Library Progress International
Vol.43, No.1, January-June 2023: P.56-70
DOI: 10.48165/bpas.2023.43.1.7

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article
Available online at www.bpasjournals.com

Annona muricata (Medicinal Plant) Research: A Scientometric Analysis of Global Publications Output during 1991-2021

[1]Satish Kumar*, [2]Dr. Subhash Chand, [3]Dr. Sr. Pearl, [4] Dr. Deepmala, and [5] Dr. Asha Masih

Author's Affiliation:
[1]Associate Professor & Head, Dept. of Library and Information Science, Sophia Girls' College (Autonomous), Ajmer, Rajasthan 305001, India.
[2]Head, Dept. of Geography, SGSG Government College, Nasirabad, Ajmer, Rajasthan 305601, India.
[3]Principal, Sophia Girls' College (Autonomous), Ajmer, Rajasthan 305001, India.
[4]Associate Professor & Head, Dept. of Physics, Sophia Girls' College (Autonomous), Ajmer, Rajasthan 305001, India
[5]Assistant Professor & Head, Dept. of Botany, Dayanand College, Ajmer, Rajasthan 305001, India.

Corresponding Author: Satish Kumar, Associate Professor & Head, Dept. of Library and Information Science, Sophia Girls' College (Autonomous), Ajmer, Rajasthan 305001, India
E-mail: satish.kum78@gmail.com

(Received on 11.10.2022, Revised on 24.12.2022, Approved on 30.01.2023, Accepted on 11.02.2023, Published on 15.06.2023)

How to cite this article: Kumar S., Chand S., Sr. Pearl, Deepmala, and Masih A. (2023). *Annona muricata* (Medicinal Plant) Research: A Scientometric Analysis of Global Publications Output during 1991-2021. *Library Progress International,* 43(1), 56-70.

ABSTRACT

Scientometric is defined as a technique for analysing and calculating different parameters which specify researcher's quantitative research output. This study examines scientometric analysis on Annona muricata (medicinal plant) by measuring and analysing the distribution of articles, year-wise, annual growth rate, authorship pattern, author productivity, relative growth rates, doubling time, degree of collaboration, ranked list of authors, and distribution of publications output. In this period of 31 years only 1236 publications were found. Publication of research in this field is not so much productive and only we have found that a maximum of 159 publications were published in 2020. Most prolific author is Hocquemiller, R. and at 1st rank in this field of Annona medicate. Brazil is at top position by publishing 269 publications followed by India (136). Universiti Putra Malaysia has taken lead by publishing 39 research papers. Conselho Nacional de Desenvolvimento Cientafico e Tecnola³gico funded 39 research publications only and at top position. 1194 publication are published in English language only. After analysing above parameters it has been concluded that research work on this field, in this long span is very less and therefore a huge research gap is found.

KEYWORDS: *Annona muricata, Publications, Degree of Collaborations, Scientometrics.*

INTRODUCTION

Medicinal plants have multifunctional applications and in this series *Annona muricata* has widely used in treatment of various diseases. Traditional Medicine are using by the all classes of people. The research on the plant resources in Traditional Medicine was intensified in the 20th century which opened new cures for a spectrum of different conditions

(Benzie & Wachtel-Galor, 2011; Bone & Mills, 2013), and helping to bring research relating to phytotherapy or herbal medicine into the focus of the current search for new drugs (Harvey 1999). Due to their anti-inflammatory and anticancer effects *Annona muricata* extracts is widely used. Leaves of this plant are used for various ethno medicinal purposes by traditional healers to treat several diseases including cancer, inflammation, diabetes, liver diseases, and abscesses (Abdul, 2018).

Annona muricata (Magnoliales: Annonaceae) is a tropical plant species known for its edible fruit which has some medicinal merits, but also some toxicological effects. This review focuses on the phytochemicals contents, bioactivity, biological actions and toxicological aspects of extracts and isolated compounds, as well as medicinal uses of *Annona muricata* (Coria-Tellez, 2018). The medicinal uses of the Annonaceae family were reported long time ago and since then, this species has attracted the attention due to its bioactivity and toxicity. *Annona muricata* has been used as insecticide (Leatemia & Isman, 2004) and parasiticide (Langenberger et al., 2009). It is distributed in the tropical regions of Central and South America, Western Africa and Southeast Asia (Pinto et al., 2005).

Scientometrics is a part of Library and Information Science in which data of researchers are collected and analysed with the help of scientometric tools. Merton and Garfield, 1962 stated that scientometrics as 'the field of enquiry given over to the quantitative analysis of science and scientific field'. According to the Glossary of Thompson Scientific Terminology, "Scientometric is the quantitative study of the disciplines of science based on published literature and communication.

