

Assessing India's Contribution to the Scholarly Publications of Asiatic Region

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Abstract

This write-up represents the fundamentals of SCImago Journal and Country Ranking in terms of its scope, role in scientometrics study, and the important elements of different types of scientometrics indicators. It attempts to achieve some fundamental objectives of scientometrics, like: 1. ensure access to articles published in different R&D literature at national and global level, 2. reflect and represent true picture of scholarly contribution, research, scientific productivity at national and global level, and 3. have an authentic tool / ground for effective, efficient and rigorous evaluation of scholarly works. The SJR2 indicator takes into account not only the prestige of the citing scientific journal but also its closeness to the cited journal using the cosine of the angle between the vectors of the two journals' co-citation. To eliminate the size effect, the accumulate prestige is divided by the fraction of the journal's citable documents, thus eliminating the decreasing tendency of this type of indicator and giving meaning to the scores.

Keywords: Academic Literature, Asia, Country Ranking, India, Journal Ranking, Scopus, Scholarly Literature, SCImago

1. Introduction

The SCImago Journal and Country Rank is a portal that includes the journals and country scientific indicators derived from information in the Scopus database (Elsevier B.V.). These indicators can be used to assess and analyze scientific domains. This platform takes its name from the SCImago Journal Rank (SJR) indicator, developed by SCImago using the Google PageRank algorithm. This indicates the visibility of the journals in the Scopus database from 1996.

SCImago has also developed The Atlas of Science project, which proposes the creation of an information system whose major aim is to achieve a graphic representation of IberoAmerican Science Research. Such representation is conceived as a collection of interactive maps, allowing navigation functions throughout the semantic spaces formed by the maps.

2. Development

The SJR research group from the Consejo Superior de

Investigaciones Científicas (CSIC), University of Granada, Extremadura, Carlos III (Madrid) and Alcalá de Henares is dedicated to information analysis, representation and retrieval by means of visualization techniques. SJR also provides The *Shape of Science*, which is a new graphical interface designed to access the bibliometric indicators database of the SCImago Journal and Country Rank portal, based on 2012 data

3. Coverage of Database

SJR provides full scientometric profiles of more than 17000 journals of Scopus database from the year of 1996 to 2014, along with 233 countries from all over the world. Documents are classified by area and category. There are 295 Specific Subject Areas grouped into 26 Subject Areas. In addition, there is the General Subject Area containing multidisciplinary journals, such as Nature and Science. The Subject Areas are grouped into four categories on the Scopus "Basic Search" page:

- *Life Sciences (3950 titles):* Agricultural and Biological Sciences; Biochemistry, Genetics and

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- Molecular Biology; Immunology and Microbiology; Neuroscience, Pharmacology, Toxicology and Pharmaceutics;
- *Physical Sciences (6350 titles)*: Chemical Engineering; Chemistry; Computer Science; Earth and Planetary Science; Energy; Engineering; Environmental Science; Materials Science; Mathematics;
- *Social Sciences (5900 titles)*: Arts and Humanities; Business, Management and Accounting; Decision Sciences; Economics; Econometrics and Finance; Psychology; Social Sciences; and
- *Health Sciences (6200 titles; including 100% coverage of Medline titles)*: Medicine, Nursing, Veterinary, Dentistry, Health Professions.

4. Different Types of Indicators

SJR has online tools for analyzing, comparing, and visualizing scientometric profiles of journals or countries. Its primary indicator is called 'SJR Indicator' that measures the scientific influence of the average article in a journal; it expresses how central to the global scientific discussion an average article of the journal is. There is a full list of SJR indicators available for journals and countries. Many indicators are common for both types, while some are distinct. SJR website provides following ranking and comparison: 1. country rankings, 2. journal rankings, 3. comparison of countries and regions, and 4. comparison of journals. SJR website is also useful to obtain: 1. customized rankings of journals, 2. customized ranking of countries, 3. full scientometric profile of Scopus database, 4. journal evaluation, 5. national-wide analysis, and 6. map of science (country wise co-citation networks of subject areas or subject categorize for a period, or country wise bubble charts for indicators).

