

# **Authorship Patterns of “Indian Physicists” In Web of Science Database (2011-2020)**

**Gajbe Sankalp S<sup>1</sup>; Dr. Sonwane Shashank<sup>2</sup>**

Librarian, G.E.P's, Mahila Mahavidyalaya, S.V. Joshi High School, Dombivli (E) Thane, Maharashtra, India<sup>1</sup>; Professor, Dept. of Library and Information Science, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India<sup>2</sup>

*gajbe.sankalp16@gmail.com; shashank65@gmail.com*

## **ABSTRACT**

*The study presents a Scientometric Analysis of 7362 articles published in “Indian Physicists” during the year 2011-2020. The data is collected and analyzed by using the MS- Excel software. The study focused on various aspects authorship pattern & author productivity, institution-wise distribution, geographical distribution of contribution, document type-wise distribution. Out of 7362 contributions, the study revealed that most of the papers (93%) of papers were contributed by multiple authors. United States is the top producing country with 50.79% publications of the total output. All the articles were published in English language. The study demonstrates and elaborates on the various aspects of the Journal, such as its distribution of article by year, authorship patterns, and distribution of contributions by institution, subject distributions, rank of cited authors, and geographical distributions of authors.*

**KEYWORDS:** Bibliometric, Scientometric, Authorship Pattern, Author Ranking, Indian Physicists.

## **INTRODUCTION**

Bibliometrics is a set of methods used to study or measure texts and information (Wikipedia, 2011). A bibliometric analysis is employed by many researchers to study the literature in a given field. Such a study is often carried out by counting the references cited by a large number of researchers in their papers. The term Bibliometrics is derived from two distinct words, biblio and metrics. The word biblio is derived from the combination of the Latin and Greek word biblion, meaning “book” or “paper” while the word metrics indicates the science of meter, i.e., measurement and is also derived either from the Latin word metrics or the Greek word metrikons, both meaning “measurement”. Therefore, bibliometrics connotes the science of measurement pertaining to books or documents. In a sense, information science is an extension of library science or an expansion of reference services. In other words, bibliometrics is a branch of science, which studies the behavior of information. Traditionally, it is associated with the quantitative measurement of documentary materials. Bibliometrics is the use of statistical methods in the analysis of a body of literature to reveal the historical development of subject fields and patterns of authorship, publication, and use. In other words, it is a type of research method used in library and information science. It

utilizes quantitative analysis and statistics to describe patterns of publication within a given field or body of literature. Researchers may use bibliometric methods of evaluation to determine the influence of a single writer or to describe the relationship between two or more writers or works.

## **REVIEW OF LITERATURE**

There have been few scientometrics studies conducted on individual journals. Some of the relevant studies in the aforementioned for direction are creditable of review.

Navgare and Et al (2015), evaluated a study on A scientometrics analysis of 215 articles published in “Journal of Collaborative Librarianship” by during the year 2009 to 2014. In his study they showed that distribution of contribution, authorship pattern & author productivity, institution-wise distribution, geographical distribution of contribution, document type-wise distribution, and average length of paper, mail domain wise distribution and number of references in each year.

Wankhede, Kakde and Khandare (2015), they study “A Bibliometric Analysis Of The Urban Library Journal On Doaj” contents 36 articles published in “Urban Library Journal” during the year 2010- 2014..Data is collected and analyzed by using the SPSS software. The study concentrated on a number of factors, including authorship patterns, institutions involved, most prolific journal authors, document kinds, publications, and citations, year-by-year. The survey found that 33.33% of the papers had many authors who each contributed to the writing. With 100% of all publications produced, the United States is the leading producer. English was the only language used to publish the articles. The study illustrates and elaborates on several Journal features, including its article distribution by year, authorship patterns.

## **OBJECTIVE OF THE STUDY**

The main objective of the study is to present the growth of literature, and make Quantitative and qualitative assessment of the research by analyzing the research outputs towards identifying the following facts:

- ✓ Year-wise Distribution of Contribution.
- ✓ Year-wise Authorship pattern of Contribution.
- ✓ Degree of Collaboration
- ✓ To find out the most productive Author.
- ✓ Language-wise distribution of citations
- ✓ Ranking of First authors.
- ✓ Ranking of All authors. (General Author)

### **About the Database Web of Science**

The Web of Science, formerly Web of Knowledge, is a platform with paid access that gives users access to numerous databases that contain reference and citation data from academic journals, conference proceedings, and other publications in a range of academic subjects. The Institute for Scientific Information created it at first. Currently owned by Clarivate, which was once Thomson Reuters' Intellectual Property and Science division.

