CHAPTER NINE
FINDINGS AND CONCLUSION

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CHAPTER NINE
FINDINGS AND CONCLUSION

9.1 INTRODUCTION

The main objective of any research is either to extend the frontiers of knowledge or to bridge the gap in the existing knowledge. It may even mean giving new meanings to the accepted facets or discarding old accepted concepts in the light of newly acquired knowledge. In any case, each research has its own objectives which lead to certain results. Research is not complete until results are made available. From the results we derive the conclusion, and since research must go on in the global sense, one must try to identify areas of further research in the future.

Results of the study would be useful to the users of literature of horticulture and organizers of information for planning and managing the information sources and services.

9.2. SUMMARY OF FINDINGS

The results are summarized as follows:

9.2.1. Content Analysis of the Doctoral Dissertations

An attempt is made to recognize the content analysis of the eighty doctoral dissertations in horticulture considering following observations:

9.2.1.1. Growth of Dissertations

In order to evaluate the growth of dissertations, a study was conducted on four basic aspects i.e. (a) Departmentwise dissertation submission, (b) Yearwise break-up of
dissertations, (c) Time series analysis, and (d) Average number of references per dissertation.

9.2.1.1.2. Departmentwise Dissertation Submission

- The maximum number of dissertation contribution was 28 (35%) in the Department of Fruit & Orchard Management and the minimum number of dissertation contribution was 4 (5%) in the Department of Floriculture & Landscaping during the period of study.
- Average number of dissertations submission per department is 13.333 dissertations and standard deviation is 8.360 dissertations.

9.2.1.1.3. Yearwise Break-up of Dissertation Submission

- The highest number of 10 (12.5%) dissertations was submitted in 2005 and the lowest number of dissertations was 1 (1.25%) each for three years i.e. 1996, 1998, and 2004.
- Average number of dissertation submission per year is 4 and the standard deviation is 2.345.

9.2.1.1.4. Time Series Analysis

- The future trend of dissertation submission in horticulture will have very slow increasing trend i.e. 11.487 and 13.407 dissertations in the year 2015 and 2020 respectively.

9.2.1.1.5. Average Number of Citations

- The grand average number of citations per dissertation is 135.562 citations.
The maximum average number of citations per dissertation is in the Department of Post Harvest Technology of Horticultural Crops with 189.800 citations and the lowest with 119.112 citations in the Department of Spices & Plantation Crops.

The grand average number of citations per page of dissertation is 9.522 citations.

Average number of citations per page is the highest with 11.233 citations in the Department of Floriculture & Landscaping and the least with 8.473 citations in the Department of Horticulture.

9.2.1.2. Title of Dissertations

Title of a dissertation is the important and useful bibliographic element which helps to know the thought contents, subject relationship and identify required document.

9.2.1.2.1. Number of words Used

The maximum number of word length per doctoral dissertation is 11-15 with 34 (42.5%) dissertations and the minimum numbers of word length are 26-30 and 31-35 with 1 (1.25%) dissertations.

Average number of words used per dissertation is 13.437 and standard deviation of words is 1.576.

9.2.1.2.2. Title Keywords of High Frequency

Among 1014 words, only 733 words are considered as keywords. The words of having frequency/occurrence greater than 5 were only 21 in number. Obviously, the word Studies had the maximum frequency of 31. The other keywords in the decreasing order of frequency were: West Bengal > Mango > Management > Growth > Production > Fruits > Varieties > Development with 19, 14, 13, 12, 12, 11, 11 and 11 occurrences respectively.
9.2.1.2.3. Zipf's Law

- The value of the products of rank (r) of a keyword and frequency (f) of occurrence of the keyword ranged between log 1.491 and log 2.416. The graphical presentation of rank (r) and frequency (f) on logarithmic scale turned out to be a straight line which indicates the applicability of Zipf’s Law data in horticultural literature.

9.2.1.2.4. Cropwise Break-up

- Maximum number of dissertations was submitted on ‘Mango’ with 14 (17.5%) citations, followed by ‘Litchi’ with 6 (7.5%) citations and ‘Pointed gourd’ with 5 (6.25%) citations.

9.2.1.2.5. Subject Distribution of Dissertations

- Based on Library of Congress Subject Headings (LCSH) scheme for categorization of subject distribution, it is observed that the dissertations have been covered by almost all 44 subject headings. Total 43 subject headings are covered under the different horticultural crops and one heading is covered under metals. Consequently, it can be concluded that dissertations consists of variety of horticultural crops.

9.2.1.3. Contribution of Supervisors

- The most active supervisor with 8 (9.302%) research works to his credit is S K Mitra from the Department of Fruits & Orchard Management under Faculty of Horticulture and followed by S N Ghosh, Md Abu Hasan from the Department of Fruits & Orchard Management, J K Hore from the Department of Spices & Plantation Crops and P Hazra from the Department of Vegetables Crops under
Faculty of Horticulture with 4 (4.651%) doctoral dissertations each to credit as a supervisor.

- S K Mitra has supervised the highest share with 10 (11.628%) doctoral dissertations.
- Out of total 80 doctoral dissertations, the maximum 74 (92.5%) dissertations are from single supervisorship and only 6 (7.5%) dissertations are from double supervisorship during 1991 to 2010.
- The research culture in horticulture is favourable towards supervisors in Professor and Reader/Associate Professor rank with almost 93.023 percent doctoral dissertations.
- 98.837% of male supervisors and only 1.163% of the remaining were occupied by female supervisors who supervised doctoral dissertations during the period of study.