SJR uses different types of scientometrics indicators such as (Table 1):

- *SJR (SCImago Journal Rank) indicator*: It expresses the average number of weighted citations received in the selected year by the documents published in the selected journal in the three previous years, – i.e. weighted citations received in year X to documents published in the journal in years X-1, X-2 and X-3;
- *h-index*: The h index expresses the journal's number of articles (*h*) that have received at least h citations. It quantifies both journal scientific productivity and scientific impact and it is also applicable to scientists, countries, etc.;
- *Total documents*: Output of the selected period. All types of documents are considered, including citable and non-citable documents;
- *Total Documents (3 years)*: Published documents in the three previous years (selected year documents are excluded), – i.e. when the year X is selected, then X-1, X-2 and X-3 published documents are retrieved. All types of documents are considered, including citable and non-citable documents;
- *Total References*: It includes all the bibliographical references in a journal in the selected period;
- *Total Cites (3 years)*: Number of citations received in the selected year by a journal to the documents published in the three previous years, – i.e. citations received in year X to documents published in years X-1, X-2 and X-3. All types of documents are considered;
- *Citable Documents*: Number of citable documents published by a journal in the three previous years (selected year documents are excluded). Exclusively articles, reviews and conference papers are considered;
- *Cites per Documents (2 years)*: Average citations per document in a 2 year period. It is computed considering the number of citations received by a journal in the current year to the documents published in the two previous years, – i.e. citations received in year X to documents published in years X-1 and X-2;
- *Cites per Documents (3 years)*: Average citations per document in a 3 year period. It is computed considering the number of citations received by a journal in the current year to the documents published in the three previous years, – i.e. citations received in year X to documents published in years X-1, X-2 and X-3;
- *Cites per Documents (4 years)*: Average citations per document in a 4 year period. It is computed considering the number of citations received by a journal in the current year to the documents published in the four previous years, – i.e. citations received in year X to documents published in years X-1, X-2, X-3 and X-4;
- *Reference per documents*: Average number of references per document in the selected year;
- *Self cites*: Number of journal's self-citations in the selected year to its own documents published in the three previous years, – i.e. self-citations in year X to documents published in years X-1, X-2 and X-3. All types of documents are considered;
- *Non-citable documents*: Non-citable documents ratio in the period being considered;
- *Cited documents*: Number of documents cited at

Table 1. Different types of indicators uses by SciMago Journal ranking

For journals	For countries
SJR rank	H index
H index	Total documents (in a year or range)
Citation per document (2 years)	Total citations
Citation vs. self-citation	Citation per document
Citation per document vs. external cites per document (excluding self-citation)	Citable vs. non-citable documents
Citation per document in 2, 3 and 4 years windows)	Cited vs. un-cited documents
International collaboration (percentage of docs with more than one country)	Citation vs. self-citation
Journal's citable vs. un-cited documents	Citation per document vs. external cites per document (excluding self-citation)
References per document	Documents by subject areas (27 areas)
Total documents in a particular year	International collaboration (percentage of docs with more than one country)
Total documents in 3 years	Relative production (percentage of the region vs. percentage of the world)
Total citations in 3 years	

least once in the three previous years, i.e. years X-1, X-2 and X-3;

- *Un-cited documents*: Number of un-cited documents in the three previous years, i.e. years X-1, X-2 and X-3;
- *Percentage (%) international collaboration*: Document ratio whose affiliation includes more than one country address;
- *Percentage (%) region*: Country relative contribution to regional publication output; and
- *Percentage (%) world*: Country relative contribution to world publication output.

5. Scope of this Study

- The entire database covers a huge area and almost all countries. For the present study the four top developing countries of Asia, viz., China, Japan, India and South Korea were chosen; and
- Also the database covers almost all subjects. For the present study Biochemistry, Genetics and Molecular biology were chosen.

6. Country Search (India)

Data about scholarly communication for the period 1996-2014 in the subject areas of Biochemistry, Molecular Biology and Genetics for India as an individual country were collected (Table 2-3).