A citation index is based on the idea that in science, citations act as links between related pieces of research and point to relevant or related scientific material, such as journal articles, conference proceedings, abstracts, etc. A citation index also makes it simple to find the literature that has had the greatest influence in a given topic or across multiple disciplines. Linking to all the papers that have mentioned a particular paper, for instance, will show how influential that work is. Current trends, patterns, and newly developing fields of study can all be evaluated in this way. The Science Citation Index, created by Eugene Garfield, is credited as being the "father of citation indexing of academic literature", which eventually gave rise to the Web of Science.

### **Scope and Limitation**

This study is limited to the "Indian Physicists" during the year 2011-2020. Total 7362 articles were published during the year 2011-2020 on Web of Science. The Collected data was organized, analyze and generate the tables, using the MS Excel and presented in table, graphs and charts format for final study.

### **DATA ANALYSIS AND INTERPRETATION**

In views of the objectives of the present study, analysis the "Indian Physicists" on Web of Science during 2011-2020.

The collected data will be analysis by different scientometric techniques and parameters viz authorship pattern. Author productivity, Degree of Collaboration, etc. which is presented in the form of tables and figures.

#### **1. Year wise citation of article**

**Table No. 1:** Year wise citation of article

<b>Sr. No</b>	<b>Year wise</b>	<b>Total</b>	<b>Percentage</b>
1	2011	965	13.11
2	2012	1123	15.25
3	2013	629	8.54
4	2014	493	6.70
5	2015	495	6.72
6	2016	640	8.69
7	2017	670	9.10
8	2018	732	9.94
9	2019	778	10.57
10	2020	837	11.37
	<b>Total</b>	<b>7362</b>	<b>100.00</b>

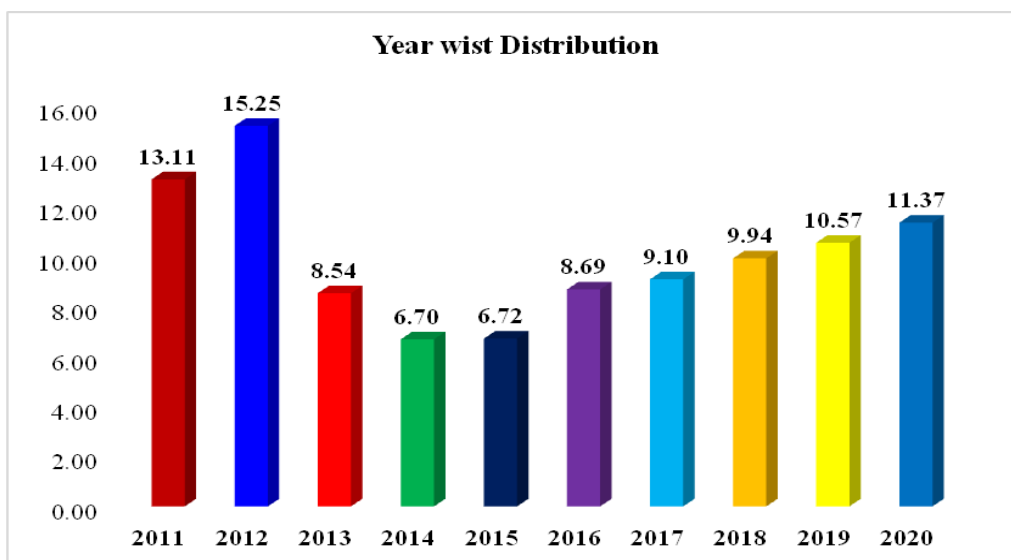


Figure No. 1: Year wise citation of article

The distribution of research articles on Indian Physicist by year indexed in Web of Science from 2011-2020. It is clear that the number of research articles has been increased over the months. It indicates also that of the 7362 articles published in 2012. i.e. (15.25%) has the highest number. While in the other years (84.75%) the lowest number.

