Summer 5-10-2021

Assessment of Research Productivity on Cyanobacteria: A Scientometric Study

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Abstract

This paper attempts to highlight the growth trends on Cyanobacteria literature and make the quantitative and qualitative assessment by analyzing various features of research output and Citations impact based on the Scopus database. A total of 5686 publications were published on Cynobacteria during 2000-2020. Year 2001 has 74.72 mean time cited per article with 137 publications*. USA has the highest share* 2792 *of publications and received 38809 Citations followed by the Peoples Republic of China with 9201 Citations for 1486 publications, Germany with 12482 Citations for 871 publications. The study found that India has recorded 5442 Citations for 632 Publications. It's noteworthy that Germany has highest citations with less number of publications compared to USA and China. The highly productive Institutions were: University of Port, Portugal with 234 publications followed by Institute of Hydrobiology with 148 publications and University of California San Diego with 128 publications. The highly productive journals are* JOURNAL OF PHYCOLOGY *with 134 Publications, followed by* PLANT AND CELL PHYSIOLOGY *with 103 followed by* HARMFUL ALGAE with 99 publications. *There were* 347 *single Author publications by the scientists and 5339 multi-Author collaborative publications. The Collaboration Index is 2.75.* The average citation per document is 25.72 and average citations per year per document is 2.7.

Keywords Scientometric, h-index, Citation Score, Impact Factor, Cynobacteria

Introduction

Scientometrics is a discipline which analyses scientific publications and citations tag on to the papers to expand an understanding of the configuration and intensification of science at global level, concert of a country in a particular domain, performance of institutions, departments/divisions and scientific eminence of an individual scientist. It also helps in knowing the information seeking behaviour of scientists by way of identifying where they publish and what they cite.

Objectives

- To find out growth of Publications
- To find out country-wise distribution of publications
- To find out publications share of highly productive countries
- To find out publication and citations according to number of collaborating countries(Single Country and Multiple Country)
- To find out highly cited publications
- To find out highly preferred journals

Methodology

The Scopus database was used for retrieving data on Cynobacteria during 2000-2020, using search term namely Cynobacteria in topic field. A total of 5686 publications to these publications were transferred to spread sheet application. The bibliographic fields were analyzed by normal count procedure for various facets using bilioshiny software. Country wise collaboration, subject domains, authorships, journals, Institutes, most cited source and highly cited papers.

Analysis and Interpretation

Growth of Publications

To analysis the year wise publication of research on Cynobacteria, the data has been presented from the below table-1, we could clearly see that during the period 2000–2020 a total of 5686 publications were published. The highest publication is 406 in 2019 with 3.54 mean cited per article followed by 404 papers in 2017 with 9.64 mean cited per article and 403 papers in 2016 with 15.21 mean cited per article. The lowest publication is 113 in 2000 with 46.59 mean time cited per article. It shows that even minimum numbers of records were scored higher mean time citations per article. It shows that there is a healthy trend in citing reference is found among the global Scientists belongs to “Cynobacteria”

Table 1 Year wise Distribution of Publications

Sl. no	Year	Articles	Sl. No	Year	Articles
1	2020	385	12	2009	207
2	2019	406	13	2008	212
3	2018	396	14	2007	219
4	2017	404	15	2006	207
5	2016	403	16	2005	212
6	2015	368	17	2004	166
7	2014	325	18	2003	157

8	2013	336	19	2002	136
9	2012	326	20	2001	137
10	2011	308	21	2000	113
11	2010	263	**Total**		**5686**

Table 2 Mean Time Cited per Article & Year

Year	Records (N)	Mean TC per Art	Mean TC per Year	Citable Years
2000	113	46.5929203539823	2.32964601769911	20
2002	136	49.2426470588235	2.73570261437908	18
2001	137	74.7226277372263	3.93276988090665	19
2003	157	52.3630573248408	3.08017984263769	17
2004	166	43.2710843373494	2.70444277108434	16
2005	200	39.06	2.604	15
2006	207	38.6908212560386	2.76363008971705	14
2009	207	39	3.54545454545455	11
2008	212	44.8066037735849	3.73388364779874	12
2007	219	40.7077625570776	3.13136635054443	13
2010	263	33.6501901140684	3.36501901140684	10
2011	308	34.0064935064935	3.77849927849928	9
2012	316	33.0379746835443	4.12974683544304	8
2014	325	21.0738461538462	3.51230769230769	6
2013	336	25.2708333333333	3.61011904761905	7
2015	368	18.1114130434783	3.62228260869565	5
2020	385	0.963636363636364		0
2018	396	6.81818181818182	3.40909090909091	2
2016	403	15.2158808933002	3.80397022332506	4
2017	404	9.64851485148515	3.21617161716172	3
2019	406	3.54187192118227	3.54187192118227	1

