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Scientometrics of Indian Bioinformatics Research output: A Study on Web of Science

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Abstract

The paper investigates Indian Bioinformatics research during 2011-2019 using Web of Science database. It attempts to quantify the national contribution to growth efforts and identify areas of citation, h-index and highly cited articles. Also highlighted the growth of Indian bioinformatics output using different scientometrics indicators. The results show the output for collaborative study, top ranked journals and authors, citation of the journals, h-index, p-index score and mapping of co-authorship and cited reference. *PLOS One* and *Gene* are the top ranked journals in bioinformatics. The study also covers for funding agencies in bioinformatics research. UGC, CSIR, DST and DBT are the major funding agencies that are responsible for more contributions in bioinformatics research in India.

Keywords: Bioinformatics, Web of Science, Co-authorship, Scientometrics, Collaboration, India

Introduction

The Scientometrics analysis is the scientific productivity of measuring and analyzing the scientific fields. The research assessment of publication productivity by using scientometrics techniques is a valuable technique. The study explores the India's performance in the field of Bioinformatics by using scientific research through quantitative and qualitative metrics of scientometrics and Bibliometrics. Its efforts on India's collaboration, authorship pattern, citations and funding agencies in fields of bioinformation research using nine years data from the web of science database.

The concept of computers, mathematical models and techniques of statistical in biology is a old concept not a new one. And the concept of computational biology was born on earl 1960's (Hagen, 2000). Thus the begun of bioinformatics and the techniques designed b computational

biologists for measuring the molecular structure, evolution of proteins and functions could also be adapted to the study of nucleic acids.

The scientific field of bioinformatics interdisciplinary that creates strategies for storing, recovering, organizing and examining of biological data. A significant movement in bioinformatics is to create programming instruments to produce valuable biological information. Bioinformatics is a different science from biological calculation, the latter being a software engineering and computer designing subfield utilizing bioengineering and biological science to assemble biological computers, while bioinformatics basically uses computers to all the more likely get science. Bioinformatics is like computational science and has comparative aspects to it yet varies on scale.

Review of Literature

Plenty of scientometric studies are available on Indian contributions in different subject fields. But very few studies have been conducted on Indian biochemistry research in the past.

Sudhler and Kumar (2020) examined 25,132 biochemistry research contributions of Indian scientists covered in the Web of Science for a period of 10 years (2004-2013). It was found that the biochemistry research is gradually growing and average annual growth rate was 36.84 per cent. The solo research was not prevalent and team research is more in the Indian biochemistry research and 97.46 per cent publications were contributed by multi- authors. Veeramuthu (2020) measured the bioinformatics literature in scientometric research during 2007-2017, in this research analysed for various tools and techniques. Journal article occupied top position, Marterns, L has the first rank among the prolific authors and analysed top 10 institutions and titles. Jahina, Batcha and Ahmad (2020) presented the Lotka's law and pattern of author productivity of Brain Concussion. This research analysed various tools and techniques like Collaborative Index, Degree of collaboration, Co-authorship index and K-S Test. Chauhan (2019) has made a study on drone research at the global level, to quantify the research output based on scopus database for a period of 1968- 2017. Various bibliometric techniques were used to find out the growth rate of publications (annually 16.00 percent), citation analysis (cited rate 58.33 percent), authorship pattern and most productive countries were studied using various bibliometric methods. Malik, Aftab and Ali (2019) 3 presented a bibliometric examination of the crowd sourcing publications by using web of science for a period between 2008 and 2017. It was identified that 81 per cent of the total publications were articles and PLOS One was identified as the top journal in terms of total output and total citations.

Jahina. and Batcha. (2019) represented the bronchitis research in authorship pattern. This study used Pajak mapping tool for make the mapping degree of collaboration, geographical wise collaboration and mapping of co-authors. This study mainly discovered these types of collaboration. Pandey, Verma and Shukla (2019) used various scientometric indicators like year wise growth rate, more productive authors, source wise, subject wise and funding agencies. Council of scientific and industrial agencies (CSIR) has the most popular funding agency in bioinformatics research in India. Chakraborty. C was the most prolific author in bioinformatics

and this research concluded that growth of bioinformatics is steadily increasing trend. Sab, Kumar and Biradar (2018) carried out the Medical research in India. This study focused for growth between India and International collaboration. Gopal and Sudhier (2017) conducted the study about collaborative research in bioinformatics in India, this study results found that the degree of collaboration was 0.91 and highest publications covered from collaboration publications.

