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Review Paper

Scientometric Analysis of Research Publications on Biodiversity of Himalaya during year 1992-2014

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Abstract
This research paper is focused on scientometric analysis of Scopus database to evaluate research publications on Biodiversity of Himalaya. This study analyses research output during 1992–2014 on different parameters including global publications share and citation impact, etc. As per global publication concern, a total of 590 papers were published which received 4964 citations with an average of 8.41 citations per paper. India has contributed 44.98 percentage share of publication and secured first position. Moreover, collaboration at different levels such as author, institution is measured along with the status of collaboration at international level. This paper finds trend towards collaborative research is gaining momentum. The paper analyses the researches on Himalayan Biodiversity and this will be helpful for researchers.

Key Words: *Himalaya, Biodiversity, Scientometric, Scopus, Bibliometric, Analysis*

Introduction

Scientometric is the study of measuring and analyzing science, technology and innovation. Major research issues include the measurement of impact, reference sets of articles to investigate the impact of journals and institutes, understanding of scientific citations, mapping scientific fields and the production of indicators for use in policy and management contexts. In practice there is a significant overlap between scientometrics and other scientific fields such as bibliometrics information systems, information science and science of science policy. The coverage of this paper is biodiversity of Himalayan region during the period 1992-2014. Earlier a paper was published which was analyzed the data on biodiversity of India during 2003-2012.

The Himalayan region is unique for its diverse natural and socio-economically important flora and fauna that is why it is globally recognized as one of the biodiversity hotspot. Biodiversity, or biological diversity, is the variability within and between all micro-organisms: plants and animals both wild and domesticated, and the ecological system in which they co-exist. It starts with genes and manifests itself as organisms, species, populations and communities which ultimately lead to the formation of ecosystems, landscape and ultimately biosphere. Biodiversity provides the fundamental base to mountain region agriculture and to the economic systems. It is, indeed, the ultimate basis for local self sufficiency and a global asset bringing benefits to people in many more ways than we realize.

The major objectives framed for the purpose of the study are to analyze the Indian research performance in Himalayan Biodiversity R&D during 1992-2014, based on publications output, as indexed in Scopus database. In particular, the study focuses on the following objectives:

- *To identify and analyze the rate of growth of the published literature on the Biodiversity of Himalaya.*
- *To study the global and Indian research output with citation impact.*
- *To measure and calculate the relative growth rate of publications.*
- *To study the geographical distribution of the research output.*
- *To analyze the authorship pattern and examine the extent of the research collaboration.*
- *To examine the pattern of output according to performing sectors and the impact of the output as seen by Relative Citation Impact (RCI) and Average Citation per paper (ACPP)*
- *To assess the Institution wise research concentration on the Biodiversity of Himalaya.*

Materials and Methods

The present study aims at analyzing the research output in the field of Himalayan studies. The Scientometric methodology was followed to compute various parameters like Average Citation Per Paper (ACPP), Cited Percentage (CP), proportion of Highly Cited Papers (HiCP) and Internationally Collaborated Papers (ICP), and different quality indexes (h-index, gindex, hg-index, P-index). The keyword "Himalay*" and “Biodiversity” were used in "title, abstract and keyword" tag and restricting it to the period

1992-2014 in "date range tag" for searching the global publication data in the study and this was the main search string. The publications are mostly in the form of Primary Journals, Notes, Letters, Reviews, Editorial Materials, Meeting Abstracts, Bibliographic Items and Discussions. The data were then manually checked to avoid redundancy and anomalies and irrelevant records were removed. The present papers and articles are retrieved and downloaded from the Scopus database (http://www.scopus.com) for the period 1992-2014 which includes research publications of the world and 20 most productive countries in Himalayan R&D. The authorship pattern has been identified along with top collaborative authors. The top productive authors were identified and their performances were accessed based on their publications' impact. The most collaborating institutions and countries have been recognized using extraction of information from affiliation text. Defining a research domain via a set of queries is not a simple task. In this paper, the main string used to retrieve data on "Himalaya" and "Biodiversity" were as follows:

((TITLE-ABS-KEY(himalay*) AND TITLE-ABS-KEY(biodiversity)) AND PUBYEAR>1991 AND PUBYEAR<2015)

This may be too simple an approach, using "Himalay*"and "Biodiversity" as the query to define Biodiversity of Himalayan region and considering it to be a useful approach when the domain is interdisciplinary and difficult to define; often experts in the field are themselves unable to agree on the precise nature of Himalayan research.

