

Phytochemistry Research in India: A Scientometric Profile

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Abstract

This study investigate the observations of research publications in the field of Phytochemistry in India as reflected from the Web of Science (WoS) core collection database during 1994-2014. As per the database, a total 1280 scholarly publications with 1216 citations and 2083 cited references were found and have retrieved in worldwide and from India, 121 research outputs with 1446 citations and 473 authors and the cited references are 8732 were collected in the time span of 21 years. This paper discusses the various types of Phytochemistry publications such as articles, reviews, article based proceedings papers, correction and editorial materials. This paper deals with in terms of authorship pattern, single vs. joint - authored research publications, International collaboration, Institution based collaboration, subject based categories, most cited references, ranking of core journals, highly cited authors, papers and productive keywords. This paper highlights different parameters in terms of evaluation such as h-index, g-index, e-index, hc-index, HI-index, HI-norm, HI-annual, hm-index, AW-index, AWCR, and AWCRpA.

Keywords: Phytochemistry, Scientometrics, Publication analysis, Research trends, H-index, G-index, E-index, HC-index, WoS, India.

Introduction

Plants are used as drug in all walks of life in the electronic age since the period of ancestors. In ancient Greece, researchers classified the plants and provided descriptions of them accordingly helping the identification procedure. Educationists (such as Professor Jeffrey Harborne given so many researches in Phytochemistry) can play a vital role in this area of research as this kind of research requires a multi-disciplinary attitude and includes proficiency in this field. We thank to Jeffrey Harborne of his hard work and persistence for this filed so as to we have been able to produce research papers in Phytochemistry (Phillipson, 2001).

The term 'Phytochemistry' has defined 'the branch of chemistry dealing with the chemical processes associated with plant life and the chemical compounds produced by plants' (<http://www.yourdictionary.com/phytochemistry>). According to Merriam-Webster dictionary, defined 'the chemistry of plants, plant processes, and plant products'

(<http://www.merriam-webster.com/dictionary/phytochemistry>). Phytochemistry, or the chemistry of plants, one of the early subdivisions of organic chemistry, has been of great importance in the identification of plant substances of medicinal importance (Oxford online dictionary). The branch of organic chemistry dealing with the chemistry of plants (<http://www.wordfind.com>).

To identify the progress and development of recent trends of Phytochemistry research performance and also to support and strengthen this Phytochemistry field, researchers have taken into attention this topic to estimate and scrutinize the analysis by means of scientometric observations. Scientometric analysis is employed by the research scientists to study the growth of scientific publications in given science field specifically. This study is based on the bibliographic analysis which was first used the term by Pritchard (1969) as the application of statistical and mathematical methods to books and other communications. As this scientometric research is the one of the emerging thrust areas of research in the electronic knowledge world, integrating several branches of human knowledge.

Related work

A number of scientometric as well as bibliometric studies have already done by various researchers and scientists in different subjects for past few decades. Mallikand Mandal (2013) reported the literature outputs and collaborative structure analyzing microRNA for the year 2002 to 2012. The results reveal that the annual growth of countries was 36.60% and institutions were 76.64%, journals was 64.80% and the research areas was 30.5%. The average number of research papers per author was increased in first three years and after that it was decreased gradually. USA topped the list and followed by China in mircoRNA research. Shao et al. (2013) studied the scientometric analysis in oncology literature during 2001-2010. The author has selected 30 oncology journals data were collected from the web of science database. Based on the analysis, it was identified that the primary research centers and noticed the top 20 institutions in oncology. Yu et al (2012) described the scientific publications in the field of photosynthesis for the year 1992-2009. The data was collected through web of science (WoS) Science Citation Index Expanded (SCI- Expanded). The findings show that the study involved in terms of research outputs, form-wise manuscripts, subject-wise, language-wise, country –wise and institution –wise outputs. The study identified that climate change; water, stress, nitrogen and carbon dioxide were the hot topics of research on photosynthesis. Aswathy and Gopikuttan (2012) have carried out the single journal study in the Journal of Spacecraft and Rockets which was published by American Institute of Aeronautics and Astronautics for the period between 2006 and 2010. This study covered 780 literature output and 15648 references. The analysis includes various factors such as research growth rate, proportion of authorship trends, length of papers, wise distribution based on the subject, institutions, and collaborative countries. The scientometric indicators such as degree of collaboration, Lotka's law were also applied to test the author productivity. It is found that most of the journal articles published from USA as the origin of this journal and the multi-authored papers were majority than the single authors.

Liang et al (2015) assessed the quantitative and qualitative based scientific papers from various countries related to arthroscopy to examine the salient features of global wise

literature output. The web of science search engine was used to collect the publications for the period from 1999 to 2013. The global literature output of 12,553 were produced and the increased time trend for the number of papers examined as 2.27-fold between 1999 and 2013. The major proportion of research papers were published by North America, Western Europe and Eastern Asia and the high income countries produced more than 90 percent of articles. 9.11% were published by middle-income countries and only 0.02% was from lower-income countries. When adjusted by GDP, the Republic of Korea ranked in the first, and Finland was in the second place and the third rank got by Turkey. The highest citation mean value (35.56) received by Sweden, and followed by Switzerland (23.39) and the Netherlands (18.90).