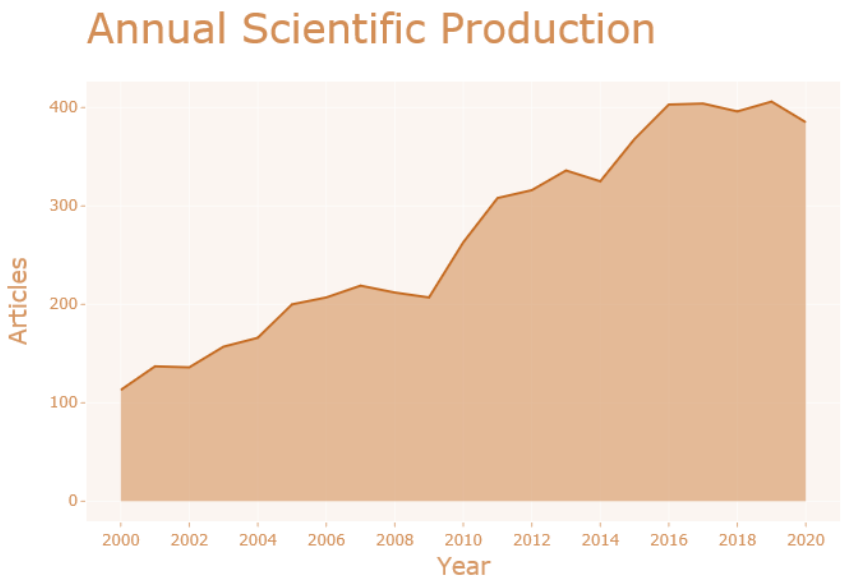


Figure 1 Year wise Distribution of Publications

Document wise Distribution

A study of data in table-2 indicates the source wise distribution of research output in Cynobacteria during the period of twenty one years from 2000 to 2020. Out of various sources of publications in Cynobacteria, journal articles that appeared in the journals have shown a predominant contribution of 4362 and this source occupies the first position. The source of review comes second in order 470 of sharing total research output in Cynobacteria during the period of analysis. The source of Meeting Abstract comes in the third position 441 with respect to total output in "Cynobacteria" research during the study period.

Table 3 Document wise distribution of Publication

Sl. No	Document Types	Records	Sl. No	Document Types	Records
1	Article	4362	10	Letter	14
2	Article; Book Chapter	9	11	Letter; Early Access	1
3	Article; Data Paper	2	12	Meeting Abstract	441
4	Article; Early Access	19	13	News Item	25
5	Article; Proceedings Paper	194	14	Retraction	1
6	Biographical-Item	1	15	Review	470
7	Correction	49	16	Review; Book Chapter	20
8	Editorial Material	73	17	Review; Early Access	2
9	Editorial Material; Book Chapter	2	18	Review; Retracted Publication	1

Source Wise Distribution

The study found that the total research output of the Cynobacteria for the study period (2000 –2020) published in 1101 journals. Table 3 indicates the top 15 journals, the research productivity of 134 articles covered in "Journal of Phycology" with citation of 4301 h-index 35, g-index 65 &m – index 1.6 followed by Plant and Cell Physiology with 103 records having citation of 2612. Journal of Applied and Environmental Microbiology having 68 articles with 7533 citations.

Table 3 Most Cited Sources

Sl. No	Sources	Articles	Citations
1	Journal of Phycology	134	4301
2	Plant and Cell Physiology	103	2612
3	Harmful Algae	99	2209
4	Phycologia	97	3228
5	Hydrobiologia	90	3702
6	Journal of Applied Phycology	87	1986
7	Plos One	84	2187
8	Frontiers in Microbiology	80	
9	Proceedings of The National Academy of Sciences of The United States of America	73	6132
10	Photosynthesis Research	71	1927
11	Applied and Environmental Microbiology	68	7533
12	Water Research	67	3299
13	Toxicon	50	2693
14	Limnology and Oceanography	49	4640
15			