Singh (2017) determined collaboration and authorship pattern of biotechnology research in India. Publication highly collaborated with United States and India and measured the activity index, gradually increased in this research. Gopal and Sudhier (2015) studied qualitatively the growth of bioinformatics research in India. This study found that degree of collaboration was 0.93 and most publications for journal article compared to other documents. Bradford's law of scattering not fit for this study. Dutta and Rath (2013) studied on the cosmology research in India. Sudhier and Dileep kumar (2010) in their study determined the bibliometric characteristics of the biochemistry research in the University of Kerala, India, including subject wise break-up, bibliographic forms of cited documents, most cited journals, collaboration in authorship, etc. Molatudi, Neo and Pouris (2009) contributed the Bibliometrics tools and techniques, the 808 records for South Africa research during the period 16 years from 1990 to 2006 which was equivalent to world output 0.35%. Glanzel, Janssens and Thijs (2009) analysed the citation impact and publication activity in bioinformatics research, this analysis based on quantitative analysis. National publication activities and international collaboration analysed in this comparative study.

Objectives of the study

- ❖ To examine the year wise distributions and types of publication
- ❖ To find out the Authorship pattern of Bioinformatics research
- ❖ To analyse the Journal wise distribution with H-index
- ❖ To examine the cited publications of Bioinformatics
- ❖ To study the authors H-index and also found that P-index
- ❖ To prepare the mapping of Co-authors and cited reference
- ❖ To funding agencies involved in Bioinformatics research

Methodology

This study examined scientific publications generated by bioinformatics, bioinformation researchers working in vision science in India through a systematic search of Web of Science using the Web of Science interface, throughout this paper, the terms bioinformatics will be used inclusively to describe bioinformation and related basic science work concerning vision. Retrieval was restricted to publications for which the authors were associated with an Indian author of the database. This research focused for citation, authorship pattern, h-index, p-index and funding agencies. Various techniques and tool used for this study like Bibexcel tool for analyzing the data, Excel sheet for arranging the results and Pajak used for mapping tool. Records were retrieved using

the search terms, TS=(Bioinformatics) AND CU=(India). The period of analysis was restricted to publication from Jan 2011 to Dec 2019 by using the span.

Analysis and Interpretation

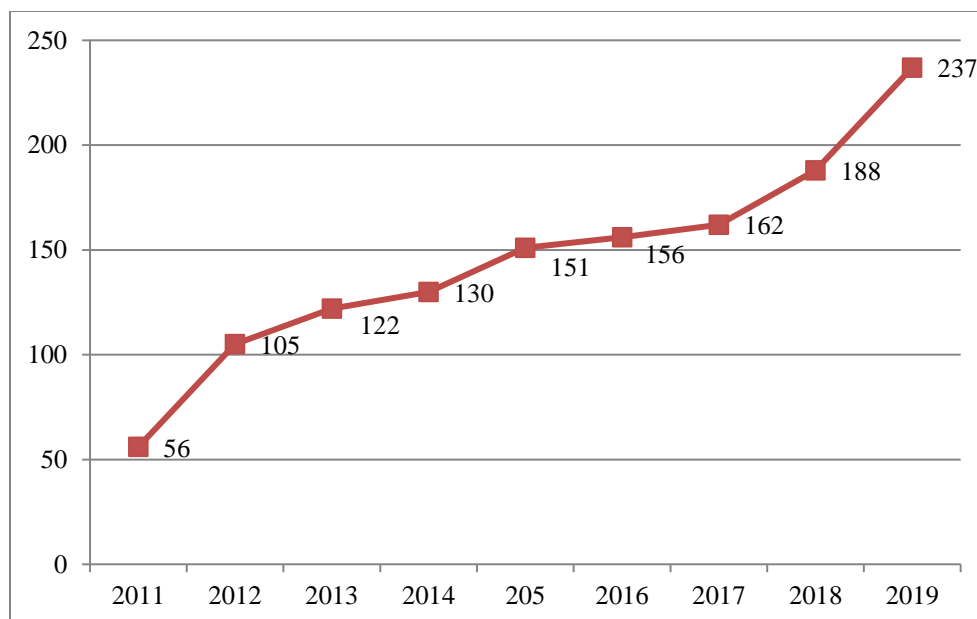
Year wise Publications

Table 1: Year wise distributions

Sl.No	Year	Publications	%	Cum.Publications
1	2011	56	4.28	-
2	2012	105	8.03	161
3	2013	122	9.33	283
4	2014	130	9.95	413
5	2015	151	11.55	564
6	2016	156	11.94	720
7	2017	162	12.39	882
8	2018	188	14.38	1070
9	2019	237	18.13	1307
	Total	1307	100	

The 1307 publications that were accessed from Web of Science database on bioinformatics research by Indian researchers working in a institutions and organizations spread all over the country. Whereas there were publications growth increasing in each year from 2011 to 2019 (Nine Years) in the year 2019 has highest publications with 237 (18.13%), followed by 2018 publication with 188 (14.38%). In this study gradually increased 4.28% to 18.13% publications.

