

## BIBLIOMETRIC STUDY OF DR. R.C.SINHA, A PLANT PATHOLOGIST

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*The paper studies the research articles published in Indian and foreign journals by Dr. R.C. Sinha, an Indian born Canadian and an internationally reputed plant virologist. This bibliometric study is an attempt to analyze his articles using Science Citation Index and study their impact on the world literature.*

### **INTRODUCTION**

The nature of the literature of any scientific field can mainly be studied from two angles. Firstly, it can be studied through abstracting and indexing periodicals and secondly, with the help of certain tools like Science Citation Index. For evaluating any article, the citation study is useful. The other way of studying the literature of a field is to study the work of individuals who are eminent in the field and have contributed significantly in scientific research. The impact of such persons can be studied through the citation analysis of their original articles published in reputed journals or papers presented at the conferences. Such bibliometric studies need revision to see the impact of changed pattern of the research environment and to see the importance of an individual's work with the passage of time. Earlier, Sinha and Bhatnagar [1] carried out Dr. R.C. Sinha's study in 1980 and some conclusions were

drawn. Probably, this study was the first study of its kind at that time. After that, so many bibliometric studies on individual profile of the scientists have been carried out by different workers viz., Gupta [2], Sinha and Furquan Ullah [3], Kalyane [4], Sinha and Furquan Ullah [5], Kalyane and Devari [6], Kalyane and Kalyane [7], Kademani et al, [8], Kalyane and Kademani [9], Kademani et al [10], Kalyane and Samanta [11] and Kalyane [12].

The present study is the revision of an earlier study [1] and has been carried out to view changes that have taken place in the nature of writing the papers in the field of his research and their impact on world literature in the two and half decades.

### **METHODOLOGY**

Dr. Sinha was requested to send his biodata with a list of his publications. The other authors with whom Dr. Sinha has worked were also taken into consideration. The details regarding each published paper were written on separate cards and were analyzed and compared with Science Citation Index. The brief biographical sketch of Dr. Sinha is as follows:

Name	:	Dr. R.C. Sinha
Present Address	:	21, Barran Street, Nepean Street, Canada K2J 1 G3
Qualification	:	D.Sc. in 1974 from London University (UK)
Research Experience	:	43 Years
Number of Publications	:	97 Papers
Honours & Award	:	Associate Editor of <i>Virology</i> during 1971-74. In 1985 appointed as the Chairman of Plant Microbe Interaction Program at Plant Research Centre of Agriculture, Canada.

## CHRONOLOGICAL DETAILS OF HIS MAJOR RESEARCH FIELD

Dr. Sinha's personal letter dated June 3, 2000 details out his research activities as given under:

- a) During 1956-1957, he was a Research Scholar at Lucknow University, Lucknow (India) and got the initial training in plant pathology under the supervision of Dr. S.N. Dasgupta.
- b) In years 1958-1960, he was the Ph. D. Scholar at Rothamsted Experimental Farm, Harpenden, England under the supervision of Sir Fredrick Bawden. The title of his doctoral thesis was 'Red Clover Mottle Virus', a newly discovered virus.
- c) The years 1960-1965, Dr. Sinha spent as Research Associate at University of Illinois, USA. His work was mainly focused on virus transmitted by leafhoppers with emphasis on detection of wound-tumour virus in vector leafhoppers using fluorescent-antibody technique.
- d) During 1965-1997, he worked as Research Scientist at Agriculture Ministry, Canada (Ottawa). Here, he concentrated on leafhoppers transmitted plant virus. In his research in 1967 he proved that the 'Aster Yellow Disease' is caused by mycoplasmas instead of virus. This was the first time when mycoplasmas were found to cause diseases in plants. Earlier, they were known to cause diseases in human beings only. However, the diseases caused by mycoplasmas in plants and human beings are not interrelated. He has worked on various aspects of mycoplasmas such as transmission, serological detection and their purification upto 1990. Meanwhile, based on his findings on the transmission of viruses and mycoplasmas by various leafhopper vectors, he submitted his D.Sc. thesis to London University, London and