Table 2. Indicators showing India's scholarly publications

Indicator	1996 - 2014
h-index	212
Documents	126059
Citable Documents	122425
Citations	1323471
Self-Citations	451371
Citations per Document	10.50

7. Country Rankings

The ranking is done on the basis of h index. The ranking parameters are as follows (Table 4):

Table 3. Year-wise measurement of India's scholarly publications

Year	Docu-ments	Citable Docu-ments	Cites	Self Cites	Cites per Doc.	Self Cites per Doc.	Cited Docs.	Un-cited Docs.	% Inter-national Collaboration	% Re-gion	% World
2014	15547	14623	6266	2675	0.40	0.17	3419	12128	18.02	14.05	4.74
2013	14270	13871	30425	11768	2.13	0.82	8279	5991	18.28	13.93	4.51
2012	13270	12891	58355	20980	4.40	1.58	9502	3768	17.89	14.47	4.42
2011	11445	11117	73454	26086	6.42	2.28	8790	2655	17.30	14.34	4.15
2010	9584	9344	86547	29545	9.03	3.08	7747	1837	17.44	13.40	3.72
2009	8046	7839	92598	31610	11.51	3.93	6694	1352	18.17	11.76	3.17
2008	7150	6948	94017	30891	13.15	4.32	6029	1121	17.87	11.61	3.00
2007	6276	6087	101735	34067	16.21	5.43	5546	730	17.48	11.33	2.74
2006	5684	5519	105386	35207	18.54	6.19	5131	553	17.86	11.82	2.64
2005	5194	5079	102822	34680	19.80	6.68	4687	507	19.25	12.06	2.55
2004	4364	4263	91589	29921	20.99	6.86	3999	365	19.23	11.03	2.23
2003	3956	3866	86702	28944	21.92	7.32	3624	332	20.12	10.90	2.12
2002	3526	3469	76594	26281	21.72	7.45	3262	264	15.80	11.05	1.97
2001	3133	3071	62900	21546	20.08	6.88	2847	286	14.43	10.23	1.79
2000	2843	2792	60122	19349	21.15	6.81	2629	214	16.92	9.28	1.63
1999	3085	3042	53772	18413	17.43	5.97	2790	295	19.32	10.37	1.83
1998	2926	2885	51783	17999	17.70	6.15	2680	246	18.46	10.14	1.70
1997	2934	2914	45650	1560	15.56	5.64	2538	396	16.56	10.50	1.70
1996	2826	2805	42754	1849	15.13	5.25	2548	278	19.57	10.85	1.65

Table 4. Countries ranking on the basis of publications and citations

Rank	Country	Total pub. docs.	Citable documents	Citation	Self-ci-tat-ion	Cita-tion per docs.	h-in-dex
1.	Japan	27555	27141	577989	123821	27.2	278
2.	China	40680	40252	252186	105415	10.65	137
3.	South Korea	6950	6803	85162	12995	27.32	111
4.	Singapore	2516	2476	49232	4193	42.91	95
5.	India	17581	16688	101725	37723	10.11	91
6.	Taiwan	5712	5624	50008	9129	19.84	84
7.	Hong Kong	1852	1813	29702	3925	25.32	69
8.	Thailand	2133	2071	13373	2321	14.25	46
9.	Malaysia	3163	3147	12228	2321	9.12	38
10.	Viet Nam	377	374	4149	470	16.42	28
11.	Indonesia	483	477	2946	473	12.68	27
12.	Pakistan	1352	1343	4695	1377	11.63	27
13.	Philippines	288	288	2955	247	16.2	24
14.	Bangladesh	580	574	2764	1029	8.83	22
15.	Cambodia	110	109	1098	114	24.81	18
16.	Sri Lanka	200	192	1312	189	12.1	18
17.	Nepal	158	154	1169	151	13.6	17
18.	Macao	132	130	806	365	9.08	15
19.	Kazakhstan	724	720	546	160	5.59	12
20.	Laos	52	52	538	37	17.9	11
21.	Mongolia	53	53	694	22	46.95	11
22.	Myanmar	28	28	340	49	15.39	10

23.	North Korea	8	8	183	0	20.81	8
24.	Uzbekistan	68	67	320	18	8.19	7
25.	Brunei Darus-salam	18	18	135	10	10.74	6
26.	Afghanistan	8	7	43	2	8.03	3
27.	Bhutan	9	8	20	4	2.67	3
28.	Kyrgyzstan	16	16	7	0	0.27	1
29.	Maldives	2	2	4	0	2	1
30.	Northern Mariana Islands	1	1	6	2	6	1
31.	Tajikistan	30	30	2	0	0.29	1
32.	Timor-Leste	1	1	2	0	2	1
33.	Turkmenistan	3	3	0	0	0	0