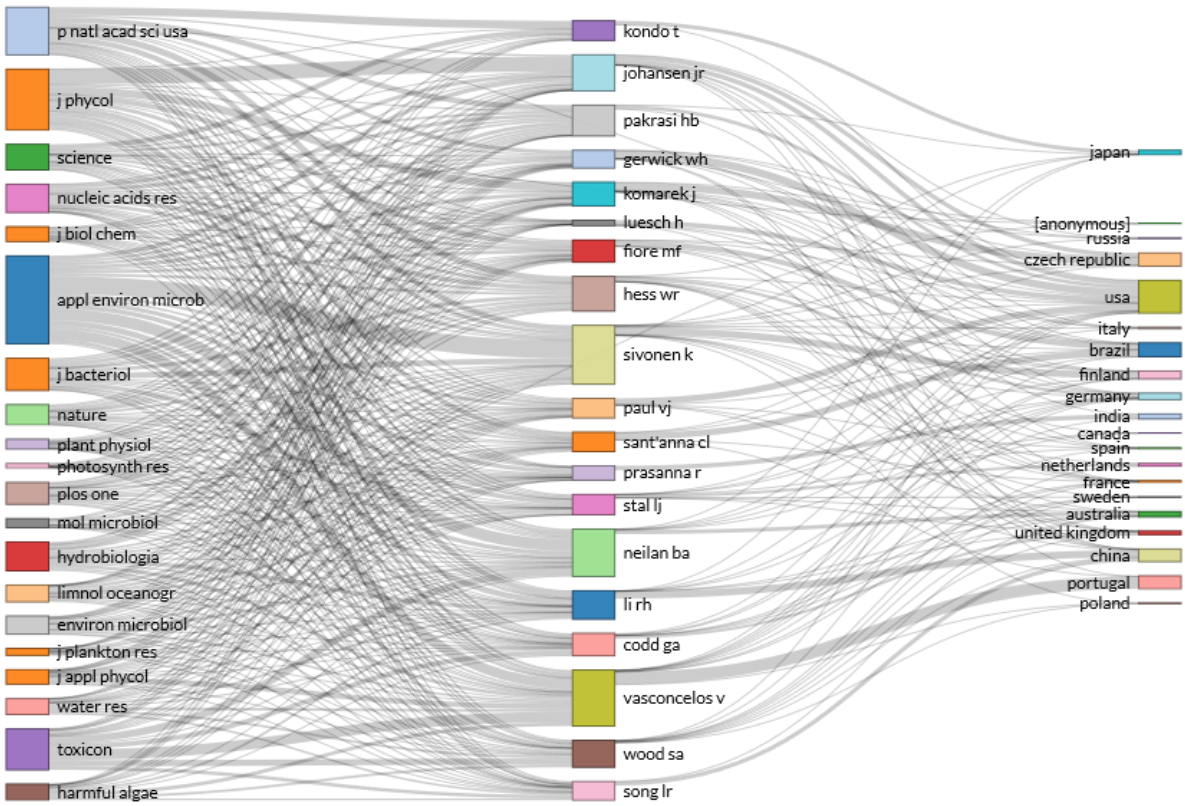


Figure 2 Most Cited Sources

Table 3 Source Impact with H-index, G-index, M-index

Source	H_Index	G_Index	M_Index	TC	NP	PY_start
Journal of Phycology	35	65	1.66666666666667	4617	134	2000
Plant and Cell Physiology	14	21	0.666666666666667	474	103	2000
Hydrobiologia	25	35	1.19047619047619	1720	90	2000
Journal of Applied Phycology	24	37		1681	87	2000
Proceedings of The National Academy of Sciences of The United States of America	41	73	1.95238095238095	5824	73	2000
Photosynthesis Research	22	45	1.04761904761905	2130	71	2000
Applied and Environmental Microbiology	41	61	1.95238095238095	3837	68	2000
Abstracts of Papers of The American Chemical Society	0	0	0	0	62	2000
Environmental Microbiology	28	47	1.33333333333333	2227	53	2000
International Journal of Systematic and Evolutionary Microbiology	24	42	1.14285714285714	2058	42	2000
Journal of Plankton Research	21	35	1	1282	38	2000
Applied Microbiology and Biotechnology	18	34	0.857142857142857	1261	34	2000
Aquatic Microbial Ecology	17	30	0.80952380952381	915	34	2000
Freshwater Biology	18	29		1125	29	2000
Fems Microbiology Letters	14	26	0.666666666666667	782	26	2000
Ecotoxicology and Environmental Safety	12	24	0.571428571428571	585	24	2000
Microbiology	9	12	0.428571428571429	166	23	2000
Nova Hedwigia	10	15	0.476190476190476	257	23	2000
Archives of Microbiology	15	22		809	22	2000
Journal of Bacteriology	13	21	0.619047619047619	1046	21	2000
Microbiology-SGM	14	21	0.666666666666667	1124	21	2000
Journal of Applied Microbiology	13	19	0.619047619047619	822	19	2000
Marine Ecology Progress Series	17	19	0.80952380952381	1140	19	2000
Journal of Natural Products	13	18	0.619047619047619	684	18	2000
Current Microbiology	11	17	0.523809523809524	363	17	2000