REVIEW OF LITERATURE

Gupta & Dhawan (2018) assessed the research output of robotics, in India during the period 2007-2016. A total of 99237 publications were retrieved and India accounted for 2.21 percent world share in the field; it totalled 4402 outputs, from 138 in 2007 to 762 records in 2016. Almusawi et al. (2017) had examined effect of salinity stress on morphological and anatomical parts of Bacopa monnieri and announced that adding the proline to the MS medium containing salinity agent alone or in blend with drought agent (PEG) didn't improve the shoot augmentation or root advancement. Batcha (2017) have examined the robotics research output with 5316 papers obtained from Web of Science database for the period of 1990-2016. The USA was the most publishing country producing 36.3 percent of the research output. Records mostly were in journal articles accounted 67.4 percent. Finally, the authors from the USA accounted for the most publications share. Husain & Mushtaq (2015) did the scientometric investigation on the valuation of climate change data between 2009 and 2013. The data were retrieved from web of science database and a total of 17,266 records were found in this field from several research-based institutions all over the world. The maximum number of publications of 4788 was recorded in the year 2013 from USA.

OBJECTIVES OF THE STUDY

This study has the following objectives:

1. To study year -wise distribution of the publications published during 1991 to 2021.
2. To find annual growth rate of publications.
3. To reveal authorship pattern and author productivity.
4. To examine relative growth rates and doubling time of publications.
5. To study country wise, document wise and subject -wise distribution of publications.
6. To study the institute wise and funding sponsor wise distribution of publications.
7. To identify and prepare the ranked list of source title.
8. To identify and prepare the ranked list of authors.
9. To study the distribution publications output by broad subject areas.

RESEARCH METHODOLOGY AND LIMITATION OF THE STUDY

The required data was collected from Scopus database for the period 1991 to 2021. It can be observed that 1236 research publication retrieved from this database on *Annona muricata* medicinal plant. The researcher downloaded the

data and then further analysed the data with the help of MS Excel software as per the objectives of the study. The aim of the study is to tabulate and to analyse thrust areas of *Annona muricata* medicinal plant.

RESULT AND DISCUSSIONS

1. Year-Wise Distribution of Publications & Annual Growth Rate

1(a) Year-Wise Distribution of Publications

Table 1: Year-Wise Distribution of Publications & Annual Growth Rate

S. No.	Year	No. of Publications	%	Cumulative No. of Publications	AGR (%)
1	1991	5	0.40	5	-
2	1992	2	0.16	7	-60
3	1993	7	0.56	14	250
4	1994	5	0.40	19	-28.57
5	1995	8	0.64	27	60
6	1996	8	0.64	35	0
7	1997	18	1.45	53	125
8	1998	16	1.29	69	-11
9	1999	13	1.05	82	-18.75
10	2000	9	0.72	91	-30.76
11	2001	13	1.05	104	30.76
12	2002	9	0.72	113	-30.76
13	2003	13	1.05	126	30.76
14	2004	15	1.21	141	15.38
15	2005	15	1.21	156	0.00
16	2006	16	1.29	172	6.66
17	2007	10	0.80	182	-37.5
18	2008	20	1.60	202	100
19	2009	27	2.18	229	35
20	2010	30	2.40	259	11.11
21	2011	45	3.64	304	50
22	2012	53	4.28	357	17.77
23	2013	36	2.91	393	-32.07
24	2014	70	5.60	463	94.44
25	2015	85	6.87	548	21.42
26	2016	70	5.60	618	17.64
27	2017	83	6.71	701	18.57
28	2018	104	8.41	805	25.30
29	2019	122	9.87	927	17.30
30	2020	159	12.86	1086	30.32
31	2021	150	12.13	1236	-5.66
Total		**1236**	**100**		

Table 1 shows total '1236' publications have been published in these thirty-one years. Maximum 159 publications are published in 2020. On this plant at initial level research was very less but it took momentum after 2007.The year-wise distribution of publications is displayed in Figure 1. The Figure is drawn between two parameters no. of publications and year-wise growth and shows the growth of publications with respect to the Year.It is clear from the Figure that in 2020 maximum number of publications were published.

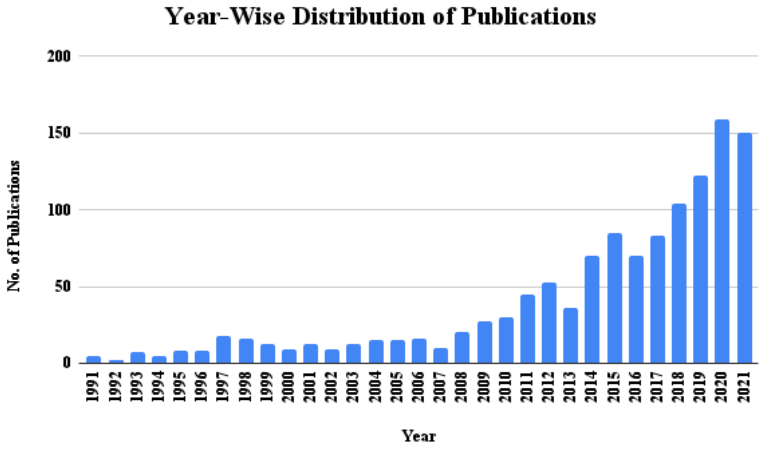

Figure 1: Year-Wise Distribution of Articles

1(b) Annual Growth Rate

The *annual growth rate* (AGR) reflects the rate of growth over a single year.

$$Annual\ Growth\ Rate = \frac{(Suceeding\ Value - Previous\ Value)}{Previous\ Value}$$

The following Figure 2 demonstrates the growth of articles with AGR. From this figure, it is observed that the year 1993 has the highest and positive AGR (in %) among others. The year 1992, 1994, 1998, 1999, 2002, 2007, 2013, 2021 have negative AGR (in %).