was awarded the degree in 1974. In 1985, he was appointed as the Chairman of Plant Microbe Interaction Program at Plant Research Centre of Agriculture, Canada, where he headed a team of five scientists as Senior Scientist and worked on mycotoxins which are produced by *Fusarium severe gramineanum*, a fungus that causes severe loss to wheat field by producing Fusarium Head Blight (FHB) disease in wheat in North America, Europe and Asia. In 1992, he started work on immunological techniques to detect the mycotoxins with the help of a young chemist and ultimately developed biotechnological-based diagnostic procedure for detecting Deoxynivalinol (DON) of wheat and also produced specific monoclonal antibodies against this DON and a rapid serological procedure to detect DON in grains. It is noteworthy to mention here that on the findings of his research an American Company has developed a kit in 1995 to detect DON that is now sold throughout the world.

Even after 1997, he is actively engaged in the same research field.

## ANALYSIS

The following is the break up of his 97 papers published in different journals and as book chapters:

Indian Journal	:	1
Foreign Journals	:	78
Book Chapters	:	18

The yearwise break up of the articles, in Table 1 reveals that out of 97 articles published between 1959 to 1998, maximum number of articles (7) were published during 1974, followed by 5 each in 1983, 1984 and 1998 and 4 in 1988. Besides, as a single author, he published 30 articles and as joint author 67 articles.

Table 1

*Yearwise Productivity*

Year	Single Author	Joint Authored		Three Authored or More		Total No. of Papers
		1st Author	2nd Author	1st Author	Other Author	
1959	-	-	1	-	-	1
1960	3	-	-	-	-	3
1961	-	-	1	-	1	2
1962	-	1	-	-	1	2
1963	1	1	-	-	-	2
1964	-	1	1	1	-	3
1965	2	1	-	-	-	3
1966	-	-	-	-	1	1
1967	1	3	-	-	-	4
1968	2	1	-	-	-	3
1969	1	2	1	-	-	4
1970	-	1	2	-	1	4
1971	1	-	-	-	-	1
1972	1	2	-	-	1	4
1973	2	-	1	-	-	3
1974	2	1	3	-	1	7
1975	-	-	-	1	-	1
1976	1	-	-	1	-	2
1977	-	1	1	-	-	2
1978	-	-	1	-	-	1
1979	3	-	-	-	-	3
1980	-	3	-	-	-	3
1981	1	-	1	-	-	2
1982	-	-	2	-	-	2
1983	2	1	2	-	-	5
1984	2	1	-	1	1	5
1985	-	-	1	-	-	1
1986	1	1	-	-	-	2
1987	-	-	-	-	-	-
1988	2	-	2	-	-	4
1989	2	-	-	-	1	3
1990	-	1	1	-	1	3
1991	-	-	2	-	-	2
1992	-	-	1	-	-	1
1993	-	-	-	-	1	1
1994	-	-	-	-	-	-
1995	-	-	-	1	-	1
1996	-	1	-	-	-	1
1997	-	1	-	-	-	1
1998	-	-	3	-	2	5
Total	30	24	27	5	12	98

The journal preferences according to the number of papers published in different journals can be studied through Table 2.

From the Table 2, it is clear that the main preferences are for *Virology* in which 23 articles

were published followed by *Phytopathology* (10), and *Phytopathology Z.* (7) and others include book chapters which totalled 18. Up to 1980, Dr. Sinha has produced 58 papers only which were raised to 97 at present.