Analysis and Discussion

During 1992-2014 a total 590 publications recorded globally on Biodiversity of the Himalayas. Figure 1 shows the trend of number of publication during 1992-2014. It is obvious that there were less number of publications on biodiversity of Himalaya during 1992-1999, thereafter it shows an increasing trend in publications producing maximum (89) in the year of 2014. Figure 1 below shows that the attention of scientists in the field of biodiversity of Himalaya came across from the year 2000 onwards in which 16 publication were contributed, thereafter number of publication started increasing. Maximum 389 (66.09%) publications published during the period of 2009-2014.

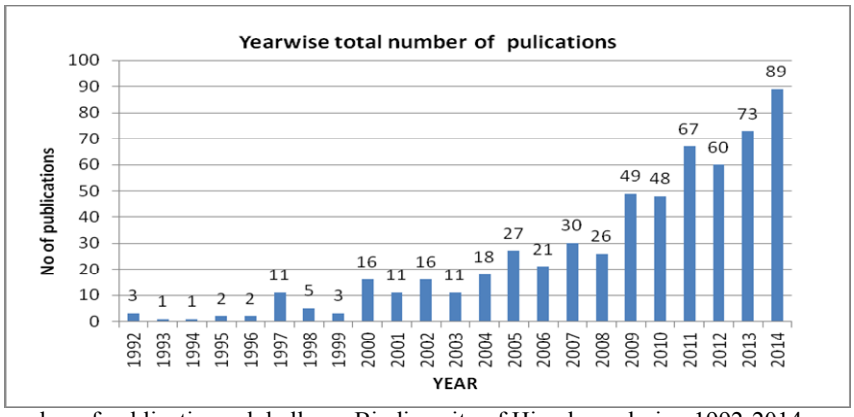

Fig 1. Year wise total number of publications globally on Biodiversity of Himalaya during 1992-2014.

During 1992-2014 out of the total publications, article constitutes major group contributing 87.5% of total publications followed by reviews (4.20%) and conference paper (3.08%). Rest of the groups like book chapters, Notes, Books, and letters fall in rage of 0.68-1.71% (Table 1).

Table1: Types of documentation on biodiversity of Himalaya during 1992-2017.

Sl	Document type	Numbers	% value
1	Article	511	87.5
2	Review	25	4.28
3	Conference Paper	18	3.08
4	Book Chapter	10	1.71
5	Note	5	0.86
6	Book	4	0.68
7	Article in Press	4	0.68
8	Letter	4	0.68
9	Editorial	1	0.17
10	Erratum	1	0.17
11	Undefined	1	0.17

Table 2 below depicts the total number of publication and total citation globally. Maximum (466) citation recorded for the year 2009, however, maximum average citation per paper (58.50) was observed for the publication of the year 1996. Total 4964 citations for the publications during 1992-2017 were recorded.

Table 2. Growth and citation influence of biodiversity of Himalaya R&D during 1992-2014.

Year	Total publications	Total citation	Average citation per paper
1992	3	39	13.00
1993	1	0	0.00
1994	1	1	1.00
1995	2	22	11.00
1996	2	117	58.50
1997	11	188	17.09
1998	5	56	11.20
1999	3	81	27.00
2000	16	367	22.94
2001	11	142	12.91
2002	16	193	12.06
2003	11	95	8.64
2004	18	302	16.78
2005	27	418	15.48
2006	21	339	16.14
2007	30	422	14.07
2008	26	163	6.27
2009	49	466	9.51
2010	48	380	7.92
2011	67	524	7.82
2012	60	274	4.57
2013	73	286	3.92
2014	89	89	1.00
1992-2014	**590**	**4964**	**8.41**

During 1992-2014 a total of 154 journals covered 440 articles about biodiversity of Himalaya. However, 5 or <5 articles appeared in 136 journals, 6-10 publication in 75 journals and >10 published in 10 journals. Maximum 24 articles on Himalayan biodiversity appeared in Current science followed by Biodiversity and Conservation (23). Table 3 presents a list of top 10 source journals globally.

