International Journal of Research Publication and Reviews

Quantitative Measurement of the Research in Synthetic Fiber : A Scientometric Analysis

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ABSTRACT

This paper presents the results of Scientometric analysis of Synthetic Fibre literature based on the data retrieved from Scopus database covering the period 1983-2017. The aims to examine the year-wise distribution, Relative growth rate, Doubling time, Time Series analysis, to list productive authors, journals, to identify document type and keyword distribution. The results indicate a negative growth in future years. However Indian Contribution towards this research was found to be high compared to any developed country. The most productive year was 2006 with 486 (4.43%) records followed by 446 (4.06%) in 2007 and 441(4.02%) in 2017 and the least productive year was in 2010 with 198 (1.80%) records. The predicted value of literature output has decreased from 441(2017) to 294.73 (2025) and the value further decreased in the year 2030 (290.95).

KEYWORDS: Scientometrics, Synthetic Fibre, Time Series Analysis, Relative Growth Rate and Doubling Time.

1. Introduction

Scientometrics is the study of the quantitative aspects of the process of science as a communication system. Scientometrics is a branch of the science "Science of Science" (Price 1963). Scientometrics is widely used to evaluate scientific activities. It is one of the tools for measuring scientific activities in any field of knowledge. They are a valuable technique for assessing research productivity and studying scholarly communication.Scientometric analysis has received adequate attention and has been widely applied to evaluate the research performance of scientists and the growth of various disciplines. Scientometrics can be effectively used to assess and compare scientific activities in institutions, countries, and various sectors. Moreover, they are used to assess research collaborations, map scientific networks and track the evolution of scientific fields (Senthilkumar and Ulaganathan 2016).Scientometric analyses the quantitative aspects of generation, dissemination, and utilization of scientific information in terms of the contribution to the understanding of the mechanism of scientific research (Braun et al 1987).

The application of quantitative methods to measure the activities of libraries has become more popular. Measuring the research impact plays an important role in how individuals, research groups, journals, academic departments, institutions, and countries are ranked in their respective areas of contribution to scholarship (Ying Ding et al. 2014).The new potential is open to Fibre by building on traditional Fibre engineering which produced Fibre composite materials for the amusement and car industries, civil engineering and construction, and the aerospace industry: separating membranes using hollow Fibre for artificial organs, plastic optical Fibre for information technology, biodegradable Fibre for ecological conservation and Fibre with biological functions. Greater integration and research effort in this field of Fibre will ensure increasingcontribution to new aspects of the environment and human life. To achieve these aims innovative technology is required. A Quantitative Research study is required to evaluate the entire research activities in this field would further direct specialist Fibre technologists, scientists, students in Fibre science, and others in this Fibre industry field to achieve innovative new millennium Fibre. Hence it is more vital to focus the study on measuring the research output in this emerging field of Fibre.

2 Review of Literature

Koenig (1983) examined pharmaceutical research from a bibliometric perspective. The study found that there are bibliometric correlates of successful pharmaceutical research, specifically, the amount and proportion of the star (highly cited) clinical medicine articles. The study reveals that company research reported in basic biomedical research journals is incredibly highly cited, on a par with NIH-supported graduate school research. Schubert. A, Zsindely and Braun (1985), analyzed that, proved to be more productive authors than "average scientists" of the identical country, but no particular eminence of the professors may be revealed. A correlation was found between the standard of clinical medicine papers and therefore the morbidity within the countries in question.Baskaran, (2013) explored Degree of collaboration and its' mean value is found to be 0.963. The top three

institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University, and Anna University. Baskaran and Sivakami, (2014) discussed Quantitative analysis is carried out to identify the literature growth, authorship pattern, collaboration and journal distribution on Swine influenza disease research based on data obtained from Pubmed databases for a period from 2006-2010. A total of 2360 articles were downloaded from Pubmed database using the search term "Swine*" subjected to bibliometric data analysis techniques. Baskaran (2013) analysed that Information science focuses on understanding problems from the perspective of stakeholders and then applying information and other technologies as needed. In other words, it tackles systemic problems first rather than individual pieces of technology within that system. In this respect, information science can be seen as a response to technological determination, the belief that technology "develops by its own laws, that it realizes its own potential, limited only by the material resources available, Baskaran (2013) analysed that a total number of 6610 records which were retrieved from the Web of Science was used to assess the academic productivity and distribution of research diversity of cryptography field from four major countries -China, USA, Taiwan and Japan which contributed more papers in cryptography and allied field of researches. Baskaran (2013) discussed that Doubling time (Dt) was found to be increased and decreased trend in this study. Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University and Anna University. Baskaranand Binu (2019) analysed that Majority of respondents 416 (98.8%) are searching for educational and research Information. The findings of the study could identify the various parameters while access Electronic resources by the academic community. The study would helpful to bring to access Electronic Information for momentum of gain research and academic ideas among the users. Baskaran (2018) examined that computers became involved in the delivery of education, a proposed definition identifies the delivery of instructional materials, using both print and electronic media. Baskaran (2016) discussed the highest publication published in Bioinformatics journal and Harvard University scientists contributed highest number of publication in the study. RGR and DT is exhibits that fluctuating trend happening whole period of study. Baskaran (2015) studied the three Major Paradigm Shifts 21st Century Library Setting, Revolutionary Changes, Library Roles, Millennial Generation, Cyber Infrastructure Characteristics, Major Challenges of 21st Century Librarian, Tasks, Library Should Be, Customers Expectations and so on. Baskaran (2015) analyzed the USA scientists have contributed totally 15832 (30.815%) items and include 87.947% percent are appeared as journal articles. Harvard University scientists are much attention in produced large number of research papers and they hold top level among research collaboration in enzyme research.