Karaulova, et al (2016) studied nanotechnology research in Russia with 83 regions, 261 institutes publishing on Nanoscience were located in 40 of these regions. Moscow, Moscow Region, St. Petersburg, and Novosibirsk published Russian nanotechnology papers, contributing over 80 % of the total output and Moscow was the leading with 35 % of all RAS publications. It was found that the majority of Russian publications in English were published in translated journals and the yearly output of Russian nanotechnology research papers were gradually increased between 1990 and 2012. Physics was the dominant subject category in the disciplinary structure of the nanotechnology literature output.

Zyoud, Al-Jabi and Sweileh (2015) have analyzed scientometric study on worldwide paracetamol poisoning research output. A total of 1721 literature output were collected with 72 countries during the period of study. The results showed that the maximum number of scientific publications related to paracetamol poisoning were from the United States with 30.39 percent, and occupied in the first rank, and followed by India with 10.75% and had placed in the second position, and in the rank had received by United Kingdom with 9.36 percent. The total citations were evaluated and the mean value of 12.3 citations per document and the median was 4 and the h-index of the collected documents was 57. To support and strengthen the current research, authors' early works have chosen and the works dealt with in terms of authorship pattern, collaborative research work in Library Herald (Velmurugan and Radhakrishnan, 2015), Journal of Intellectual Property Rights (Velmurugan, 2014).

Source Data of Phytochemistry in INDIA

The source data of Phytochemistry in India has been investigated by the researchers using the publish or perish (PoP) software in terms of year –wise total number of papers, citations, papers per author, authors per paper, h-index, g-index, e-index, hc-index, hI-index, hI,norm, hI,annual, hm-index, AW-index, AWCR and AWCRpA etc. the Table 1 illustrate the whole details of source data of Phytochemistry. This type of effort has already been done by the same authors in Pharmacognosy research as reflected in the Web of Science in Advances in Pharmacognosy and Phytomedicine (Velmurugan & Radhakrishnan, 2015).

Table 1

Phytochemistry details

Sl.no	Item Details	Description
1	Source topic	Phytochemistry
2	Geographical area	INDIA
3	Database	Web of Science Core Collection
4	Query date	2015-12-08
5	Papers	121
6	Citations	1446
7	Years	21 (1994-2014)
8	Cites/year	68.86
9	Cites/paper	11.95/2.0/0 (mean/median/mode)
10	Cites/author	354.66
11	Cites/author/year	16.88
12	Papers/author	38.69
13	Authors/paper	3.91/3.0/3 (mean/median/mode)
14	h-index	18 (79%)
15	g-index	36 (91%)
16	e-index	28.57
17	hc-index	16
18	hI-index	3.31
19	hI,norm	8
20	hI,annual	0.38
21	hm-index	7.81
22	AW-index	16.09
23	AWCR	258.73
24	AWCRpA	73.20
25	Hirsch a=4.46, m=0.86	
26	Contemporary ac=4.04	

H-index is one of the tools to measure both the scientific productivity and the impact of published work of a scientist or a researcher. To calculate it, only two pieces of information are required: the total number of papers published (N_p) and the number of citations (N_c) for each paper. The index can also be applied to the productivity and impact of a group of scientists, departments or universities or countries.

The g-index improves the h-index by giving weightage to the highly-cited articles; e-index is to differentiate between scientists with similar h-indices and different citation patterns as well; hc-index is also called the contemporary h-index. It denotes that for an article published during the current year, its citations count for four times.

hI-index divides the standard h-index by an average number of authors (articles) that contribute to the h-index, in order to reduce the effects of co-authorship; $h_{I,norm}$, that gives a different approach: instead of dividing the total h-index, it normalizes the number of citations for each paper by dividing the number of citations by the number of authors for a particular paper; hI,annual is meant for an indicator of an individual's average annual research impact, as opposed to the lifetime score which is given by the h-index or $h_{I,norm}$; hm-index

determines the multi-authored h_m index based on the resulting effective rank of the papers using undiluted citation counts; Age –Weighted Citation Rate (AWCR) where the number of citations to a given paper which will be divided by the age of the paper; The AW-index is defined as the square root of the AWCR so as to allow the comparison with the h-index; AWCRpA deals with per-author age-weighted citation rate is similar to the plain AWCR, which is normalized to the number of authors for each paper. (Source: <http://www.harzing.com>). These parameters are used to identify research output of Phytochemistry as well as individual authors' potentials.

Materials and Method

For publication analysis, researchers have selected the web of science database and the search term 'Phytochemistry'. A total of 1280 world records were retrieved during the period from 1994 to 2014. Researchers refined the geographical area and chosen the country 'INDIA' and collected one hundred and twenty one (=121) records with 1446 total global citations (TGCS) and 8732 cited references (CR) from 60 core journals by 473 total authors in India collaborated with only 17 countries for the period of 21 years.

Scientometric tools used

To estimate the research output based on the data, the following scientometric tools have been employed for this analysis to retrieve the better results for the study. The tools such as:

- Degree of Collaboration (DC),
- Compound annual growth rate (CAGR),
- Growth Models such as Liner Growth Model, Exponential Growth Model, Logarithmic Growth Model and
- R- squared value (R^2)

Computer Software used

To retrieve and visualize the publication output on Phytochemistry, the following computer free as well as commercial softwares were used during the period of study.