## 2 Authorship pattern of citations

The authorship patterns of citation are arranged as Single, Two, Three, Four, Five, Six, Seven, Eight, Nine, Ten and More Than Ten Author. The citations are arranged under each category for counted their percentage in authorship pattern for showing the trends of research as solo or corporate in Indian Physicist research, which is shown in the table No.2 and figure no 2

Table – 2 Authorship Pattern of Citations

Sr. No	Authorship Pattern	Frequency	Percentage
1	Single Author	449	6.10
2	Double Author	1561	21.20
3	Three Author	1650	22.41
4	Four Author	1141	15.50
5	Five Author	677	9.20
6	Six Author	366	4.97
7	Seven Author	220	2.99
8	Eight Author	139	1.89
9	Nine Author	96	1.30
10	Ten Author	61	0.83
11	More Than Ten Author	1002	13.61
	<b>Total</b>	<b>7362</b>	<b>100.00</b>

## Authorship Patterns of "Indian Physicists" In Web of Science Database (2011-2020)

It is observed from the above table that, out of 7362 authors citations, the single author with 449(6.10%) of total citation, followed by two authors with 1561(21.20%) citations, three authorship is most prominent with 1650(22.41%) of total citations, four authors with 1141(15.50%) citations, five authors with 677(9.20%) citations, six authors with 366(4.97%) citations, seven authors with 220(2.99%) citations, Eight authors with 139(1.89%) citations, Nine authors with 96(1.30%) citations, Ten authors with 61(0.83%) citations and the More Than Ten Author citations are 1002(13.61%) citation respectively.

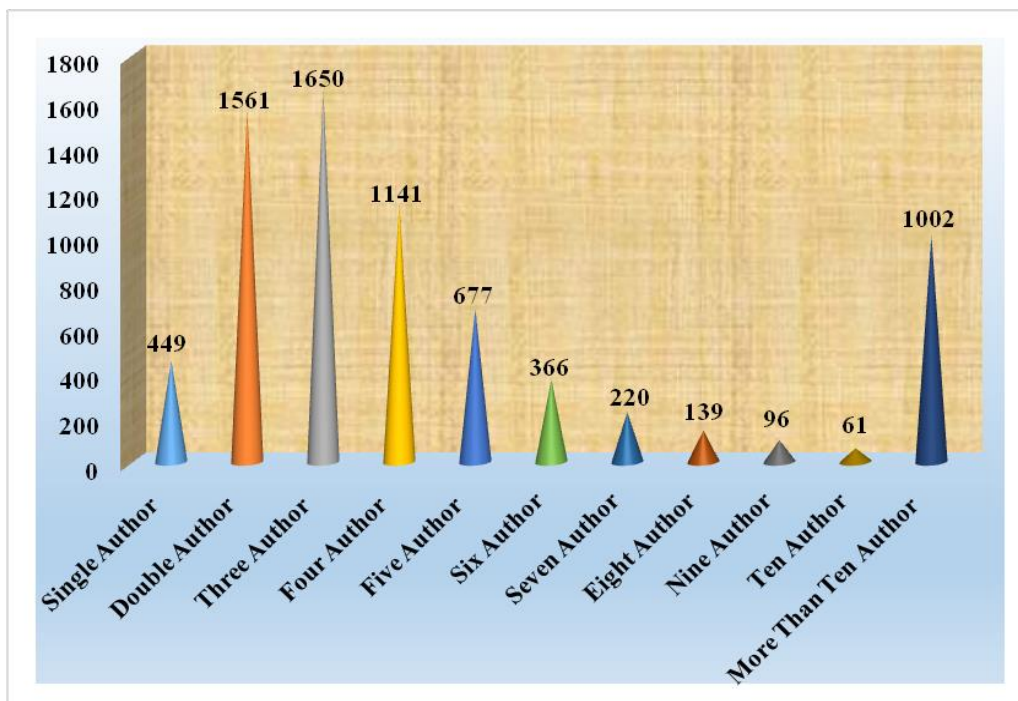


Figure No.2 Authorship pattern of total citations

### 3 Authorship Pattern year wise

Collaborative research is very much feature of the library and information science especially during the 21<sup>st</sup> century. It is the natural reflection of complexity. Scale and cost of modern irrisaction in Library and Information Science. Multi Authorship provides different measures of collaboration in the subject. Table No.3 reveals the authorship pattern of the articles published during the period of study.