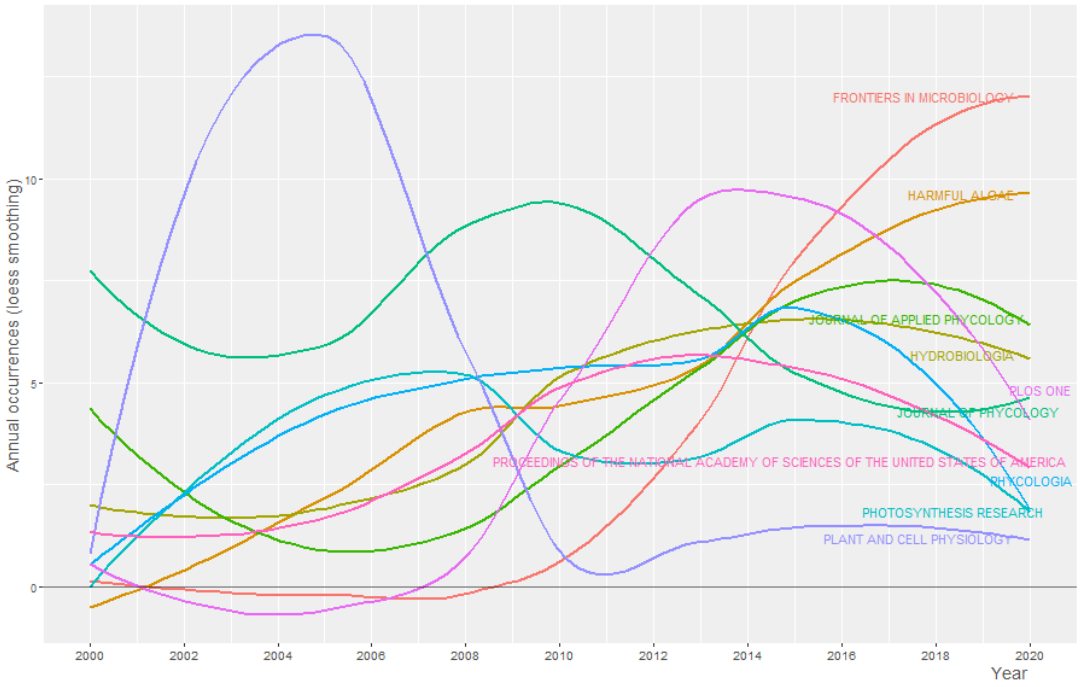


Figure 3 Source Growth

Author Collaboration

There were 14909 authors involved in the research on Cynobacteria and published at least one publication. Among the author wise publication, multi authored documents has highest share with 14667 documents whereas single author shared publications 242 documents. Collaboration Index is 2.75. "Vasconcelous V" having 73 records with articles fractionalized of 14.68,21 h-index, 32 g-index times cited 1178 started his publications in the year 2002, followed by "Sivonen K" having 63 records with articles fractionalized 11.98 having highest citation of 3040 with h-index 32, g-index 55.