Table 5. Year-wise measurement of the scholarly publications of China, Japan, India and South Korea

Year	China					Japan				
	Tot. Pub. docs.	Self cites/ docs.	% of citable docs.	Cit-able docs.	Cites/ doc.	Tot. Pub. Doc.	Self cites/ doc.	% of citable doc.	Cit-able docs.	Cite/ doc.
2014	10450	0.222	23.722	10288	0.432	3215	0.418	26.034	3156	0.578
2013	9452	1.554	67.933	9352	2.896	3387	2.771	73.782	3356	3.666
2012	5698	3.906	84.152	5659	6.890	2595	6.407	86.898	2535	8.368
2011	3466	5.696	81.102	3432	9.823	1850	10.173	90.054	1824	13.157
2010	2052	6.657	78.460	2024	11.198	1444	11.902	87.258	1414	15.062
2009	1984	6.420	68.044	1959	10.091	1555	12.110	85.466	1521	15.656
2008	1164	10.818	86.082	1151	16.852	1304	16.006	89.264	1276	20.629
2007	859	11.692	86.380	850	18.714	1261	23.458	90.008	1229	29.658
2006	771	9.381	87.808	764	15.821	1,181	34.152	91.617	1159	41.264
2005	640	13.333	90.000	637	20.428	895	27.030	90.168	885	33.923
2004	615	9.491	87.805	612	16.473	988	25.887	90.283	973	32.686
2003	536	8.433	84.142	534	14.554	993	27.909	93.051	983	34.609
2002	457	4.455	90.153	454	10.048	915	30.508	91.148	901	38.456
2001	307	4.059	76.873	307	9.049	834	31.556	91.007	821	40.625
2000	389	5.720	76.864	389	10.807	954	31.349	92.977	943	40.343
1999	566	5.836	76.678	566	9.929	903	29.635	90.476	898	38.481
1998	480	4.096	78.958	480	7.388	1132	31.463	88.163	1,129	39.606
1997	406	2.362	82.020	406	5.638	993	30.716	86.908	990	39.770
1996	388	2.258	80.928	388	5.353	1156	23.089	86.332	1,148	30.176
2014	3122	0.143	15.695	2967	0.255	1716	0.441	25.641	1672	0.551
2013	2836	0.934	47.250	2727	1.470	1451	2.712	68.436	1429	3.398
2012	2686	1.993	63.328	2594	3.240	933	6.251	85.209	904	7.833
2011	1836	3.338	69.499	1746	5.377	611	8.545	89.362	588	10.755
2010	1210	4.048	68.760	1138	6.255	395	11.658	89.114	380	14.587
2009	885	5.011	75.367	816	7.718	376	14.426	78.989	373	16.540
2008	717	8.264	77.824	639	12.365	224	16.728	82.589	224	19.313
2007	598	9.092	79.599	530	13.707	230	31.396	81.739	228	36.287
2006	474	11.099	84.599	420	16.422	201	31.990	93.532	198	37.139

2005	392	8.842	85.204	353	15.268	112	30.866	95.536	112	37.232
2004	275	14.251	84.727	240	21.153	127	55.528	94.488	125	62.465
2003	261	8.816	84.291	253	14.245	129	28.558	98.450	127	33.612
2002	258	8.833	87.597	251	14.926	90	46.989	95.556	89	53.611
2001	259	9.463	82.625	253	13.981	83	46.120	90.361	82	52.783
2000	259	6.290	84.556	257	10.803	61	26.197	95.082	61	29.672
1999	398	4.470	78.643	395	7.839	60	36.650	93.333	60	40.317
1998	343	5.770	85.714	340	10.195	67	29.134	85.075	67	31.687
1997	364	4.706	84.615	363	8.181	38	15.816	92.105	38	18.816
1996	408	4.792	87.990	406	8.708	46	8.609	82.609	46	12.565

- **Subject Area:** Biochemistry, Genetics and Molecular Biology
- **Subject Category:** Biochemistry, Genetics and Molecular Biology (miscellaneous)
- **Region:** Asiatic Region, and
- **Period:** 1996 – 2014.