Figure 1: Year wise distributions

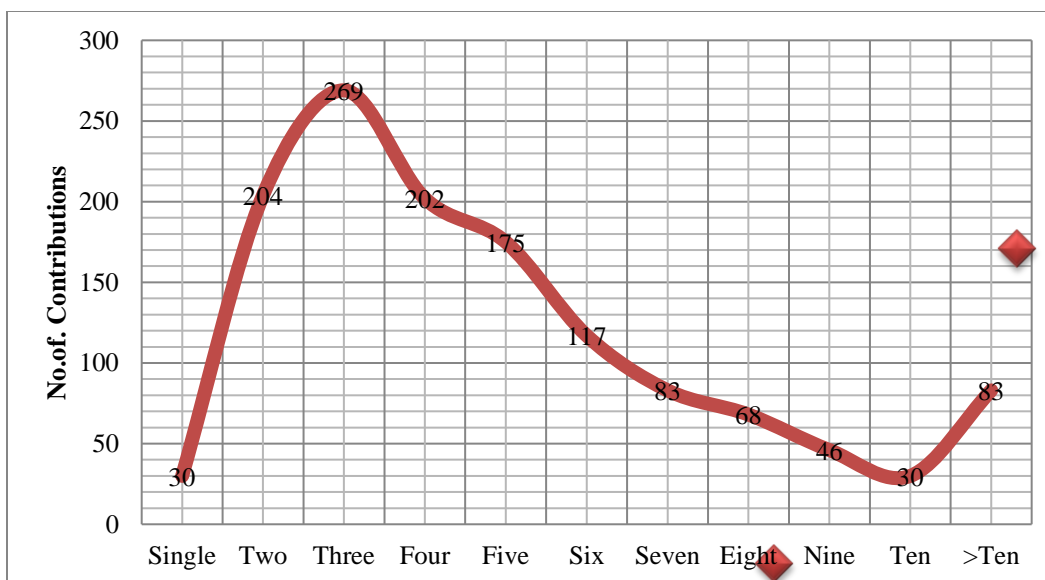


Authorship Pattern

Table 2: Year wise Authorship Pattern

Year/ Authors	1	2	3	4	5	6	7	8	9	10	10<	Total
2011	5 (8.93)	9 (16.07)	15 (26.79)	4 (7.14)	5 (8.93)	3 (5.36)	5 (8.93)	3 (5.36)	4 (7.14)	1 (1.79)	2 (3.57)	56 (100)
2012	5 (4.76)	17 (16.19)	22 (20.95)	17 (16.19)	18 (17.14)	8 (7.62)	3 (2.86)	4 (3.81)	2 (1.90)	2 (1.90)	7 (6.67)	105 (100)
2013	1 (0.82)	22 (18.03)	21 (17.21)	22 (18.03)	18 (14.75)	10 (8.20)	8 (6.56)	9 (7.38)	3 (2.46)	-	8 (6.56)	122 (100)
2014	2 (1.54)	19 (14.62)	20 (15.38)	29 (22.31)	18 (13.85)	12 (9.23)	6 (4.62)	9 (6.92)	3 (2.31)	4 (3.08)	8 (6.15)	130 (100)
2015	6 (3.97)	19 (12.58)	34 (22.52)	24 (15.89)	13 (8.61)	14 (9.27)	13 (8.61)	6 (3.97)	9 (5.96)	4 (2.65)	9 (5.96)	151 (100)
2016	4 (2.56)	29 (18.59)	30 (19.23)	19 (12.18)	22 (14.10)	17 (10.90)	7 (4.49)	7 (4.49)	2 (1.28)	3 (1.92)	16 (10.26)	156 (100)
2017	3 (1.85)	30 (18.52)	35 (21.60)	25 (15.43)	14 (8.64)	14 (8.64)	10 (6.17)	8 (4.94)	5 (3.09)	3 (1.85)	15 (9.26)	162 (100)
2018	2 (1.06)	25 (13.30)	37 (19.68)	27 (14.36)	36 (19.15)	16 (8.51)	14 (7.45)	10 (5.32)	10 (5.32)	6 (3.19)	5 (2.66)	188 (100)
2019	2 (0.84)	34 (14.35)	55 (23.21)	35 (14.77)	31 (13.08)	23 (9.70)	17 (7.17)	12 (5.06)	8 (3.38)	7 (2.95)	13 (5.49)	237 (100)
Total	30	204	269	202	175	117	83	68	46	30	83	1307