Baskaran (2012) discussed that Doubling Time (D$_t$) has shown as fluctuating trend during the period of study. The result examined the author exponential growth using least squares excluding high productive authors and maximum likelihood method. Lotka's law is found to be applicable to graph theory research during the study period. Baskaranand Ramesh (2019) analyzed that The study analyses Electronic information access pattern among the faculty members is the significant role in the Engineering institutions towards various tasks to fulfil by the respondents. The study aim to analyze that 76 percent of the respondents are male and 26 percent of them are female observed from the study. Baskaran (2018) discussed that Coursera and EdX have partnered with elite institutions in Europe, Asia, and Australasia, and new MOOC platforms have been developed including Future Learn in the UK, OpenupEd, and iVersity in Europe and Open2Study in Australia. Baskaran and Ramesh Babu(2019) examined the publication productivity of Forensic Medicine output during 1989-2016. The growth of the publications, RGR and Dt of the research output, Collaboration of authors, Collaborative co-efficient etc. in the study. Baskaran (2018) analyzed the highest SD was 21. 71405 and 21.71405 the problems were found Do not have smart Phone and Lack of security on personal information. The highest CV was 864.5 found on Lack of security on personal information. Baskaranand Karuilancheran (2015) analyzed the C.V. at 0.05 significant level for 29 degrees of freedom is 42.56 and the calculated value of Chi-Square (X^2) obtained in this case is 5309.368. Afterwords, the performance of researchers started diminishing. It was supported by SPI that ranges between 9 and 10 only. Baskaran (2014) discussed the quantitative analysis of the productivity and characteristics of citations of Library and Information Science (LIS) publications during 2003-2012. A Total of 1942 contributions published and 12502 citations received in the LIS journals indexed in SSCI. 21.36% of citations were received in 2012. Baskaran, C. (2013) analyzed that faculty members who respondents to the study, 70 (59.1%) learned through guidance from their teachers/guide 28 (56%). It is proved that the highest proportion of faculty member, 21 (42%), use their department for accessing the information, while 28 (40%) of the research scholars were accessing their e-journals in their department itself.

Baskaran (2019) analyzed the 210 (55.26) respondents are extremely satisfied on OPAC/Web OPAC. 205(53.90) respondents are extremely satisfied on E-Databases, 192(50.52) respondents are extremely satisfied on Automated circulation services. Baskaran (2018) explored the map the number of publications, growth rate and doubling time, scattering of publication over journals, and its impact on publication output, authorship patterns and Global citation score of bioremediation research publication in India using the HistCite, VOSviewer software. Indian Institute of technology, Baba atomic research centre and CSIR are the major producers of research output in the area of bioremediation. Sivakamiand Baskaran (2016) analysed that total of 64030 records were obtained from MEDLINE databases have been taken for this study. All kinds of resources are fallen in highest in the year 2010 &2011 with average publications of 2,784 per year. The Time series analysis ware carried out for the top most productive country (USA) and India to compare the research output in forth coming years. Baskaran (2014) discussed quality of collection with respect to books, Journals and e-resources. Yahoo is most popular search engine among the user for browsing the net. Book lending service is the most prefer by the staff.

Saravanan, and Baskaran (2019) examined the identifies bibliographic coupling of the institution, language distribution, keyword distribution, geographical distribution of the literature and Historiography on Local and Global Citation is also analyzed. Baskaran (2019) analyzed the majority 90 (33%), 76 (27.8) and 51 (18.7%) of the respondents of them recorded that "Strongly Agree", "Agree", and "No Comment" respectively to prefer "Easy to access massive amount of data to analyse". Baskaran (2018) examined the majority of publications 44.15% representing by the two authors in the analysis BM. Guptha was published 18 papers in DJLIT, who is a ranked 1 author. It followed by Chenupathi K. Ramiah shored second his publications 11. University of Delhi, which is the top ranked institution.Binuand Baskaran (2017) analyzed the assess the user satisfaction with respect to the eresources and services. It reveals that majority of respondents are using e-resources at large extent or very large extent for different purposes. Users' satisfaction level is very high with respect to various electronic resources and services available in the library. Ramesh Babu and Baskaran (2017) analyzed the analyses that research growth trend of Forensic Medicine during 1989-2015. It is observed highest out of Forensic Medicine research Forensic Medicine research in 2013 was 447 (11.05 %) of the publications, followed by 420 (10.38%) of the publication brought out in 2015. the doubling time of the publications also a fluctuate trend appears whole study period.Baskaran (2020) analyzed the lowest relative growth rate (RGR; 0.04) was found in 2008. 2010, 2012, and 2014 RGR rose up to 0.75 in 1990, and the average mean value of relative growth rate (RGR) is 0.15.