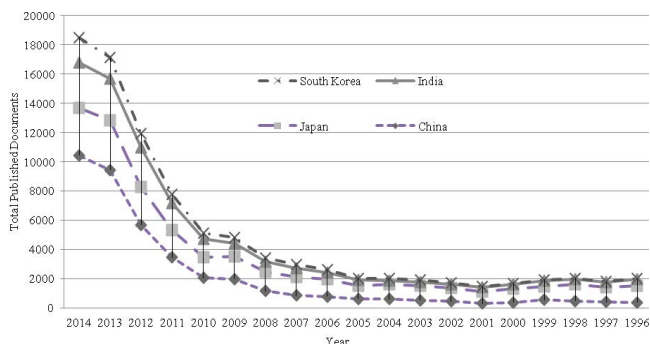


Figure 1. Year-wise distribution of total published documents.

8. Comparative Analysis

This comparison is done for the following countries, subject areas, subject categories and parameters:

- **Countries:** China, Japan, India and South Korea,
- **Subject area:** Biochemistry, Genetics and Molecular Biology
- **Subject category:** Biochemistry, Genetics and Molecular Biology (miscellaneous)
- **Region:** Asiatic Region, and
- **Period:** 1996 – 2014.

8.1 Total Published Documents

Figure 1 and Table 5 show that in the initial years there was only a slight difference in the number of published documents between the countries. But over a period of time the gap has widened. Except for China, the other three countries have more or less the same average rate of growth in publications.

8.2 Per Document (Cites-Self cites)

The Figure 2 and Table 5 show that from the beginning South-Korea performed consistently well in comparison with the other three countries. However, there has been steep fall since 2006.

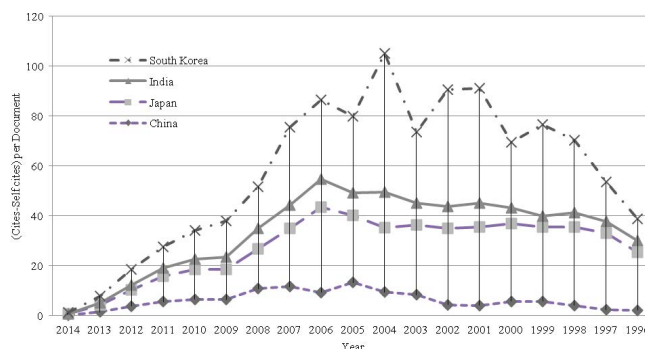


Figure 2. Year-wise distribution of per document (Cites-Self cites).

8.3 Percentages of Cited Documents

The picture is very disappointing for India. Figure 3 and Table 5 shows that the beginning time India achieved the highest rank, but over time India has moved to 4th position.

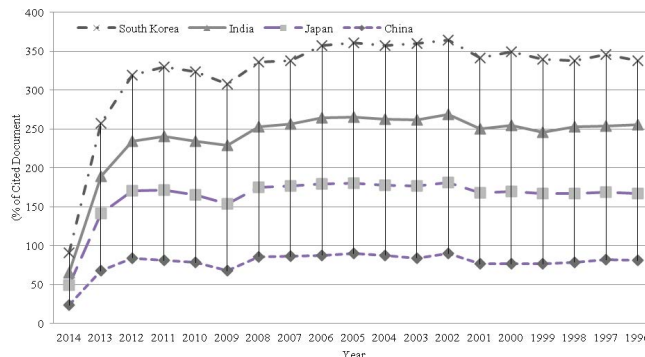


Figure 3. Year-wise distribution of Percentages of cited documents.

Table 6. Year-wise measurement of the scholarly publications of China, Japan, India and South Korea

