	2246	100	100

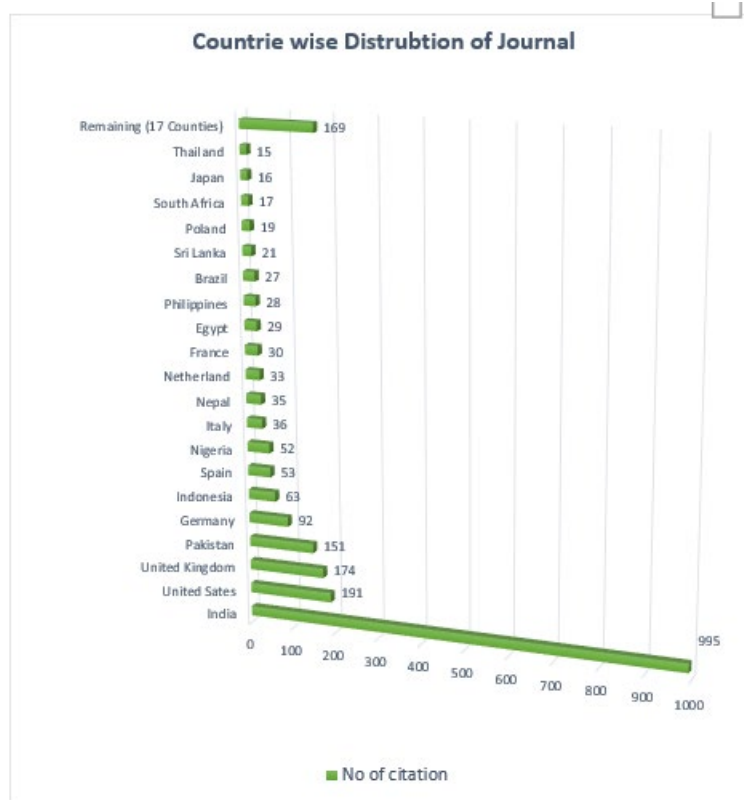


Figure 6 Top 20 Country-wise Distribution of Journals.

7.8. CHRONOLOGICAL DISTRIBUTION OF JOURNAL

Table 9 and fig. 7, indicates that comprehensive information on the complete citations of the journals cited in the theses was collected from the study. Articles published as old as 1921 above has been cited. The highest cited year were 2001-2010 with 697 citations i.e. (31.03%)

Table 9 Chronological Distribution of Journal articles

Year	citations	Cumulative Citation	Percentage (%)	Cumulative Percentage (%)
1921-1930	36	36	1.60	1.60
1931-1940	89	125	3.96	5.56
1941-1950	97	222	4.32	9.88
1951-1960	63	285	2.80	12.68
1961-1970	106	391	4.58	17.26
1971-1980	185	576	8.3	25.56
1981-1990	281	857	12.6	38.16
1991-2000	458	1315	20.39	58.55
2001-2010	697	2012	31.03	89.58
2011-2020	234	2246	10.42	100
Total	2246	2246	100%	100%

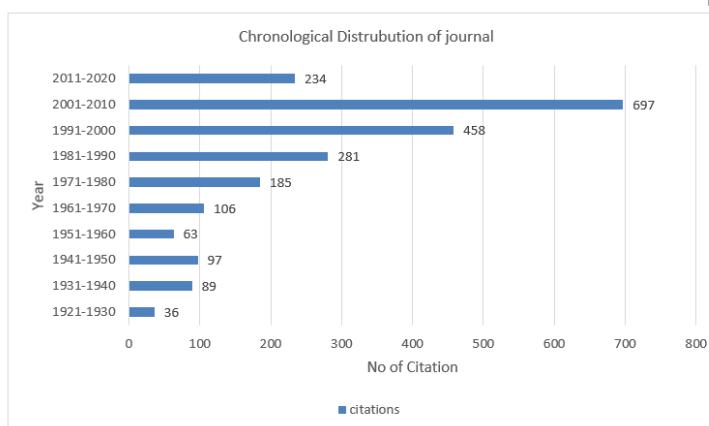


Figure 7 Chronological distribution of Journals

Bradford Law of scattering and analysis of Bradford's Zone

Bradford law serves as a general guideline for librarian in determining the number of one journal of core journal in any field. It states that journals in single filed can be divided into three zones, each containing the same number of citations.