Table 3. Distribution of publications in top 10 journals.

Sl	Source	No of articles
1	Current Science	24
2	Biodiversity and Conservation	23
3	Plos One	19
4	Mountain Research and Development	18
5	Indian Journal of Traditional Knowledge	13
6	Tropical Ecology	13
7	Biological Conservation	11
8	Environmental Conservation	9
9	Forest Ecology and Management	9
10	Asian Agri History	8

When we discuss about the institutions Govind Ballabh Pant National Institute of Himalayan Environment and Sustainable Development appeared at top by contributing 54 publications followed by Kunming Institute of Botany Chinese Academy of Sciences (24) and University of Delhi (23) respectively. Indian institutions exhibited their dominance by securing 7 positions among top 10 list (Table 4).

Table 4. List of top 10 Institutions globally contributing on Himalayan Biodiversity

Sl	Name of Institution	No of publications
1	Govind Ballabh Pant National Institute of Himalayan Environment and Sustainable Development	54
2	Kunming Institute of Botany Chinese Academy of Sciences	24
3	University of Delhi	23
4	University of Kashmir	19
5	Kumaun University India	18
6	Wildlife Institute of India	18
7	Hemwati Nandan Bahuguna Garhwal University	18
8	International Centre for Integrated Mountain Development Nepal	17
9	Tribhuvan University	14
10	Institute of Himalayan Bioresource Technology India	12

Total 48 countries contributed in the research output in Biodiversity of Himalaya during 1992-2017. India contribution appeared as largest (44.98%) followed by United States (9.02%) and China (8.39%) respectively. Contribution of 31 countries was 5 or less than five publications, 8 countries 10 or less than 10 and only 10 countries produced more than 11 publications during the year 1992-2018. List of top 20 countries contribution is being presented in Table 5 below.

Table 5. Number of publications and percent contribution of top 20 countries in Biodiversity of Himalaya during 1992-2014

Sl	Country	No of publications	% value
1	India	354	44.98
2	United States	71	9.02
3	China	66	8.39
4	Nepal	46	5.84
5	United Kingdom	40	5.08
6	Pakistan	32	4.07
7	Germany	26	3.30
8	Australia	15	1.91
9	Canada	14	1.78
10	Italy	12	1.52
11	Norway	10	1.27
12	Netherlands	9	1.14
13	Austria	8	1.02
14	France	8	1.02
15	Switzerland	7	0.89
16	Bhutan	6	0.76
17	Japan	6	0.76
18	New Zealand	5	0.64
19	Czech Republic	4	0.51
20	Taiwan	4	0.51

Among authors, total 167 authors contributed during 1992-2014. Indian scientists occupied all top 10 positions (Table 6). RK Maikhuri attainted top rank in the list by contributed maximum 19 articles during the period of 1992-2014.

All the publication on biodiversity of Himalaya covered 23 subject areas, maximum attention was given to Agricultural and Biological sciences (313) followed by Environmental Science (254). Table 7 summarizes the distribution of publication in various subject areas.

Conclusion

This study presents result of a detailed scientometric analysis of research publications on Biodiversity of Himalaya during the period 1992-2014. The publications indexed in Scopus have been analyzed and different scientometric indicators were obtained.

These results may be useful for prospective students, researchers and research policy makers in the institution and other relevant bodies. As per scientometric analysis, India, rank first in publication output among top 20 most productive countries in Himalayan R&D and G.B. Pant Institute of Himalayan Environment and Development is in first position among top 10 Institutions of the world as per Scopus database keyword "Himalay*" and "Biodiversity".