Rank	Journal title	SJR	h-index	Total Docs. (3 yrs)	Total Refs.	Total Cites (3 yrs)	Citable Docs. (3 yrs)	Cites per Doc. (2 yrs)	Ref. per Doc.	Country
1.	Indian Journal of Medical Research	0.701	55	919	7820	1345	662	1.65	24.14	India
2.	Journal of Bio-sciences	0.635	50	313	4327	569	289	2.01	39.34	India
3.	Tohoku Journal of Experimental Medicine	0.497	40	385	3456	562	379	1.38	30.86	Japan
4.	Journal of Medical Investigation	0.384	33	114	1499	134	114	1.12	23.79	Japan
5.	Experimental Animals	0.546	29	129	1789	144	116	1.03	35.08	Japan
6.	Journal of Zhejiang University Science. B.	0.429	28	384	4676	571	367	1.45	38.64	China
7.	Science China Life Sciences	0.6	28	455	7009	651	425	1.65	37.08	China
8.	Acta Medica Okayama	0.35	27	174	1307	180	173	0.85	24.66	Japan
9.	Bio-medical Research	0.517	25	137	1327	177	137	1.15	28.23	Japan
10.	Biotechnology	0.217	17	137	1148	99	136	0.47	29.44	Pakistan
11.	Journal of Ginseng Research	0.781	15	161	668	363	160	2.71	22.27	South Korea
12.	Bio-Science Trends	0.579	14	135	1587	233	126	1.85	31.12	Japan
13.	Artificial Life and Robotics	0.272	13	245	666	79	211	0.43	10.57	Japan
14.	Indian Journal of Medical Research, Supplement	0.108	13	9	54	2	8	0.25	54	India
15.	Bio-medical Research	0.178	12	289	2708	127	288	0.39	23.55	India
16.	Life Science Journal	0.161	12	5063	42160	844	5063	0.16	21.41	China
17.	Journal of Pharmacy and Bio-allied Sciences	0.371	11	334	2278	369	279	0.98	23.48	India
18.	Biology and Medicine	0.275	10	111	1659	109	111	0.5	22.73	India

19.	Chiang Mai Journal of Science	0.178	10	241	2684	92	231	0.35	30.85	Thailand
20.	International Journal of Integrative Biology	0.118	10	44	454	6	44	0	32.43	India
21.	Hokkaido Journal of Medical Science	0.113	9	29	0	5	29	0.22	0	Japan
22.	Journal of Bio-medical Research	0.531	8	189	1443	262	180	1.7	42.44	China
23.	Journal of Natural Science, Biology and Medicine	0.341	8	197	2257	218	187	0.96	19.97	India
24.	Journal of Pharmaceutical Analysis	0.36	8	179	1569	191	179	1	26.15	China
25.	Proceedings of the Indian National Science Academy	0.129	8	210	4552	48	204	0.29	41.01	India
26.	Research Journal of Pharmaceutical, Biological and Chemical Sciences	0.157	8	1704	27267	373	1704	0.18	21.67	India
27.	Bio-medicine	0.131	7	386	1736	13	353	0.04	16.69	India
28.	Journal of Oral Bio-sciences	0.219	7	115	1286	68	113	0.64	36.74	Japan
29.	Journal of the Korean Society for Applied Biological Chemistry	0.283	7	277	3437	199	268	0.68	28.64	South Korea
30.	Plant Root	0.266	6	26	250	13	24	0.79	35.71	Japan
31.	Mass Spectrometry Letters	0.121	4	67	452	14	19	0.56	22.60	South Korea
32.	National Journal of Physiology, Pharmacy and Pharmacology	0.144	4	79	1091	20	70	0.29	17.32	India
33.	Pakistan Journal of Life and Social Sciences	0.178	4	69	302	23	69	0.33	30.20	Pakistan

34.	Tropical Life Sciences Research	0.159	4	48	593	19	48	0.25	37.06	Malaysia
35.	Asia Life Sciences	0.109	3	37	0	7	36	0.27	0	Philippines
36.	Genomic Medicine, Bio-markers, and Health Sciences	0.138	3	53	0	13	52	0.21	0	Taiwan
37.	IP SJ Transactions on Bioinformatics	0.102	3	16	15	1	13	0	7.5	Japan
38.	Journal of Shanghai Jiaotong University (Medical Science)	0.102	3	1086	6446	24	1085	0.02	17.19	China
39.	Journal of Chemical and Pharmaceutical Sciences	0.121	2	117	128	10	117	0.09	9.85	India

8.4 Citable Documents

Figure 4 and Table 5 shows, at this stage the situation of all countries is good. The number of citable documents is going up from the beginning. India started at 2nd position; and now in position 3. On the other hand, China started at 3rd position, now achieved the 1st position in 2014.