9.2.1.4. Genderwise Distribution of Researchers

- 67 (83.75%) male researchers and 13 (16.25%) female researchers were submitted doctoral dissertations during the period of study.

9.2.1.5. Number of Pages Used in Dissertations

- The maximum number of text pages appeared in dissertations is 297 pages and the minimum is 53 pages.
- Average number of text pages per dissertation is 134.187 pages and standard deviation is 52.280 pages.
- The maximum number of bibliographic pages appeared in dissertations is xlix pages and the minimum is iii pages.
Average number of bibliographic pages per dissertation is approximate XV pages and standard deviation is approximate IX pages.

The maximum number of appendix pages appeared in dissertations is xvi pages and the minimum is ii pages.

Average number of page of appendices is 5.75 pages and standard deviation of page of appendices is 2.989 pages.

9.2.1.6. Number of Chapters Used in Dissertations

The highest number of 49 (61.25%) dissertations has 6 chapters, followed by 27 (33.75%) dissertations which 5 chapters.

Average number of chapters per dissertation is 5.712 and standard deviation of chapters is 0.556.

9.2.1.7. Number of Illustrations Used in Dissertations

The mean of tables of total 80 doctoral dissertations is 42.237, median is 39.5 and mode is 30.

The mean of figures / diagrams of total 80 dissertations is 22.95, median is 18.5, and mode is 10.

The mean of plates / photographs is 7.137, median is 10 and mode is 7.

9.2.2. Citation Analysis of the Doctoral Dissertations

The main objective of this study is to find out the different characteristics of cited documents like journals, journal articles, books, conference papers, conference proceedings, and theses & dissertations only.
9.2.2.1. Bibliographic Forms Used by the Researchers

- The highest number of citations recorded is from periodicals with 8571 (79.032\%) citations. Under periodical form of document, Journal Articles occupied with 8437 (77.796\%) citations.

- Book source with 1403 (12.937\%) citations is the next favoured bibliographic form of the researchers in horticulture.

- Journal article and book citations both constitute 90.733\% citations of the total citations.

- Web resources citations are the lowest i.e. 16 (0.147\%) citations.

- Horticulture scientists prefer to cite traditional sources and hardly cited Web resources.

9.2.2.2. Yearwise Distribution of Bibliographic Forms

- The highest number of overall periodical citations was recorded in the year 2005 with 998 citations and the least number of citations was 68 in 1998.

- The highest number of overall book citations was recorded in the year 2005 with 154 citations and the least being 9 citations in 1998.

- The highest overall conference paper citations were recorded in the year 2005 with 70 citations and the least was 1 citation in 1992.

- The uppermost overall citation to theses & dissertation citations was evident in the year 2009 with 21 citations and the least was 1 citation each in the years 1992, 1996 and 2004.
9.2.2.3. Distribution of citations in Dissertations

➢ The maximum number of references per dissertation is between 105-134 citations in 19 (23.75%) dissertations, closely followed by 75-104 citations in 17 (21.25%) dissertations and minimum is between ‘255 and above’ citations in 2 (2.5%) dissertations.

➢ The maximum number of average citations per dissertation is 189.00 citations in the year 2004 and the minimum is 52.33 citations in the year 1994.

➢ The average number of citations per dissertation is calculated to be 135.56 during the period of study.

9.2.2.4. Analysis of the Journal Citations

Journals are the carriers of the latest information and are the most important components of the information resources used by researchers. Most of the research output and original findings or new application of existing knowledge are reported in journals. This study covers the following observations.

9.2.2.4.1. Distribution of Journal Citations

➢ The maximum number of journal citations per dissertation is between 20-34 citations in 30 (37.5%) dissertations and the minimum is between 80-94 citations in 1 (1.25%) dissertations.

➢ The average number of journal citations per doctoral dissertation during 1991-2010 is calculated as 30.25 citations and standard deviation is 20.225 citations.
9.2.2.4.2. Ranking of the Journal Citations

- ‘Hort Science’ occupies the first rank with 441 (5.227%) citations of the total journal citations and followed by ‘Journal of the American Society for Horticulture Science’ with 405 (4.801%) citations.

- The Journal Article citations with 8437 citations are scattered in 545 different Journal citations. However, most of citations (51.027%) are found in 13 Journal citations, which is only 2.385 % of the total number of Journals citations.

- The 32 Journal titles account for 75.393% of citations and remaining nearly 25% of cited are drawn from as many as 513 other Journal citations.

9.2.2.4.3. Bradford’s Law of Scattering

- According to Bradford, the relationship of three zones is an approximately geometric series in the form 1: n: n^2. But it is found that the relationship of each zone in the present study is 6: 17: 522 = 6: 6×3: 6×9^2 =1: 3: 9^2 = 1: 3: 3^4

When 3=n, then 1: n: n^4,

Therefore, Bradford’s law does not fit well in cited Journals.

