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Research Article

INDIAN JOURNAL OF BIOTECHNOLOGY: A BIBLIOMETRIC STUDY

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ABSTRACT

This paper presents a bibliometric features and characteristics of the journal titled 'Indian Journal of biotechnology'. It publishes four issues per year by NISCAIR, New Delhi. The data were downloaded from the journal's website. The Bibliometric analysis has been conducted with 448 contributions published in the journal selected six years for a period between 2007 and 2012. The analysis covers mainly discuss the each article, year wise distribution of contributions, and number of authorship, volume wise authorship, author's productivity and the single and multi-authored papers and also many more features. Findings of the studies pointed out towards the advantages and weakness of the journal which are helpful for its further development. The result revealed that the highest number of contributions i.e., 87 (19.41 %) were published in the years 2007. The highest number 436 (97.33 %) articles were contributed by joint authors and the rest of 12 (2.67 %) articles contributed by single author. The degree of collaboration is 0.97. The average length of the articles varied from a minimum of 5.94 pages in the year 2012.

Keywords: Bibliometrics; Authorship Pattern; Degree of Collaboration; Journal of Biotechnology; Indian Journal; Publication Analysis; India.

INTRODUCTION

The term 'Bibliometrics' defined as 'the application of mathematical and statistical methods to books and other communication medium' by Pritchard, A. (1969). Bibliometric methods are used in studies of properties and behaviour of recorded knowledge for analysis of the structures of scientific and research areas, and for evaluation of research activity and administration of scientific information. Various statistical methods are applied to study to measure, authorship, citation and publication pattern, and the relationship within scientific domains and research communities and to structure of specific fields. In this sense, bibliometrics is also relevant for researchers, policy and decision makers and also researchers outside the library and information science (LIS) field to track the trend in the specific field in their research work. Patra S.K; Bhattacharya, P & Verma, N (2006). Sengupta (1990) defined it as the "organization, classification and quantitative evolution of publication patterns of all macro and micro communications along their authorship by mathematical and statistical calculus." 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 secondary periodicals, studying publications by scientists, citation studies and so on. It can also be used in the identification of emerging research areas.

SOURCE: INDIAN JOURNAL OF BIOTECHNOLOGY

Indian Journal of Biotechnology is a leading quarterly journal, published by the National Institute of Science Communication and Information Resources (NISCAIR), New Delhi. It is started as a quarterly journal in 2002, publishes full papers, short communications and reviews in agricultural, animal, environmental, industrial, medical, and microbial biotechnology, bioinformatics, and socio-legal and ethical aspects in biotechnology. The latest developments in biotech-industry are covered under Notes and News. Indian Journal of Biotechnology has been selected for coverage in Thomson Reuter's products and custom information services. Beginning with Volume 7 (1) 2008, information on the contents of this publication will be indexed in namely Science Citation Index Expanded (also known as SciSearch); Journal Citation Reports/Science Edition and Biotechnology Citation Index. This coverage is in addition to existing inclusion in Biological Abstracts and BIOSIS Previews. Data were collected from their website: http://www.niscair.res.in; http://nopr.niscair.res.in for analyzing and arrive its results.

RELATED WORK

Gupta, B M; Bala, A and Kshitig, A (2013), analysed the global publications output in cataract research during 2002-11 on several parameters including contribution & citation impact of top 15 most productive countries, different types of cataract research, research output by different population age groups, subject-wise break-up of research output, relatedness of various diseases to cataract research, research contribution. The Scopus Citation Database had been used to retrieve the data for 10 years (2002-11) by searching the keywords "cataract" in the combined Title, Abstract and Keywords field. The world publication output in cataract research consisted of 27053 papers during 2002-11, which increased from 2025 papers in 2002 to 3080 papers in 2011, witnessing an annual average growth rate of 4.89%. The average citation impact per paper registered by world publications was 6.94 during 2002-11, which decreased from 7.82 during 2002-06 to 5.21 during 2007-11.Tsay (Ming-Yueh), 2011, conducted the study was to explore the journal bibliometric characteristics of the *Journal of Information Science* (JIS) and the subject relationship with other disciplines by citation analysis. The citation data were drawn from references of each article of JIS during 1998 and 2008. The databases like Ulrich's Periodical Directory, Library of Congress Subject Heading, retrieved from the WorldCat and LISA database were used to identify the main class, subclass and subject of cited journals and books. The results was found that the journal articles are the most cited document, followed by books and book chapters, electronic resources, and conference proceedings, respectively.