Table2

*Journal Preferences According to the Number of Papers published*

Sl.No.	Name of the Journals	No. of Articles
1.	<i>Virology</i>	23
2.	<i>Canadian Journal of Plant Pathology</i>	13
3.	<i>Phytopathology</i>	10
4.	<i>Phytopathology Z</i>	07
5.	<i>Annals of Applied Biology</i>	02
6.	<i>Annals of Entomological Society of America</i>	02
7.	<i>Journal of General Virology</i>	02
8.	<i>Methods in Mycoplasmaology</i>	02
9.	<i>Acta Virologica</i>	01
10.	<i>Advances in Vector Research</i>	01
11.	<i>Advances in Virus Research</i>	01
12.	<i>Canadian Journal of Botany</i>	01
13.	<i>Canadian Journal of Microbiology</i>	01
14.	<i>Canadian Plant Disease Survey</i>	01
15.	<i>European Journal of Plant Pathology</i>	01
16.	<i>Journal of Agricultural Food Chemistry</i>	01
17.	<i>Journal of Bacteriology</i>	01
18.	<i>Journal of Economic Entomology</i>	01
19.	<i>Journal of Microbiology</i>	01
20.	<i>Journal of Phytopathology</i>	01
21.	<i>Journal of Ultrastructural Research</i>	01
22.	<i>Mycopathologica</i>	01
23.	<i>Plant Disease Reporter</i>	01
24.	<i>Recent Advances in Mycoplasmaology</i>	01
25.	<i>Hindustan Antibiotic Bulletin</i>	01
26.	<i>Yale Journal of Biological Medicine</i>	01
	<i>Others (Book Chapters)</i>	18
Total		97

Table 3

*Journalwise Productivity*

Name of the Journals	Year of Publication of papers	Yearwise No. of Papers	Total Number of Papers
<i>Acta Virologica</i>	1968	1	1
<i>Advances in Vector Research</i>	1991	1	1
<i>Advances in Virus Research</i>	1968	1	1
<i>Annals of Applied Biology</i>	1960	2	2
<i>Annals of Entomological Society of America</i>	1966	1	
<i>Annals of Entomological Society of America</i>	1970	1	2
<i>Canadian Journal of Botany</i>	1984	1	1
<i>Canadian Journal of Plant Pathology</i>	1980	1	1
<i>Canadian Journal of Plant Pathology</i>	1979	1	
<i>Canadian Journal of Plant Pathology</i>	1980	1	
<i>Canadian Journal of Plant Pathology</i>	1981	1	
<i>Canadian Journal of Plant Pathology</i>	1982	1	
<i>Canadian Journal of Plant Pathology</i>	1983	1	
<i>Canadian Journal of Plant Pathology</i>	1984	1	
<i>Canadian Journal of Plant Pathology</i>	1986	1	
<i>Canadian Journal of Plant Pathology</i>	1988	1	
<i>Canadian Journal of Plant Pathology</i>	1989	1	
<i>Canadian Journal of Plant Pathology</i>	1991	1	
<i>Canadian Journal of Plant Pathology</i>	1992	1	
<i>Canadian Journal of Plant Pathology</i>	1996	1	
<i>Canadian Journal of Plant Pathology</i>	1997	1	13
<i>Canadian Plant Disease Survey</i>	1982	1	1
<i>European Journal of Plant Pathology</i>	1998	1	1
<i>Journal of Agriculture Food Chemistry</i>	1995	1	1
<i>Journal of Bacteriology</i>	1985	1	1
<i>Journal of Economic Entomology</i>	1969	1	1
<i>Journal of General Virology</i>	1990	1	
<i>Journal of General Virology</i>	1993	1	2
<i>Journal of Microbiology</i>	1984	1	1
<i>Journal of Phytopathology</i>	1998	1	1
<i>Journal of Ultrastructural Research</i>	1976	1	1
<i>Mycopathologica</i>	1998	1	1
<i>Methods in Mycoplasmaology</i>	1983	2	2
<i>Plant Disease Reporter</i>	1974	1	1
<i>Phytopathology</i>	1963	1	
<i>Phytopathology</i>	1964	1	
<i>Phytopathology</i>	1965	1	
<i>Phytopathology</i>	1968	1	
<i>Phytopathology</i>	1972	1	
<i>Phytopathology</i>	1974	1	
<i>Phytopathology</i>	1977	1	
<i>Phytopathology</i>	1978	1	

Contd.