- HistCite
- Microsoft Excel
- VOS viewer
- Publish or perish (PoP)

Data Analysis

Comparative growth analysis of research papers between World and India

Table 2 and Figure 1 & 2 bring out the growth pattern of research productivity between World and India in Phytochemistry for the year 1989-2014. The results mirror that maximum number of scientific papers more than three digits (=118 articles) were published from all over the World in 2011 whereas in Indian literature outputs more than two digits (13 articles) were produced in 2010. The highest number of research articles (=148, 11.6%) were published in 2014 throughout the world and the majority of Indian literature (=28, 23.1%) were produced in 2011. It is identified from the Table 2 based on the papers in India, the

colossal number of (= 28, 23.17%) articles were published in 2011 and the least number of papers (=5 and below) were found almost before 2008 and the nil number of publications in the year 2008. The growth rate is gradually increased except 2009 in terms of world productivity and the growth rate is slightly decreased compare with world literature in Phytochemistry during the study period.

Table 2

Growth analysis of research papers

Sl.no	PY	World		India	
		TP	TP%	TP	TP%
1	1989	3	0.2	-	-
2	1990	3	0.2	-	-
3	1991	6	0.5	-	-
4	1992	18	1.4	-	-
5	1993	18	1.4	-	-
6	1994	21	1.6	2	1.7
7	1995	26	2.0	-	-
8	1996	28	2.2	-	-
9	1997	36	2.8	2	1.7
10	1998	28	2.2	-	-
11	1999	27	2.1	1	0.8
12	2000	29	2.3	-	-
13	2001	34	2.7	-	-
14	2002	26	2.0	-	-
15	2003	36	2.8	2	1.7
16	2004	32	2.5	3	2.5
17	2005	35	2.7	2	1.7
18	2006	41	3.2	1	0.8
19	2007	81	6.3	5	4.1
20	2008	70	5.5	-	-
21	2009	58	4.5	6	5.0
22	2010	84	6.6	13	10.7
23	2011	118	9.2	28	23.1
24	2012	114	8.9	16	13.2
25	2013	160	12.5	18	14.9
26	2014	148	11.6	22	18.2
		1280	100	121	100