9.2.2.4.4. Application of Leimkuhler Model

- By applying the Leimkuhler model for the verification of Bradford’s law of scattering, it is found that the percentage error (0.1834) is very negligible. So the Bradford’s law fits very well in journal citations data set. Although three zones are not exactly the 1/3rd of total citations as mentioned and proved by Bradford. There is no exact match in the number of citations of each group.
9.2.2.4.5. Identification of Indian Journal Citations

- Out of total 545 journal citations of both Indian and foreign, 191 journal citations are from India, which comes to 35.046 percent citations. This clearly indicates that Indian researchers in horticulture use more foreign journals for their research work than Indian ones.

- ‘South Indian Horticulture’ ranks the top with 397 (11.148%) citations. The same journal is also coming to the third position in the common rank list of Indian and foreign journals also.

- This is followed by ‘Haryana Journal of Horticultural Science’ and ‘Journal of Root Crops’ with 364 (10.221%) citations each as second rank and ‘Indian Journal of Agricultural Science’ and ‘Indian Horticulture’ with 315 (8.845%) citations each as third position.

9.2.2.4.6. Frequencywise Analysis of Journal Citations

- The present study reveals that Quarterly (4/year) journals are the most cited journals by the researchers which account for 152 (27.890%) citations and followed by Monthly (12/year) with a share of 130 (23.853%) citations.

9.2.2.4.7. Countrywise Distribution of Journal Citations

- The most of the journal citations come from India with 191 (35.046%) citations and followed by USA with 94 (17.248%) citations.

- Only top two countries (India and USA) cover 52.294 percent of cited journals, top 4 countries cover 73.578 percent of total citations, top 9 countries cover 90.642 percent citations and remaining 15 countries cover 9.358 percent citations.
9.2.2.4.8. Subject Distribution of Journal Citations

➢ Subject distribution of research indicates that maximum number of 142 (26.055%) journal citations has been cited in the field of horticulture and followed by agricultural science numbering 130 (23.853%) citations.

➢ The coverage of food science & technology, plant physiology, botany and soil science are 52 (9.541%), 43 (7.890%), 35 (6.422%) and 26 (4.771%) citations respectively.

9.2.2.4.9. Language Distribution of Journal Citations

➢ Out of a total 545 journal citations, 534 of them are in English language forming 97.982 percent citations; while all other 6 languages account to 2.018 percent citations only.

9.2.2.4.10. Chronological Distribution of Journal Citations

➢ The researchers prefer the most of the journal with 149 (27.340%) citations in the period 1970-1979, followed by 137 (25.138%) citations in the period 1960-1969 and 76 (13.945%) citations in the period 1950-1959.

➢ 52.478 percent of cited journals is in the period 1960-1979.

9.2.2.4.11. Half-life of Journal Citations

➢ The mean year of journal citations is found to be 47.123 and the half-life of journals cited by the researchers is calculated as (median year) 43.791 years.

9.2.2.5. Analysis of the Journal Article Citations

Articles distribution, authorship pattern, collaborative research, subject wise distribution, language wise distribution and age distribution of journal article citations are analysed for this study.
9.2.2.5.1 Distribution of Journal Article Citations

- It was found that 18 (22.50%) dissertations have 65-94 citations and only 2 (2.50%) dissertations have ‘215 & above’ citations.
- The maximum number of article citations was 289 citations and the minimum number of article citations was 7 citations.

9.2.2.5.2. Yearwise Distribution of Journal Article Citations

- The maximum average number of article citations per doctoral dissertation is 145 citations in the year 1991 and minimum is 39.67 citations in the year 1994.
- The grand average number of journal article citations per dissertation is calculated to be 105.46 during the period of study.

9.2.2.5.3. Authorship Pattern of Journal Article Citations

The focus of this study is authorship trends of cited articles in references of doctoral dissertations during 1991-2010.

9.2.2.5.3.1. Distribution of Authorship Pattern

- Out of 8437 citations, 1763 (20.896%) citations are single authored journal articles, 6665 (78.997%) citations are multi-authored journal articles and 9 (0.107%) citations are written by anonymous authors.
- Maximum average number of articles per doctoral dissertation is 162.000 citations in 2004 and minimum average number of articles per doctoral dissertation is 39.670 citations in 1994.
- The grand average journal article citations per dissertation are 105.460 citations.
9.2.5.3.2. Author Output of Journal Article Citations

- The average of cited authors per journal article during 1991-2010 is calculated as 2.484 citations.
- A total of 20,915 authors are contributed 8,428 journal article citations (excluding 9 anonymous article citations).

9.2.5.3.3. Application of Lotka’s Law

- In this study, Dmax is greater than the Kolmogorov-Smirnov test (K-S test) critical value. Therefore, this result indicated that the distribution of author productivity is not match by the lotka’s law. The consequence means the Lotka’s law is not suitable for the literature author productivity distribution in horticultural research.

9.2.5.3.4. Average Number of Authors Per Article Citations

- The highest average number of authors per article citations is seen in 2010 with 2.830 citations and the lowest average number of authors per article citations is observed in 1998 with 1.853 citations.
- The grand average number of authors per article citation is 2.482 citations.