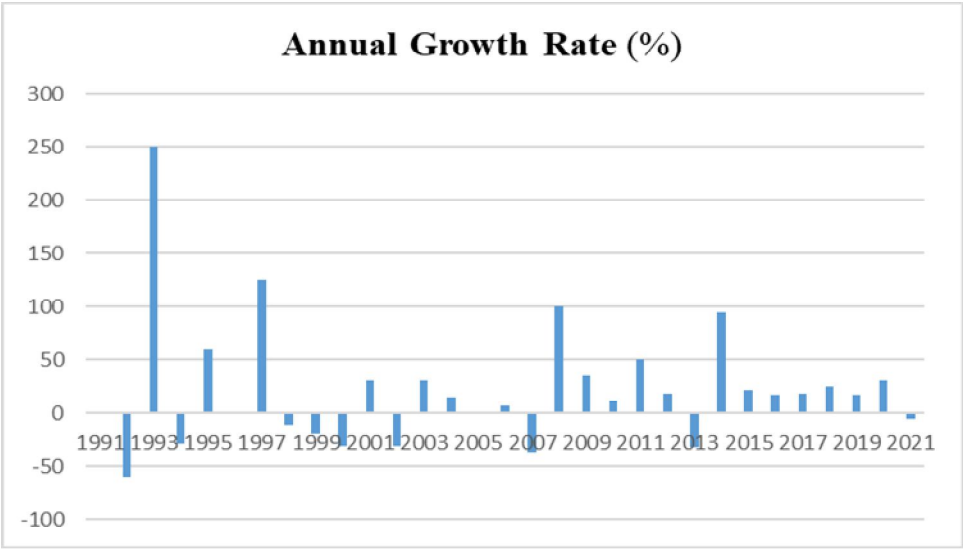

Figure 2: Annual Growth Rate

2. Authorship Pattern

Table 2: Authorship Pattern

Year	Single Author	Two Authors	Three Authors	Four Authors	Five Authors	Six Authors	More than Six Authors	No. of Publications
1991	0	0	0	3	0	0	2	**5**
1992	0	1	0	0	0	0	1	**2**
1993	0	1	0	1	2	3	0	**7**
1994	0	0	2	2	0	1	0	**5**
1995	0	1	2	1	0	0	4	**8**
1996	0	2	2	0	1	2	1	**8**
1997	1	0	3	2	7	5	0	**18**
1998	3	1	3	2	1	2	4	**16**
1999	1	1	3	3	4	0	1	**13**
2000	0	4	0	1	3	0	1	**9**
2001	0	5	5	2	0	0	1	**13**
2002	2	1	2	0	1	1	2	**9**
2003	0	1	3	3	1	2	3	**13**
2004	1	1	6	3	0	2	2	**15**
2005	0	5	2	2	0	2	4	**15**
2006	1	1	4	2	1	3	4	**16**
2007	0	0	3	0	3	1	3	**10**
2008	2	2	2	5	3	0	6	**20**
2009	0	8	5	6	3	4	1	**27**
2010	1	5	6	4	5	4	5	**30**
2011	6	7	2	7	8	5	10	**45**
2012	2	9	7	7	11	6	11	**53**
2013	0	4	4	8	9	7	4	**36**
2014	9	13	9	7	15	9	8	**70**
2015	3	10	18	20	13	14	7	**85**
2016	0	5	18	7	13	11	16	**70**
2017	2	7	13	15	19	8	19	**83**
2018	2	13	8	21	20	13	27	**104**
2019	2	12	21	23	16	18	30	**122**
2020	5	12	20	24	25	27	46	**159**
2021	3	18	26	23	18	12	50	**150**
Total	**46**	**150**	**199**	**204**	**202**	**162**	**273**	**1236**

Table 2 describes the authorship pattern of publications during the period 1991 to 2021.The total number of publications are 1236, in which 46 single author publications, 150 two authors publications, 199 three authors publications, 204 four authors publications, and so on. It shows that article publication trend was towards the multiple author approach. The following figure 3 demonstrates the authorship pattern between the no. of publication and years. From this figure, it is found that the category of four authors has the largest community.