Figure 1: Authorship Pattern



It is clear from table 2 and figure 1 that out of 1307 publications, three authored contributions 269 publications are more than other publications. Two authors contributions for 204 publications, followed by four authors publications 202, while single author and ten author Contributions same (30 publications) and also lowest contribution of this research. In the year of 2019 has the highest publications (237) produced, following by 2018 (188). It could be discovered from the above table that three authors contributions rank first in order, double authors rank second and four authors collaboration rank third place in this table. And also authorship pattern level increased in this bioinformatics research.

Types of Documents

Table 3: Types of Publication

Publication Type	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Article	49	89	104	107	128	131	143	159	198	1108
Review	4	9	10	13	17	19	16	17	28	133
Editorial Material	3	5	2	7	1	-	-	3	4	25
Article; Proceedings Paper	-	1	1	2	4	2	1	3	4	18
Meeting Abstract	-	-	4	-	-	2	1	-	2	9
Correction	-	1	-	-	1	1	-	1	1	5
Review; Book Chapter	-	-	1	1	-	1	-	2	-	5

Article; Book Chapter	-	-	-	-	-	-	-	2	-	2
Article; Data Paper	-	-	-	-	-	-	-	1	-	1
Letter	-	-	-	-	-	-	1	-	-	1
Total	56	105	122	130	151	156	162	188	237	1307

Publications can be categorized as journal articles, reviews, book chapter, editorial materials, proceeding paper, meeting abstract etc. as shown in table 3. Most of the publications were published as a journal article (1108 articles) in the year of 2019 has the highest articles published (198). Other publications type has been published minimum publications between 133 to 1 publications.

Top Ranked Journals

Table 4: Ranking of Journals with H-index

Sl.No	Journal Name	Articles	Citations	h-index	Citation sum within h-core
1	PLOS One	66	1095	19	700
2	GENE	31	239	9	169
3	Current Bioinformatics	27	81	4	57
4	Interdisciplinary Sciences-Computational Life Sciences	21	45	4	21
5	OMICS-A Journal of Integrative Biology	18	77	6	61
6	Scientific Reports	16	74	5	50
7	International Journal of Biological Macromolecules	15	181	6	162
8	Ieee-Acm Transactions on Computational Biology And Bioinformatics	14	104	7	89
9	Computational Biology and Chemistry	14	49	5	35
10	Indian Journal of Biotechnology	13	14	3	9
11	Current Science	13	19	2	13
12	Frontiers In Microbiology	12	115	6	97
13	3 Biotech	12	20	3	12
14	Journal of Proteome Research	11	132	7	123
15	Journal of Cellular Biochemistry	11	62	3	50
16	International Journal of Data Mining And Bioinformatics	11	30	3	21
17	Fish & Shellfish Immunology	10	96	5	84

18	BMC Genomics	10	212	5	207
19	BMC Bioinformatics	10	47	4	38
20	Journal of Biomolecular Structure & Dynamics	10	26	3	15
21	Database-The Journal Of Biological Databases And Curation	9	50	4	46
22	Journal Of Biological Chemistry	9	113	3	104
23	International Journal of Peptide Research And Therapeutics	9	8	2	5
24	Journal of Biosciences	8	32	4	29
25	Genomics	8	27	2	24

Table 4 shows that, A total number of 555 journals appeared in the list of 1307 publications from 2011 to 2019. Table 2 reveals that *PLOS ONE* journal has 66 publications, 1095 citations, 19 h-index and 700 h-core, followed by *GENE* journal has 31 articles, 239 citations, 9 h-index and 169 h-core, *Current Bioinformatics* journal has 27 articles, 81 citations, h-index and 57 h-core. This ranking of journal distributions clearly shows in table 4. It is covered bioinformatics research from Web of Science database journals; *PLOS One* got the first rank and also highest citations in this table.