(Contr.) Table 3

Name of the Journals	Year of Publication of papers	Yearwise No. of Papers	Total Number of Papers
<i>Phytopathology</i>	1983	1	10
<i>Phytopathology Z</i>	1974	2	
<i>Phytopathology Z</i>	1975	1	
<i>Phytopathology Z</i>	1976	1	
<i>Phytopathology Z</i>	1977	1	
<i>Phytopathology Z</i>	1979	1	
<i>Phytopathology Z</i>	1980	1	7
<i>Recent Advances in Mycoplasmaology</i>	1990	1	1
<i>Virology</i>	1959	1	
<i>Virology</i>	1960	1	
<i>Virology</i>	1961	2	
<i>Virology</i>	1962	1	
<i>Virology</i>	1964	2	
<i>Virology</i>	1965	2	
<i>Virology</i>	1967	4	
<i>Virology</i>	1969	2	
<i>Virology</i>	1970	3	
<i>Virology</i>	1971	1	
<i>Virology</i>	1973	2	
<i>Virology</i>	1974	1	23
<i>Hindustan Antibiotics Bulletin</i>	1972	1	1
<i>Yale Journal of Biological Medicine</i>	1984	1	1
<i>Other (Book Chapters)</i>	1969	1	
	1972	2	
	1973	1	
	1974	1	
	1979	1	
	1981	1	
	1984	1	
	1986	1	
	1988	3	
	1989	2	
	1990	2	
	1998	2	18
<b>Total</b>		<b>97</b>	<b>97</b>

Table 3 shows that maximum number of articles (23) were contributed in *Virology* followed by *Canadian Journal of Plant Pathology* (13), *Phytopathology* and *Phytopathology Z*. It is clear from the above table that in *Virology*, he has written articles from 1959 to 1974 and contributed 23 articles; in *Phytopathology*, he contributed 10 articles during 1963-1983 and in *Phytopathology Z*, 7 articles during 1974-1980. It is interesting to

note that the author has stopped to contribute for *Virology* after 1974 and shifted his research field to Pathology and published his articles in *Canadian Journal of Plant Pathology*, still the highest numbers of papers is in *Virology*. It is also evident that *Virology* and *Canadian Journal of Plant Pathology*, *Phytopathology* and *Phytopathology Z* are the main journals that have been chosen for publishing articles by Dr. Sinha.

This leads to the fact that *Canadian Journal of Plant Pathology*, *Phytopathology* and *Phytopathology Z* are predominately related to the plant virological research field and *Virology* and *Canadian Journal of Pathology* have better links with other journals and are cited as references. The other journals which have one or two articles are not so much devoted to the specific disciplines of plant virology and they also carry other aspects of plant pathology.

### CITATION ANALYSIS

The technique of citation analysis using *Science Citation Index* (SCI) has been employed to evaluate the contributions of 97 articles. This study examines the life span of the articles up to which they are cited. SCI studies the work of whomsoever appears as the first author and citations appear under that name (13).

Therefore, Dr. Sinha's work as a first author only could be studied. Table 4 depicts that the article published in 1969 in *Virology* was cited 21 times (18 times cited by others and only 3 times by the author) between 1975-1999 followed by the article published in 1974 in *Phytopathology* which was cited 21 times during 1975-1993 (16 times by others and 5 times by the author). The next article cited 19 times (18 times by others and once by the author) during 1981-1999 was published in *Canadian Journal of Plant Pathology*. The article published in 1983 in *Phytopathology* was cited 15 times (14 times by others and once by the author) during 1984-1995. This means that these papers still have the relevancy in present environment too because these are being cited continuously since their publication. The other articles that have been cited less times reveal that either these papers are of less importance or have the regional value.

Table 4

*Citation Scenario of Each Article showing the Life Span and Frequency*

Sl.No.	Journal Name with Article Page Nos.	Year of Publication	Citation Years' Blocks in SCI	Citation Cited by Others	Details Self Cited	Total Citations
1.	<i>Virology</i> 10: 344-52	1960	1973-77	3	-	3
2.	<i>Virology</i> 17: 582-87	1962	1973-77	1	-	-
		1989		1	-	2
3.	<i>Virology</i> 21: 183-87	1963	1973-77	1	-	-
		1979		1	-	2
4.	<i>Virology</i> 24: 626-34	1964	1973-77	5	1	9
		1979		1	-	-
		1986		2	-	9
5.	<i>Virology</i> 24: 666-67	1964	1973-77	1	-	-
		1979		1	-	2
6.	<i>Virology</i> 27: 673-86	1965				
		1981		2	-	-
		1985		1	-	-
		1986		2	-	-
		1988		1	-	6
7.	<i>Virology</i> 26: 118-19	1965	1981	1	-	1
8.	<i>Virology</i> 31: 446-48	1967	1975-79	2	-	-
		1989		1	-	-
		1997		1	-	4

Contd.