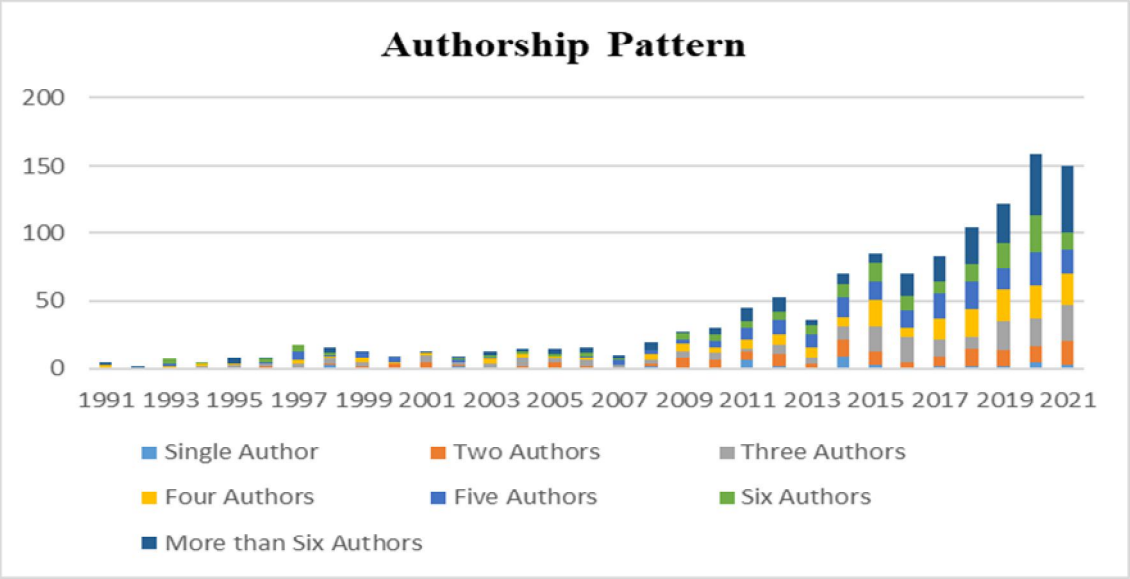

Figure 3: Authorship Pattern

3. Author Productivity

The average number of authors per paper (publication) is obtained by dividing the total number of articles by the total number of authors (papers). This may be a very useful indicator for determining a journal's or author's average effect.

Table 3: Author Productivity

Year	Number of Authors	Number of Publication	APA	AAPP
1991	28	5	0.17	5.6
1992	9	2	0.22	4.5
1993	34	7	0.20	4.85
1994	20	5	0.25	5
1995	42	8	0.19	5.25
1996	26	8	0.30	3.25
1997	83	18	0.21	4.61
1998	73	16	0.21	4.56
1999	54	13	0.24	4.15
2000	35	9	0.25	3.88
2001	40	13	0.32	3.07
2002	35	9	0.25	3.88
2003	67	13	0.19	5.15
2004	67	15	0.22	4.46
2005	71	15	0.21	4.73
2006	81	16	0.19	5.06
2007	60	10	0.16	6
2008	103	20	0.19	5.15
2009	101	27	0.26	3.74
2010	148	30	0.20	4.93
2011	204	45	0.22	4.53

2012	250	53	0.21	4.71
2013	175	36	0.20	4.86
2014	285	70	0.24	4.07
2015	363	85	023	4.27
2016	368	70	0.19	5.25
2017	399	83	0.20	4.80
2018	558	104	0.18	5.36
2019	611	122	0.19	5.00
2020	859	159	0.18	5.40
2021	805	150	0.18	5.36
Total	**6054**	**1236**	**0.20**	**4.89**

Table 3 reveals the data which deals with author productivity.1236 publications are retrieved. The *Productivity per author* and *Average Authors Per Paper* are calculated by the following formulae

$$Productivity\ per\ author = \frac{Number\ of\ Articles}{Number\ of\ Authors}$$

= 0.20

The *Productivity per author* is less than one which means on an average Productivity per author is only 20%.

$$Average\ Authors\ Per\ Paper = \frac{Number\ of\ Authors}{Number\ of\ Articles}$$

= 4.89

4. Relative Growth Rate of Articles & Doubling Time

Relative Growth Rate (RGR) is a measure to study the growth of number of articles over the period whereas Doubling Time (DT) is defined as the time when records become doubles values. The Relative Growth Rate of Articles and Doubling Time statics are mentioned in the following Table 4.

Table 4: Relative Growth Rate of Articles & Doubling Time

Year	No. of Articles	Cumulative Total	$LogW_1$	$LogW_2$	RGR	Doubling Time (DT=0.693/RGR)	Mean RGR= ΣR/N	Mean ΣDt/N
1991	5	5	0.698	0.698	-	-		
1992	2	7	0.301	0.845	0.544	1.27		
1993	7	14	0.845	1.146	0.301	2.30		
1994	5	19	0.698	1.278	0.58	1.19		
1995	8	27	0.903	1.431	0.528	1.31		
1996	8	35	0.903	1.544	0.641	1.08		
1997	18	53	1.255	1.724	0.469	1.47		
1998	16	69	1.204	1.838	0.634	1.09		