Highly Cited Papers

Table 5: Highly cited Papers in Bioinformatics

Rank	Authors	Title	Records	Year	Total Citation	P-index
8	Kumar A	Refolding of biotech therapeutic proteins expressed in bacteria: review	39	2013	26	2.59
12	Kumar S	Enhanced biodegradation of low and high-density polyethylene by novel bacterial consortia formulated from plastic-contaminated cow dung under thermophilic conditions	35	2017	11	15.12
3	Sharma A	Next generation sequencing and de novo transcriptome analysis of <i>Costus pictus</i> D. Don, a non-model plant with potent anti-diabetic properties	31	2012	48	4.21
6	Singh S	Insights into structural and functional diversity of Dof (DNA	29	2015	36	3.55

		binding with one finger) transcription factor				
2	Kumar R	Current state-of-art of sequencing technologies for plant genomics research	23	2012	71	6.03
13	Arockiaraj J	Nanomaterial and toxicity: what can proteomics tell us about the nanotoxicology?	22	2017	10	1.66
1	Chakraborty C	Multiancestry genome-wide association study of 520,000 subjects identifies 32 loci associated with stroke and stroke subtypes	21	2018	118	8.72
14	Kumar M	Extraction and Quantitation of Coumarin from Cinnamon and its Effect on Enzymatic Browning in Fresh Apple Juice: A Bioinformatics Approach to Illuminate its Antibrowning Activity	19	2013	9	1.62
4	Kumaresan V	An overview of recent advances in structural bioinformatics of protein-protein interactions and a guide to their principles	18	2014	40	4.46
9	Sharma P	Nutrigenomics research: a review	17	2013	25	3.33
7	Pasupuleti M	Microbiome Selection Could Spur Next-Generation Plant Breeding Strategies	16	2016	32	4
11	Palanisamy R	Biotechnological and bioinformatics approaches for augmentation of biohydrogen production: A review	15	2016	16	2.57
12	Doss CGP	Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India	14	2015	11	2.05
12	Sharma S	Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India	14	2015	11	2.05

12	Pandey A	Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India	14	2015	11	2.05
12	Bhatt P	Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India	14	2015	11	2.05
12	Sharma R	Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India	14	2015	11	2.05
10	Mohanty AK	Microalgal bioengineering for sustainable energy development: Recent transgenesis and metabolic Engineering strategies	13	2016	20	3.13
10	Bandyopadhyay S	Microalgal bioengineering for sustainable energy development: Recent transgenesis and metabolic engineering strategies	13	2016	20	3.13
15	Prasad TSK	Protein engineering and its applications in food industry	12	2017	5	1.28
15	Singh P	Protein engineering and its applications in food industry	12	2017	5	1.28
15	Maulik U	Protein engineering and its applications in food industry	12	2017	5	1.28
5	Singh R	The changing epitome of species identification - DNA barcoding	11	2014	39	5.17
5	Sharma D	The changing epitome of species identification - DNA barcoding	11	2014	39	5.17
5	Kumar P	The changing epitome of species identification - DNA barcoding	11	2014	39	5.17

This table 5 shows that cited publications, highly output records title with citations. Kumar A has the highest publications 39 output and totally 26 citations with 2.59 P-index. in this year of 2013. Kumar S has 35 output records, 11 citations with 15.12 P-index in the year of 2017, followed by Sharma A has the 31 output records, 48 citations with 4.21 P-index in the year of 2012. This table shows that rank of citations, citations wise Chakraborty.C has first rank and more citations

(118) but he has lowest publication (21) and got more citations with 8.72 P-index, followed by Kumar.R has the 71 citations with 23 publications and 6.03 P-index. Other authors have the less than 50 citations. This table reveals that Chakraborty.C has the first rank in citations with 21 publications, but Kumar A has the highest publications; he got 8th rank of this cited publications.

Top Ranked Authors

Table 6: Top ranked Authors

Authors	Publications	Citations	H-core	P-index
Kumar A	39	271	213	12.35
Kumar S	35	461	388	18.24
Sharma A	31	371	304	16.44
Singh S	29	275	220	13.76
Kumar R	23	268	240	14.62
Arockiaraj J	22	220	184	13.01
Kumar M	19	283	248	16.15
Kumaresan V	18	186	153	12.43
Sharma P	17	197	184	13.17
Pandey A	14	373	359	21.5
Maulik U	12	190	171	14.44
Singh A	11	285	281	19.47
Sharma D	11	185	179	14.6
Singh R	11	177	170	14.17
Kumar D	10	215	204	16.66
Singh N	6	189	186	18.12
Varshney RK	5	203	203	20.2
Agrawal A	2	178	178	25.12
Ghosh B	2	176	176	24.93
Subramanyam C	1	334	334	48.14
Talukdar R	1	334	334	48.14
Vuyyuru H	1	334	334	48.14
Sasikala M	1	334	334	48.14
Reddy DN	1	334	334	48.14
Jandhyala SM	1	334	334	48.14

This table 6 reveals that top most authors citations with P-index and h-core. This table arranged in citations wise. Kumar.S has 461 citations in whole study period (2011 to 2019) with 18.24 P-index and 388 h-core. Pandey.A has 373 citations with 21.50 P-index and 359 h-core, followed by Sharma has 371 citations with 16.44 P-index and 304 h-core. Other results shown in table 4. Authors publications, citations, h-core and P-index show in this table. Some of the authors contributions only one publication but citations are high, while Subramaniyam.C, Talukdar. R, Vuyyuru.H, Sasikala.M, Reddy.DN and Jandhyala SM have one publication but 334 citations, with 48.14 P-index.