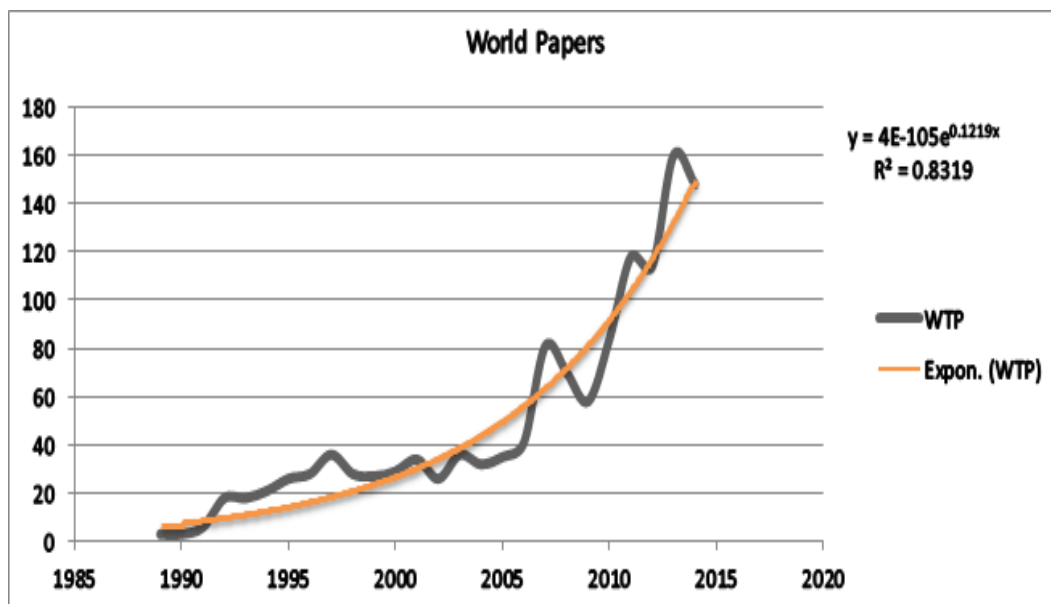


Figure 1. World Literature output

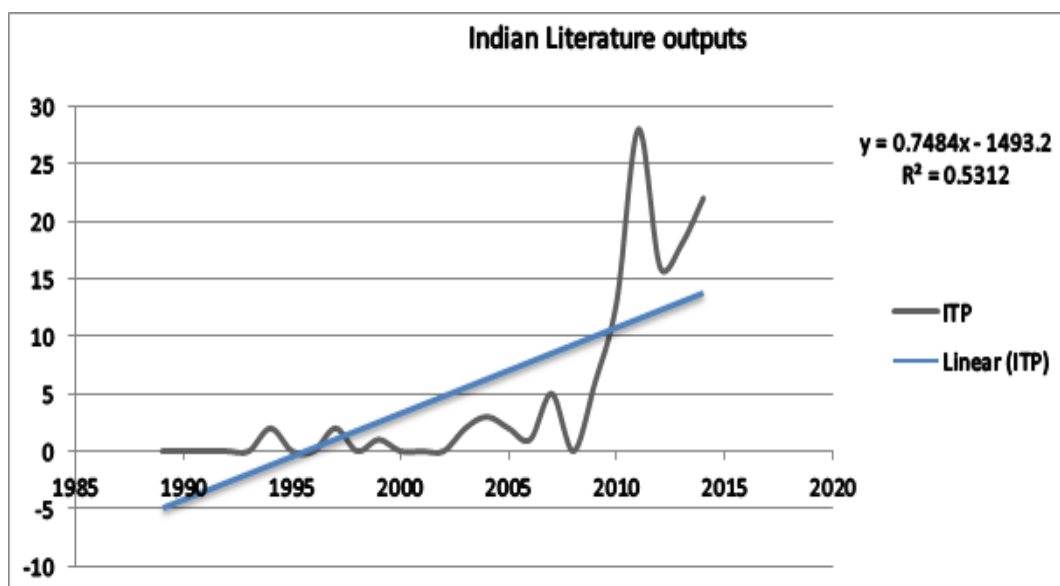


Figure 2. Literature output-India

The trend line analysis has been to determine the exponential and linear values of world and Indian literature outputs in Phytochemistry. The trend lines such as exponential and linear trend line value and R-squared values were measured through Microsoft Excel. Therefore, researchers identified the exponential growth value of world literature output is $y = 4E-105e^{0.1219x}$, and the R^2 value is 0.8319. The Indian outputs of linear trend line value is $y = 0.7484x - 1493.2$, and the R^2 value is 0.5312. R^2 value is also called R-squared value.

WoS Form- wise publication on Phytochemistry

Manuscripts are classified in terms of articles, review, article based on proceedings paper, correction, editorial materials, notes, short communications, and abstract etc. For the present study, researchers are taken all types of documents which are available in the web of science

bibliographic database during the period of study. The major proportion of articles were produced in the form of research articles (=61, 257 citations) 50.4 percent, and followed by review (=57, 1186 citations) 47.1 percent, articles from proceeding papers, correction, editorial materials are each one records (0.8%) respectively. The results bring out that most of the documents are research articles (=50.4%) and placed in the first rank and based on the citations review articles are in the first rank (=1186 citations).

WoS Year-wise growth of Literature on Phytochemistry

Table 2 Figure 3-4 illustrate the growth rate of Indian literature performance and activity of researchers in terms of publication trends. In this regard, the publication productivity has increased two papers from 1994 to six papers in 2009 and in the year 2010 onwards, the growth level has started double digit i.e. 13 research papers (=10.7%). The maximum number of 28 papers (=23.1%) were published during the year 2011 and again decreased to 16 papers (=13.2%) in the year 2012 and in the year 2014 some minor growth rate is shown. The results bring out the growth analysis of Phytochemistry in India is in the fluctuation trend. While we calculate in terms of citations, the huge number of citations (=436 citations) with 2 papers and the average citation per paper is 218 in the year 1997 and the least number of citations (=2 citations) with 2 papers and the average citation per paper is only one. The overall average citation is 103.28. The citation growth rate has been grown positively but some time it goes negatively during the study.

Table 2

Growth of Literature output-India

#	PY	Records	Percent	TC	CPP
1	1994	2	1.7	2	1
2	1997	2	1.7	436	218
3	1999	1	0.8	4	4
4	2003	2	1.7	10	5
5	2004	3	2.5	53	17.67
6	2005	2	1.7	6	3
7	2006	1	0.8	159	159
8	2007	5	4.1	5	1
9	2009	6	5.0	203	33.83
10	2010	13	10.7	146	11.23
11	2011	28	23.1	241	8.61
12	2012	16	13.2	103	6.44
13	2013	18	14.9	52	2.89
14	2014	22	18.2	26	1.18