1999	13	82	1.114	1.913	0.799	0.86	**0.817**	**0.863**
2000	9	91	0.954	1.959	1.004	0.69		
2001	13	104	1.114	2.017	0.903	0.76		
2002	9	113	0.954	2.053	1.099	0.63		
2003	13	126	1.114	2.100	0.986	0.70		
2004	15	141	1.176	2.149	0.973	0.71		
2005	15	156	1.176	2.193	1.017	0.68		
2006	16	172	1.204	2.235	1.031	0.67		
2007	10	182	1.000	2.260	1.260	0.54		
2008	20	202	1.301	2.305	1.002	0.69		
2009	27	229	1.431	2.359	0.928	0.74		
2010	30	259	1.477	2.413	0.936	0.74		
2011	45	304	1.653	2.482	0.829	0.83		
2012	53	357	1.724	2.552	0.828	0.83		
2013	36	393	1.556	2.594	1.038	0.67		
2014	70	463	1.845	2.665	0.820	0.84		
2015	85	548	1.929	2.738	0.809	0.85		
2016	70	618	1.845	2.790	0.945	0.73		
2017	83	701	1.919	2.845	0.926	0.74		
2018	104	805	2.017	2.905	0.888	0.78		
2019	122	927	2.086	2.967	0.881	0.78		
2020	159	1086	2.201	3.035	0.834	0.83		
2021	150	1236	2.176	3.092	0.916	0.76		
Total	**1236**				25.34	26.76		

The RGR and DT model developed by Mahapatra (1985) and calculated by the following formula.

$$RGR = \frac{\log W_1 - \log W_1}{(T_2 - T_1)}$$

= 0.817

where, T_1 and T_2 represent initial and final Time, respectively.

$$Doubling\ Time = \frac{0.693}{R}$$

= 0.863

The following Figure 6 represents the graph of RGR and DT.

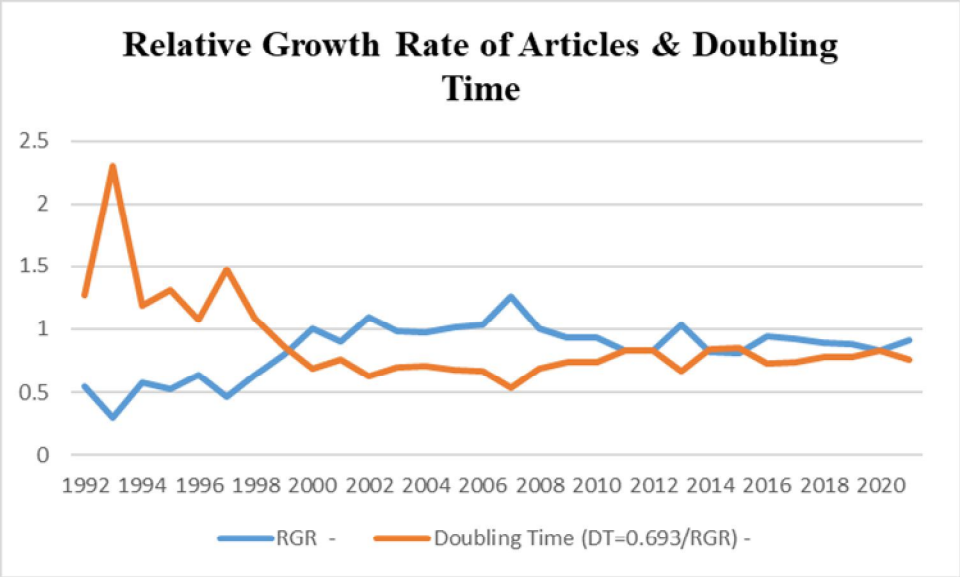

Figure 4: AGR Growth and DT of Publications

5. Degree of Collaboration

The degree of collaboration is defined as the ratio of collaborative research publications to total research papers in the subject during a certain time period. Subramanyam (1983) proposed a formula for the degree of collaboration and it is mentioned in the following formula (6).

$$Degree\ of\ Collaboration\ (DC) = \frac{N_m}{(N_m + N_s)} \qquad (6)$$

DC= represent the degree of collaboration. N_m and N_s represent the Multiple Author Publications and Single Author Publications respectively.

Table 5: Degree of Collaboration

Year	Single Author Publications (Ns)	Multiple Author Publications (Nm)	Nm+Ns	Degree of Collaboration DC=Nm/(Nm+Ns)
1991	0	5	5	1
1992	0	2	2	1
1993	0	7	7	1
1994	0	5	5	1
1995	0	8	8	1
1996	0	8	8	1
1997	1	17	18	0.98
1998	3	13	16	0.97
1999	1	12	13	0.98
2000	0	9	9	1
2001	0	13	13	1
2002	2	7	9	0.8
2003	0	13	13	1

2004	1	14	15	0.98
2005	0	15	15	1
2006	1	15	16	0.99
2007	0	10	10	1
2008	2	18	20	0.9
2009	0	27	27	1
2010	1	29	30	0.98
2011	6	39	45	0.91
2012	2	51	53	0.92
2013	0	36	36	1
2014	9	61	70	0.88
2015	3	82	85	0.90
2016	0	70	70	1
2017	2	81	83	0.95
2018	2	102	104	0.98
2019	2	120	122	0.98
2020	5	154	159	0.93
2021	3	147	150	0.97
Total	**46**	**1190**	**1236**	**0.96**

The Table 5 figures out the degree of collaboration. From this table, it is observed that years 1991, 1992, 1993, 1994, 1995, 1996, 2000, 2001, 2003, 2005, 2007, 2009, 2013 and 2016 have the highest (1.00) degree of collaboration. From this table, we have also observed the average degree of collaboration was 0.96, which is nearly equal to one. This implies that multiple authors contributed more than single authors.

