Scientometric Analysis of Gene Cloning Research Output

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Abstract

The present paper analyses the publications of the journal, 'Gene Cloning Research Output' 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; The average number of pages per journal article is 8.37 in the block year 2001 to 2005, whereas it was 8.50 in the block year 2011 to 2015. Subsequently there is an increasing trend in all the blocks year periods. On the whole the average number of pages per Journal article has been arrived at 8.42.

Keywords

Bibliometric; Scientometrics; Gene Cloning

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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).

On review of the literature it was found that none of the studies have been conducted either at macro or micro level on the growth pattern of literature in the field of 'Gene Cloning'. A large number of articles in journals, research papers presented in conferences, reports and so on are published on 'Gene Cloning'. Being a popular medical subject, there is a continuous growth of information in the field of ''Gene Cloning '' and related subjects, it is necessary to study quantitatively, the research output of literature by applying scientometric tools/indicators. This study would be benefited to identify the major areas of research in the field of ''Gene Cloning '' and to asses the extent of research carried out by scientists from various countries. For these reasons, it is proposed to study quantitatively the research literature published on ''Gene Cloning '' covered in the bibliographic database namely PubMed in MEDLINE format.

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.

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

ANALYSIS

The research productivity on 'Gene Cloning' covered in the database is shown in Table 1. It is observed that 66790 records on 'Gene Cloning' are covered in the total output of MEDLINE database in the study period. The literature has been classified according to year of publication. It is found that there is a gradual decreasing of literature in the subject of study by year after year. The year 2001 has marked a maximum of 8.61% out of total productivity in the study period

Table 1: Quantum of Literature published in Gene Cloning by year wise

S.No.	Year	Frequency	%	Cumulative %
1	2001	5749	8.61	8.61
2	2002	5357	8.02	16.63
3	2003	5155	7.72	24.35
4	2004	5082	7.61	31.96
5	2005	4651	6.96	38.92
6	2006	4432	6.64	45.56
7	2007	4424	6.62	52.18
8	2008	4288	6.42	58.6
9	2009	4311	6.45	65.05
10	2010	4082	6.11	71.16
11	2011	3996	5.98	77.14
12	2012	4397	6.58	83.72
13	2013	3956	5.92	89.64
14	2014	3478	5.21	94.85
15	2015	3432	5.15	100.00
Total		**66790**	**100.00**	

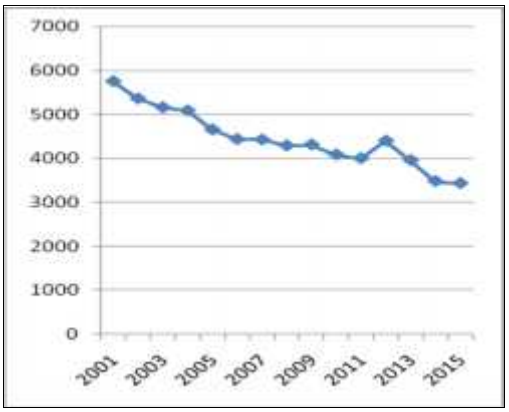


Figure 1 Year wise Productivity of Gene Cloning Research

QUANTUM OF GENE CLONING RESEARCH OUTPUT ACCORDING TO SUB-FIELDS

It has been found that the Gene Cloning literature output has been grouped in 23 major sub-fields based on database coveredTherefore the literature has been grouped in those major sub-fields and the data is presented in Table 5.2. It is observed that majority of the literatures are covered on "Biochemistry" followed by "Veterinary Science" and "Genetics".

Table 2: Quantum of Gene Cloning Research output according to Sub-fields

S.No.	Sub-field	No. of Contribution	%	Cumulative Total	Cumulative %
1	Biochemistry	20536	30.75	20536	30.75
2	Veterinary Science	12066	18.07	32602	48.81
3	Genetics	10401	15.57	43003	64.39
4	Molecular Biology	6672	9.99	49675	74.37
5	Gastroenterology	2657	3.98	52332	78.35
6	Amino Acids	1851	2.77	54183	81.12
7	Enzymology	1686	2.52	55869	83.65
8	Pharmacology	1636	2.45	57505	86.10
9	Cell culture	1248	1.87	58753	87.97
10	Physiology	1062	1.59	59815	89.56
11	Adult	1021	1.53	60836	91.09
12	Biotechnology	655	0.98	61491	92.07
13	Immunology	591	0.88	62082	92.95
14	Geriatrics	474	0.71	62556	93.66
15	Agriculture	422	0.63	62978	94.29
16	Oncology	264	0.40	63242	94.69
17	Microbiology	230	0.34	63472	95.03
18	Ascomycota	218	0.33	63690	95.36
19	Pathology	207	0.31	63897	95.67
20	Virology	207	0.31	64104	95.98
21	Biodegradation	172	0.26	64276	96.24
22	Algorithms	170	0.25	64446	96.49
23	Obstetrics and Gynecology	79	0.12	64525	96.61
	Others	2265	3.39	66790	100.00
	Total	**66790**	**100.00**		