9.2.5.3.5. Productive Pattern of Authors in article Citations

- It is clear that two authored articles with 3125 (37.039%) citations are the highest in the cited journals, followed by three authored articles with 2119 (25.116%) citations, single author articles with 1763 (20.896%) citations and four authors articles with 956 (11.332%) citations.
9.2.2.5.3.6. Collaborative Research of Articles Citations

- The highest number of article citations is with 947 (11.236%) citations in the year 2005 and the average number of article citations per year is 421.4 citations.
- The least number of article citations were made with 68 (0.807%) citations in 1998.
- The degree of collaboration in article citations is 0.791.

9.2.2.5.4. Subject Distribution of Journal Article Citations

- ‘Mango-growth’ ranked highest with 277 scores representing 3.284 percent citations, ‘Litchi production’ and ‘Pointed gourd-Genetic diversity’ followed with 268 scores representing 3.176 percent citations each. ‘Chilli-Fertilizers’ recorded 255 scores representing 3.022 percent citations, and Banana-Chemical compositions’ recorded 246 scores representing 2.916 percent citations.
- The first 9 subject areas cover 25.698 percent citations of the total journal article citations. The first 31 subject areas contributed 58.754 percent citations and remaining 41.246 percent of citations are distributed among 223 other subject coverage.

9.2.2.5.5. Language Distribution of Article Citations

- English language occupies the first place with 7697 (91.229%) citations of the total citations, followed by German with 254 (3.010%) citations, Russian with 195 (2.311%) citations.
- Out of a total 8,437 article citations, 7,697 of them are in English language and other 6 languages cover to only 8.991 percent citations.
9.2.2.5.6. Chronological Distribution of Article Citations

- 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 1980-1999.

9.2.2.5.7. Half-life of Article Citations

- The Mean year of article citations is found to be 28.703 years and the half-life of journal article citations by the researchers is calculated as (Median year) 24 years.

9.2.2.6. Analysis of the Book Citations

In order to find out the distribution of books, authorship pattern, collaborative research, geographical distribution, country distribution, subject analysis, rank list of most cited books, publisher’s contribution to book citations, age and obsolescence studies were made.

9.2.2.6.1. Distribution of Book Citations

- The maximum number of book citations per dissertation is between 14-18 citations in 26 (32.5%) dissertations and the minimum is between 24-28 citations in 4 (5.0%) dissertations.

- The average no of book citations per doctoral dissertation during the year from 1991 to 2010 are calculated as 17.538 citations.

9.2.2.6.2. Authorship Patterns of Book Citations

- Out of total 1403 citations, the maximum number of book citations with 149 (10.620%) are cited in the dissertations in 2005 and followed by 142 (10.121%) citations in 2006 as second position. The lowest number of books with 9 (0.641%) are cited in 1998.
The maximum number of books is with single author 692 (49.322%) citations, books with two authors 458 (32.644%) citations occupy the second positions followed by three authored books 108 (7.698%) citations.

Single and two author books constitute 81.966 percent of the total citations.

Out of 1327 cited books (written by personal authors), about 679 (51.168%) publications are single authored and 648 (48.832%) are multi-authored.

The degree of collaboration in book citations is 0.488. The trend is definitely indicative towards less collaboration within personal authors.

The highest collaboration is found 0.667 in 1998, followed by 0.625 in 2004 and 0.598 in 2007.

9.2.2.6.3. Geographical Distribution of Book Citations

India ranks first with 511 book citations forming 36.422 percent citations of the total 1403 cited books. It is followed by USA with 453 (32.288%) book citations.

Only two countries (India and USA) shares with (68.710%) book citations published during this period. Rest cited books are from 26 countries with 31.29% citations.

Out of 1403 citations, the citations of Indian books are 511 (36.422%) and the citations of foreign books are 892 which come to 63.578 percent.

A State/Union Territory-wise analysis reveals that the majority of the books are published from Delhi with 298 (58.317%) citations and 66 (12.916%) books are published from West Bengal as the second rank.
The majority of the books are published from New Delhi/Delhi with 298 (58.317%) book citations, followed by 66 (12.916%) citations from Calcutta/Kolkata, 25 (4.892%) citations from Madras/Chennai.

Top three cities cover 76.125 percent citations, top eight cities/towns cover 90.999 percent citations and remaining 20 cities/towns cover 9.001 percent citations of the total citations.

9.2.2.6.4. Subject Distribution of Book Citations

‘Statistical methods-Agricultural workers’ account for 149 (10.620%) citations, ‘Soil chemical analysis’ with 139 (9.907%) citations, ‘Agricultural chemistry’ with 130 (9.266%) citations, and ‘Soil analysis’ with 117 (8.339%) citations.

9.2.2.6.5. Language Distribution of Book Citations

Out of a total 1403 citations, 1391 of them are in English language forming 99.145 percent of the total citations, while all other four languages accounted to only 0.855 percent citations. So from this study it is found that English is the dominant language.

9.2.2.6.6. Rank List of the Most Used Book Citations

The most cited book is ‘Statistical methods for agricultural workers’ cited 149 (10.620%) times, followed by ‘Soil chemical analysis’ cited 139 (9.907%) times, ‘Official methods of the analysis’ cited 126 (8.981%) times and ‘Soil and plant analysis’ cited 101 (7.199%).