(Contd.) Table 4

Sl.No.	Journal Name with Article Page Nos.	Year of Publication	Citation Years' Blocks in SCI	Citation Cited by Others	Details Self Cited	Total Citations
9.	<i>Virology</i> 31: 461-66	1967	1975-79	2	-	5
		1981		2	-	
		1984		1	-	
10.	<i>Virology</i> 32: 402-05	1967	1981	1	-	2
		1988		1	-	
11.	<i>Virology</i> 38: 679-84	1969	1975-79	2	1	6
		1981		1	-	
		1985		1	-	
		1986		1	-	
12.	<i>Virology</i> 33: 702-08	1967	1975-79	2	1	12
		1980		1	1	
		1986		1	-	
		1988		1	-	
		1989		1	-	
		1994		2	-	
		1997		1	-	
		1998		1	-	
13.	<i>Virology</i> 39: 759-67	1969	1975-79	8	2	21
		1983		-	1	
		1984		1	-	
		1985		1	-	
		1987		2	-	
		1990		1	-	
		1991		2	-	
		1993		1	-	
		1998		1	-	
		1999		1	-	
14.	<i>Virology</i> 40: 665-72	1970	1975-79	3	1	14
		1980		1	-	
		1981		2	-	
		1982		1	-	
		1986		1	-	
		1989		1	-	
		1990		1	-	
		1994		1	-	
		1997		1	-	
15.	<i>Virology</i> 44: 342-51	1971	1975-79	6	-	9
		1980		1	-	
		1987		1	-	
		1989		1	-	

Contd.



(Contd.) Table 4

Sl.No.	Journal Name with Article Page Nos.	Year of Publication	Citation Years' Blocks in SCI	Citation Cited by Others	Details Self Cited	Total Citations
16.	<i>Virology</i> 51: 244-46	1973 1980 1987 1989	1975-79	1 2 1 1	- - - -	5
17.	<i>Canadian Journal of Pl. Pathology</i> 1: 65-70	1979 1982 1983 1985 1986 1987 1990 1991 1993 1994 1999	1981	2 2 1 1 2 2 2 2 2 1 1	- - 1 - - - - - - - -	19
18.	<i>Canadian Journal of Pl. Pathology</i> 2: 119-24	1980 1983 1986 1991 1992	1982	1 1 1 1 1	- - - - -	5
19.	<i>Canadian Journal of Pl. Pathology</i> 5: 7-10	1983	Nil	Nil	Nil	Nil
20.	<i>Canadian Journal of Pl. Pathology</i> 6: 200-05	1984 1990 1991 1993 1994	1987	2 4 2 1 1	- - - - -	10
21.	<i>Canadian Journal of Pl. Pathology</i> 8: 387-93	1984 1991 1993 1994 1999	1987	2 1 1 1 2	- - - - -	5
22.	<i>Canadian Journal of Pl. Pathology</i> 18: 233-36	1996 1999	1997	1 10	- -	11
23.	<i>Canadian Journal of Pl. Pathology</i> 19: 8-12	1997 1999	1998	1 4	- -	5
24.	<i>Phytopathology</i> 53: 1170-73	1963 1983 1984	1973-77	1 1 1	- - -	3
25.	<i>Phytopathology</i> 55: 324-27	1965	Nil	Nil	Nil	Nil

Contd.