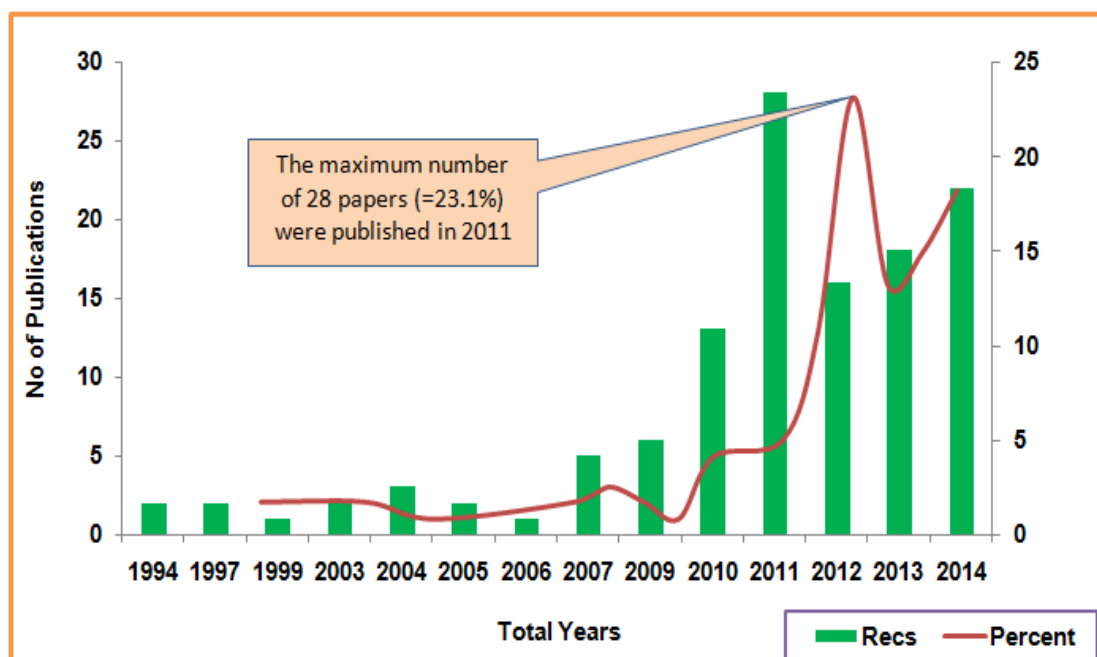


Figure 3. Growth of Literature output-India

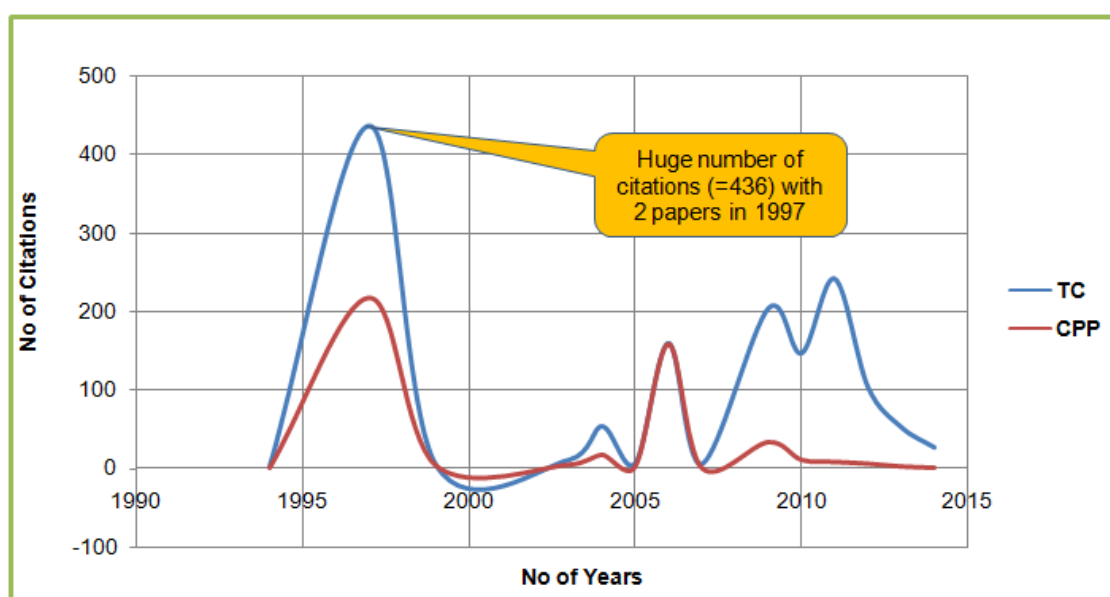


Figure 4. Citation-wise growth pattern

WoS Authorship pattern on Phytochemistry research

Table 3 Figure 5 depicts that authorship pattern of Phytochemistry in Indian research during the period of study. The maximum number of scientific publications (=469, 99.15%) were produced by the collaborative researchers and scientists. It identifies the majority of scholarly papers (=38, 114 authors) were written by three authors and has occupied first rank and followed by 24 research papers (=96 authors) were contributed by four authors and got by second position. The third most productive research papers (=20, 40 authors) were written by two authors and the least number of research articles (=1 paper, 8 authors) were contributed by eight authors and the average percentage of authors all over the papers is 8.33.

Table 3

Authorship pattern

Sl.no	Pattern	Total Papers	Total authors	Percentage	Cumulative percentage
1	Single authors	4	4	3.31	3.31
2	Two Authors	20	40	16.53	19.84
3	Three Authors	38	114	31.40	51.24
4	Four Authors	24	96	19.84	71.08
5	Five Authors	19	95	15.70	86.78
6	Six Authors	7	42	5.79	92.57
7	Seven Authors	4	28	3.31	95.88
8	Eight Authors	1	8	0.82	96.7
9	Nine Authors	0	0	0	0
10	Ten Authors	0	0	0	0
11	Eleven Authors	2	22	1.65	98.35
12	Twelve Authors	2	24	1.65	100
Total		121	473	100	