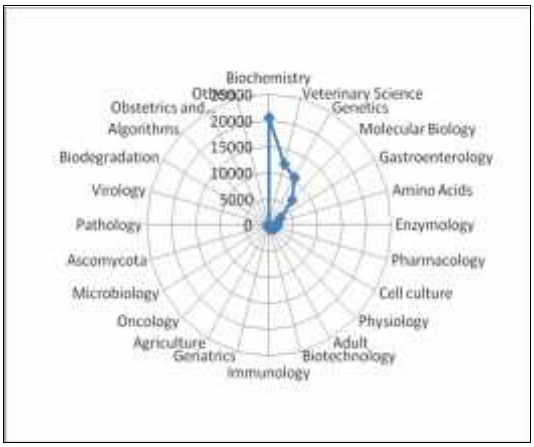


Figure 2 Rotate graph for the sub-fields of Gene Cloning Research

DISTRIBUTION OF RESEARCH PRODUCTIVITY ACCORDING TO COUNTRY Vs. YEAR

Distribution of contributions of Gene Cloning by country and year wise is presented in Table 5.3. It is seen from the table 5.3 that United States has produced 27017 records out of 66790 records, ranking in the first position, followed by England (16046) and Netherland (8397) as second and third positions respectively. Indian contributions (198) have been ranked in the 16th position with 0.30% of total output (Figure 5.3). The highest number of publications were seen in the year 2001 (5749), followed by 2002 (5357).

Table 3: Year Vs. Country wise Distribution of Gene Cloning Research

COUNTRY	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	**No. of records**	**%**
United States	2808	2510	2407	2357	2027	1766	1667	1617	1513	1392	1428	1640	1432	1260	1193	27017	40.45
England	1310	1332	1204	1151	1124	1063	1132	1165	1119	1051	997	907	950	730	811	16046	24.02
Netherlands	592	521	541	530	492	537	553	504	622	628	594	751	574	528	430	8397	12.57
Germany	273	274	307	339	295	397	386	324	320	420	349	452	394	378	300	5208	7.80
China	208	257	299	294	336	310	293	293	246	221	193	220	166	124	138	3598	5.39
Japan	96	97	97	82	81	74	71	69	113	78	92	64	54	65	64	1197	1.79
Switzerland	93	42	37	33	31	29	25	23	21	32	43	52	56	78	100	695	1.04
Korea (South)	36	29	19	33	38	31	69	72	55	62	41	52	34	34	41	646	0.97
France	26	28	40	50	51	38	42	46	45	31	52	27	36	29	26	567	0.85
Ireland	116	95	38	24	34	26	21	29	32	26	25	26	25	15	21	553	0.83
Brazil	2	4	5	2	4	10	8	8	12	19	27	28	62	82	139	412	0.62
Russia (Federation)	26	28	22	21	27	19	26	12	20	18	24	22	16	12	17	310	0.46
Canada	43	25	16	32	13	31	28	20	32	12	19	13	8	9	3	304	0.46
Austria	25	11	10	17	8	19	20	13	21	14	12	32	24	14	28	268	0.40
Greece	26	29	26	25	21	11	11	2	7	6	13	24	18	17	21	257	0.38
India	5	8	4	12	10	8	8	18	12	9	15	20	27	20	22	198	0.30
Australia	11	7	14	11	8	5	11	4	23	7	11	11	21	17	11	172	0.26
Denmark	12	15	17	16	5	10	7	14	22	7	12	6	6	8	9	166	0.25
Spain	7	8	9	6	8	6	5	10	10	13	5	2	6	6	0	101	0.15
Poland	8	6	7	5	10	5	4	5	8	6	7	4	6	6	6	93	0.14
Iran	0	0	0	0	0	0	1	4	9	4	8	13	14	14	25	92	0.14
Belgium	4	1	2	3	6	5	4	6	10	3	4	2	1	3	3	57	0.09
Italy	2	5	6	3	7	3	3	7	2	1	3	5	3	2	2	54	0.08
Ukraine	2	2	1	4	0	9	2	4	4	4	2	1	1	2	0	38	0.06
Slovakia	6	3	2	2	1	4	2	0	4	0	2	4	3	2	2	37	0.06
New Zealand	3	1	0	4	0	0	2	2	2	3	4	2	1	1	4	29	0.04
Thailand	2	1	3	2	0	1	2	2	5	1	2	2	2	4	0	29	0.04
Scotland	3	6	4	2	1	0	1	2	1	0	2	0	3	2	0	27	0.04