The highest number of publications (293; 63.55%) accumulated from information science library science. This area has been ranked first among 25 research fields listed in the study. Baskaran (2020) describes Altmetrics use in public APIs across platforms to gather data with open scripts and algorithms. Altmetrics did not originally cover citation counts. It calculated scholar impact based on diverse online research output, such as social media, online news media, and online reference managers. Baskaran, C. (2020) analyzed the 11,941 total records on social networks and media retrieved from Web of Science database during the period of study. The predominantly records 2,576 (21.57%) of the publications brought out in 2018, followed by 2,281 (19.10%) records published in 2017.Palaniveland Baskaran (2018) studied the 2313 scholarly communications published in the Economic Affairs Journal. The analysis cover mainly the number of articles, form of document, the study is obtained from the SCOPUS database in 2313 results for thirty seven years in this results retrieved are analyzed using excel worksheets. Pramanathanand Baskaran (2015) discussed the 199 (49.13%) and 131 (43.52%) of the respondents were female respondents from Bharathidasan University and Periyar University. Majority of the 310 (76.54%) and 198 (65.78%) of the respondents who have got research experience below 3 years from Bharathidasan and Periyar university. Murugaiahand Baskaran (2013) analyzed the high number of papers was collaborated with United States researchers in the field of Human DNA. The study measures the performance based on several parameters, country year-wise growth rate, authorship pattern, collaborative index, collaborative coefficient, leading collaborative countries and authors have contributed publications in Human DNA research. Baskaran (2020) discussed the maximum 290 (12.20%) of the publications contributed by the researchers from Central Electro chemical Research Institute was highly collaborated with Alagappa Universities , which has top Citations and h-Index 3852 and 32 respectively. The propounded according to Google Scholar Metrics (GSM) SK Pandian was to be a top ranked researcher, despite his year wise citations shows 4491 and h-Index credited 36 during 2008-2018. Ramesh and Baskaran (2019) analyzed the respondents "Satisfied" with e-resources offering lecturing materials. This data presents that a large number of respondents 265 (51.0%) prefer gateway portal to a "Large Extent' and 139 (26.7%) of the respondents prefer to a "Very Large Extent". On the other hand, it has also been noticed that 105 (20.2%) of the respondents are "Less satisfied" whereas 11 (2.1%) of the respondents opted "No Comment". Prasad and Baskaran (2019) studied the study analyses the male respondents are found 263(69.21%) which is followed by female respondents 117 (30.79%).285(75%) which is followed by M.Phil. with NET qualified respondents 51 (13.42%) and PG with NET qualified respondents 44 (11.57%). Majority of 259 (98.50%) respondents are got training from the University Library for accessing the E-Resources and Only 4 (1.50%) male respondents are not getting training from the University Library. Prasad and Baskaran (2019) analyzed the 380 (100%) respondents are aware of E-Resources available in the University Library. the majority of 259 (98.50%) respondents are got training from the University Library for accessing the E–Resources and Only 4 (1.50%) male respondents are not getting training from the University Library. It is also seen that out of 117 (30.80%) female respondents. Baskaran (2018) discussed the majority of 63 (27.6%) specified "Aware" and Usage of Whatsapp, 53 (23.2%) You Tube, 47 (20.6%) Google+, 46 (20.2%) Face Book, 23 (10.1%) Tumbler/Messenger, 21 (9.2%) Twitter, 18 (7.9%) Others and 17 (7.5%) Instagram. Functions appropriate to their parent institutions. Pramanathan and Baskaran (2014) analyzed the 230 (58.4%) of the research scholars covered under the study involve that internet provides required information which satisfactorily or fulfilling their research at Large Extent. Majority of the respondents access electronic resources through the Electronic mail 252 (63.95%). Pitchaipandi and Baskaran (2020) analyzed the 6.4%"Research Collaboration "Strongly agree" of the respondents respectively. 30.9% purpose of Web 2.0 for Collaborations of Research Communication while 19.6% Opportunities and Learning for Web 2.0 tools support social interaction in the learning process of the respondents respectively. Baskaran (2021) analyzed the majority 134 (1.96%) of the publications contributed by the researchers from the University of California systems. Zhang Y was the top author has contributed 16(0.23%) of the publications in the field of Web 2.0, subsequently, Kolt GS, Li Q, Vandelantte C, Zhang J, the publications equally appears 13(0.19%) of the publications. Baskaranand Pitchaipandi (2021) analyzed the respondents highly prefer group sites (Yahoo, Google, and Whatsapp). The research analyses that social media tools for research the majority of the respondents highly preferred Facebook wall for shared the research information by the respondents in the eight Universities in Tamil Nadu. Pitchaipandiand Baskaran (2021) examined the 51.3% of the respondents visit 1/hr day in using WhatsApp. 78.9% of the respondents added the Whatsapp Groups from Friends of the respondents respectively. Among the WhatsApp as instructive help devices and administrations in a Thiruvalluvar University. Baskaran (2020) analyzed that there are twenty five institutions are listed, among them University of Washington has contributed highest 48 (0.98%) of the publications witnessed be a first position out of twenty five. Radhakrishnan andBaskaran, C. (2020) discussed there is a moderate correlation between Citation and Altmetric Score. Only one paper obtains citation and Altmetric score equally. Another paper gets citation and Altmetric score in near equal. Out of the 10 papers, four papers received more citations. Of the 4 highly cited articles, three papers receive very low Altmetric score and only one paper receives high Altmetric score.