Table No.3: Authorship Pattern year wise

Sr. No	Year	Authorship pattern					Total	%
		Single	Two Author	Three Author	Four Author	More Than Four Author		
1	2011	70	210	216	144	325	965	13.11
2	2012	61	228	293	184	357	1123	15.25
3	2013	28	154	147	92	208	629	8.54
4	2014	44	99	116	52	182	493	6.70
5	2015	32	99	99	92	173	495	6.72

6	2016	53	130	130	96	231	640	8.69
7	2017	45	136	136	107	246	670	9.10
8	2018	33	158	151	108	282	732	9.94
9	2019	39	166	180	120	273	778	10.57
10	2020	44	181	182	146	284	837	11.37
	Total	449	1561	1650	1141	2561	7362	100.00
	%	6.10	21.20	22.41	15.50	34.79	100.00	

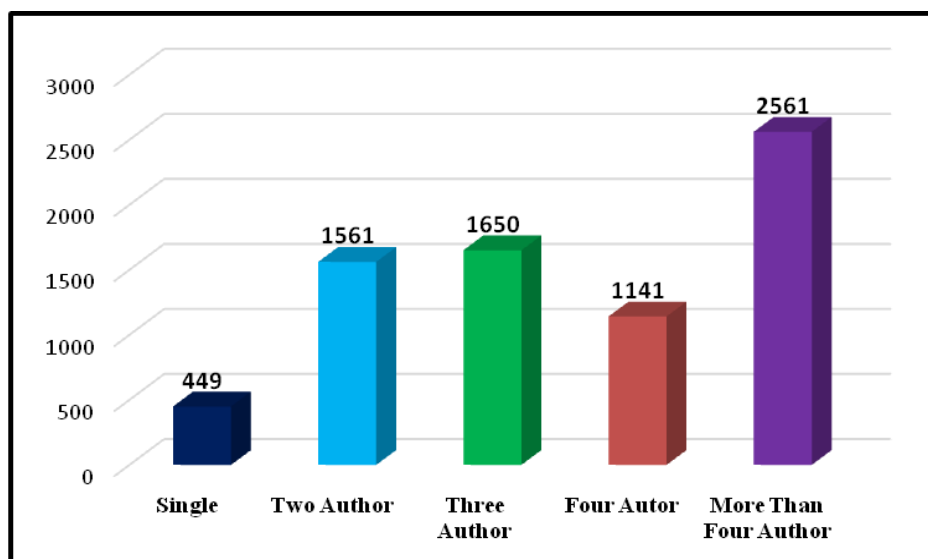


Figure No. 3: Authorship Pattern year wise

It is clear that the 449 articles written by single author and it is the highest number published in Web of Science 2011. It indicates also that 28 articles written by single author published in Web of Science 2013. It is the lowest number. The number of research articles has been published in Web of Science written by two authors i.e. 228 (2012) it is the highest number and 99 articles published in 2014 & 2015 with lowest number. It indicate that in 2012, 293 research articles are published written by three authors as well as 99 research articles are published in 2015 and those are lowest number. 52 research articles are published in year 2014. It is the lowest number. 184 articles written by four authors published in 2012 i.e. highest number. More than four authors contributed 173 research articles in the year 2015. It is the lowest contribution. In the year 2012, 357 research articles contribution by more than four authors. It is the highest number is the ten years rank. 2561 research articles are contributed by more than four authors.

#### 4. Degree of Collaboration

Degree of collaboration (DC) among different authors presented in Table No.4.10 in order to calculate the Degree of Collaboration (DC) the formula given by Subramanyam (1983) have been employed which is expressed mathematical as;

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$$DC = \frac{Nm}{Nm + Ns}$$

Whereas- DC= Degree of Collaboration  
 Nm= No. of multi authors papers  
 Ns= No. of Single authored Papers.

Here - Nm= 895  
 Ns= 70

$$DC = \frac{895}{70 + 895} = 0.93$$

**Table No.4:** Degree of Collaboration

Sr. No.	Years	Single Author Papers	Multi Author Papers	TA	TP	DC
1	2011	70	895	57535	965	0.93
2	2012	61	1062	95732	1123	0.95
3	2013	28	601	128009	629	0.96
4	2014	44	449	135396	493	0.91
5	2015	32	463	122789	495	0.94
6	2016	53	587	135991	640	0.92
7	2017	45	625	162668	670	0.93
8	2018	33	699	194852	732	0.95
9	2019	39	739	125821	778	0.95
10	2020	44	793	127518	837	0.95
	<b>Total</b>	<b>449</b>	<b>6913</b>	<b>1286311</b>	<b>7362</b>	<b>0.94</b>

(N.B. TA-Total Authors, TP-Total Paper, DC-Degree of Collaboration)



**Figure No. 4:** Degree of Collaboration



The above table reveals that, the year wise degree of collaboration which is falls between 0.96 and 0.91 with an average of 0.94 during the study period.