Bibliometrics law

- 1) The relatively few core journals on the givens subject produce approximately one third of all the articles.
- 2) A second Zone contains the same number of articles as the first but a more significant number of Journals.
- 3) A third zone contains the same number of articles as the second but still a more significant number of journals
- 4) The mathematical relationship of the number of journals in the core to the first zone is a constant "n" and the second zone of the relationship id "n²". Bradford expresses this relationship as 1: n: n². The number of journals in each Bradford's Zone can be calculated from multiplier constant K that is called Bradford Constant using the formula Egghe (1986)

$$K = (ey \times Y_m)^{1/p}$$

Where y is Euler's number having the value of 0.57772; Y is the highest number of journal citation;

P is the Bradford group or number of zones (P-3). From table 3, the number of the highest journal citation is 101.

$$e = 2.718$$

T = total number of journals

So that,

$$\begin{aligned} K &= (2.718 \times 0.57772 \times 101)^{1/3} \\ &= (1.781 \times 101)^{1/3} \\ &= 5.644 \end{aligned}$$

$$\text{Nucleus Zone } r_0 = (T (K-1)) / (K^P - 1)$$

$$\begin{aligned} &= (236(5.644-1)) / (5.644^3 - 1) \\ &= 236 \times 4.644 / (179.788 - 1) \\ &= 1095.984 / 178.788 \\ r_0 &= 6.130 \end{aligned}$$

$$\text{First Zone } r_1 = r_0 \times K$$

$$\begin{aligned} &= 6.130 \times 5.644 \\ &= 34.597 \end{aligned}$$

$$\text{Second Zone } r_2 = r_0 \times K^2$$

$$= 6.130 \times 5.6442$$

$$= 6.130 \times 3 \times 1.854$$

$$= 195.269$$

According to Bradford zones, thus identified in the form of as 1:n: n2 in the present study, the relationship of each zone is 6:35:195.

Table 7 Bradford zones and their journals

Zone	No. of Journal	Cumulative no of journals	Journals Percentage %	No. of Citation	Percentage %	Cumulative no of citation	Cumulative Percentage %
1	6	6	2.54	368	16.38	368	16.38
2	35	41	14.83	658	29.3	1026	45.68
3	195	236	82.64	1220	54.32	2246	100
Total	236	236	100%	2246	100%	2246	100%

- Zone 2: 35 Journals 658 citation
- Zone 3: 195Journals 1220 citation

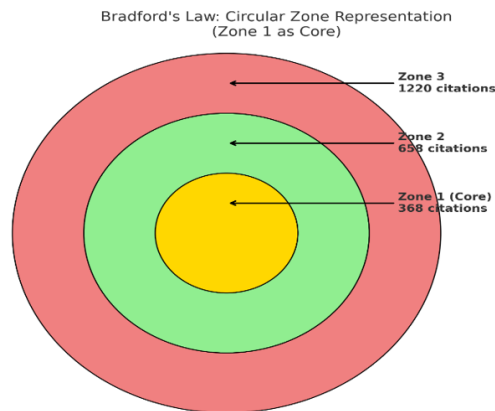


Figure 9 Bradford zones

8. MAJOR FINDING

From the analysis and interpretation of data, the following finding can be summarized:

The study identified a lack of uniformity among theses about citations format. It is to be emphasized further that there is no consistency even within the citation of the theses. Print source is highly cited as compared to e-resources. Average number of citations per theses is 94.9 %. Journals citations are predominant with 73.93%. Multiples authored paper is maximum (85.05%) and single authored paper account for 14.95 % of the total citation. Degree of collaboration of authorship in the present study was 0.8504. Researcher highly cited paper written in English especially from India (44.30%) followed by United States and United Kingdom. The citation relating to journal literature in department of Agronomy theses accepted by College of Agriculture, Central Agricultural University confirms Bradford Law of Scattering.

9. CONCLUSION

Citation analysis in any research activities has become one of the popular methods to study subject relationships, authorship pattern, impact, publication trends, and to identify core journal in a particular subject field or for a particular scientific community. The citation analysis of postgraduate theses submitted to the Department of Agronomy, College of Agriculture, Central Agricultural University reveals significant insights into the referencing patterns, research focus, and academic influences within the discipline. The study highlights the predominant use of national and international

journals, government reports, and standard agronomy textbooks, reflecting a strong reliance on both foundational and contemporary research sources.

Findings indicate that most theses cite recent literature, suggesting a commitment to keeping pace with evolving trends and innovations in agronomic research. Frequently cited sources and authors point to key areas of focus such as crop production, soil fertility, weed management, and sustainable agriculture. This analysis also sheds light on the degree of interdisciplinary and the global relevance of local research efforts. Overall, this study helps evaluate the academic rigor of postgraduate research and provides direction for improving library resources, guiding student researchers, and shaping future research priorities. It serves as a valuable tool for enhancing the quality and impact of scholarly work in the field of agronomy at Central Agricultural University, College of Agriculture, Imphal, Manipur. The present study has also given us many ideas about the citation pattern in the post-graduate theses in the department of Agronomy accepted by College of Agriculture, Central Agricultural University. It provides amole to suggest and recommend aspect for overall convention development. The data are analyzed and interpreted based on the facts of the proceeding. And finally, it is also for promotion and tenure purposes by looking at the quality of sources where a scholar's work has been published and cited.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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