Baskaranand Binu (2020) discussed that majority of respondents 109 (25.9%) are post graduates and 75 (17.8%) are having PG with NET qualification. Mean value for 'To borrow books' was 3.86 and assigned the rank one. Majority of respondents 416 (98.8%) are searching for educational and research Information. The findings of the study could identify the various parameters while access Electronic resources by the academic community. Baskaranand Ramesh (2020) analyzed that Two hundred fifty-one (48.3%) respondents rated that information sought from e-books are "excellent" while 205 (39.4%) of the respondents rated them as "very good." Two hundred eighty (53.8%) respondents "agree" that electronic journals save the time of the user while 219 (42.1%) of the respondents "strongly agree." A miniscule number, 21 (4.0%), respondents "disagree." Baskaran, C. (2020) discussed that Currently, ROAR lists 1,793 and Open DOAR lists about 1,966 IRs all over the world. It is found that more institutions (47) installed the D-Space (62%). It is followed by e-prints adopted (26), and two institutions implemented OAR through GSDL. Ramesh, P and Baskaran, C. (2019) analysed that at a large number of respondents 265 (51.0%) prefer gateway portal to a "Large Extent'and 139 (26.7%) of the respondents prefer to a "Very Large Extent". On the other hand, it has also been noticed that 105 (20.2%) of the respondents are "Less satisfied" whereas 11 (2.1%) of the respondents opted "No Comment". Radhakrishnanand Baskaran (2019) analyzed that square root of total authors, who have contributed 7.94 % of the total contribution, is found to be 255.52 in Price square Root Law. The findings of Pareto's 80/20 rules state that 20% of the authors contributed only 46.60% of the total contribution.Baskaranand Babu, P. R. (2019) discussed the activity index and exponential growth of authors analysed during 1989-2016. The result of the study found that publications growth between 11 (0.26%) in 1989 and 447 (10.76%) in 201. RGR shows a fluctuates trend between 0.02 and 1.02 in 2005, 2006 and 1991 respectively. Complete twenty three years the research could be observed that RGR less than 1. Baskaran, C. (2018) discussed that highest of 2093 (13.94%) citations received by Prof. Sanjeeviraja out of 180 (11.41%) of the Publications during the period. Material Science has 5632 Citations for 488 Publications with the highest h-index was 37. Baskaranand

Rameshbabu (2018) conducted the study largest output in was found 447 publications in 2013. It is found the DC between 0.64 and 0.94 and overall DC measured to be 23.08 throughout study period. The study could be found DC was an increased and a decreased trend appeared in the whole study period. Value n in the field of Forensic Medicine is being analysed, it has calculated the exponential growth is n= 4.4320914 for author. Radhakrishnan and Baskaran (2018) discussed that maximum number of articles 114 (4.83%) were published in the year of 2015. In the Authorship Pattern, the major contribution of articles was from two authors 776 (32.87%). The Time series analysis technique reveals the estimated future growth of articles in the Journal will be increased from 63.81 (2016) to 88.13 in 2020 and 93.66 in the year 2025. Murugiahand Baskaran (2014) analyzed the document types, journal articles were the highest numbers with 7210 papers or 99.26%. From this study, it is observed that the Journal of Biological Chemistry has published with 529 research papers and find top position which is accounted for 7.28% of the total articles. Sivakamiand Baskaran (2014) analyzed that kinds of resources are fallen in highest in the year 2010 & 2011. Collaborative authors' productivity is more than a single contribution. The degree of collaboration C= 0.884 represents 88 percent of collaborative authors article that were published during the study periods. Bradford's law fits well on sample.