Table 4 Author wise distribution of publications

Sl. No	Authors	Articles	Articles Fractionalized	Sl. No	Authors	Articles	Articles Fractionalized
1	Vasconcelos V	73	14.68	11	Codd GA	29	6.04
2	Sivonen K	63	11.98	12	Kondo T	28	8.41
3	Komarek J	48	18.97	13	Prasanna R	28	5.03
4	Johansen JR	46	10.50	14	Wood SA	26	5.04
5	Li RH	45	10.82	15	Hess WR	25	5.59
6	Gerwick WH	40	8.64	16	Song LR	25	5.69
7	Sant Anna CL	37	7.68	17	Stal LJ	25	9.17
8	Paul VJ	36	9.78	18	Luesch H	24	6.03
9	Neilan BA	32	8.42	19	Pakrasi HB	24	6.32
10	Fiore MF	31	5.64	20	Garcia-Pichel F	23	5.69

Table 5 Author Impact with h-index, g-index and m-index

Author	h_index	g_index	m_index	TC	NP	PY_start
Vasconcelos V	21	32	-	1178	73	2002
Sivonen K	32	55	1.524	3040	63	2000
Komarek J	19	37	1.000	1426	48	2002
Johansen Jr	21	37	1.050	1443	46	2001
Li Rh	14	23	0.700	639	45	2001
Gerwick Wh	22	39	1.048	1583	40	2000
Sant'anna Cl	12	19	0.571	407	37	2000
Paul Vj	21	36	1.050	1934	36	2001
Neilan Ba	20	32	0.952	1567	32	2000
Fiore Mf	16	23	0.762	576	31	2000
Codd Ga	15	29	0.750	1382	29	2001
Kondo T	16	28	0.762	1429	28	2000
Prasanna R	16	28	0.842	816	28	2002
Wood Sa	15	21	0.938	475	26	2005
Hess Wr	17	25	0.810	927	25	2000
Song Lr	14	20	0.933	442	25	2006
Stal Lj	14	25	0.667	770	25	2000
Luesch H	13	23	0.722	556	24	2003
Pakrasi Hb	16	24	0.941	804	24	2004
Garcia-Pichel F	15	23		994	23	2000
Hasler P	10	17	0.556	291	23	2003
Vasconcelos Vm	15	23	0.750	636	23	2001
Zehr Jp	17	23	0.850	1802	23	2001
Ikeuchi M	11	21	0.550	689	21	2001
Jokela J	13	21	0.867	731	21	2006