Table 7: Citation Per Year

Authors	Citation	h-index	Citation Per Year
Kumar S	461	12	13.17
Arockiaraj J	220	11	10
Singh S	275	9	9.48
Pasupuleti M	175	9	10.94
Kumaresan V	186	9	10.33
Palanisamy R	172	9	11.47
Sharma A	371	9	11.97
Maulik U	190	8	15.83
Pandey A	272	8	19.43
Bhatt P	162	8	11.57
Gnanam AJ	153	8	15.3
Chaurasia MK	100	7	11.11
Kumar R	268	7	11.65
Sowdhamini R	137	7	13.7
Singh A	285	7	25.91
Kasi M	104	7	14.86
Singh R	177	6	16.09
Sharma R	133	6	9.5
Bandyopadhyay S	145	6	11.15
Kumar D	215	6	21.5
Sharma P	197	6	11.59
Kumar M	283	6	14.89
Gupta S	160	6	16
Chakraborty C	95	6	4.52

Figure 2: Citation Per Year

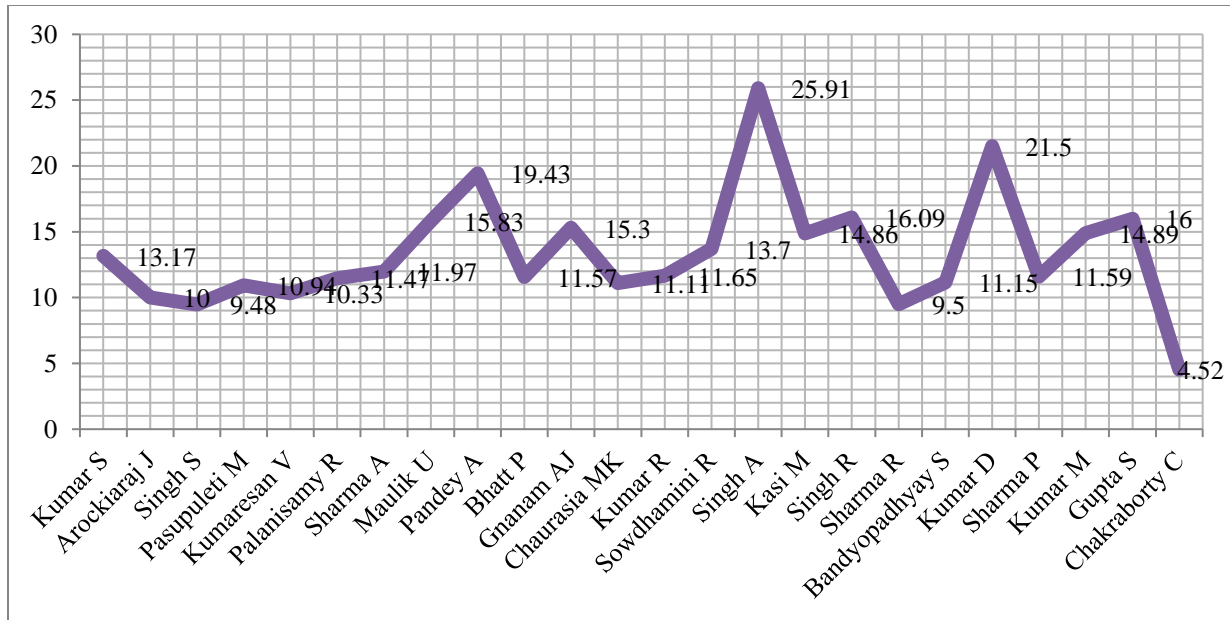


Table 7 conducted the authors citation per year with h-index. This table arranged in h-index wise. Kumar.S has 12 h-index with 13.17 citation per year, totally, 461 citations. Arockiaraj.J has 11 h-index, with 10 citation per year and totally 220 citations, followed by Singh.S has 9 h-index with 9.48 citation per year and totally 275 citations. Remaining details shown in table 5. Singh.A has the most citation per year 25.91, but total citations 285 with 7 h-index, followed by Kumar.D has 21.5 citation per year, total citations 215 with 6 h-index. This table reveals that the highest citation per year for Singh.A (25.91)