Baskaran, C and Gopalakrishnan (2013) analyzed the information use behaviour by the Chemistry teachers in Arts and Science Colleges in Tiruchirappalli region, Tamilnadu. Though it is assumed in information user studies that the employees in general tend to be ready to make use of information source and make an attempt to keep abreast of the information published in various sources. Baskaran, C. (2013) examined the Doubling time (Dt) was found to be increased and decreased trend in this study. Degree of collaboration and its means value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University and Anna University. Veeramuthu and Baskaran (2018) analyzed the maximum articles 568 were published in the year 1999 and the minimum 46 in the year 1995. In the authorship pattern, the maximum articles 5131 were published by single author. The RGR in the starting year 1990 is 0.78 and 0.03 in the last year 2017. The Doubling time in the starting year 1990 was 0.88 and in the last year 2017 was 27.47. Baskaran (2011) emphasis on open access resources and initiatives in various institutions in India. It also explains about the Open Access Initiatives Repository policies and other issues. Baskaran, C. (2011) analyzed the Author's collaboration analyzed through Subramanian's formula and it expressed C= Nm/Nm+ Ns. Lotka's law and bradford's law of scattering were applied to count the author productivity and core journals in this specific subject. Lotka's law is n= 2 and Bradford's law scattering 1: n: n2. These have been analysed in this study. Pitchaipandiand Baskaran (2020) investigated the The social Networks and Media exchange information, ideas and pictures/videos in virtual communities and networks. The assessment of this study was the role and consumption of Social Networks/Media Research Communication by the Students and Research Scholars' Social Science at Alagappa University, Karaikudi, Tamilnadu. Senthil Kumar and Baskaran (2018) discussed the Journal named "Advanced Materials Research" ranked in the top position in contributing articles 59 (2.28%) in this field. The highly prolific author is Monteiro S.N who has contributed 41 articles 0.47 %.   Krishnan and Baskaran (2018) studied the maximum articles 1084 were published by four authors. The RGR in the starting year 2000 is 0.71 and 0.12 in the last year 2017. The Doubling time in the starting year 2000 was 0.98 and in the last year 2017 was 5.96. In the Country wise distribution of articles, the major contribution was from China 1381 (19.25%). Baskaran, and Anbu, S. G. (2011) This research attempt to the internet based resources by the students of Hindustan college of Engineering, Chennai (India). The aim is to determine the use of Internet based resources by the students skills in handing the different types of documents can access to academic and various purposes. This survey reflects the availability of e-resources and typically examines the quantum of their use in Hindustan college of Engineering.

3. Methodology

The study intends to identify the growth and development of scientific output in the field of Synthetic Fibre. The required data have been collected from the Scopus database covering the period of 1983 to 2017. By using Scopus Database for a total of 10,977 records were retrieved using the search term **"Synthetic Fibre."** Collected data were analyzed by using MS-Excel as per the given objectives of the study and the data has been presented in tabular and graphical form. The study examines the growth rate of the research literature output, productive authors, journals, institution, and distribution of publication by region and structure.This study discusses and analyzeddifferent Scientometricparameters apply with year-wise Relative Growth Rate (RGR) and DoublingTime (Dt), Time series, Ranking of authors, Source wise distribution, Keyword analysis of Synthetic fiberLiterature during 1983-2017.

4. Results and Discussion

A total of 10977 documents on the selected topic were analyzed in the following manner. The relevant data available in the Scopus database were downloaded directly by the researcher, the data were analyzed using MS-Excel and necessary calculations were done to draw few more inferences and few results either got from the Scopus database directly or from MS-Excel.

4.1 The Year-wise publication output on Synthetic Fibre

Table 1 shows the year-wise research outputon Synthetic Fibre literature.An effort was made to analyze the year-wise productivity of Synthetic Fibreliterature research output. A total of 10977 records were published during 1983-2017 on Synthetic Fibre covered in the Scopus database. It can be observed from the above table that the most productive year was 2006 with 486 (4.43%) records followed by 446 (4.06%)in 2007 and 441(4.02%) in 2017 and the least productive year was in 2010 with 198(1.80%)records. It is noted that 50% of the publications were contributed in the

years between 1983 and 2000 and balance 50% of the publications were contributed during the last 17 years (2001-2017). It is identified from Table 1 that there exists fluctuation throughout the study period in the productivity of Synthetic Fibre literature.