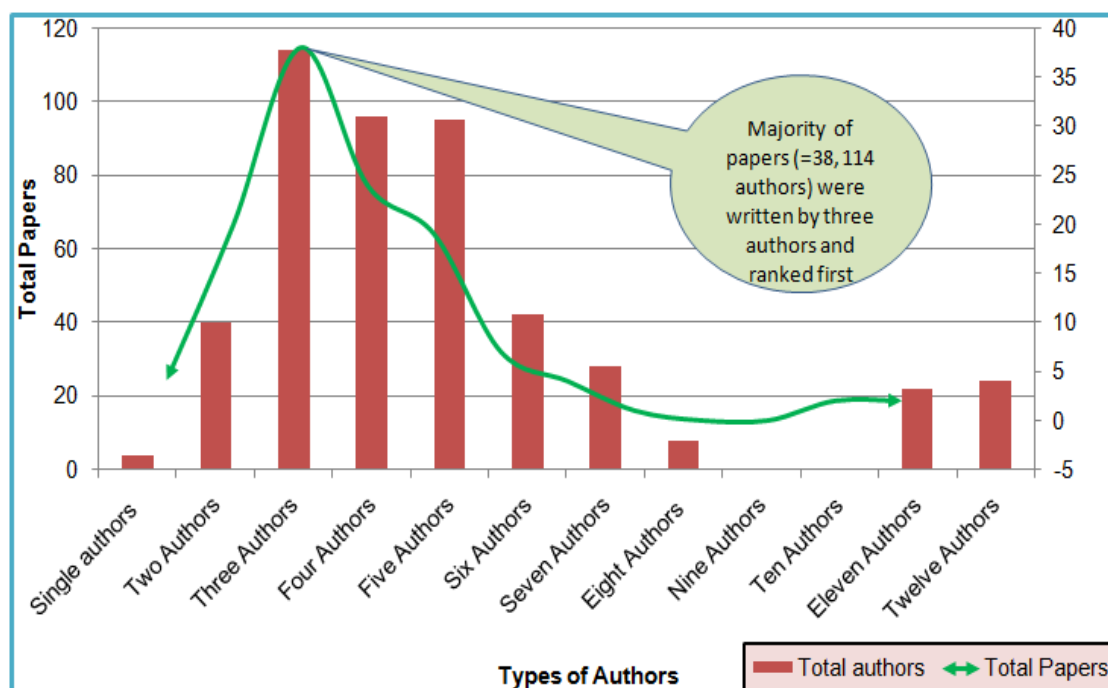


Figure 5. Authorship pattern in India

WoS Single vs. Multi- authored research publications in Phytochemistry

To evaluate the authorship pattern in terms of single versus multi-authored literature outputs in Phytochemistry during the period of study, the degree of collaboration (DC) is used. The degree of collaboration (DC) is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period of time. This formula is suggested by Subramanyam (1983) is used and it is expressed as:

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

Where, C - denotes the degree of collaboration in a discipline; Nm- indicates the number of multi-authored research papers in the discipline published during a year; Ns- represents the number of single authored papers in the discipline published during the same year. Hence, it is observed based on the formula and it is found that the degree of collaboration in the Phytochemistry analysis is 0.99.

Table 4

Degree of collaboration (DC)

Sl.no	Single Authors	Percentage	Multi-Authors	Percentage	Total Authors	Total %	DC
1	4	0.85	469	99.15	473	100	0.99

