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## Scientometric Analysis of the International Journal of Toxicology

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#### Abstract

*The present paper analyses the publications of the journal, 'International Journal of Toxicology' for the period from 2011 to 2015. The study emphasizes on ascertaining the year wise growth of publications, authorship pattern, geographical distribution etc. The data were extracted from the Web of Science database for five years period. The outcomes of the study are: multi-authorship publications dominate over the single authored publications; there is a remarkable difference existing between the quantity of publications cited and the uncited and D.V. Belsito from Columbia University, USA ranked first among the authors*

#### Keywords

Bibliometrics; Scientometric Study; Toxicology authorship pattern;

#### Electronic access

The journal is available at [www.jalis.in](http://www.jalis.in)



Journal of Advances in Library and Information Science  
ISSN: 2277-2219 Vol. 6. No.4. 2017. pp.418-426

## 1. INTRODUCTION

Journals being a primary source of information, play a pivotal role in the process of scholarly communication. It is the means through which the new inventions and findings are communicated by the scientists and scholars to the world. Schaffner (1994) has identified that constructing a collective knowledge base, disseminating information, authenticating the quality of research, giving out rewards and building scientific communities as the five prominent roles played by the journals within the scholarly communities. The peer review process plays an active role in ratifying the research quality in a field. But, as mentioned by Kumashiro (2005) it may also hinder publicizing new ideas and methods (Solomon, 2007). Peer reviewed journals are likely to remain as a very important means through which the research findings are communicated to the present and anticipated scientific communities (Thyer, 2008).

*International Journal of Toxicology* is a peer reviewed academic journal bearing ISSN number 10915818. It publishes scholarly articles in the Toxicology discipline. The journal is being published since 1982 by the SAGE publications in association with the American College of Toxicology. It is a bimonthly Journal which publishes 6 issues in a year. According to the Journal Citation Report® (2016), the Impact Factor (IF) of the journal is 1.205. The journal publishes the peer reviewed papers on the latest topics which are of current interest to the Toxicologists. The output of the International Journal of Toxicology during the period of 5 years (2011-2015) is analysed in the present study to identify the growth, volume and yearwise distribution of the publications, authorship pattern, geographical and countrywise distribution of publications and author's ranking.

## 2. REVIEW OF RELATED LITERATURE

Mini Devi (2013) conducts the bibliometric study on the core journals in the field of Toxicology. The data for the study was obtained from the Toxicology Information Online (TOXLINE) database. The study has found that the journal *Toxicology* secured first rank and the USA was found to be the most productive country with 47.45% of the total journals. Gorraiz and Schloegl (2007) carry out an analysis on Pharmacology and Pharmacy journals using bibliometric measures. The study aims at evaluating the suitability of the Scopus database for conducting the bibliometric analysis as compared to the Web of Science. The study reveals that Scopus is

the most suitable database for conducting bibliometric analysis. Madhubala and Singh (2014) study the contributions made during 2009-2013 to the Indian Journal of Biochemistry and Biophysics (IJBB). The NISCAIR Online Periodicals Repository (NOPR) was used as the source for the study. The study has revealed that the Indian contributions were more compared to the other countries and about 51.3% of the total output was contributed by the multi - authors.

Schloegl and Gorraiz (2010) investigate the existing similarities and differences between the global usage and global citation metrics for the Pharmacy and Pharmacology journals. The study emphasizes on finding out whether the number of citations had any direct influence on the number of the downloads. Mini Devi (2007) examines the phenomena of bibliographic coupling in nine core journals of Toxicology as reflected in the TOXLINE (Toxicology Information Online). The study has noted that the journal *Toxicology* had the highest percentage of bibliographically coupled papers. Bird (2008) examines 27 journals indexed in the Journal Citation Reports (JCR). The database was searched by using the keyword Toxicology for the period 1999-2006. The impact factors and h-indices of the journals from 1999-2006 were recorded. The study has revealed that, all the 27 Toxicology journals had lower impact factors compared to other scientific journals. Zyoud et al. (2014) assess the research output contributed by the 13 Middle Eastern Arab countries to the area of Toxicology using international peer reviewed Toxicology journals as source of data. The study reveals that there is a promising rise in the Toxicology research in the Arab world. It has also revealed that the research output is low in some countries.