6. Document Type distributions of Publications

Table 6: Document Type distributions of Publications

Document Type	**Number of Publications**
Article	1075
Review	59
Conference Paper	70
Book Chapter	12
Note	9
Editorial	4
Conference Review	2
Data Paper	2
Short Survey	2
Erratum	1
Total	**1236**

Table 6 shows the distribution of 1236 research output. 1075 publications are research Articles, 59 are Reviews papers, 70 are Conference Papers, 12 are Book Chapters, 9 are Notes. The contribution of Conference Review and Editorial are 2 and 4 respectively. From the table, it has been observed that the researchers prefer journal articles as compare to others.

.

7. Countries–Wise Distribution of Publications

Table 7: Country-Wise Distribution of Publications (Top 10)

Rank	Name of Country	Number of Publications
1	Brazil	269
2	India	136
3	Indonesia	136
4	Mexico	104
5	Malaysia	91
6	United States	90
7	Nigeria	82
8	France	58
9	Colombia	33
10	Egypt	31

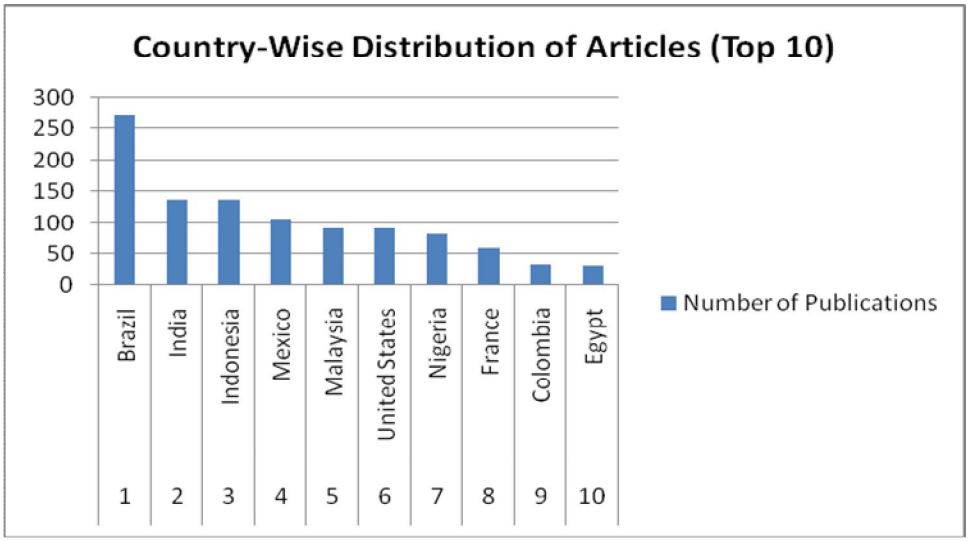

Figure 5: Countries–Wise Distribution of Publications (Top 10)

Table 7 displays the country-wise contribution of 1236 published publications from different countries. It is found that the highest number of publications are from Brazil (269), followed by the India (136), Indonesia (136), Mexico (104), Malaysia (91), United States (90) and so on. Figure 5 demonstrate the county wise statistics of publications production. From this figure it is clear that Brazil is the top most country published highest number of publications.

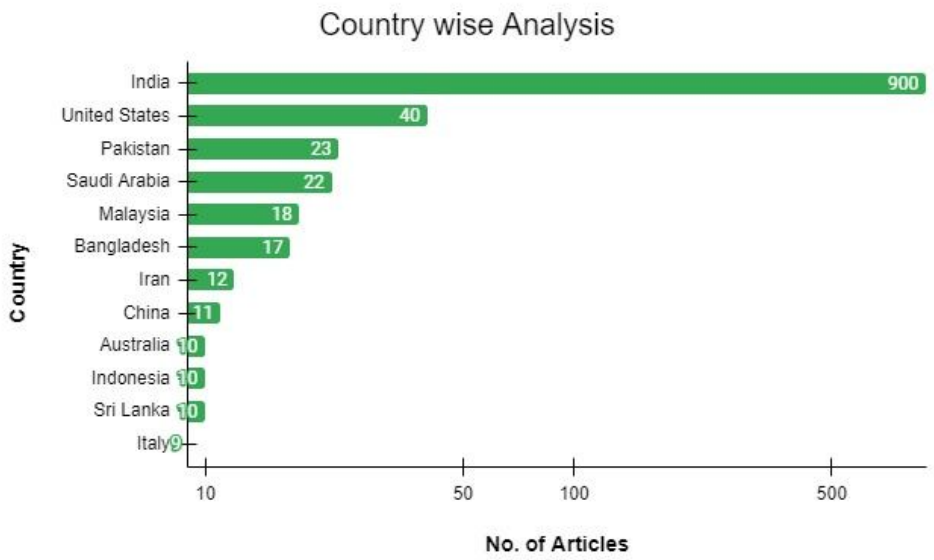

Figure 6: Country-Wise Distribution of Publications

8. Institution Wise Distribution of Publications

Table 8: Institution Wise Distribution of Publications (Top 5)