The data were collected from the annual reports of Central Tuber Crops Research Institute (CTCRI) were studied and the results was found that the highest number of 169 papers were published in the year 2006 and the average number of publications per year was 97.82 and the most of the papers were multi authored i.e. 87.68 %. The degree of collaboration of scientists of CTCRI was 0.87 and most of the articles published by the scientists were from foreign journals i.e. 51.89 %. Sudhier K.G. P and Priyaalakshmi, V (2013).

Thanuskodi S (2011) analysed the journal titled "Library Herald" for the period between 2006 and 2010. The analysis covered mainly the number of articles, authorship pattern, subject wise distribution of articles, average number of references per articles, forms of documents cited, year wise distribution of cited journals etc. it was found that all the studies point towards the merits and weakness of the journal which will be helpful for its further development. The result showed that out of 138 articles single author contributed 72 (52.17%) articles while the rest 66 (47.83%) articles were contributed by joint authors. The study revealed that most of the contributions are from India with 89.85 % and the rest 10.15 % only from foreign sources.

The study investigated the papers of Rabindranath Tagore (1861–1941) received Nobel Prize for Gitanjali (Songs Offerings) in 1913 which is a collection of poems from different kavyagrantha (book of poems). The growth of poems of Gitanjali, their lengths, places and dates of writings, use of words, rank frequency of different words and to find out whether Gitanjali follows any bibliometric law. The study was found the results of the title Gitanjali with the help of bibliometric techniques. It was observed from the study that many poems of Gitanjali are songs, written long before the publication and submission of Gitanjali for Nobel Prize. Ray Partha Pratim1, Sen B.K.(2012).

Hussain, Akhtar; & Fatima, Nishat. (2011), observed that a bibliometric analysis of the Chinese Librarianship: an International Electronic Journal for the period of 2006-2010 has been conducted. The study demonstrates and elaborates on the various aspects of the Journal, such as its distribution of article by year, authorship patterns, distribution of contributions by institution, subject distributions, citation patterns, length of article, rank of cited authors, and geographical distributions of authors. It was observed the growth, contribution, and impact of research carried out by the researchers at the Orissa University of Agricultural Technology (OUAT), Bhubaneswar, India, based on the publications indexed in Scopus during 2008 to 2012. It was identified that the average annual publications range from 33 to 34 papers, with 0.96 degree of collaboration. The maximum numbers of papers were published within the 1-5 page range. OUAT, S. K. Mishra, Agricultural and Biological Sciences, and India are the most prolific institution/organization, author, subject area, and country respectively. Maharana, Rabindra K. (2013).

The study was analysed and compared twenty-one core LIS journals published between 1980 and 1999 to ascertain the research contribution of developing countries and Eastern European countries. He found that the number of articles from China, Saudi Arabia, Turkey, Botswana, Ghana, Kuwait, and Taiwan has increased considerably while those in India, Nigeria, Pakistan, Brazil, and Poland have declined. Uzun (2002). Thanuskodi (2010) analysed the journal published 249 articles during the period of study. The maximum numbers of contributors are single authors with 31.32%. The Study revealed that majority of articles (96.85%) contains references which include journals, books, conference proceedings, dissertations, etc.

Chaurasia, Kamal Kumar. (2008) analysed and observed that the journal i.e. Annals of Library and Information Studies during the period between 2002 and 2006 which showed trend of growth in contributions and average number of contributions is 21.4 per volume. The majority of the library and information scientists prefer to do collaborative research and contribute their papers jointly. Most of the contributions are on Bibliometrics (36.45%). IT & Digital technologies in Libraries have also got sufficient papers. The institutional and geographical distribution of contributions is calculated. Most of the contributions are with citations. Majority of the library and information scientists have cited journals in large number (50.15%) while books comes on second with 273 (19.96%) citations. 'Annals of Library & Information Studies' occupies the 1st rank & 'Scientometrics' occupies the 2nd rank in the ranked list of cited journals.