It is observed that the first 9 books received around 50 percent references and the remaining 224 books received around 50 percent of the total references.
9.2.2.6.7. Publisher’s Rank List of Book Citations

- The ‘Indian Council of Agricultural Research (ICAR), New Delhi’ takes the top position in Indian publisher with 183 (13.043%) citations, followed by ‘John Wiley, New York’ with 156 (11.120%) citations as the second position in foreign publisher and ‘Association of Official Agricultural Chemists, Washington’ with 127 (9.052%) citations as third position in foreign publisher.

- The top only 6 publishers cover 50.178 percent citations, out of which 2 publishers are in India, 2 publishers in USA and 2 publishers in UK.

9.2.2.6.8. Chronological Distribution of Book Citations

- Most of the citations 375 (26.728%) preferred by the researchers is in the period 1980-1989, followed by 347 (24.733%) citations in 1990-1999 and 231 (16.465%) citations in the period 1970-1979.

- Out of total 1403 book citations 722 (51.461%) books citations are in the period of 1980-1999.

- The horticultural scientists cited more books with 375 (26.728%) citations in between 20-29 years, followed by 348 (24.804%) citations in between 10-19 years and 212 (15.110%) citations in between 30-39 years.

9.2.2.6.9. Half-Life of Book Citations

- The Mean year of book citations in doctoral dissertations is found to be 31.056 years and the Half-Life of book citations is calculated as (Median Year) 27 years.

9.2.2.7. Analysis of the Conference Paper Citations

It has been found that 512 conference paper and conference proceeding citations were used by the researchers in their doctoral dissertations during the period of study. An
attempt is made to identify conference paper citations and conference proceeding citations.

9.2.2.7.1. Distribution of Conference Paper Citations 1991-2010

- The maximum number of conference papers cited with 65 (12.695%) citations in 2009, followed by 51 (9.961%) citations in 2001 and 49 (9.570%) citations in 2000.

- The maximum average number of conference paper citations per dissertation is 21.00 citations in 1996 and the minimum is 0.50 citations in 1992. The average number of citations per dissertation is calculated to be 6.40 citations during the period of study.

9.2.2.7.2. Yearwise Distribution of Authorship Pattern of Conference paper Citations

- Out of 512 citations, 198 (38.672%) citations are single authored conference papers and 314 (61.328%) citations are multi-authored conference papers.

- Citations to single author contributions are more in number in the year 2009 with 26 citations, followed by 25 citations in 2005 and 19 citations in 2000.

- Among the multi-author conference papers, the share of three author contributions is found to be more i.e. 140 (27.344%) citations, followed by 118 (23.046%) citations of two author contribution and 35 (6.836%) citations of four author contributions.
9.2.2.7.3. Collaborative Research of Conference Paper Citations

- The degree of collaboration in conference paper citations for all the years from 1991 to 2010 is 0.613. The trend is definitely indicative towards more collaboration within authors.
- The highest collaboration is found 1.000 in 1992, followed by 0.750 in 2002, 0.692 in 1999 and 0.686 in 2001.

9.2.2.7.4. Subject Distribution of Conference Paper Citations

- ‘Yams-Fertilization’ ranked highest with 33 (6.445%) citations, followed by ‘Citrus-Nutrition studies’ with 28 (5.469) citations; and ‘Mangoes-genetic diversity’ & ‘oranges-growth’ with 25 (4.883%) citations each.
- The first 6 subject headings cover with 25.977 percent of the total citations. The first 13 subject headings contributed 51.173 percent and remaining 48.827 percent of cited conference papers are distributed among 95 other subject headings.

9.2.2.7.5. Rank List of Conference Titles Used by Researchers

- ‘Golden Jubilee Symposium Horticultural Society of India’ scores the highest percentage (6.641%) of citations, followed by ‘National Symposium of Banana Production Technology’ with 4.883 percent citations and ‘Sixth International Grass Land Congress’ with 3.516 percent citations.

9.2.2.7.6. Types of Proceeding Citations Used by Researchers

- The highest symposium proceedings are used by the researchers in their dissertation references with 228 (44.531%). Symposium covered at national level with 106 citations and at international level with 122 citations. Seminar ranked second with 84 (16.406%) citations at national level 34 citations and at
international level 50 citations, followed by congress with 80 (15.625%) citations at national level 14 citations and at international level 66 citations.

9.2.2.7.7. Editorship Pattern of Conference Proceeding Citations

➢ Three editors constituting 233 (45.507%) citations occupy the first place and followed by two editors with 181 (35.352%) citations.

➢ As there are only 38 (7.422%) single editorship as compared to 474 (92.578%) multi-author proceedings, the results clearly state that horticultural scientists prefer to work in a group environment.

9.2.2.7.8. Geographical Distribution of Conference Proceeding Citations

➢ Researchers have preferred Indian conference proceedings with 265 (51.758%) citations. Australia ranked second in order with 59 scores, representing 11.523 percent and USA 46 scores, representing 8.984 percent.

➢ The Indian statewise analysis of cited conference proceedings indicate that out of 265 citations, 44 (16.604%) is from Karnataka state, followed by Tamil Nadu covered with 41 (15.471%) citations.

➢ Bangalore (Karnataka) and Coimbatore (Tamil Nadu) have contributed the highest number of conferences i.e. 41 (15.472%) citations each, followed by 23 (8.679%) citations each from Kasaragod (Kerala) and New Delhi, 18 (6.793%) citations from Kalyani (West Bengal), and 16 (6.038%) from Nagpur (Maharashtra).