Singapore	0	3	8	4	2	2	0	0	1	0	1	3	2	1	0	27	0.04
Egypt	0	0	1	5	1	1	0	0	5	1	0	2	1	3	4	24	0.04
United Arab Emirates	0	0	2	1	1	4	2	2	4	1	2	1	1	2	1	24	0.04
Hungary	1	2	2	2	3	1	3	1	1	1	0	1	0	1	0	19	0.03
Malaysia	0	0	1	2	0	1	0	1	1	3	2	3	1	3	0	18	0.03
Pakistan	0	0	0	0	0	0	7	4	1	2	0	0	2	1	0	17	0.03
Other Countries	3	7	4	8	6	6	8	5	8	6	5	5	6	5	11	93	0.14
Total	**5749**	**5357**	**5155**	**5082**	**4651**	**4432**	**4424**	**4288**	**4311**	**4082**	**3996**	**4397**	**3956**	**3478**	**3432**	**66790**	**100.00**

DISTRIBUTION OF RESEARCH PRODUCTION BY LANGUAGE Vs. YEAR

The distribution of Gene Cloning literature by language is shown in Table 5.4. The scholarly communication is effected through English language in almost all the countries irrespective of the native language of the country. This phenomenon is not an exception to the subject of Gene Cloning which published about 94.85% of the research output in English. This is followed by Chinese (4.40%) and Russian (0.39%) as second and third positions respectively.

Therefore from the above analysis, it is inferred that English language is dominating in the scholarly communication of Gene Cloning research.

Table 5.4: Language Vs. Year wise distribution of Gene Cloning Research

Languages	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	**No. of records**	**%**
English	5532	5081	4841	4800	4334	4145	4162	4017	4069	3883	3815	4193	3804	3366	3311	63353	94.85
Chinese	165	211	261	244	274	245	221	248	211	176	160	187	137	98	101	2939	4.40
Russian	25	29	23	20	25	16	25	13	14	14	15	10	11	8	15	263	0.39
Japanese	18	19	13	8	10	9	10	1	2	3	3	3	3	2	3	107	0.16
French	2	8	7	3	3	2	2	3	1	0	2	3	0	0	1	37	0.06
Spanish	1	1	2	0	3	2	3	1	2	1	1	0	0	1	0	18	0.03
Ukrainian	2	0	0	0	0	6	0	2	3	2	0	1	0	1	0	17	0.03
German	0	2	2	4	1	1	0	2	2	1	0	0	0	0	0	15	0.02
Polish	2	0	4	1	1	0	0	0	1	1	0	0	0	0	0	10	0.01
Turkish	0	1	0	1	0	1	0	1	1	0	0	0	1	1	1	8	0.01
Portuguese	0	0	0	0	0	2	1	0	2	1	0	0	0	0	0	6	0.01
Dutch	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0.01
Croatian	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	3	0.00
Czech	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0.00
Italian	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0.00
Danish	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00
Hebrew	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.00
Hungarian	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00
Korean	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.00
Serbian	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.00
Total	**5749**	**5357**	**5155**	**5082**	**4651**	**4432**	**4424**	**4288**	**4311**	**4082**	**3996**	**4397**	**3956**	**3478**	**3432**	**66790**	**100.00**

BIBLIOGRAPHIC FORMS Vs. YEAR WISE DISTRIBUTION OF GENE CLONING ENGINEERING RESEARCH

Table 5 reveals the distribution of the 'Gene Cloning' research output according to bibliographic form and year of publication. It is an accepted fact that most of the scholarly communication of scientific research is published in periodicals and sometimes presented in the conferences. Of course, those conference papers are further updated and published in journals of the respective field of knowledge. Therefore, scientific communication is being mostly made through subject periodicals, as they are termed as primary vehicles of research communication.