Figure 3: Co-authorship

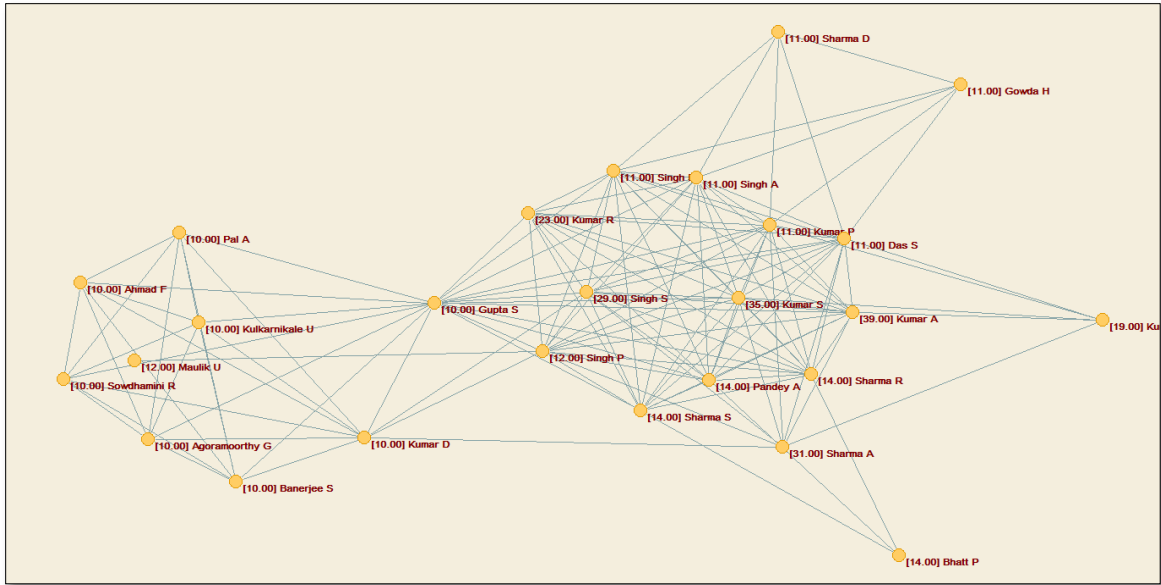
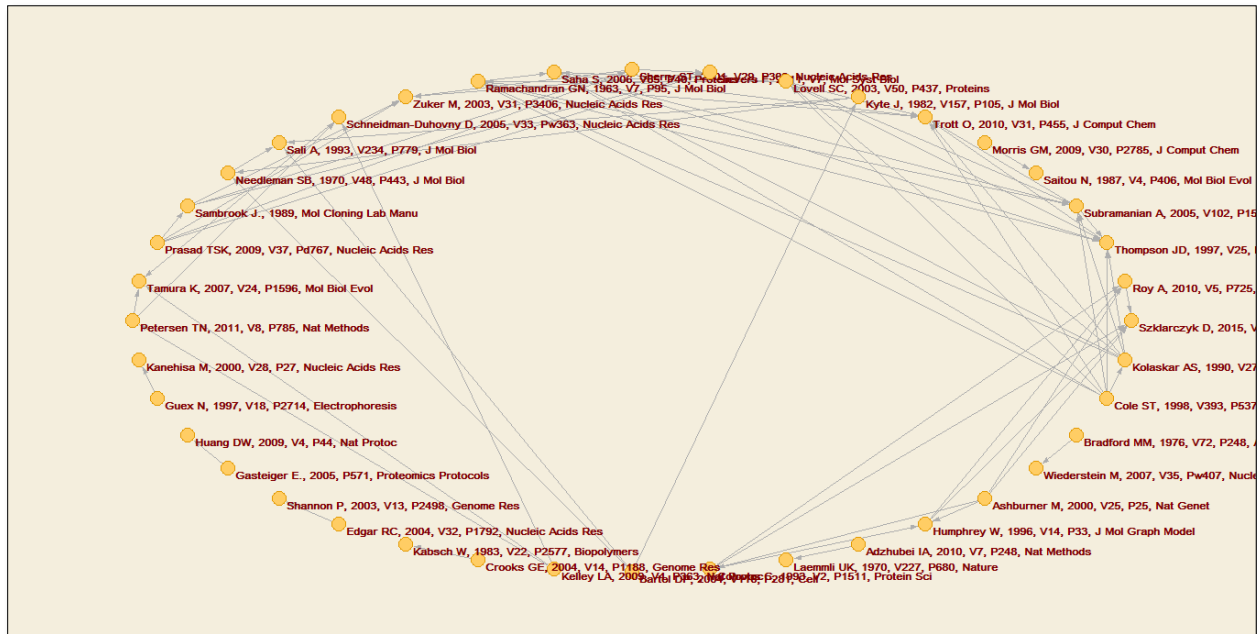