9.2.2.7.9. Subjectwise Distribution of Conference Proceeding Citations

➢ Out of 512 cited conference proceedings, the maximum number of conference proceedings are related to ‘Horticulture’ with 98 (19.141%) citations, followed by
Bananas with 55 (10.742%) citations, Fruit science and Mango with 40 (7.813%) citations each and Citrus culture with 26 (5.078%) citations.

9.2.2.7.10. Chronological Distribution of Conference Proceeding Citations

- There are more number of citations 153 (29.882%) distributed in the period 1990-1999, followed by 148 (28.906%) citations in the period 1980-1989 and 113 (22.071%) citations in the period 1970-1979.
- Out of total 512 citations, 301 (58.788%) conference proceedings citations are in the period 1980-1999. The minimum number of citations are 1 (0.195%) each in the period 1990-1999, 1910-1919 and 1930-1939.

9.2.2.7.11. Half-Life of Conference Proceeding Citations

- The Mean year of cited conference proceedings is found to be 23.408 and the half-life of conference proceedings cited by the horticultural scientists is calculated as (Median year) 19 years.

9.2.2.8. Analysis of Dissertation Citations

From the analysis, it has been found that 158 dissertations (83 doctoral dissertations and 75 master dissertations) were used by the researchers in their doctoral dissertations in horticulture during the study period. This study attempts to identify the yearwise break-up of dissertations, rank list of dissertations; geographical, subjectwise and chronological distribution of cited dissertations.

9.2.2.8.1. Yearwise Break-up of Dissertation Citations

- Out of 83 doctoral dissertations used by the researchers during this period, 11 citations are the highest used in 2009, followed by 10 citations in 2000, 9 citations in 2000, 8 citations in 2003 and 7 citations each are used in 2005 and 2006.
Out of 75 master dissertations used by the researchers during this period, 13 dissertations are the highest used in 2006, followed by 10 dissertations are used in 2009, 9 dissertations are used in 2000 and 7 dissertations are used in 2008.

The maximum total dissertations cited with 21 (13.292%) in 2009, followed by 20 (12.658%) citations in 2006, 18 (11.392%) citations in 2000 and 17 (10.759%) citations in 2008.

9.2.2.8.2. Rank List of the Doctoral Dissertation Citations

‘Evaluation of Mango Varieties and Hybrids of West Bengal’ and ‘Studies on the Improvement in the Methods Litchi Production in West Bengal’ these two dissertations occupy the first rank with 4.820 percent each.

‘Ontogenetic Studies of Fruits Development and minimizing cracking in Litchi Chinensis Sonn.’, Standardization of Agro-technique on Growth and Yield of Pointed-gourd’, ‘Studies on Nutrition, Pruning and Weed control of Litchi cv. Bombai’, and ‘Studies on the Physiology of Growth, flowering and Fruit Growth in Guava’ these four dissertations occupy the second rank with 3.614 percent citations each.

9.2.2.8.3. Rank List of the Master Dissertation Citations

‘Studies on Fruit Cracking in Litchi Chinensis Sonn.’, ‘Studies on Nutrition of Sweet Orange var. Mosambi’, and Study on the Effect of Plant Hormones on the Germination of Seed and other Aspects of Plant Growth in Okra’ score the highest 4% citations each.

Total 5 master dissertation titles cover 2 citations each and total 56 master dissertation titles cover 1 citation each.
9.2.2.8.4. Geographical Distribution of Dissertation Citations

- The researchers have preferred Indian dissertations with 131 (82.911%) citations. USA ranks second in order with 9 (5.696%) citations, followed by China 8 (5.063%) citations, UK with 5 (3.165%) citations. The minimum number of citation is 1 (0.633%) in Bangladesh only.

- Out of 131 cited dissertations, West Bengal, being the host state of the both BCKV and UBKV where the majority of the researchers received the highest number 58 (44.275%) of dissertations, followed by Maharashtra with 12 (9.160%) dissertations and Delhi and Tamil Nadu with 10 (7.634%) dissertation each.

- The lowest number of dissertations received from Assam and Madhya Pradesh states with 1 (0.763%) dissertation each.

9.2.2.8.5. Subject Distribution of Dissertation Citations

- It is observed that dissertations is scattered over 71 subject headings. ‘Litchi-Collection & Preservation’ account for 14 (8.228%) citations, ‘Litchi-Growth’ and ‘Mango-Growth’ with 8 (5.064%) citations each, and ‘Mango-Collection & Preservation’ and ‘Brinjal-Growth’ with 6 (3.797%) citations each.

9.2.2.8.6. Academic Institutionwise Contribution to Dissertation Citations

- It is observed that researchers have cited a total of 158 dissertations during 1991 to 2010. ‘Bidhan Chandra Krishi Viswavidyalaya’ contributes the highest dissertations 57 (36.076%) citations, followed by ‘Indian Agricultural Research Institute’ and ‘Tamil Nadu Agricultural University’ with 10 (6.329%) citations each and ‘South China University’ with 8 (5.063%) citations.
The top only 4 academic institutes covered 53.797 percent of total citations, top 11 academic institutions covered 72.781 percent and remaining 31 academic institutions cover below 3 citations with 43 (27.219%) citations.