### 3. OBJECTIVES OF THE STUDY

The main objective of the study is to evaluate the impact of the journal using various bibliometric measures. The specific objectives of the study are to:

1. To study the chronological growth of the literature
2. To determine the authorship pattern ;
3. To ascertain the geographical distribution of Toxicology output ;
4. To assess the proportion of single and multi - authored publications ;
5. To evaluate the volume-wise proportion of different types of information sources ;

6. To measure the average immediacy index of the journal for the period of study.

### 4. METHODS & MATERIALS

The Web of Science is the most widely used database for conducting scientometric analysis in various disciplines. The data for the study was retrieved from the Science Citation Index Expanded within the Web of Science core collection. The study is limited to the period of five years from 2011 to 2015. The database was searched for the data using the advanced search option. The Syntax used for searching the database is SO=(International Journal of Toxicology) PY=(2011 - 2015). The obtained data was tabulated and analysed to attain the objectives of the study.

### 5. ANALYSIS & INTERPRETATION

#### 5.1 Year-wise distribution of papers

The table 1 portrays the year-wise distribution of the output. The number of publications decreased from 207 in the year 2011 to 167 in the year 2015. The highest and lowest number of publications was contributed in the year 2011 and 2012 respectively. There was a drastic decline in the number of publications in the year 2012. Though, the number of publications decreased, there was not much difference in the number of citations received between the papers published in the year 2011 and 2012. This indicates that the quantity of papers may have been decreased, but the quality of the papers has increased for the year 2012.

**Table 1:** Year-wise distribution of papers

Year	Volume No.	No. of Issues	No. of papers	%
2011	30	6	207	27.8
2012	31	6	68	9.13
2013	32	6	145	19.5
2014	33	6	157	21.1
2015	34	6	167	22.4
Total			744	100

## 5.2 Volume-wise distribution of papers

**Table 2 :** Volume-wise distribution of papers

Issue No.	Volume No.		32	33	34	Total
	30	31				
1	144	10	87	100	106	447
2	17	9	8	6	11	51
3	10	10	20	12	12	53
4	10	20	8	14	13	71
5	14	10	12	10	12	60
6	12	9	10	15	13	62
Total	207	68	145	157	167	744

The table 2 depicts the volume-wise distribution of the publications. The highest number of papers (207) were published in the volume 30 which forms about 27.82 % of the total publications. It is evident from the table that the first issues of all the five volumes have the higher number of publications, which forms about 60% of the total output. Whereas, there is a drastic decline in the number of publications in the successive issues of all the volumes. The least number of publications (6) were published in the second issue of the 33<sup>rd</sup> volume.

## 5.3 : Types of Information Sources

**Table 3:** Types of Information Sources

Year	Volume No.	Issue No.	Articles	Meeting Abstracts	Reviews	Editorial Materials	Corrections	Biographical Items	Book Reviews	Total
2011	30	1	7	137	-	-	-	-	-	144
		2	16	-	1	-	-	-	-	17
		3	9	-	-	1	-	-	-	10
		4	7	-	-	2	1	-	-	10
		5	13	-	-	1	-	-	-	14
		6	12	-	-	-	-	-	-	12
2012	31	1	9	-	-	1	-	-	-	10
		2	7	-	-	1	-	1	-	9
		3	10	-	-	-	-	-	-	10
		4	19	-	-	-	1	-	-	20
		5	10	-	-	-	-	-	-	10
		6	9	-	-	-	-	-	-	9
2013	32	1	6	80	-	1	-	-	-	87
		2	7	-	-	1	-	-	-	8
		3	18	-	1	1	-	-	-	20
		4	6	-	1	1	-	-	-	8
		5	12	-	-	-	-	-	-	12
		6	8	-	1	1	-	-	-	10
2014	33	1	15	83	1	1	-	-	-	100
		2	6	-	-	-	-	-	-	6
		3	12	-	-	-	-	-	-	12
		4	11	-	1	2	-	-	-	14
		5	9	-	-	1	-	-	-	10
		6	15	-	-	-	-	-	-	15
2015	34	1	8	97	-	1	-	-	-	106
		2	8	-	-	-	-	-	3	11
		3	11	-	-	1	-	-	-	12
		4	9	-	1	1	-	-	2	13
		5	12	-	-	-	-	-	-	12
		6	13	-	-	-	-	-	-	13
Total			314	397	7	18	2	1	5	744