Bakri, A. & Willett, P. (2008) carried out the citation patterns in the Malaysian Journal of Library and Information Science (MJLIS) from 2001-2006, the number of publications has increased from the 76 articles in the study to 85 articles here, with statistically significant changes in the types of article, in the numbers of references per article and in the lengths of the articles. The complete set of 161 articles attracted a total of 87 citations, 52 of which were self-citations, with 14% of the MJLIS articles having been cited at least once. Maharana and Sethi (2013) analyzed a bibliometric study on the research output of Sambalpur University's publication in Web of Science between 2007 and 2011.

The bibliometric analysis of the 'IFLA Journal' during five years from 2008- 2012, the study was undertaken to examine the year-wise distribution of contributions, authorship pattern, degree of collaboration, top contributing authors, language of articles, number of references, author self-citation, length of articles, country-wise distribution of articles and top contributing institutions. Siwach, Anil kumar (2013). Ambika, M; Alwarammal and Chinnadurai (2013), investigated that bibliometric analysis of the Annals of library and information studies journal for a period between 2002 and 2011. It was found that the year wise contribution of papers were maximum number 43 out of 283 during the year 2010.most of the articles were published from universities when the institution wise distribution of papers was analysed.

Baskaran C. (2013) observed that the bibliometric study on Cryptography published during 2000–2011 using the data retrieved from the Web of Science (WoS). A total number of 6610 records which were retrieved from the Web of Science was used to assess the academic productivity and distribution of research diversity of cryptography field from four major countries -China, USA, Taiwan and Japan which contributed more papers in cryptography and allied field of researches. The highest RGR is 0.44 in 2002 and Dt is 21. 656 in 2008 measured during the period. Pillai et.al. (2007), investigated the authorship pattern and collaborative research in physics with a sample of 11,412 journals and 1,328 book citations appended in the physics doctoral dissertations awarded by the Indian Institute of Science, during 1999-2003. The degree of collaboration in different years was calculated and the average value of it for journals was 0.08 and 0.44 for books. The authorship collaboration is more in journal articles than in books.

Verma, Neerja, Tamrakar, Rajnish and Sharma Priyanka. (2007) investigated that the year wise, institutions wise, statewise distribution of contributions, authorship pattern, citation analysis, length of the contributions etc.

Mishra P.N., Goswami N.G and Panda K.C. (2013) evaluated the impact of 204 Grant-in-Aid projects at CSIR-National Metallurgical Laboratory, India during 1995–2010 through Bibliometric method. The trends of publications during 16 years showed that SCI papers were in increasing trends and reflect a healthy sign as performance indicators of the sponsored projects. The projects under basic

research contributed a maximum of 226 papers with 845 citations, shared 64.50% of the total 1310 citations. The average impact factor of papers was 1.552. The highly cited papers published in the area of water quality-assessment, received 88 Citations, other highly cited papers fall in the domain of corrosion protection and prevention, waste management and utilization and materials science and technology. Jena et.al. (2006), observed the trend of publications such as the year wise distribution of articles, bibliographical distribution of citations, authorship pattern, citation pattern, average length of articles, number of tables and figures used, time lag, geographical distribution of authors and subject analysis have been studied.

Velmurugan, C. (2013), explored that from the study of the publication of papers in Annals of Library and Information Studies. The analysis conducted with 203 contributions published in the journal for a period of selected six years i.e. 2007 – 2012. It was observed from the study that the highest number of contributions i.e., 43 (21.19%) were published in the year 2010. Most of the contributions are found by double authored i.e., 88 (43.35 %.). The degree of collaboration (i.e.131out of 203) was high in terms of authorship pattern was 0.64. Serenko Alexander, Nick Bontis and Joshua Grant (2009), applied qualitative and quantitative data analysis techniques to determine author distribution, country, individual and institutional level productivity rankings, and employed methodologies. It was found that an average manuscript was written by 1.73 authors.

OBJECTIVES OF THE STUDY

To make an analyzes of articles published in IJBT from 2007 to 2012

To observe the authorship pattern for a period of study

To identify the year wise contributions of articles

To study the period and volume wise authorship pattern

To examine the author's productivity

To scrutinize the single and multi-authored papers of the journal and

To find out the Degree of collaboration

METHODOLOGY

The data have been collected from the NISCAIR website of Indian journal of Biotechnology. Four forty eight issues of six volumes from 2007 to 2012 have been selected six years for the study. For each article, year wise distribution of contributions, number of authorship, volume wise authorship, author's productivity and the single and multi-authored papers were noted down for the study. These data were organized, calculated, tabulated, analyzed and presented by using simple arithmetic and statistical methods for its results.