9.2.2.8.7. Chronological Distribution of Dissertation Citations

The maximum number of 58 (36.709%) dissertation citations are preferred by the researchers in the period 1980-1989 and followed by 51 (32.278%) citations in the period 1990-1999.

68.987% of citations are preferred by the researchers in the period 1980-1999.

9.2.2.8.8. Half-Life of Dissertation Citations

The Mean year of dissertation citations is calculated to be 22.8 years and half-life of dissertation citations is calculated as (Median year) 22.5 years.

9.2.3. Contribution of Horticultural Scientists

The research contributions of scientists reflect the identity of an academic institution. Here, an attempt has been made to analyse the research contribution of the horticultural scientists of the BCKV and UBKV in the period from 1991 to 2010 particularly with regard to cited journals and books appeared in doctoral dissertations and also analyse their choice for publications during the period of study.

9.2.3.1. Contribution of Scientists to Journal Article Citations

This study is to explore the publication output of the horticultural scientists to cited articles of the BCKV and UBKV in the period 1991 to 2010. Here 86 supervisors and 80 research scholars are considered as scientists during study period. Scientists at BCKV and UBKV, contributed their research work in journals, are treated as authors.
9.2.3.1.1. Most Prolific Author Article Citations

- The most prolific author was S N Ghosh who topped the list with 23 (9.584%) papers each during the 1991-2010, followed by M A Hasan with 21 (8.750%) papers, P Dutta with 18 (7.5%) papers, P Hazra with 17 (7.084%) papers, S K Mitra with 14 (5.834%) and H Sen with 11 (4.584%) papers.

9.2.3.1.2. Co-Authorship and Credit Study for the Individual Author

- The most credited author was S N Ghosh with 18.166 points, followed by S K Mitra with 17.791 points, P Dutta with 13.250 points, M A Hasan with 12.082 points, P Hazra with 9 points and so on.

9.2.3.1.3. Self-Citing Supervisors

- The present study reveals 65 number of total supervisors self citation comprising 0.771 percent of total citation and 27.083 percent of total contributed supervisors. The ratio of Self-Citing Supervisors (SCS) to total citations is 1:129.8 and the ratio of SCS to contributed supervisors is 1:3.692.

9.2.3.1.4. Self-Citing Researchers

- The present study identifies 6 researchers self citations that account to 0.071 percent of the total citations and 11.321 percent of the total researchers citations. The ratio of researchers self citation to total citations is 1:1406 and the ratio of researchers self citation to contributed researchers is 1:9.

9.2.3.2. Choice of Journal Citations for Publication by Scientists

The literature of any field emerging from the research publications is the best indicator or exposer of the trends. Under this section, an attempt has been made to examine the choice
9.2.3.1. Choice of Indian Journals for Publications

- ‘The Horticultural Journals’ takes the top position in Indian Journals with 31 articles (15.98%) and followed by ‘Indian Journal of Horticulture’ with 27 articles (13.918%).

9.2.3.2. Choice of Foreign Journals for Publications

- The top position is occupied by ‘Environment and Ecology’ with 22 (47.827%) article citations and followed by ‘Acta Horticulturae’ with 13 (28.261%) article citations.

9.2.3.3. Contribution of Scientists to Book Citations

Here 86 supervisors and 80 research scholars are considered as scientists during study period. Scientists at BCKV and UBKV, contributed their research work in books, are treated as authors.

9.2.3.3.1. Most Prolific Cited Author of Book Citations

- The most prolific author is T K Bose who tops the list with 66 (78.572%) citations and followed by S K Mitra with 7 (8.333%) citations.

9.2.3.3.2. Co-Authorship and Credit Study for the Individual Author

- The most credited author was T K Bose with 20.125 points and followed by M G Som with 14.125 points.
9.2.3.3. Self-Citing Supervisors

- Out of total 84 contributed supervisors, 10 number of supervisors self-citation comprising 0.753 percent of total citations and 11.905 percent of total contributed supervisors.

- The ratio of supervisor self-citations to total citations is 1 : 132.7 and the ratio of supervisor self citation to total contributed supervisors is 1: 8.4.

9.2.3.4. Self-Citing Researchers

- The present study identifies 2 researchers self citations that accounts to 0.151 percent of total citations of books and 22.23 percent of the total contributed researchers.

- The ratio of researcher self citations to total citations is 1: 663.5 and the ratio of researcher self citations to total contributed researchers is 1: 4.5.

9.2.3.4. Choice of Book Citations for Publication by Scientists

An attempt has been made to examine the choice of Indian and foreign books by the particular 166 horticultural scientists (86 supervisors and 80 research scholars) at BCKV and UBKV. Scientists contributed their research work in either books, are treated as authors.

9.2.3.4.1. Choice of Indian Books for Publications

- ‘Commercial Flower’ takes the top position in Indian books with 24 (32.876%) citations and followed by ‘Fruits: Tropical and Sub-tropical’ with 18 (24.658%) citations.
9.2.3.4.2. **Choice of Foreign Books for Publications**

- ‘Overview of Lychee Production in the Asia-pacific Region’ and ‘Genetic Improvement of Vegetable Crops’ occupy the first preference by the scientists with 4 (36.364%) citations each and followed by ‘Postharvest physiology, Handling and Utilization of Tropical and Sub-tropical Fruits and Vegetables’ with 2 (18.181%) citations as second choice.