The table lustrates the proportion of different types of documents forming the total output. Meeting abstracts and articles formed the first and second major portion forming 53.36% and 42.20% of the total output respectively. Meeting abstracts and articles together formed about 95.56% of the total

output. Rest of the 4.44% was formed by the other document types such as Reviews (0.94%), Editorial Materials (2.41%), Corrections (0.26%), Biographical Items (0.13%) and Book Reviews (0.67%).

**Table 4:** Authorship pattern

Year	Volume No.	Issue No.	Single author	Two authors	Three authors	Four authors	>Four authors	Total
2011	30	1	64	15	10	12	43	144
		2	-	-	-	1	16	17
		3	1	-	-	2	7	10
		4	2	-	2	2	4	10
		5	-	1	2	-	11	14
		6	1	-	3	2	6	12
2012	31	1	1	-	-	2	7	10
		2	2	2	-	1	4	9
		3	1	1	2	1	5	10
		4	1	1	1	-	17	20
		5	-	-	-	2	8	10
		6	-	-	2	2	5	9
2013	32	1	4	6	9	14	54	87
		2	1	1	1	2	3	8
		3	-	-	-	3	17	20
		4	1	1	1	2	3	8
		5	-	1	-	1	10	12
		6	1	-	2	-	7	10
2014	33	1	1	5	16	15	63	100
		2	-	-	1	-	5	6
		3	-	2	1	1	8	12
		4	2	-	-	1	11	14
		5	2	1	1	-	6	10
		6	-	-	2	4	9	15
2015	34	1	2	14	15	12	63	106
		2	3	-	-	2	6	11
		3	1	2	2	-	7	12
		4	3	1	-	1	8	13
		5	1	-	1	2	8	12
		6	-	-	1	2	10	13
Total			95	54	75	89	431	744

#### 5.4 Authorship Pattern

The table 4 exhibits the authorship pattern of the publications. Single author contributions were 95 in number, which formed 12.76% of the total output. Rest of the 649 publications were contributed by the co-authors, which is about 87.23% of the total publications. Two authors contributed less number of publications (54). Whereas, more than five authors contributed highest number (431) of publications, which is about 57.93%. It can be derived from the table that the multi-authorship publications dominate over the single authored publications.

#### 5.5 Distribution of citations

The table 5 shows the number of citations received by the publications. A total of 1425 citations including the self citations received by 744 articles were analysed. Among the 744 articles, 267 (35.88%) articles were cited. Whereas, the rest of the 477 (64.11%) articles did not receive any citation. Out of the 267 articles cited, major proportion (20.5%) of the articles received single citation each, followed by, 17.97% articles which received two citations each. Remaining 38.5% of the articles received citations between 3 and 57. Thus, it can be inferred from the table that there is a remarkable difference existing between the quantity of publications cited and uncited.

**Table 5 :** Distribution of citations

No. of citations	No. of articles	%
0	477	64.11
1	55	7.39
2	48	6.45
3	32	4.30
4	32	4.30
5	21	2.82
6	15	2.01
7	9	1.20
8	10	1.34
9	7	0.94
10	6	0.80
11 - 57	32	4.30
Total	744	100

#### 5.6 Volume-wise distribution of citations

The table 6 sheds light on the volume-wise distribution of citations, average citations per paper and the number of publications not cited. Though the lowest number of papers were published in the volume 31, it had the highest average citation per paper (6.04) and very least percentage of uncited papers (14.70%). This shows that the articles published in the vol. 31 were of the high quality. The Average Citation Per paper for all publications was 1.92. Though, the 30<sup>th</sup> volume published the highest number of papers, 69.08% of the total papers remained uncited. This shows the quality of the papers was not upto the mark. It is evident from the table that the high quantity papers and high quality papers were published in the volume 30 and 31 respectively.