RESULTS AND DISCUSSION

DISTRIBUTION OF CONTRIBUTION

Table no 1 shows that the year-wise distributions of articles have been arranged in which shows the highest number of contributions i.e., 87 (19.41 %) were published in the years 2007 whereas the minimum number of 64 (14.29 %) was published in the year 2010. From the above Table no 2 also reveals month and Issue-wise distribution articles in which Volume No. 6 shows the highest number of total articles. The second highest position is occupied by Volume No. 7. It is followed by volume 11and the lowest number of total articles in volume 9. The contribution of articles in volume 6 and 7 were more in October and December respectively.

Table. 1. Year / Volume / Month and Issue – wise Distribution of Articles

Month	Year / Volume No						Total No of Articles
	2007 / 6	2008 / 7	2009 / 8	2010 / 9	2011 /10	2012 / 11	
Jan – Mar	21	21	18	16	21	17	114
Apr – Jun	22	21	16	16	16	19	110
Jul – Sep	22	21	16	16	16	21	112
Oct – Dec	22	22	17	16	15	20	112
Total	**87**	**85**	**67**	**64**	**68**	**77**	**448**
%age	**19.41**	**18.97**	**14.96**	**14.29**	**15.18**	**17.19**	**100**

Table. 2. Distribution of Document Type Papers

Document Type	Total No of Papers	Total No of Selected papers	%age
Review	48	48	10.71
Articles	331	331	73.88
View points	2	-	-
Short communications	69	69	15.41
Conference Reports	1	-	
Book review and others	3	-	-
Total	**454**	**448**	**100**

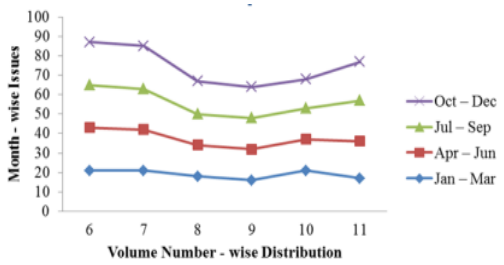


Table 2 shows that this study aims to explore papers with references, such as articles, reviews, short communications, news and conference reports, 448 articles were only selected for further exploration. It indicates that the majority 73.88 % of papers and followed by 15.14 % of short communications were noted down for the period of study.

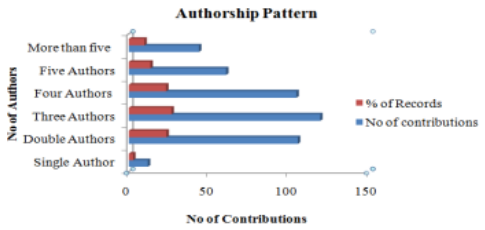


Fig. 2. Authorship Pattern

The table.3 reveals that the details about the authorship pattern of articles published during the period of study. Out of total of 453 articles, the maximum number of contributions i.e. 124 (27.38 %) have been contributed by Three authors and followed by 117 contributions (25.83 %) and 99 contributions (21.85 %) and the minimum number of contributions i.e. 12 (2.64 %) by single author.

Table 3. Authorship Pattern

Kinds of Authors	Total No of contributions	% of Records
Single Author	12	2.67
Double Authors	106	23.66
Three Authors	120	26.79
Four Authors	105	23.44
Five Authors	61	13.62
More than five	44	9.82
Total	**448**	**100**

Table. 4. Year - wise Authorship Pattern

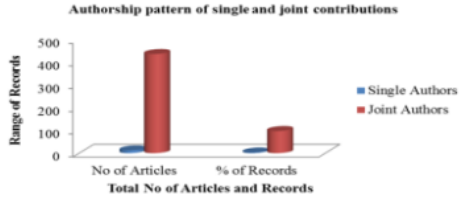
	Year							
Authors	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**	**% of Records**
Single Author	3	19	21	14	6	9	72	16.07
Two Authors	2	15	16	18	12	10	73	16.29
Three Authors	2	11	15	20	13	7	68	15.18
Four Authors	2	12	23	16	10	3	66	14.74
Five Authors	1	29	24	14	10	6	84	18.75
More than Five	2	20	21	23	10	9	85	18.97
Total	**12**	**106**	**120**	**105**	**61**	**44**	**448**	**100**
Percentage (%)	**2.67**	**23.66**	**26.79**	**23.44**	**13.62**	**9.82**	**100**	