Name of Institution	Number of Publications	Rank
Universiti Putra Malaysia	39	**1**
Universite Paris-Saclay	34	**2**
Universidade de SÃ£o Paulo	26	**3**
Universidade Federal de Campina Grande	24	**4**
Universidad AutÃ³noma de Nayarit	24	**4**
Universidade Federal de Alagoas	24	**4**
Universidade Estadual Paulista JÃºlio de Mesquita Filho	24	**4**
BiomolÃ©cules : Conception, Isolement, SynthÃ¨se	24	**4**
CNRS Centre National de la Recherche Scientifique	22	**5**
Universidade Estadual de Campinas	22	**5**

Table 8 displays the contribution of 1236 published articles from different Institution (Top 5). Universiti Putra Malaysia is at I rank by publishing 39 publications. Universite Paris-Saclay is at II rank by publishing 34 publications. Universidade de SÃ£o Paulo is at III rank by publishing 26 publications and so on.It is observed that the three institutions Universidade Federal de Campina Grande, Universidad AutÃ³noma de Nayarit and Universidade Federal de Alagoas, Universidade Estadual Paulista JÃºlio de Mesquita Filho and BiomolÃ©cules: Conception, Isolement, SynthÃ¨se are at fourth rank.

9. Funding Sponsor Wise Distribution of Publications (Top 10)

Table 9: Funding Sponsor Wise Distribution of Publications (Top 10)

Name of Funding Sponsor	Number of Articles
Conselho Nacional de Desenvolvimento CientÃfico e TecnolÃ³gico	80
CoordenaÃ§Ã£o de AperfeiÃ§oamento de Pessoal de NÃvel Superior	73
Consejo Nacional de Ciencia y TecnologÃa	27
MinistÃƒÂ©rio da CiÃƒÂªncia, Tecnologia e InovaÃƒÂ§ÃƒÂ£o	27
National Cancer Institute	18
FundaÃ§Ã£o de Amparo Ã Pesquisa do Estado de SÃ£o Paulo	17
MinistÃ©rio da CiÃªncia, Tecnologia e InovaÃ§Ã£o	16
National Institutes of Health	16
FundaÃ§Ã£o de Amparo Ã Pesquisa do Estado de Minas Gerais	14
Universiti Putra Malaysia	10

Table 9 displays about the funding agencies statistics that they have sponsored Articles. Conselho Nacional de Desenvolvimento CientÃ-fico e TecnolÃ³gico had sponsored 80 publications and at rank I, CoordenaÃ§Ã£o de AperfeiÃ§oamento de Pessoal de NÃvel Superior had sponsored 73 publications, second highest, Consejo Nacional de Ciencia y TecnologÃa, had sponsored 27 publications third highest and so on.

10. Subjects-Area WiseDistribution of Articles (Top 10)

Table 10: Subject-Area Wise Distribution of Publications

S. No.	Subject-Area	Total Number of Articles
1	Agricultural and Biological Sciences	527
2	Pharmacology, Toxicology and Pharmaceutics	350
3	Biochemistry, Genetics and Molecular Biology	308
4	Medicine	275
5	Chemistry	205
6	Environmental Science	91
7	Engineering	65
8	Chemical Engineering	59
9	Immunology and Microbiology	53
10	Materials Science	41

Table 10 represents a list of subject area wise distribution of publications in the field of *Annona muricata*. Agricultural and Biological Sciences had published 527 publications followed by Pharmacology, Toxicology and Pharmaceutics published 350, Biochemistry, Genetics and Molecular Biology published 308, Medicine (275), Chemistry (205) and so on.

11. Ranked List of Source Title (Top 10)

Table 11 represents list of those Journals who have maximum contribution in research publication of *Annona muricata***.** Journal of Ethnopharmacology is at top position by publishing 48 publications followed by Revista Brasileira De Fruticultura published 25, Acta Horticulturae, 24, Iop Conference Series Earth And Environmental Science 18 publications and so on.