**Table 6 :** Volume-wise distribution of citations

Year	Volume No.	No. of publications (Percentage)	No. of citations (Percentage)	ACP	PNC (percentage)
2011	30	207 (27.82)	449(31.28)	2.17	143 (69.08)
2012	31	68(9.13)	416(28.98)	6.12	10(14.70)
2013	32	145 (19.48)	250(17.42)	1.72	94(64.82)
2014	33	157(21.10)	195(13.58)	1.24	100(63.69)
2015	34	167(22.44)	125(8.71)	0.75	130(77.84)
Total	-	744	1435	1.93	477(64.11)

PNC – Publications Not Cited; ACP – Average Citation Per Paper

### 5.7 Age-wise distribution of citations

The table provides the age-wise distribution of citations. The Immediacy Index stipulates the speed with which the publications in a journal are appended as references in other literature (Mcveigh, 2014). Higher the number of citations received by the papers in the first year of their publication, higher the Immediacy Index. About 4.52% of the papers

received citations in the first year of their publication. The average Immediacy Index of the journal during the period was 0.10. It can be observed from the table that, except for the year 2015, the articles have received maximum number of citations in the third year of their publication. After the third year, there was a gradual decrease in the number of citations received.

**Table 7 :** Age-wise distribution of citations

Articles published		Citing year							
Number	Year	2011	2012	2013	2014	2015	2016	2017	Total
207	2011	14	57	101	81	77	79	40	449
68	2012		14	54	108	98	80	62	416
145	2013			5	53	73	72	47	250
157	2014				20	54	80	41	195
167	2015					12	63	50	125

### 5.8 Ranking of authors

The table 5 enumerates the top 20 prolific authors according to their rank. The 2,670 authors contributed to 744 articles during the period of five years. The average number of authors per paper was

3.58. The top seven authors secured first rank by contributing 51 papers each, which is about 47.98% of the total output. Andersen F. A secured second rank by contributing 50 papers. The top 20 productive authors contributed to 628 papers which is about 84.40% of the output.

**Table 8 :** Ranking of authors

Name of the author	Affiliation of the author	No. of publications	Percentage (%)	Rank
Belsito D V	Columbia University Medical Center, New York, NY.	51	6.855	1
Bergefeld W F	Cleveland Clinic Foundation, Cleveland, Ohio.	51	6.855	1
Klaassen C D	University of Kansas Medical Center, Kansas.	51	6.855	1
Marks J G	Penn State Health Milton S. Hershey Medical Center, Hershey.	51	6.855	1
Shank R C	University of California, Irvine.	51	6.855	1
Slaga T J	The University of Texas Health Science Center, San Antonio.	51	6.855	1
Synder P W	Experimental Pathology Laboratories inc. Midwest, West Lafayette, Indiana, USA.	51	6.855	1
Andersen F A	The Cosmetic Ingredient Review (CIR), Washington D.C, USA.	50	6.720	2
Hill R A	University of Louisiana, Monroe, USA.	49	6.586	3

Liebler D C	Protypia LLC, Brentwood, USA.	32	4.301	4
Fiume M M	The Cosmetic Ingredient Review (CIR), Washington D.C, USA.	17	2.285	5
Genter M B	University of Cincinnati Cincinnati, Ohio.	17	2.285	5
Liebler D	Protypia LLC, Brentwood, USA.	17	2.285	5
Heldreth B	The Cosmetic Ingredient Review (CIR), Washington D.C, USA.	15	2.016	6
Liu J	The Huazhong University of Science and Technology, Wuhan, China.	14	1.882	7
Mckee R H	ExxonMobil Biomedical Sciences Inc, Annandale, USA.	14	1.882	7
Becker L C	The Cosmetic Ingredient Review (CIR), Washington D.C, USA.	13	1.747	8
Forster R	CiTox Lab, Laval, Canada.	13	1.747	8
Bouchard G F	Sinclair Research Center LLC, Auxvasse,USA.	10	1.344	9
Degeorge G	MB Research Labs, Spinnerstown, Pennsylvania.	10	1.344	9

### 5.9 Geographical distribution of authors

The table 6 presents the volume wise geographical distribution of the authors. The Indian authors contributed 21 publications. The major portion (723) of the publications were from the foreign authors. The efforts should be made by the Indian authors to publish more internationally collaborated papers in order to increase their visibility in the *International Journal of Toxicology*. While identifying the authors and their affiliation, several inconsistencies were found with regard to the names of the authors and their affiliation. Based on the affiliation and the email address provided, the names Liebler D and Liebler D C were found to be used for the same author. However, they have been listed as two different authors in the Web of Science.