9.3. **Recommendations**

The investigator puts forward the following few recommendations for implementation:

Citation data could not retrieved easily from each dissertation because citations appended in dissertations did not follow uniform citation pattern. Investigator has faced a lot of problem in the time of data collection. In this regard, the manual of American Psychological Association (APA) / Modern Language Association (MLA) / Harvard System of Referencing (HSR) as standard for citation is quite advisable and may be followed by the Universities. Such standards could have ensured a uniform citation pattern throughout reference section as well as text of the dissertation.

Except journals and books other forms of documents like conference papers, theses & dissertations, reports, standards, dissertation abstracts are least used because of the inadequacy of information about these documents and these documents are not easily accessible due to many restrictions. It is suggested that concerned authorities make an attempt to overcome these restrictions.

Web resources citations were least used in spite of the digital environment. A reason for this is that horticulture researchers were yet to appreciate the importance of the indication of web resources referencing in their projects or that they had little or no access to
Internet facilities or lacked basic information literacy skills needed to use the facilities. It is suggested that departmental libraries or University central library may provide the internet facilities to the researchers and concerned teachers motivated the researchers for using the Internet.

Orientation programme should be arranged to know the several useful resources of the University central library as well as departmental libraries.

The domain of joint authored papers indicated to the emergence of team work in research activities. Hence team research must be encouraged.

Rising journal subscription costs, shrinking budget allocation, and lack of space for current library holdings have resulted in number of ‘document use’ studies. Librarians have been trying to determine library collection development policies which will make optimum use of money and space available while meeting the current and future needs of the library users. In this regard it may be ensured by all the libraries in a geographical area to see that at least one of the core journals is available in any one of the libraries in a locality. This forces to establish resources sharing. Selection of core journals has to be made using appropriate bibliometric techniques.

9.4. Conclusion

Dissertation is the highest research contribution of a doctoral student in academic world. As a result, dissertations in the field of horticulture were analysed because they served as the best representation of the research interests of doctoral students at both BCKV and U BKV in West Bengal. The present study is the first of its kind to study the bibliometric indicators in horticultural literature. This is a preliminary study on horticulture research in West Bengal. This may trigger more bibliometric studies for the purpose of evaluating
horticulture research in India. Such study would be useful in devising appropriate policies to alleviate the horticulture status of India.

Bibliometrics has established itself as a viable and distinctive research technique for studying science of science based on dissertations and citation data. Citation analysis is one of the most important bibliometric techniques involving analysis of the references forming part of primary communication. Cito-analytical studies of doctoral dissertations which are the products of research activity form an important source of information. Bibliometrics as a technique has extensive applications in identifying the research trends in a subject; trends in authorship and collaboration in research; core periodicals; obsolescence and dispersion of scientific literature useful in estimating the comprehensiveness of periodicals; studying the author productivity; characteristics of subject literatures and helpful in formulation of need based collection development policy; weeding and stacking policy; science policy studies and many others.

It is hoped that this study will be helpful to researchers who want to identify primary sources of information. Studies of this kind will be useful for library and information professionals who want to provide suitable services for users and researchers. It can also serve as a feedback to librarians in the selection and acquisition of journal, book and other important documents most useful to researchers in horticulture. The methods in this study will help horticulture as well as agricultural science librarians to determine which materials are being used at their libraries. Ultimately, it is also assumed that an improved collection for horticultural literature will better support the research needs of future doctoral students in the field of horticulture.

Findings from this study show several important areas of reference materials as vital information sources in research for doctoral students. This will no doubt help the BCKV
and UBKV’s Central Libraries and other Departmental Libraries in their budget planning to judiciously use their shrinking budgets and funds to make far-reaching library-material collection decisions. These findings are also more helpful for librarian and information scientists to take decisions about collection development, removing out dated documents from the shelves, binding of back volumes of journals and also in maintaining of need based collection in the libraries.

9.5. Future Scope of the Research

The present study does not investigate M Sc Dissertations on horticulture at Central Library, BCKV, Mohonpur, Nadia, West Bengal and UBKV, Pundibari, Cooch Behar, West Bengal. It is hoped that further studies will be intensive study on such data. Similarly, it would also be relevant, for further research, to study the characteristics of the scientific production of doctoral dissertations of other branches of agricultural sciences. Along these lines, further citation analysis research in other states of our country could shed light on the universal aspects of doctoral dissertations.

Given the fact that, defining, qualitative studies on this process provided more narrow results, the combination, in further research, of both quantitative and qualitative approaches to the study on dissertation literatures is likely to provide interesting results. Further research in the area could also combine this quantitative data with a qualitative analysis of the factors that affected doctoral students’ contribution to papers.

Overall, this study makes an original contribution to Library and Information Science (LIS), taking into account the central importance of bibliometric methods, and to the information science and higher education. The results obtained provide important insight into the extent, as well as a better understanding of the importance of doctoral students’ as
well as library authority, both in terms of papers and citations. More generally, it also shows the importance of doctoral programmes, not only for the reproduction of new researcher, but also for the research system as a whole, as doctoral students contribute to an important proportion of the knowledge output of the system. These findings should be of great interest to university administrators as well as to research councils and other research scholars in general.