Table 6: Author list of publications during 1992-2014 in biodiversity of Himalaya

Sl	Name of author	No of publications	Country
1	Maikhuri, R.K.	19	India
2	Nautiyal, S.	17	India
3	Rao, K.S.	14	India
4	Samant, S.S.	12	India
5	Roy, P.S.	12	India
6	Sharma, E.	11	India
7	Pandit, M.K.	10	India
8	Rawat, G.S.	9	India
9	Singh, R.K.	8	India
10	Rawal, R.S.	8	India

Table 7: Distribution of publications in various subject areas during 1992-2014

Sl	Subject area	No of publications
1	Agricultural and Biological Sciences	313
2	Environmental Science	254
3	Social Sciences	76
4	Biochemistry, Genetics and Molecular Biology	75
5	Medicine	72
6	Earth and Planetary Sciences	38
7	Multidisciplinary	34
8	Pharmacology, Toxicology and Pharmaceutics	21
9	Immunology and Microbiology	20
10	Arts and Humanities	16
11	Health Professions	13
12	Chemistry	10
13	Engineering	9
14	Chemical Engineering	5
15	Computer Science	5
16	Energy	5
17	Physics and Astronomy	5
18	Economics, Econometrics and Finance	4
19	Business, Management and Accounting	3
20	Decision Sciences	2
21	Materials Science	2
22	Mathematics	2
23	Veterinary	2

Networking and extensive collaboration can play a key role in raising good research questions and hypothesis and subsequently improve the citation impact of research. The quality of research is also affected by inadequate expertise, lack of uniform methodologies and instrumentation and data collection and synthesis protocols. There is also a need for introduction of better field research facilities and system of rewards and establishment of long-term ecological monitoring sites collect and monitor regular data. This research paper will be very helpful for researchers.