In this study, about 96.35% have published in Journal Articles followed by Eluvation Study (0.92%) and English Abstract (0.84%). The literature published in other bibliographic forms is less than 1.89% of the total output

Table 5: Publication Type Vs. Year wise distribution of Gene Cloning Research

Pub. Type	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	**No. of records**	**%**
Journal Article	5652	5269	5025	4979	4552	4339	3809	4166	4205	3985	3882	4022	3656	3427	3382	64350	96.35
Evaluation Studies	13	28	0	55	54	59	52	58	66	56	61	50	33	19	12	616	0.92
English Abstract	0	0	0	0	0	0	238	0	0	0	0	186	138	0	0	562	0.84
Comparative Study	0	0	0	0	0	1	270	33	0	0	0	91	81	10	0	486	0.73
Case Reports	34	24	1	10	11	17	20	16	16	16	30	20	18	11	21	265	0.40
News	9	10	79	6	3	0	2	1	0	0	1	0	2	0	0	113	0.17
Comment	8	13	22	4	13	7	2	2	7	0	1	1	3	0	2	85	0.13
Letter	6	4	16	7	4	1	9	3	3	2	5	7	13	2	2	84	0.13
Historical Article	4	3	0	6	4	4	7	4	5	13	4	5	4	6	7	76	0.11
Clinical Trial	1	1	0	4	2	0	5	2	2	0	3	4	2	3	1	30	0.04
Editorial	2	3	12	0	1	0	1	0	0	1	2	2	0	0	0	24	0.04
Biography	2	0	0	0	2	0	1	2	3	1	0	4	2	0	0	17	0.03
Review	2	0	0	5	0	0	4	0	0	2	1	1	1	0	0	16	0.02
Others	16	2	0	6	5	4	4	1	4	6	6	4	3	0	5	66	0.10
TOTAL	5749	5357	5155	5082	4651	4432	4424	4288	4311	4082	3996	4397	3956	3478	3432	66790	100.00

QUANTUM OF GROWTH IN PAGES IN GENE CLONING RESEARCH CONTRIBUTIONS

Table 6 indicates the growth in the total pages of Gene Cloning research contributions. It is noticed from Table 5.6 that in 2001 the total output pages were 47772 and it grows to the grand total of 560869 in 2015. The total pages of journal articles were 47041 in 52001 and it grows to the grand total of 541641 in 2015. The journal article pages share 96.57% of the Gene Cloning research publication.

Table 6: Quantum of growth in pages in Gene Cloning Research contributions

Sl. No.	**Year**	**Total output pages**	**Total pages of Journal articles**	**% of Journal Articles pages to Total output pages**
1	2001	47772	47041	98.47
2	2002	44683	44037	98.55
3	2003	43096	42108	97.71
4	2004	42367	41607	98.21
5	2005	39085	38332	98.07
6	2006	36969	36203	97.93
7	2007	37986	33007	86.89
8	2008	36320	35295	97.18
9	2009	35519	34677	97.63
10	2010	33915	33148	97.74

11	2011	33382	32512	97.39
12	2012	37410	34450	92.09
13	2013	33556	31176	92.91
14	2014	29496	29117	98.72
15	2015	29313	28931	98.70
Total		**560869**	**541641**	**96.57**

FINDINGS

1. A total of 64525 contributions cover 23 major sub-fields of Gene Cloning research productivity during the study period from 2001 to 20159 (except others). Out of 23sub-fields the maximum numbers of contributions are covered on Biochemistry" followed by "Veterinary Science" and "Genetics"
2. Gene Cloning which published about 94.85% of the research output in English. This is followed by Chinese (4.40%) and Russian (0.39%) as second and third positions respectively. It is interesting to note that that English language is dominating in the scholarly communication of Gene Cloning research
3. 96.35% have published in journals followed by Evaluation Study (0.92%) and English Abstract (0.84%).). The literature published in other bibliographic forms is less than 1.89% of the total output.
4. The journal article pages share 96.57% of the Gene Cloning research publication.
5. An average of 8.40 pages per contribution and 8.42 pages per journal article have been noticed.

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