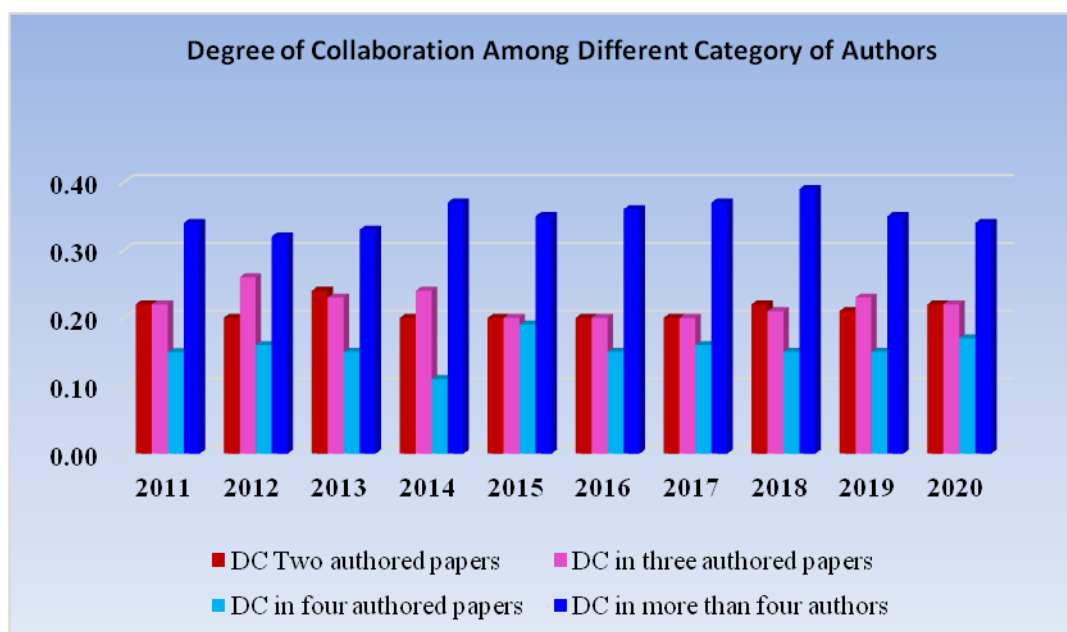
**5 Degree of Collaboration among different category of authors**

The degree of collaboration or the collaboration coefficient is the ratio of the number of collaborative papers to the total number of papers published during a fixed period of time.

Collaboration coefficient is the ratio of the number of collaborative papers to the total number of papers published.

**Table No.5:** Degree of Collaboration among different category of authors

Sr. No.	Year	DC Two authored papers	DC in three authored papers	DC in four authored papers	DC in more than four authors
1	2011	0.22	0.22	0.15	0.34
2	2012	0.20	0.26	0.16	0.32
3	2013	0.24	0.23	0.15	0.33
4	2014	0.20	0.24	0.11	0.37
5	2015	0.20	0.20	0.19	0.35
6	2016	0.20	0.20	0.15	0.36
7	2017	0.20	0.20	0.16	0.37
8	2018	0.22	0.21	0.15	0.39
9	2019	0.21	0.23	0.15	0.35
10	2020	0.22	0.22	0.17	0.34



**Figure No. 5:** Degree of Collaboration among different category of authors



## Authorship Patterns of "Indian Physicists" In Web of Science Database (2011-2020)

The table No.5 shows that, the degree of collaboration among two authors publication 0.24 is the highest and least was 0.20. In three authors collaboration 0.26 is highest least 0.20 in four authors collaboration 0.19 was highest and least was 0.11 whereas more than four authors' collaboration 0.39 was highest and least was 0.32. It was noticed that 0.39 was highest among the collaboration in different category of authors.