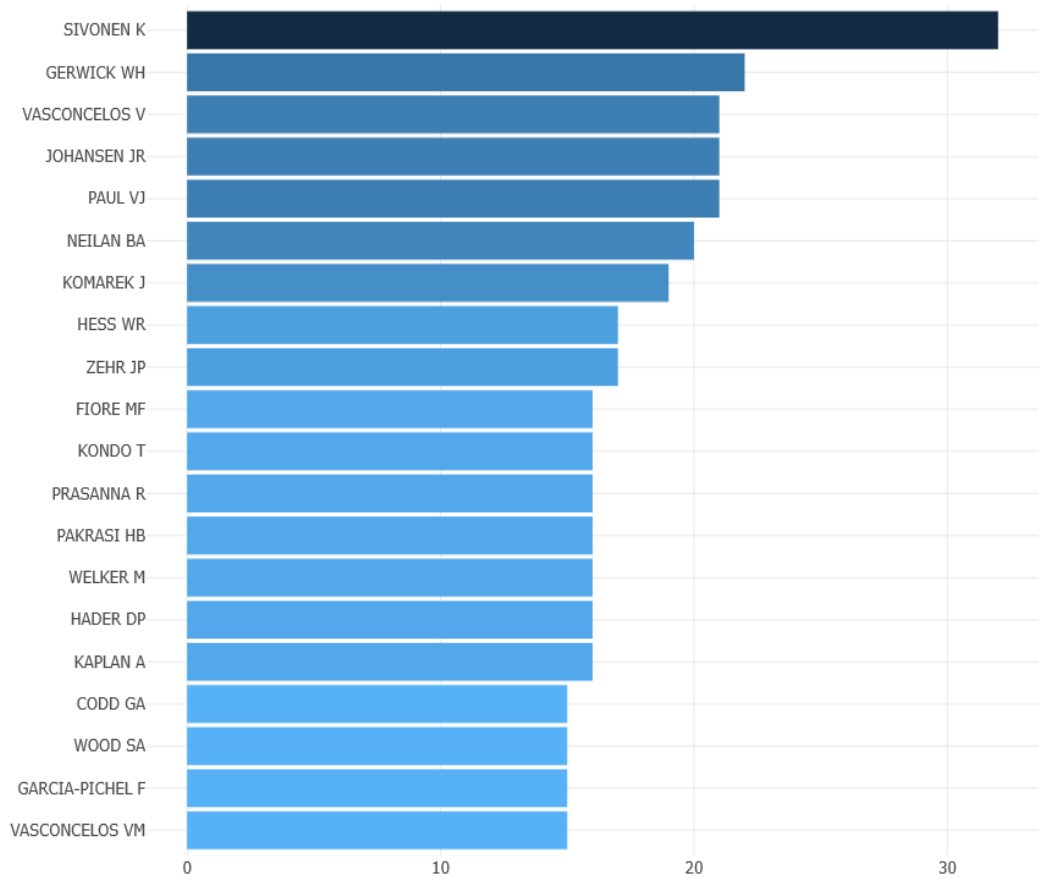


Figure 4 Author wise distribution of publications

Country wise distribution of publications

The study of Country wise distribution of research output is an important feature in prominence the research and development in any discipline of science. In this context, the analysis of performance of scientists is quite obvious with a view to reflect their achievements in attracting the attention of researchers/ scientists in terms of published research articles in the journals of various countries. USA has highest collaboration of 2792 records followed by China with 1486 and Japan with 899.

Table 5 Country Scientific Production

Sl. No	Country	Frequency	Sl. No	Country	Frequency
1	USA	2792	14	Russia	297
2	China	1486	15	Poland	289
3	Japan	899	16	Italy	274
4	Germany	871	17	Netherlands	242
5	Brazil	633	18	Finland	223
6	India	632	19	Sweden	221

7	France	594	20	South Korea	212
8	Czech Republic	506	21	Israel	185
9	Australia	498	22	Argentina	134
10	Spain	433	23	Mexico	124
11	Uk	399	24	New Zealand	117
12	Portugal	387	25	Greece	98
13	Canada	320			