The table shows volume wise authorship pattern of contributions. It indicates that out of the 72 contributions of single author, volumes 8 has the highest number i.e., 21 (29.17 %) whereas the volume 6 has the lowest number i.e. 3 (4.17 %) contributions. Out of the 73 contributions by two authors, vol. 9 has the highest i.e. 18 (24.65 %) and vol. 6 has the lowest number i.e., 2 (2.73 %) contributions. Out of 68 contributions by three authors, vol. 9 has

the highest i.e. 20 (29.41 %) and vol. 6 has the lowest number i.e., 2 (2.94 %) contributions. Out of 66 contributions by four authors, vol. 8 has the highest number i.e. 23 (34.84 %) and the vol. 6 has the lowest number i.e. 2 (3.03 %) contributions. Out of 84 contributions by five authors, vol.7 has the highest number i.e. 29 (34.52 %) and vol.6 has the lowest number ie 1 (1.19 %) contributions. Out of 85 contributions done by more than five authors' volumes 9 has the highest i.e. 23 (27.07 %) and vol.6 has the lowest number i.e. 2 (2.35 %) of lowest authors.

Table. 5. Authorship pattern of single and joint contributions

Years	2007	2008	2009	2010	2011	2012	No of Articles	% of Records
Single	3	2	2	2	1	2	12	2.67
Joint	69	71	66	64	83	83	436	97.33
Total	**72**	**73**	**68**	**66**	**84**	**85**	**448**	**100**

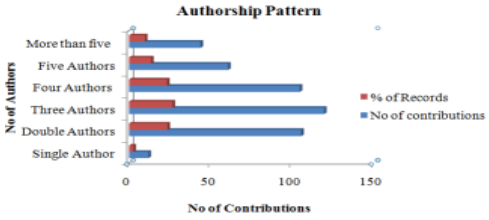


able no 5 indicates that out of 448 articles single author contributed only 12 (2.67 %) articles while the rest 436 (97.33 %)articles were contributed by joint authors. It showed that the majority of the articles have been contributed only by multiple authors.

Table. 6. Institutions – wise Distribution of Contributions

Institutions	No of articles	%age
Universities	784	46.51
Colleges	176	10.95
Research Institutions	684	42.54
Total	**1608**	**100**

INSTITUTION WISE DISTRIBUTION



Graph. 3. Institutions – wise Distribution of Contributions

Table 6 shows the type of institutions with which the authors of the articles were affiliated. Out of 448 contributions, the highest number of i.e. 784 articles (46.51 %) were from authors affiliated with

Universities and followed by 684 articles (42.54 %) were from Research Institutions and the lowest number i.e. 176 (10.95 %) has been contributed by Colleges.

Table. 7. Geographical Distribution of Articles

Name of the institution	No of articles	%age
Indian	411	91.74
Foreign	37	8.26
Total	**448**	**100**

GEOGRAPHICAL DISTRIBUTION OF ARTICLES

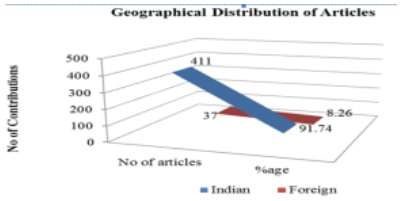


Fig.Geographical Distribution of Articles

The table 7 showed that most of the contributions are from India with 91.74 % and the rest 8.26 % only from foreign sources.