(Contd.) Table 4

Sl.No.	Journal Name with Article Page Nos.	Year of Publication	Citation Years' Blocks in SCI	Citation Cited by Others	Details Self Cited	Total Citations
26.	<i>Phytopathology</i> 58: 452-55	1968	1975-79	1	-	2
		1989		1	-	
27.	<i>Phytopathology</i> 62: 377-83	1972	1975-79	4	-	10
		1982		2	-	
		1989		2	-	
		1994		2	-	
28.	<i>Phytopathology</i> 64: 1156-58	1974	1975-79	4	2	21
		1981		-	1	
		1982		2	-	
		1983		1	1	
		1984		2	1	
		1985		1	-	
		1986		1	-	
		1987		1	-	
		1988		1	-	
		1990		1	-	
		1991		1	-	
29.	<i>Phytopathology</i> 67: 570-72	1977	1975-79	1	-	2
		1997		1	-	
30.	<i>Phytopathology</i> 73: 1199-1202	1983	1984	1	1	15
		1985		1	-	
		1986		1	-	
		1987		2	-	
		1990		1	-	
		1991		2	-	
		1993		3	-	
31.	<i>Phytopathology Z</i> 81: 124-32	1974	1975-79	1	1	3
		1980		1	-	
32.	<i>Phytopathology Z</i> 84: 300-06	1975	1975-79	1	1	2
33.	<i>Phytopathology Z</i> 87: 314-23	1976	1983	1	-	1
34.	<i>Phytopathology Z</i> 96: 132-39	1979	1975-79	1	1	5
		1984		1	1	
		1998		1	-	
35.	<i>Phytopathology Z</i> 99: 294-300	1980	1984	1	1	4
		1985		1	-	
		1998		1	-	

Contd.

(Contd.) Table 4

Sl.No.	Journal Name with Article Page Nos.	Year of Publication	Citation Years' Blocks in SCI	Citation Cited by Others	Details Self Cited	Total Citations
36.	<i>Acta Virologica</i> 12: 546-50	1968	1975-79	1	2	
		1981		1	1	
		1982		1	-	
		1994		1	-	
37.	<i>Ad. in Virus Research</i> 13: 181-223	1968	1975-79	5	-	6
		1989		1	-	
38.	<i>Ann. Applied Biol.</i> 48: 742-48	1960	1973-77	3	-	4
		1993		1	-	
39.	<i>Ann. Applied Biol.</i> 48: 749-55	1960	1985	1	-	1
40.	<i>Canadian Jl. of Microbiology</i> 26: 1157-61	1980	1982	4	-	12
		1983		2	-	
		1984		2	1	
		1985		1	-	
		1988		1	-	
		1992		1	-	
41.	<i>Jl. Agri. Food Chem</i> 43: 1740-44	1995	1997	1	-	7
		1998		2	-	
		1999		4	-	
42.	<i>Jl. Microbiology</i> 50: 155-60	1984	Nil	Nil	Nil	Nil
43.	<i>Jl. Ultrastruct Res.</i> 54: 183-89	1976	1975-79	3	1	-
		1980		1	-	
		1981		-	1	
		1984		1	-	
		1987		1	-	
		1999		1	-	
44.	<i>Methods in Mycoplasmology</i> 56: 737-43	1983	1983	-	1	
		1984		1	-	
		1985		1	-	
		1986		1	-	
		1987		1	-	
45.	<i>Yale Jl. of Biol. Medicine</i> 56: 737-43	1984	1984	1	-	1

## CONCLUSION

It is concluded from the present study that Plant Virology and Pathology are established fields of knowledge like Nuclear Physics and Industrial Chemistry. Quite a few journals are exclusively devoted to this discipline. SCI is the tool to study the individual scientist's work through citation and it can be used for similar studies in different fields of research in various disciplines. However, this cannot be applied in certain cases efficiently, particularly where the journals are not being covered in the SCI as in Indian context. For this, Sinha and Dhiman (14) have suggested to develop their own Indian Science Citation Index. The present study reveals that though Dr. Sinha has selected another journal to publish his articles but the field of his research remains more or less the same. The articles published in *Virology* are highly cited articles followed by the articles published in *Canadian Journal of Plant Pathology*. Other individual studies like this can also be revised and updated after a definite period of time to see the impact of the research on world literature and life span of a paper through citation studies.

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