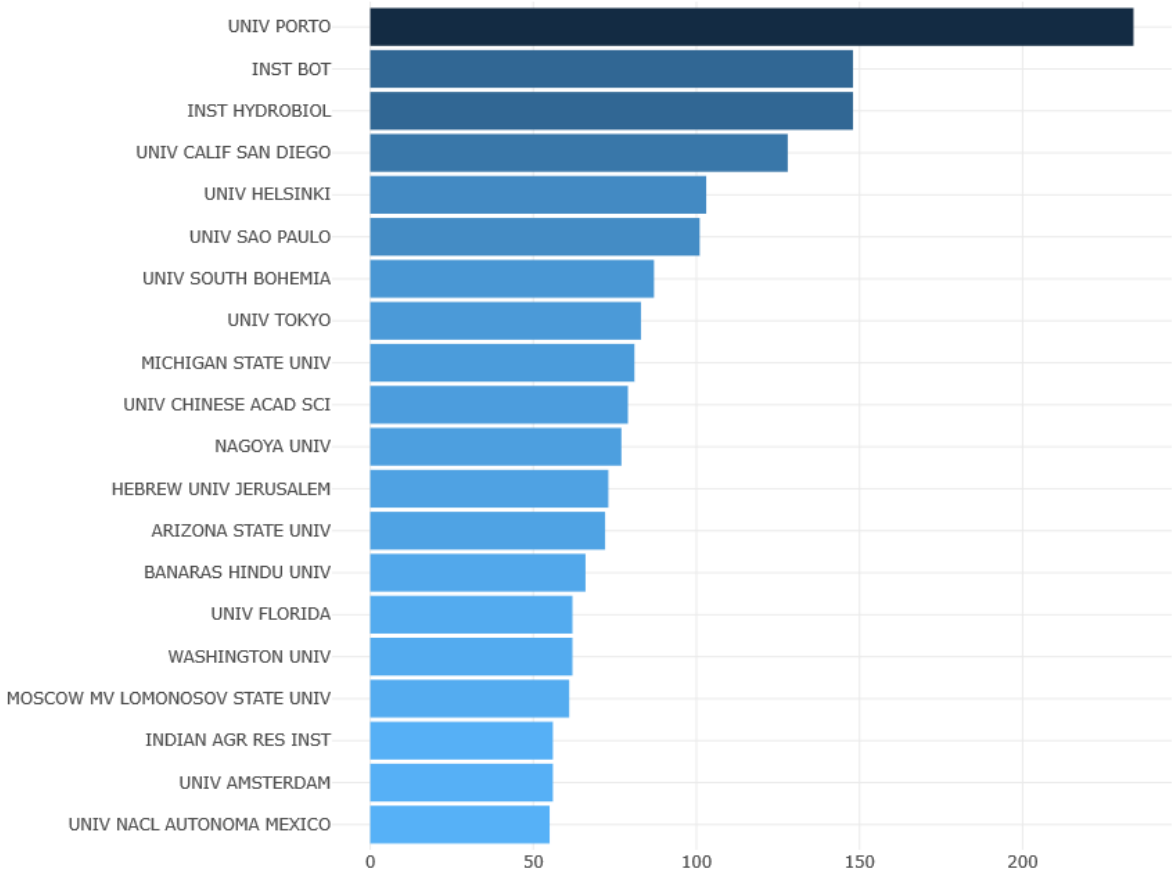


Figure 5 country wise distribution of publications

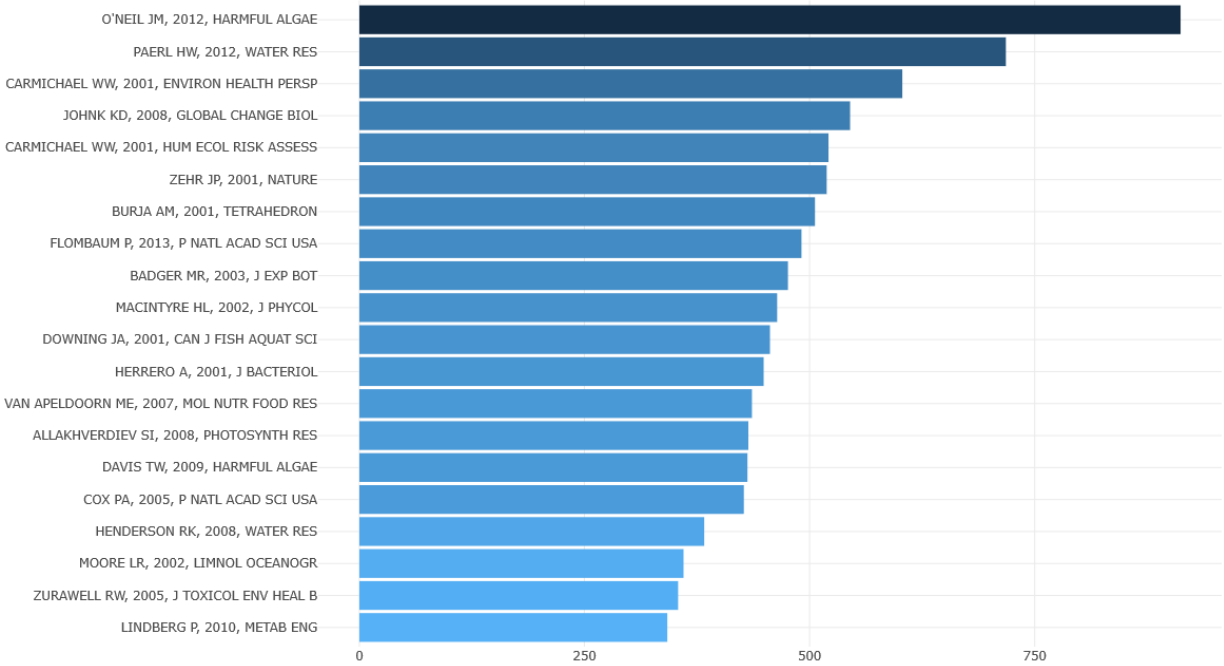
Most Global Cited Documents

The highly cited top 20 publications during the study period is listed in below. The most frequently cited one was “Tapponnier P , Xu ZQ, Roger F, Meyer B, Arnaud N, et al., Geology - Oblique stepwise rise and growth of the Tibet plateau, SCIENCE. 2001 NOV 23; 294 (5547): 1671-1677” with 2180 citations followed by “ Agrawal A , Gibson CC , Enchantment and disenchantment: The role of community in natural resource conservation, WORLD DEVELOPMENT. 1999 APR; 27 (4): 629-649” with 1273 Citations. The study found that 16

received more than 500 Citation each and 2 papers only received more than 1000 Citations. The highest number of Citations per Year is 109.22 by YAO TD, 2012, NAT CLIM CHANGE.