Figure 4: Cited Reference



Pajek is used to create co-authorship and cited reference map based on bibliographical data from web of science database. Co-authorship mapping (Figure-4) reveals that most collaborated authors in bioinformatics research. Cited reference mapping (Figure-5) reveals that highly cited documents reference shown in this map.

Funding Agencies

Table 8: Funding Agencies

Sl.No	Funding Agencies	Records
1	Department of Biotechnology (DBT), Government of India	74
2	Council of Scientific & Industrial Research (CSIR)	57
8	University Grants Commission (UGC)	42
6	Indian Council of Medical Research (ICMR)	32
10	Department of Science and Technology (DST)	27
16	Indian Council of Agricultural Research (ICAR)	7

Table 8 gives the funding agencies involved in bioinformatics research in India. This table shows the top funding agencies contributions; the important and familiar funding agencies are all follows, Department of Biotechnology, Government of India, Council of Scientific & Industrial Research (CSIR), UGC, Indian Council of Medical Research (ICMR), DST Department of Science & Technology and Indian Council of Agricultural Research (ICAR). These are all in Indian funding agencies and help to develop the Bioinformatics research growth.

Institutions- wise Distribution

Table 9: Institution wise distributions

Sl.No	Institution	Records	TLCS	TGCS
1	Indian Institute of Technology	67	10	545
2	CSIR	53	28	900
3	VIT University	42	13	242
4	Indian Institution Science	36	6	474
5	Indian Statistical Institute	35	23	344
6	University of Delhi	31	2	245
7	Jawaharlal Nehru University	28	3	263
8	SRM University	28	43	349
9	Manipal University	27	12	215
10	Banaras Hindu University	26	5	292
11	Jadavpur University	23	17	259
12	Institute of Bioinformatics	22	14	327
13	Jamia Millia Islamia	21	14	125
14	King Saud University	17	5	143

15	International Centre for Genetical Engineering & Biotechnology	16	2	187
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This table shows that institution wise distributions, 1706 institutions contributed bioinformatics research in India. In this research top fifteen institutions shown in this table, Indian Institution Technology has the highest distribution 67 publications, 10 local citation scores and 545 global citation scores. CSIR 53 publications were second contribution in bioinformatics research in India, 28 local citation scores and 900 global citation scores. VIT University 42 publications were third contribution in this research, 13 local citation score and 242 global citation scores.

Findings and Conclusion

The scientometrics research on bioinformatics research in India based on Web of Science shows that publication in bioinformatics by India scientists has increased steadily during the period 2011-2019. A total of 1307 records were retrieved from the WoS for study period. In the year of 2019 has the highest publications with 237(18.13%), in the year wise publications increased from 4.28% to 18.1% publications. India has totally, 276 local citation scores and 11021 global citation scores. The authorship stud that multiple authorship prevails in almost all fields and this study also three authors collaboration more contribution in bioinformatics research. Ranking of journals wise, *PLOS One* has the highest publications (66) and 1095 citations, 19 h-index and 700 h-core. Cited documents results for Chakroborty.C has the first rank in citations with 21 publications, but Kumar.A has the highest publications (39), he got 8th rank of this cited publications and lowest citations. So, publications and citation are important to researchers or authors. Citation per year wise, Singh.A has the highest citation per year (25.91). This study also found that P-index, h-index, h-core and mapping for co-authorship and cited reference made by Pajak mapping tool. Funding Agencies, Department of Biotechnology, Government of India, CSIR, DST, UGC, ICMR, and ICAR these all funding agencies helps to improve the bioinformatics research growth. Indian funding agencies Department of Biotechnology, DST, UGC, and CSIR are the most important role play in this research.

The overall research can be summed up as the status of Indian research in bioinformatics has increased from 2011 to 2019. However, due to the emerging important of bioinformatics in the international research, government to put an emphasis on bioinformatics research to attract also other private institution and laboratories to it. And India collaborate with foreign institutes will help in getting more funds also. This study reveals about that growth of this study, citation facts, collaborations and Indian funding agencies of Bioinformatics.

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