Table 11: Ranked List of Source Title (Top 10)

Rank	Name of Source Title	Total Number of Publications
1	Journal Of Ethnopharmacology	48
2	Revista Brasileira De Fruticultura	25
3	Acta Horticulturae	24
4	Iop Conference Series Earth And Environmental Science	18
5	Iop Conference Series Materials Science And Engineering	15
6	Food Chemistry	14
7	Southwestern Entomologist	13
8	Aip Conference Proceedings	12
8	Journal Of Natural Products	12
8	Pharmacognosy Journal	12
9	Evidence Based Complementary And Alternative Medicine	10
9	Molecules	10
10	Pharmaceutical Biology	9

12. Ranked List of Prolific Authors

Table 12: Ranked List of Prolific Authors (Top 10)

Rank	Name of Author	Number of Publications
1	Hocquemiller, R.	19
2	Laurens, A.	17
3	Gheyi, H.R.	16
4	Balois-Morales, R.	15
5	Gleye, C.	14
6	Champy, P.	13
6	McLaughlin, J.L.	13
7	CavÃ©, A.	11
7	LaprÃ©vote, O.	11
7	de Lima, G.S.	11

Table 12 represents list of those authors who have published more than 10papers and. Hocquemiller, R.is at top by publishing 19 publications followed by Laurens, A. (17), Gheyi, H.R. (16), Balois-Morales, R. (15) and so on.

FINDINGS AND CONCLUSIONS

For studying *Annona muricata* we had fetched '1236' publication from the year of 1991 to 2021 using the Scopus database. Annual growth rate is highest in 1993. It is analyzed by authorship pattern that the category of four authors has the largest community (204). The *Productivity per author* is less than one which means on an average Productivity per author is only 20% and AAPP is 4.89. Relative Growth Rate (RGR) of publication related to *Annona muricata* is 0.817 and average of doubling time is 0.86. The overall degree of collaboration was 0.96. Brazil is a top position by publishing 269 publications. Researchers preferred research publication in this field. Universiti Putra Malaysia is at I rank by publishing 39 publications. Conselho Nacional de Desenvolvimento CientÃfico e TecnolÃ³gico had sponsored 80 publications and at rank I. Hocquemiller, R. is most prolific author.

REFERENCES

1. Abdul Wahab, S. M., Jantan, I., Haque, M. A., & Arshad, L. (2018). Exploring the leaves of Annona muricata L. as a source of potential anti-inflammatory and anticancer agents. *Frontiers in pharmacology, 9*, 661. https://doi.org/10.3389/fphar.2018.00661
2. Almusawi, A.H.A., Al-Aradi H. J, and Hammadi K.J. (2017). The impact of salinity stress on morphological and anatomical aspects of water hyssop Bacopa monnieri (L.) Wettst grown in vitro. *African journal of biotechnology, 16*(15), 801-807.
3. Batcha, M. S. (2017). Research output analysis on robotic technology: A scientometric study. *Indian Journal of Information Sources and Services, 7*(1), 25-31.
4. Benzie, I.F.F. & Wachtel-Galor, S., (2011). Herbal Medicine: *An introduction to its history, usage, regulation, current trend and research needs*, in: Benzie, I.F.F., Wachtel-Galor, S. (Eds.), Herbal Medicine: Biomolecular and Clinical Aspects, 2nd ed. Boca Raton (FL), CRC Press.
5. Bone, K., & Mills, S. (2012). *Principles and practice of phytotherapy: modern herbal medicine*. Elsevier Health Sciences.
6. Coria-Téllez, A. V., Montalvo-Gónzalez, E., Yahia, E. M., & Obledo-Vázquez, E. N. (2018). Annona muricata: A comprehensive review on its traditional medicinal uses, phytochemicals, pharmacological activities, mechanisms of action and toxicity. *Arabian Journal of chemistry, 11*(5), 662-691.
7. Gupta, B.M & Dhawan, S.M (2018). Robotics research in India: A scientometric assessment of Indian publications output during 2007-2016. *Journal of Scientometric research, 7*(2), pp. 84-93.
8. Harvey, A. L. (1999). Medicines from nature: are natural products still relevant to drug discovery?. *Trends in Pharmacological Sciences, 20*(5), 196-198.
9. Husain, S and Mushtaq, M (2015). Research Assessment of Climate Change Data: A Scientometric Construct. *Qualitative & Quantitative Methods in Libraries Special Issue*, 183-194.
10. Langenberger, G., Prigge, V., Martin, K., Belonias, B., & Sauerborn, J. (2009). Ethnobotanical knowledge of Philippine lowland farmers and its application in agroforestry. *Agroforestry systems, 76*(1), 173-194. https://doi.org/10.1007/s10457-008-9189-3
11. Leatemia, J. A., & Isman, M. B. (2004). Insecticidal activity of crude seed extracts ofAnnona spp., Lansium domesticum and Sandoricum koetjape against lepidopteran larvae. *Phytoparasitica, 32*(1), 30-37. https://doi.org/10.1007/BF02980856
12. Merton, R. K. & Garfield, E. (1963). Forward to Little Science, Big science and Beyond by DJ de solla Price. 1963. Columbia University Press; New York.
13. Pinto, A.C.Q., Cordeiro, M.C.R.., Andrade, S.R.M., Ferreira, F.R., Filgueiras, H.A.C., Alves, R.E. and Kinpara, D.I. (2005). Annona species, International Centre for Underutilised Crops, University of Southampton, Southampton, UK.
14. Scientometrics (2008). *Glossary of Thompson Scientific Terminology* online. Retrieved from http://science.thomsonreuters.com/support/patents/patinf/terms/>