**Table 9 :** Geographical distribution of authors

Year	Volume No.	Issue No.	Indian authors	Foreign authors
2011	30	1	3	141
		2	1	16
		3	-	10
		4	-	10
		5	-	14
		6	2	10
2012	31	1	-	10
		2	1	8

		3	1	9
		4	2	18
		5	-	10
		6	-	9
2013	32	1	-	87
		2	-	8
		3	-	20
		4	1	7
		5	-	12
		6	-	10
2014	33	1	2	98
		2	2	4
		3	1	11
		4	-	14
		5	1	9
		6	-	15
2015	34	1	1	105
		2	-	11
		3	1	11
		4	1	12
		5	-	12
		6	1	12

**Table 10 :** Country-wise distribution of publications

Country	No. of Publications	%
USA	513	60.6
Canada	55	10.7
Peoples Republic of China	27	3.19
England	27	3.19
Germany	26	3.07
India	24	2.83
Switzerland	23	2.71
Japan	23	2.71
South Korea	14	1.65
France	12	1.41
Denmark	8	0.94
Brazil	7	0.82
Netherlands	5	0.59
Egypt	5	0.59
Australia	5	0.59
Turkey	4	0.47
Tunisia	4	0.47
Saudi Arabia	4	0.47
Poland	4	0.47
Italy	4	0.47
Iran	4	0.47
Argentina	4	0.47
Spain	3	0.35
Scotland	3	0.35
Russia	3	0.35
Malaysia	3	0.35
Austria	3	0.35
Taiwan	2	0.23
Sweden	2	0.23
Singapore	2	0.23
Nigeria	2	0.23
Mexico	2	0.23
Israel	2	0.23
Ireland	2	0.23
Hungary	2	0.23
Vietnam	1	0.11
Thailand	1	0.11
South Africa	1	0.11
Romania	1	0.11
Portugal	1	0.11
Peru	1	0.11
Pakistan	1	0.11
Nepal	1	0.11
Greece	1	0.11
Ghana	1	0.11
Czech Republic	1	0.11
Cuba	1	0.11
Belgium	1	0.11
Total	846**	

\*\* the number differs because of multi-authored articles contributed by authors from more than 2 nations.

### 5.10 Country-wise distribution of publications

The table 7 indicates the countrywise distribution of publications. As the journal is an American Publication, major portion (60.6%) of the contributions were from the American authors. The USA ranked first with the highest number of publications, followed by, Canada which contributed 10.7% of total publications. The rest of the contributions were from the other countries.

## 6. CONCLUSION AND SUGGESTIONS

The study analyses the 744 papers published in the *International Journal of Toxicology*. As the findings showed that major proportion of the output remains uncited, efforts should be made by the authors to publish more quality papers in order to decrease the proportion of uncited papers. There was a drastic decline in the number of publications for the year 2012. Though, the year 2012, had the least number of publications, the higher Average Citation Per Paper value and least number of uncited publications, shows that, the quality of publications was also highest for the same year. About 60.6% of the publications were from the USA, as the journal is published by SAGE in association with the American College of Toxicology.

It is found from the study that there were lack of inconsistencies in the Web of Science with regard to the names of the authors and their respective affiliation. For example, the names Liebler D and Liebler D C were found to be same author, as they had the same affiliation and email address. However, the Web of Science has listed them as variant authors. These kinds of issues will give rise to several conflicts in the mind of the researchers while finding the institution wise productivity. The Immediacy Index of the journal being 0.10 indicates that the articles published in the journal were not recognised soon after their publication among the scientific community. The average authors per paper being 3.58 reveals that there is an increasing trend towards the multi-authorship. The proportion of publications contributed by the Indian authors formed about 2.82%. Therefore, it is high time for the Indian authors to focus on producing more number of internationally collaborated papers in order to increase their visibility in the International Journal of



Toxicology. The number of received citations are considered as one of the basic factors to measure the quality of publications among the scientific community. Hence, efforts should be made by the academia towards contributing more number of quality papers instead of merely producing more number of papers.

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