Table 1. Year-wise publication output on Synthetic Fibre

S. No	Year	No. of Articles	Percentage	Cumulative	Cumulative %
1	1983	293	2.67	293	2.67
2	1984	315	2.87	608	5.54
3	1985	330	3.01	938	8.55
4	1986	287	2.61	1225	11.16
5	1987	324	2.95	1549	14.11
6	1988	342	3.12	1891	17.23
7	1989	371	3.38	2262	20.61
8	1990	357	3.25	2619	23.86
9	1991	356	3.24	2975	27.10
10	1992	349	3.18	3324	30.28
11	1993	314	2.86	3638	33.14
12	1994	334	3.04	3972	36.18
13	1995	256	2.33	4228	38.52
14	1996	285	2.60	4513	41.11
15	1997	243	2.21	4756	43.33
16	1998	216	1.97	4972	45.29
17	1999	232	2.11	5204	47.41
18	2000	289	2.63	5493	50.04
19	2001	326	2.97	5819	53.01
20	2002	361	3.29	6180	56.30
21	2003	359	3.27	6539	59.57
22	2004	439	4.00	6978	63.57
23	2005	411	3.74	7389	67.31
24	2006	486	4.43	7875	71.74
25	2007	446	4.06	8321	75.80
26	2008	297	2.71	8618	78.51
27	2009	242	2.20	8860	80.71
28	2010	198	1.80	9058	82.52
29	2011	207	1.89	9265	84.40
30	2012	229	2.09	9494	86.49
31	2013	233	2.12	9727	88.61
32	2014	233	2.12	9960	90.74
33	2015	269	2.45	10229	93.19
34	2016	307	2.80	10536	95.98
35	2017	441	4.02	10977	100
Total		**10977**	**100**		

4.2 Year-wise RGR and DT of the publications

Table 2 shows the Relative Growth Rate and Doubling time of Synthetic Fibre research output. The maximum RGR value is found to be 0.73 and the minimum value is found to be 0.02. In the RGR analysis, a steady decrease is found during the study period. However, Doubling Time increases from 0.95 (1984) to 31.36 (2010) and decreases from 30.67 (2011) to 16.90 (2017). The study witnessed RGR was a decreasing trend while the DT shows an increasing and decreasing trend throughout the study.

Table 2. Year-wise RGR and DT of the publications of Synthetic Fibre

Year	No. of Articles	Cumulative	W1	W2	RGR	DT
1983	293	293	0	5.68	0	0
1984	315	608	5.68	6.41	0.73	0.95
1985	330	938	6.41	6.84	0.43	1.60
1986	287	1225	6.84	7.11	0.27	2.60
1987	324	1549	7.11	7.35	0.23	2.95
1988	342	1891	7.35	7.54	0.20	3.47
1989	371	2262	7.54	7.72	0.18	3.87
1990	357	2619	7.72	7.87	0.15	4.73
1991	356	2975	7.87	8.00	0.13	5.44
1992	349	3324	8.00	8.11	0.11	6.25
1993	314	3638	8.11	8.20	0.09	7.68
1994	334	3972	8.20	8.29	0.09	7.89
1995	256	4228	8.29	8.35	0.06	11.10
1996	285	4513	8.35	8.41	0.07	10.62
1997	243	4756	8.41	8.47	0.05	13.21
1998	216	4972	8.47	8.51	0.04	15.60
1999	232	5204	8.51	8.56	0.05	15.20
2000	289	5493	8.56	8.61	0.05	12.82
2001	326	5819	8.61	8.67	0.06	12.02
2002	361	6180	8.67	8.73	0.06	11.51
2003	359	6539	8.73	8.79	0.06	12.27
2004	439	6978	8.79	8.85	0.06	10.67
2005	411	7389	8.85	8.91	0.06	12.11

Year	No. of Articles	Cumulative	W1	W2	RGR	DT
2006	486	7875	8.91	8.97	0.06	10.88
2007	446	8321	8.97	9.03	0.06	12.58
2008	297	8618	9.03	9.06	0.04	19.76
2009	242	8860	9.06	9.09	0.03	25.02
2010	198	9058	9.09	9.11	0.02	31.36
2011	207	9265	9.11	9.13	0.02	30.67
2012	229	9494	9.13	9.16	0.02	28.38
2013	233	9727	9.16	9.18	0.02	28.58
2014	233	9960	9.18	9.21	0.02	29.28
2015	269	10229	9.21	9.23	0.03	26.00
2016	307	10536	9.23	9.26	0.03	23.44
2017	441	10977	9.26	9.30	0.04	16.90
Total	**10977**					

Time Series Analysis is used to estimate the productivity of Synthetic fibre publications in the future. In this study this technique is used to estimate the literature output for the years 2025 and 2030, the time series analysis calculate as,

Straight line equation Yc=a+bX

Where a = total no. of articles divided by number of years

Where b=XY/X^2

Yc=a+bX

a =$\Sigma Y/N$ = 10977/35 = 313.63

b=$\Sigma XY/X^2$ = 2699/3570 = - 0.756

Estimated literature for 2025 is when X= 2025-2000 = 25

Yc=a+bX

Yc=313.63+ (-0.756)*25

Yc=294.73

Estimated literature for 2030 is when X= 2030-2000 = 30

Yc=a+bX

Yc = 313.63+ (-0.756)*30

Yc = 290.95

    Based on the above calculation, it is found that the predicted value of literature output has decreased from 441(2017) to 294.73 (2025) and the value further decreased in the year 2030 (290.95). Hence from the results, it is observed that the productivity of Synthetic Fibre literature may be declined in the future. Based on the analysis, the estimated future productivity of synthetic Fibre literature in 2025 and 2030 is declining.