Note: DC- Degree of Collaboration

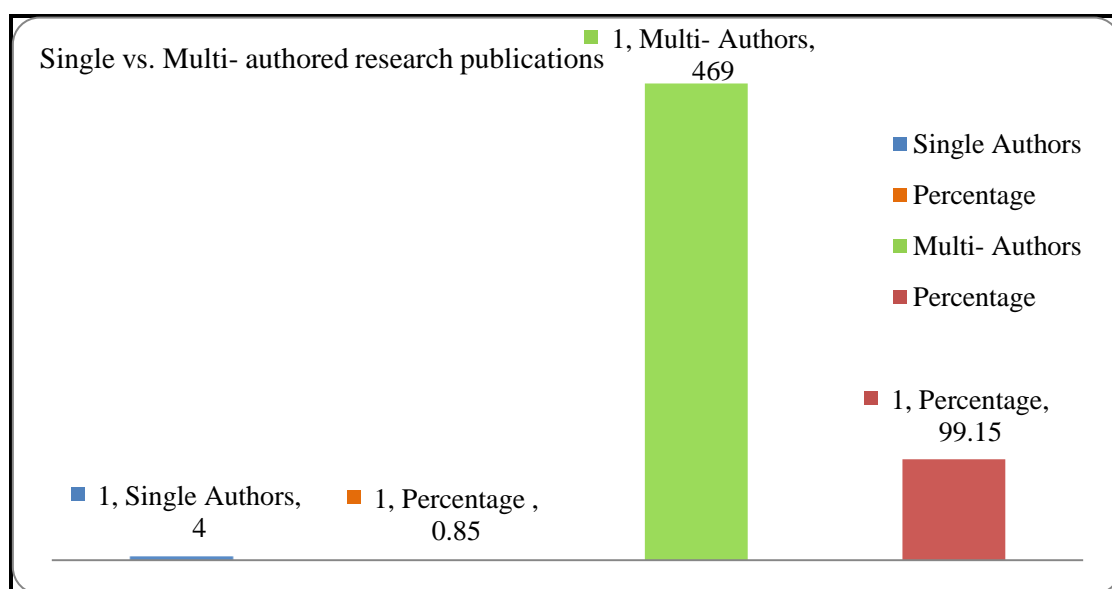


Figure 6. Single vs. Multi- authored research publications in Phytochemistry

WoS International collaboration on Phytochemistry

Table 5 indicates that the international collaborative research on Phytochemistry in India. Out of 121 scientific publications, the maximum number of outputs (=120, 99.2%) with 1025 global citations and the average citation per paper is 8.54. out of Indian research outputs, the other countries such as South Africa (=3, 2.5%) with 5 citations, Spain, United Kingdom and United States are published two research articles (=2, 1.7%) with different number of citations, and only one research article (=0.8%) are published by Australia, Brazil, Cameroon, Canada, Denmark, France, Iran, Madagascar, Mexico, Saudi Arabia, South Korea and United Arab Emirates respectively. The results indicate that very least number of papers was published by some big countries and it shows that the collaborative countries are not involved and interested to publish their research papers with India in the Phytochemistry.

Table 5

International collaboration

#	Country	Total Papers	Percent	Total citations	ACPP
1	India	120	99.2	1025	8.54
2	South Africa	3	2.5	5	1.67
3	Spain	2	1.7	1	0.5
4	United Kingdom	2	1.7	69	34.5
5	United States	2	1.7	41	20.5
6	Australia	1	0.8	25	25.0
7	Brazil	1	0.8	0	0
8	Cameroon	1	0.8	6	6
9	Canada	1	0.8	15	15
10	Denmark	1	0.8	421	421
11	France	1	0.8	6	6
12	Iran	1	0.8	2	2
13	Madagascar	1	0.8	3	3
14	Mexico	1	0.8	15	15
15	Saudi Arabia	1	0.8	1	1
16	South Korea	1	0.8	6	6
17	United Arab Emirates	1	0.8	26	26

WoS Ranking of Institutions on Phytochemistry

Table 6 indicates that the literature outputs from Institutions and University in the field of Phytochemistry during the study period. Out of 151 institutions, we have chosen to analyze only top most productive research papers which are published by the eminent scholars and faculty members of Phytochemistry department. The Table 6 illustrate the results that the highest number of articles (=7, 5.8%) with 70 global citations published by the 'Father Muller Med College' and the same articles with 108 global citations by Maharani Lakshmi Ammani Womens College and they are comes under first rank and followed by 'Banaras Hindu University' (=5, 4.1%) with only 5 citations and place in the second position and 'Annamalai University' (=4, 3.3%) with 33 citations and the same record count has got by 'Jadavpur University' with 77 global citations and they have placed in the third rank. The other institutions and universities wherein listed in the table below have placed in the fifth rank based on the research papers of Phytochemistry.

Table 6

Institution and University based distribution

Rank	Institution	Records	Percent	TLCS	TGCS
1	Father Muller Medical College	7	5.8	1	70
1	Maharani Lakshmi Ammani Womens College	7	5.8	1	108
2	Banaras Hindu University	5	4.1	0	5
3	Annamalai University	4	3.3	1	33
3	Jadavpur University	4	3.3	1	77

(=9.1%) and 136 total citations and followed by 'Food Research International' has occupied second place with 7 articles (=5.8%) and the total citations are 108. The third rank has got 'Asian Pacific Journal of Tropical Medicine' journal has positioned with 6 record count along with 18 citations and followed by 'Journal of Medicinal Plants Research' has forth rank with only five records (=37 citations), and the journals such as 'Asian Journal of Chemistry', 'Biomed Research International', 'Fitoterapia', 'International Journal of Pharmacology', 'Pharmaceutical Biology' and 'Phytochemistry' are in the fifth rank (=4, 3.3%) with different citations respectively. Among the core journals, the highest number (=457) of citations got by Phytochemistry and even though it is in the fifth rank based on the record count and the least number of (=1 citation) citations has got by the five journals and the nil (=0 citations) citations by 15 core journals

Table 7

Ranking of Core journals

Sl.no	Rank	Journal	TR	TR %	TC	TCS/t
1	1	Journal of Ethnopharmacology	11	9.1	136	37.55
2	2	Food Research International	7	5.8	108	27.00
3	3	Asian Pacific Journal of Tropical Medicine	6	5.0	18	5.33
4	4	Journal of Medicinal Plants Research	5	4.1	37	8.25
5	5	Asian Journal of Chemistry	4	3.3	3	0.65
6	5	Biomed Research International	4	3.3	3	3.00
7	5	Fitoterapia	4	3.3	67	20.85
8	5	International Journal of Pharmacology	4	3.3	7	1.40
9	5	Pharmaceutical Biology	4	3.3	8	1.60
10	5	Phytochemistry	4	3.3	457	28.31
11	6	Chinese Journal of Natural Medicines	3	2.5	2	2.00
12	6	Indian Journal of Traditional Knowledge	3	2.5	2	1.33
13	6	Journal of Vector Borne Diseases	3	2.5	28	6.83
14	6	Natural Product Research	3	2.5	10	7.00
15	7	Acta Poloniae Pharmaceutica	2	1.7	1	0.25
16	7	Evidence-Based Complementary and Alternative Medicine	2	1.7	3	0.75
17	7	Journal of Pharmacy and Pharmacology	2	1.7	93	15.50
18	7	Journal of Pure and Applied Microbiology	2	1.7	1	0.20
19	7	Journal of Scientific & Industrial Research	2	1.7	11	1.97
20	7	Journal of Steroid Biochemistry and Molecular Biology	2	1.7	9	0.92
21	7	Mini-Reviews in Organic Chemistry	2	1.7	3	1.50
22	7	National Academy Science Letters-India	2	1.7	3	1.00
23	7	Natural Product Communications	2	1.7	2	0.67
24	7	Natural Product Reports	2	1.7	211	26.33
25	8	African Journal of Pharmacy and Pharmacology	1	0.8	3	0.75
26	8	Analytical Methods	1	0.8	2	2.00
27	8	BMC Complementary and Alternative Medicine	1	0.8	25	8.33
28	8	Brazilian Journal of Pharmaceutical Sciences	1	0.8	0	0.00