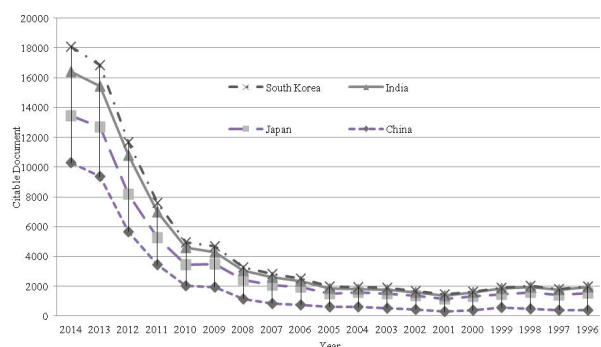


Figure 4. Year-wise distribution of citable documents.

8.5 Cites per Document

Figure 5 and Table 5 show that from the beginning Japan performed well in comparison to the other three countries. However, the figures for recent years are not encouraging. The graph of South-Korea suggests fluctuation. India's situation is not very good either.

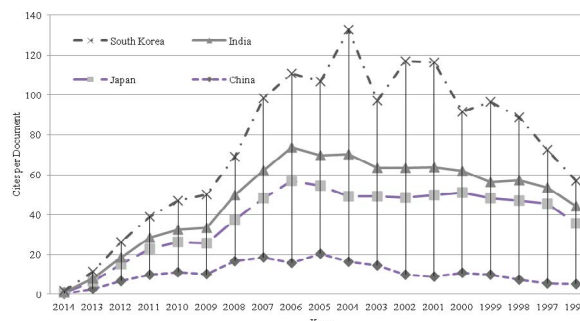


Figure 5. Year-wise distribution of cites per documents.

8.6 h-Index (Figure 6)

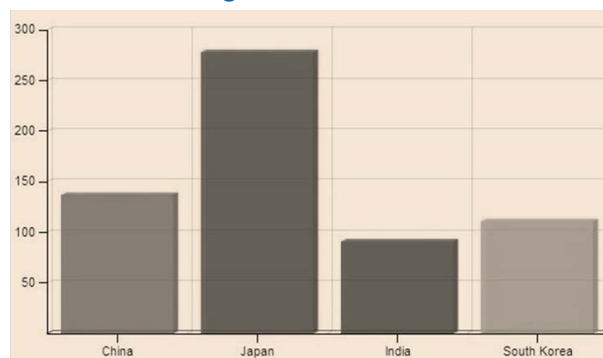


Figure 6. Position of four countries according to h-index (1996 – 2014).

9. Journal Rankings

The ranking is done on the basis of h-index. The ranking parameters are as follows:

- *Subject Area:* Biochemistry, Genetics and Molecular Biology
- *Subject Category:* Biochemistry, Genetics and Molecular Biology (miscellaneous)
- *Region:* Asiatic Region, and
- *Period:* 3 years means (from 2014 – 2012).

10. Conclusion

Using the cosine of co-citation profiles assigns greater weight to citations to thematically close journals. For example, it increases the weight of citations to journals in the same Subject Area, and especially in the same Specific Subject Area. This leads to greatly equalizing the distribution by Subject Area, and especially by Specific Subject Area, and makes scores from different areas more comparable without using any arbitrary classification of journals or weights to apply to the citations.

SCImago Journal and Country Rank (SJR) indicator solves the problem of the tendency for prestige scores to decrease over time by the use of stochastic matrices. It endows the resulting scores with meaning, and uses the cosine between the co-citation profiles of the citing and cited journals to weight the thematic relationship between the two journals. We may conclude from this comparative study:

1. According to different types of indicators (viz. total published documents, self-cites per document, citable documents, percentage of citable documents and cites per documents), China ranks first followed by Japan. Research in life science field is of a high order in these two countries. The position of India is still not so good, but is gradually improving.
2. According to h index the rank of India as an individual country is 5th in Asia for the period 1996 – 2014 in Biochemistry, Genetics and Molecular Biology (specific subject category Biochemistry, Genetics and Molecular Biology (miscellaneous)).
3. Two journals of India obtained the first and second rank according to h-index; 11 journals are included in the ranked list of SCImago Journal and Country Rank (SJR) indicator (out of 39 journals for same specific subject category and same time span).

11. Reference

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