References

1. Alex, P and Preedip, Balaji B (2010) Mapping climate change research in India: A bibliometric approach. Sixth International Conference on Webometrics, Informetrics and Scientometrics & Eleventh COLLNET Meeting, October 19–22, 2010, University of Mysore. http://webcache.googleusercontent.com/search?q=cache:e6cSSU52IlUJ:eprints.rclis.org/15301/1/Alex.doc+&cd=17&hl=en&ct=clnk&gl=in
2. Gokceoglu, Candan and Sezer, Ebru (2009) A statistical assessment on international landslide literature (1945–2008). *Landslides* December 2009, 6(4), 345-51
3. Government of India, Ministry of Science & Technology (2014) Approval for the National Mission for Sustaining Himalayan Ecosystem launched under the National Action Plan on Climate Change on. 28 February 2014. Press Information Bureau. http://pib.nic.in/newsite/PrintRelease.aspx?relid=104353
4. Himalayan natural resources. (No date). http://www.himalayanvoices.org/?q= onlinelib/documentation/natural
5. India sets up $100 mn Himalaya ecosystem mission on February 28, 2014. The BRICKS Post November 19, 2014. http://thebricspost.com/indian-sets-up-100-mn-himalaya-ecosystemmission/#.VGy30TSUfHJ
6. Kalisdha, A, Balasubramani, R, Surulinathi, M and Amsaveni, N. (2013) Indian contribution to medicinal plants research: A scientometric study. *Journal of Advances in Library and Information Science* 2013, 1(2), 65-70.
7. Li, Jinfeng, Wang, Ming-Huang and Ho, Yuh-Shan (2011) Trends in research on global climate change: A Science Citation Index Expanded-based analysis. *Global and Planetary Change* May 2011, 77(1-2), 13–20.
8. Liu, Xingiian, Benjamin Zhan, F, Hong, Song, Niu, Beibei and Liu, Yaolin (2012) A bibliometric study of earthquake research, 1900-2010. *Scientometrics* 2012, 92(3), 747-65
9. Mohamad, AN; Masrek, MN; Bin Abdul Rasam, AR (2013) A bibliometric analysis on scientific production of Geographical Information System (GIS) in Web of Science. *Information and Communication Technology (ICoICT), 2013 International Conference of,* vol., no., pp.264, 268, 20-22 March 2013. doi: 10.1109/ICoICT.2013.6574584
10. Nandy, SN, Dhyani, P. and Samal, PK (2006) Resource information database of the Indian Himalayas. ENVIS Newsletter on Himalayan Ecology, G.B. Pant Institute of Himalayan Environment and Development (GBPIHED).2006. http://gbpihedenvis.nic.in/HTML/ monograph3/Contents.html
11. National Mission for Sustaining the Himalayan Ecosystem under National Action Plan on Climate Change (2010); Draft. June 2010 dst.gov.in/scientificprogramme/ NMSHE_June_2010.pdf
12. Niu, Beibei, Hong, Song, Yuan, Jiefei, Peng, Sha, Wang, Zhen and Zhang, Xu (2014) Global trends in sediment-related research in earth science during 1992–2011: A bibliometric analysis. *Scientometrics* January 2014, 98(1), 511-529
13. Prasad, RC, Pande, GP, Singh, R.K. and Prasad, Rashmi (2016) Scientometric Exploration of Research Publications on Himalayas during the Year 1989-2014: A Scientific Review. *International Journal of Basic and Applied Sciences 2016, 5(3), 102-108.*
14. Ravichandran, P (2012) Bibliometric analysis on publication trends in the biodiversity research: A study. *Journal of Advances in Library and Information Science* 2012, 1(2), 94-99.
15. Sivasekaran, K and Srinivasaragava, S. (2013) Mapping of research publications on Himalayas: A scientometrics exploration. *IJSR – International Journal of Scientific Research* August 2013, 2(8), 222-224.
16. Srinivasa Ragavan, S, Surulinathi, Mand Neelakandan. B (2012) Indian perspective of medicinal plant research: A scientometric study. *International Journal of Plant, Animal and Environmental Sciences* July-Sept 2012, 2(3), 195-203
17. Stork, H and Astrin, J (2014) Trends in biodiversity research-A bibliometric assessment. *Open Journal of Ecology 2014*, 4, 354-370.
18. Tian, Yangge, Wen, Cheng and Hong, Song (2008) Global scientific production on GIS research by bibliometric analysis from 1997 to 2006. *Journal of Informetrics* January 2008, 2(1), 65–74
19. Vijaylakshmi, S and Ambuja, R (2013) Remote sensing literature in Scopus database: A bibliometric analysis. *International Journal of Library and Information Studies* Jan-Mar, 2013, 3(1), 70-86.
20. Wang, Ming-Huang, Li, Jinfeng and Ho, Yuh-Shan (2011) Research articles published in water resources journals: A bibliometric analysis *Desalination and Water Treatment* 2011, 28(3), 353-65
21. Wang, Xuemei and Ma, Mingguo (2009) Spatial information mining and visualization for Qinghai-Tibet Plateau's literature based on GIS. In. Proc. SPIE 7492, International Symposium on Spatial Analysis, Spatial-Temporal Data Modeling and Data Mining, 74920T (October 14, 2009); DOI: 10.1117/12.83925; http://dx.dpi/10.1117/12.839525
22. Werner Marx and Lutz Bornmann (2013) The emergence of plate tectonics and the Kuhnian model of paradigm shift: A bibliometric case study based on the Anna Karenina principle. *Scientometrics* February 2013, 94 (2), 595-614
23. Xiang, Wenting, Tian, Yange and Deng, Shuang (2009) Comparison of GIS Papers between SCI and EI databases using bibliometric analysis. *Information Science and Engineering (ICISE), 2009 1st International Conference on*, vol., no., pp.2012,2015, 26-28 Dec. 2009, doi: 10.1109/ICISE.2009.410
24. Zhuang, Yanhua, Liu, Xingjian, Nguyen, Thuminh, He, Qingqing and Hong, Song (2013) Global remote sensing research trends during 1991–2010: A bibliometric analysis. *Scientometrics* July 2013, 96(1), 203-219.