Table 5 Most Global Cited Documents with DOI

Paper	DOI	Total Citations	TC per Year
O'neil Jm, 2012, Harmful Algae	10.1016/j.hal.2011.10.027	912	101.3333
Paerl Hw, 2012, Water Res	10.1016/j.watres.2011.08.002	718	79.7778
Carmichael Ww, 2001, Environ Health Persp	10.2307/3454781	603	30.1500
Johnk Kd, 2008, Global Change Biol	10.1111/j.1365-2486.2007.01510.x	545	41.9231
Carmichael Ww, 2001, Hum Ecol Risk Assess	10.1080/20018091095087	521	26.0500
Zehr Jp, 2001, Nature	10.1038/35088063	519	25.9500
Burja Am, 2001, Tetrahedron	10.1016/S0040-4020(01)00931-0	506	25.3000
Flombaum P, 2013, P Natl Acad Sci Usa	10.1073/pnas.1307701110	491	61.3750
Badger Mr, 2003, J Exp Bot	10.1093/jxb/erg076	476	26.4444
Macintyre Hl, 2002, J Phycol	10.1046/j.1529-8817.2002.00094.x	464	24.4211
Downing Ja, 2001, Can J Fish Aquat Sci	10.1139/cjfas-58-10-1905	456	22.8000
Herrero A, 2001, J Bacteriol	10.1128/JB.183.2.411-425.2001	449	22.4500
Van Apeldoorn Me, 2007, Mol Nutr Food Res	10.1002/mnfr.200600185	436	31.1429
Allakhverdiev Si, 2008, Photosynth Res	10.1007/s11120-008-9334-x	432	33.2308
Davis Tw, 2009, Harmful Algae	10.1016/j.hal.2009.02.004	431	35.9167
Cox Pa, 2005, P Natl Acad Sci Usa	10.1073/pnas.0501526102	427	26.6875
Henderson Rk, 2008, Water Res	10.1016/j.watres.2007.10.032	383	29.4615
Moore Lr, 2002, Limnol Oceanogr	10.4319/lo.2002.47.4.0989	360	18.9474
Zurawell Rw, 2005, J Toxicol Env Heal B	10.1080/10937400590889412	354	22.1250
Lindberg P, 2010, Metab Eng	10.1016/j.ymben.2009.10.001	342	31.0909
Rasmussen B, 2008, Nature	10.1038/nature07381	333	25.6154
Tan Lt, 2007, Phytochemistry	10.1016/j.phytochem.2007.01.012	333	23.7857
Tamagnini P, 2002, Microbiol Mol Biol R	10.1128/MMBR.66.1.1-20.2002	329	17.3158
Papke Rt, 2003, Environ Microbiol	10.1046/j.1462-2920.2003.00460.x	327	18.1667
Liu Xy, 2011, P Natl Acad Sci Usa	10.1073/pnas.1103014108	320	32.0000



Findings and Conclusion

As per the Socpus database, a total of 5686 publications were published on Cynobacteria, which received 38809 citations during 2000-2020. The average number of citations per publication was 25.72. The research was peaked in 2019 with 406 Publications. Multi-Author collaborative publications were predominant in the field of Cynobacteria. The Collaboration Index is 2.75 and Citing Articles (References) 128327. The most frequently cited document was "Tapponnier P , Xu ZQ, Roger F, Meyer B, Arnaud N, et al., Geology - Oblique stepwise rise and growth of the Tibet plateau, SCIENCE. 2001 NOV 23; 294 (5547): 1671-1677" with 2180 citations. USA ranks first in the field of Cynobacteria research. "Vasconcelous V" having 73 records with articles fractionalized of 14.68,21 h-index, 32 g-index times cited 1178 started his publications in the year 2002. research productivity of 134 articles covered in "Journal of Phycology" with citation of 4301 h-index 35, g-index 65 &m – index 1.6.

References

- Laksham S., Surulinathi M., Balasubramani, R. and Srinivasaragavan S. (2020) Mapping the research output on Coronavirus: A Scientometric Study, *Gedrag & Organisatie Review*, 33(2), 163-186.
- Surulinathi M., Arputha Sahaya Rani. Y, Prasanna kumari N., Jayasuriya T. (2020) Highly Cited Works on Covid-19 Vaccine: A Scientometric Mapping of Publications, Library Philosophy and Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/4782

- Piriyadharisini. D, Srinivasaragavan. S, Dorairajan. M, Prasanna kumari. N., Mapping of Research Productivity in Nuclear Chemistry: A Scientometric Study, *Gedrag & Organisatie Review*, 33(3), 453-465.
- Srinivasaragavan. S, Varatharaja Perumal. A, Prasanna kumari N. Scientometric Analysis on Himalayas with special Reference to most Cited/Productive Authors (2020), *Sambodhi*, 43(4), 29-36