DEGREE OF COLLABORATION

Table - 8. The degree of collaboration ranges from 0.95 to 0.98 and the average degree of collaboration is 0.97. The degree of collaboration is calculated by using the following formula (K. Subramanyam, 1982):

Table 8. Degree of Collaboration

Year	Volume	No of Authors			Degree of Collaboration
		Single	Multiple	Total	
2007	6	3	69	72	0.95
2008	7	2	71	73	0.97
2009	8	2	66	68	0.97
2010	9	2	64	66	0.96
2011	10	1	83	84	0.98
2012	11	2	83	85	0.97
Total		**12**	**436**	**448**	**0.97**
Percentage %		**2.67**	**97.33**	**100.00**	

The formula is Where
C= Degree of Collaboration
Nm = Number of multiple authors
Ns = Number of single authors

$$C = \frac{N_m}{N_m + N_s}$$

$$C = \frac{436}{436 + 12 = 448}$$

In the present study the value of C is $C = 0.97$

As a result, it was found that the degree of collaboration in the journal Indian Journal of Biotechnology is 0.97.

PAGE DISTRIBUTION

Table 09 reveals the average papers per volumes per contribution.

Average pages per volumes = 3095/6 = 515.8

Average pages per issues = 3095/24 = 12. 89

Average pages per contribution =3095/448 = 6.90

Table no 9 indicates that 448 articles published with a total page of 3095 (average 6.90 pages per article) during the year 2007 -2012. It is observed that the average length of the articles varied from a

minimum of 5.94 pages in the year 2012 to a maximum of 6.82 pages in the year 2011.

Table 9 : Average Pages : Per Volume

Year	Vol. No	Total pages	No of contributions	Average
2007	6	526	87	6.04
2008	7	507	85	5.96
2009	8	419	67	6.25
2010	9	399	64	6.23
2011	10	464	68	6.82
2012	11	458	77	5.94
	Total	**3095**	**448**	**100**

Table 10: Distributions of Pages (Volume-wise) & No. of Pages in Each Issue

Month	Year / Volume					
	2007 / 6	**2008 / 7**	**2009 / 8**	**2010 / 9**	**2011 / 10**	**2012 / 11**
January	119 (9-127)	132 (9-140)	127 (9-135)	99 (7-105)	141 (9-149)	107 (7-113)
April	142 (141-282)	114 (159-272)	99 (147-243)	108 (119-224)	87 (161-247)	112 (129-240)
July	130 (293-422)	127 (283-409)	86 (253-338)	105 (233-337)	115 (257-371)	106 (251-356)
October	135 (435-569)	134 (423-556)	109 (349-457)	87 (351-437)	121 (387-507)	133 (369-501)
Total	**526**	**507**	**419**	**399**	**464**	**458**
%age	**16.99**	**16.38**	**13.53**	**12.89**	**14.99**	**14.79**

Table 11: Total No of Visitors: (Online Journal)

Month	Year and Volume wise Issues					
	2007 / 6	**2008 / 7**	**2009 / 8**	**2010 / 9**	**2011 / 10**	**2012 /12**
Jan - Mar	1929	2467	3769	5543	4318	5028
April - Jun	1775	2196	2918	3026	2315	2237
July - Sep	1648	2012	2934	2770	2152	2289
Oct - Dec	1683	1928	2640	2306	2006	1628
Total	**7035**	**8603**	**12261**	**13645**	**10791**	**11182**
%age	**11.07**	**13.54**	**19.30**	**21.48**	**16.98**	**17.60**

From the data, the above table no 10 shows that the distributions of pages in Volumes wise and no. of pages in each issue.

Table: 11, the data was noted down from the official website of http://nopr.niscair.res.in/ on 24th in the month of September 2013. A total number of 63517 online visitors from 2007 to 2012 in which the highest number of 13645 visitors has 21.48 % in the year 2010 and the lowest number of 7035 visitors has 11.07% in the year 2007.

FINDINGS & CONCLUSION

The analysis investigated and revealed the following major findings and conclusions.

The highest number of contributions i.e., 87 (19.41 %) were published in the years 2007.

The highest number 436 (97.33 %) articles were contributed by joint authors and the rest of 12 (2.67 %) articles contributed by single author.

Out of 448 contributions, the highest numbers of i.e. 784 articles (46.51 %) were from authors affiliated with Universities.

The most of the contributions are from India with 91.74 % and the rest 8.26 % only from foreign sources.

The degree of collaboration in the journal Indian Journal of Biotechnology is 0.97.

The average length of the articles varied from a minimum of 5.94 pages in the year 2012.

The highest number of 13645 visitors watched the website has 21.48 % during the year 2010.

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