Table 3. Time Series Analysis of Synthetic Fibre

Year	Count Y	X	X2	XY
1983	293	-17	289	-4981
1984	315	-16	256	-5040
1985	330	-15	225	-4950
1986	287	-14	196	-4018
1987	324	-13	169	-4212
1988	342	-12	144	-4104
1989	371	-11	121	-4081
1990	357	-10	100	-3570
1991	356	-9	81	-3204
1992	349	-8	64	-2792
1993	314	-7	49	-2198
1994	334	-6	36	-2004
1995	256	-5	25	-1280
1996	285	-4	16	-1140
1997	243	-3	9	-729
1998	216	-2	4	-432
1999	232	-1	1	-232
2000	289	0	0	0
2001	326	1	1	326
2002	361	2	4	722
2003	359	3	9	1077
2004	439	4	16	1756
2005	411	5	25	2055
2006	486	6	36	2916
2007	446	7	49	3122
2008	297	8	64	2376
2009	242	9	81	2178
2010	198	10	100	1980
2011	207	11	121	2277
2012	229	12	144	2748
2013	233	13	169	3029
2014	233	14	196	3262
2015	269	15	225	4035
2016	307	16	256	4912
2017	441	17	289	7497
Total	**10977**	**0**	**3570**	**-2699**

4.3 Ranking of Authors

19656 authors have contributed to total publications on Synthetic Fibre literature in the study period 1983-2017. An effort has been taken to rank the authors in the decreasing order of productivity.In Table 4 and Figure 1 authors at Top 50 positions with rank have been listed. The Result shows Schollmeyer has published the maximum number of 48 publications and is a topper among all the authors witnessing his contribution in the field of Synthetic fiber. In the series of ranked authors, Monteiro was 2nd rank with 43 publications followed by Zhang, Perepelkin, and Margem in 3rd, 4th and 5th rank with 35, 33, and 30 publications respectively.

Table 3. Ranking of Authors

Name of Author	Publications	Percentage of 10977	Ranking
Schollmeyer E	48	0.44	1
Monteiro S.N	43	0.39	2
Zhang Y	35	0.32	3
Perepelkin K.E	33	0.30	4
Margem F.M	30	0.27	5
Aizenshtein E.M	29	0.26	6
Stalevich A.M	27	0.25	7
Wang Y	27	0.25	7
Pennings A.J	27	0.25	7
Wang H	26	0.24	8
Fouda I.M	26	0.24	8
Hamza A.A	25	0.23	9
Wang J	25	0.23	9
Zverev M.P	23	0.21	10
Knittel D	23	0.21	10
Holme I	23	0.21	10
Liu Y	22	0.20	11
Volokhina A.V	22	0.20	11
Serkov A.T	22	0.20	11
Wang X	21	0.19	12
Yang Y	21	0.19	12
Li Y	21	0.19	12
Simpson P	21	0.19	12
Jr	21	0.19	12
Genis A.V	20	0.18	13
Teli M.D	20	0.18	13
Fiber Organo	20	0.18	13
Nosov M.P	19	0.17	14
Zhang L	19	0.17	14
Bahners T	19	0.17	14
Hearle J.W.S	19	0.17	14
Kumar S	19	0.17	14
Papkov S.P	19	0.17	14
Pavlov N.N	18	0.16	15
Druzhinina T.V	18	0.16	15
Rangnekar D.W	18	0.16	15
Ward I.M	18	0.16	15
Jawaid M	17	0.15	16
Zhang X	17	0.15	16