### 6. Authors Productivity

Yashikane and Others (2009) in their papers published in Scientometrics Journal have given a formula to calculate Average Author Per Paper (AAPP) and Productivity Per Author (PPA). The formula is mathematically represented as follows:

$$\text{AAPP} = \frac{\text{No. of Authors}}{\text{No. of Papers}} ; \frac{57535}{965} = 59.62$$

$$\text{PPA} = \frac{\text{No. of Papers}}{\text{No. of Authors}} ; \frac{965}{57535} = 0.017$$

**Table No.6:** Authors Productivity

Sr. No.	Year	Total Paper	Total Author	AAPP	PPA
1	2011	965	57535	59.62	0.017
2	2012	1123	95732	85.25	0.012
3	2013	629	128009	203.51	0.005
4	2014	493	135396	274.64	0.004
5	2015	495	122789	248.06	0.004
6	2016	640	135991	212.49	0.005
7	2017	670	162668	242.79	0.004
8	2018	732	194852	266.19	0.004
9	2019	778	125821	161.72	0.006
10	2020	837	127518	152.35	0.007
	<b>Total</b>	<b>7362</b>	<b>1286311</b>	<b>174.72</b>	<b>0.006</b>

(N.B. AAPP-Average Author per Paper, PPA-Productivity per Author)

Table No. 6 illustrates the average author per paper for the period 2011-2020 is 174.72 and productivity per author mentioned as 0.006.

The above table shows that the data pertaining to author productivity and average author per year. The highest no. of productivity per author is 0.017 and lowest no. of author is found 0.004. In the case of Average Author Per Paper the highest no. was found that 274.64 and lowest number was found 59.62.

## 7. Language-wise distribution of citations

A total number of 7362 citations of Indian Physicist in web of Science are distributed among languages used is shown in Table No.7

**Table– 7** Language-Wise Distribution of Citations

Sr. No	Language	Total	Percentage
1	English	7359	99.96
2	Chinese	2	0.03
3	Danish	1	0.01
<b>Total</b>		<b>7362</b>	<b>100.00</b>

It is observed from the above table that, out of 7362 citations, the English language scores the top position with 7359(99.96%) citations, Chinese language goes to second position with 2(0.03%) citations, and the minimum numbers of citations are from Danish language with 1(0.01%) citations. This again shows that English language is dominant over other languages

## 8. Rank list of Authors (General)

In the general rank list of author's equal weightage was given to every author irrespective of their position, whether he/she is on first, second or on sixth position. Accordingly the rank list of authors of overall proceedings was prepared and list of five top ranked authors is presented in table no. 8

**Table No. 8:** Ranking of authors (Author may be on any position)

Sr. No	Author	Citation	Percentage	Rank
1	Kumar A	1499	0.12	1
2	Jain S	1015	0.08	2
3	Bhattacharya S	979	0.08	3
4	Banerjee S	930	0.07	4
5	Finger M	891	0.07	5
6	Sharma A	879	0.07	6
7	Wang J	819	0.06	7
8	Kim H	812	0.06	8
9	Sharma V	805	0.06	9
10	Malik S	799	0.06	10
11	Belyaev A	797	0.06	11
12	Fabbri F	781	0.06	12
13	Lee S	765	0.06	13
14	Wang Z	735	0.06	14
15	Weber M	730	0.06	15
16	Muller T	706	0.05	16
17	Li W	669	0.05	17
18	Gomez JP	665	0.05	18
19	Lee J	664	0.05	19
20	Ahmad M	652	0.05	20

21	Chauhan S	650	0.05	21
22	Chen Y	637	0.05	22
23	Lee SW	620	0.05	23
24	Ghosh S	615	0.05	24
25	Vorobyev A	610	0.05	25
<b>Conti....</b>				
	<b>Total</b>	<b>1296311</b>	<b>100.00</b>	

The author which the is most preferred by researchers, that document is most important to keep in the library for that purpose author ranking is essential to librarians as well as researchers. It is observed form the above table that, a total of 1296311 personal authors appeared from 7362 citations of Indian Physicist from Web of Science. The ranking of personal authors according to their contributions is reveals that the top most cited author are “Kumar A.” scores the top position with 1499 (0.12%) citations, second rank goes to ‘Jain S’ with 1015 (0.08%) citations, followed by “Bhattacharya S.’ with 979 (0.08%) citations respectively

### **FINDINGS, CONCLUSIONS AND SUGGESTIONS**

The findings are based on the analysis of collected data appended in 7362 articles in Indian Physicists in web of Science, These are following.

1. The highest numbers 1123 (15.25%) of papers were published in 2012 contributing.
2. Year wise degree of collaboration which is falls between 0.96 and 0.91 with an average of 0.94 during the study period.
3. Average author per paper for the period 2011-2020 is 174.72 and productivity per author mentioned as 0.006
4. Mostly the articles were published in English language (99.96).
5. The top most cited author are “Kumar A.” scores the top position with 1499 (0.12%) citations.

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