Sl.no	Rank	Journal	TR	TR %	TC	TCS/t
29	8	Chembiochem	1	0.8	0	0.00
30	8	Chemistry & Biodiversity	1	0.8	6	2.00
31	8	Chinese Journal of Integrative Medicine	1	0.8	3	1.00
32	8	Current Topics in Medicinal Chemistry	1	0.8	0	0.00
33	8	Expert Opinion on Investigational Drugs	1	0.8	3	3.00
34	8	Fruits	1	0.8	0	0.00
35	8	Indian Journal of Chemistry Section B-Organic Chemistry including Medicinal Chemistry	1	0.8	2	0.10
36	8	Indian Journal of Pharmaceutical Sciences	1	0.8	0	0.00
37	8	Industrial Crops and Products	1	0.8	1	1.00
38	8	International Journal of Nanomedicine	1	0.8	43	14.33
39	8	Journal of Clinical Pediatric Dentistry	1	0.8	2	0.50
40	8	Journal of Essential Oil Bearing Plants	1	0.8	0	0.00
41	8	Journal of Food Measurement and Characterization	1	0.8	0	0.00
42	8	Journal of Food Science and Technology-Mysore	1	0.8	15	3.75
43	8	Journal of Forestry Research	1	0.8	2	1.00
44	8	Journal of Insect Science	1	0.8	3	1.00
45	8	Journal of the Indian Chemical Society	1	0.8	0	0.00
46	8	Journal of the Science of Food and Agriculture	1	0.8	5	2.50
47	8	Journal of Planar Chromatography-Modern TLC	1	0.8	0	0.00
48	8	Physiological And Molecular Plant Pathology	1	0.8	47	4.27
49	8	Phytochemicals for Pest Control	1	0.8	15	0.83
50	8	Phytochemistry Letters	1	0.8	2	1.00
51	8	Phytotherapy Research	1	0.8	8	4.00
52	8	Plant Archives	1	0.8	0	0.00
53	8	Plant Cell Tissue and Organ Culture	1	0.8	0	0.00
54	8	Polish Journal of Food and Nutrition Sciences	1	0.8	0	0.00
55	8	Proceedings of the National Academy of Sciences India Section B-Biological Sciences	1	0.8	0	0.00
56	8	Research Journal of Biotechnology	1	0.8	0	0.00
57	8	Saudi Journal of Biological Sciences	1	0.8	1	0.50
58	8	Scientific World Journal	1	0.8	1	1.00
59	8	Tropical Journal of Pharmaceutical Research	1	0.8	34	5.67
60	8	Vegetos	1	0.8	0	0.00

WoS Highly productive Keywords on Phytochemistry

It is evident from the table indicates that there are 1380 total keywords have listed in this analysis. Out of them, only top ten most productive keywords have chosen for present study. Keywords are playing a vital role in every field of knowledge in the knowledge world. Here, too there are significant to illustrate them in a statistical way. It is ranked the keywords in terms of productive aspects. The word 'Review' has 36 record counts with 409 total citations and has placed in the first rank and followed by the word 'Phytochemistry' has 33 record counts with 655 citations and ranked in the second position, 'Phytochemical' has 25 research

articles with 195 citations, and has occupied in the third rank, 'Pharmacology' (=21, 201 citations), and the key word 'Pharmacological' (=15, 144 citations) has placed in the fifth rank. The results reveal that based on the findings, the maximum number of citations (=655 citations) has occupied the word 'Phytochemistry' and has placed in the highest rank and the next 'Review' (=409 citations) is in the second rank.

Findings and Conclusion

The scientometric study is the best way to evaluate the scientific publications in any subject area. Phytochemistry is one of the thrust areas in the knowledge society. The major findings are that the highest number of research articles (=148, 11.6%) were published in 2014 throughout the world and the majority of Indian literature (=28, 23.1%) were produced in 2011. The most of the documents are research articles (=50.4%) and placed in the first rank and based on the citations review articles are in the first rank (=1186 citations). The highest number of articles (=7, 5.8%) with 70 global citations published by the 'Father Muller Med College' and the same articles with 108 global citations and it is found that the word 'Review' has 36 record counts with 409 total citations and has placed in the first rank and followed by the word 'Phytochemistry' has 33 record counts with 655 citations and ranked in the second position. As far as the research concerned, researchers have identified that this is the first scientometric study which is done in the field of Phytochemistry research output worldwide for the period of 1989-2014 and the research India level for the period 1994-2014.

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