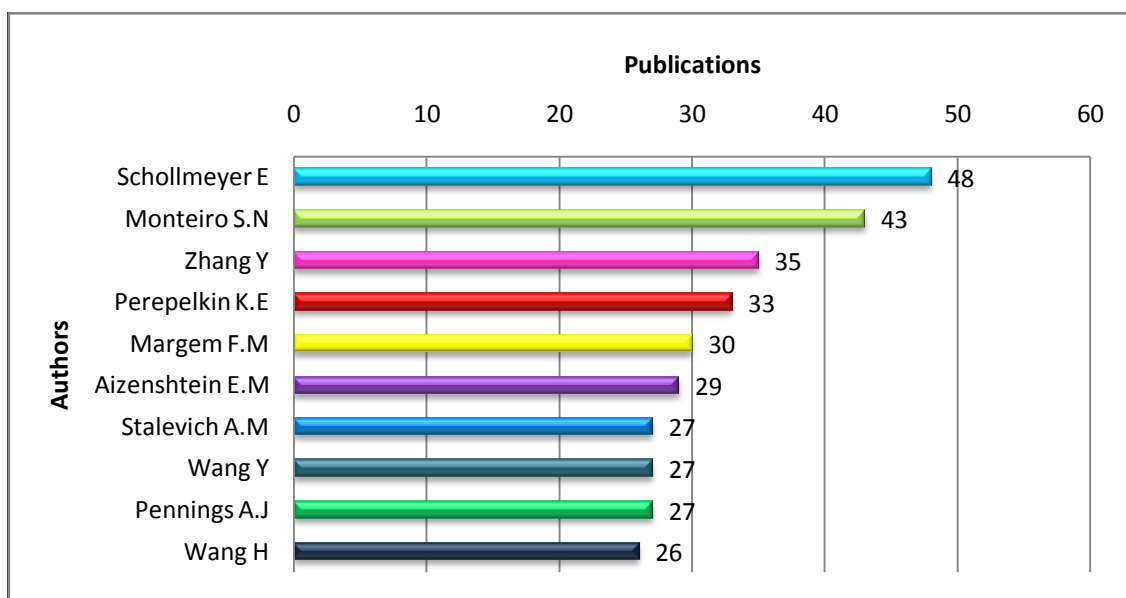| Name of Author	Publications	Percentage of 10977	Ranking
JT	17	0.15	16
Zhang H	16	0.15	16
Tsebrenko M.V	16	0.15	16
Gries T	16	0.15	16
Zhang C	16	0.15	16
Chen Y	16	0.15	16
Farris R.J	16	0.15	16
Chung T.-S	15	0.14	17
Gal'braikh L.S	15	0.14	17
Sapuan S.M	15	0.14	17
Davies P	14	0.13	18

Figure 1 : Ranking of Journals

4.4 Journals- wise Distribution

The Source Title wise distribution was explored in the selected research. Table 5 contains the top 50 Core Journals of Synthetic fiber. Overall, 2528 source titles/journals contributed to this research in which Fibre Chemistry topped in the list with 813 (7.41%) publications. It is followed by the Journal of Applied Polymer Science with 411 (3.74%), KhimicheskieVolokna with 396 (3.61%) and Chemical Fibers International contains 223(2%) publications. The study is witnessing from figure 2 mapping of Journal density shows more than 100 above of Publications contain 5 Journals, 90 above with 7 Journals, 80 above with 10 Journals, 70 above with 12 Journals, 60 above with 16 Journals, 50 above with 24 Journals, 40 above with 36 Journals, 30 above with 46 Journals and 20 above with 50 Journals.

Table 4. Journal wise Distribution of Synthetic Fibre

S. No	Title of the Journal	Count	Percentage	Ranking
1	Fibre Chemistry	813	7.41	1
2	Journal of Applied Polymer Science	411	3.74	2
3	KhimicheskieVolokna	396	3.61	3
4	Chemical Fibers International	223	2.03	4

S. No	Title of the Journal	Count	Percentage	Ranking
5	Textile Research Journal	186	1.69	5
6	Polymer	98	0.89	6
7	Journal of Membrane Science	95	0.87	7
8	Journal of the Textile Institute	83	0.76	8
9	Journal of Materials Science	83	0.76	8
10	Dyes and Pigments	82	0.75	9
11	Textile Month	78	0.71	10
12	Colourage	71	0.65	11
13	International Fiber Journal	67	0.61	12
14	JTN Weekly	62	0.56	13
15	KobunshiRonbunshu	62	0.56	13
16	Advanced Materials Research	60	0.55	14
17	Textile Outlook International	59	0.54	15
18	Macromolecules	58	0.53	16
19	Man-made Textiles in India	55	0.50	17
20	MelliandTextilberichte	55	0.50	17
21	Man-Made Textiles in India	55	0.50	17
22	Construction and Building Materials	53	0.48	18
23	Asian Textile Journal	52	0.47	19
24	Journal of Polymer Science Part B: Polymer Physics	51	0.46	20
25	Fiber Organon	49	0.45	21
26	Revista de la IndustriaTextil	47	0.43	22
27	American Dyestuff Reporter	46	0.42	23
28	Composites Science and Technology	44	0.40	24
29	Synthetic Fibre	44	0.40	24
30	Textile Asia	44	0.40	24
31	Synthetic Fibre	44	0.40	24
32	Textile Chemist and Colorist	43	0.39	25
33	Medical Textiles	41	0.37	26
34	Polymer Science U.S.S.R.	40	0.36	27
35	Fibre and Textiles in Eastern Europe	40	0.36	27
36	Advances in Textiles Technology	40	0.36	27
37	Proceedings of SPIE - The International Society for Optical Engineering	39	0.36	28
38	Wool Record	38	0.35	29
39	Polymeric Materials Science and Engineering, Proceedings of the ACS Division of Polymeric Materials Science and Engineering	36	0.33	30
40	Textile horizons	35	0.32	31
41	Journal of Fiber Science and Technology	35	0.32	31
42	Industrie Textile	33	0.30	32
43	IzvestiyaVysshikhUchebnykhZavedenii, SeriyaTeknologiyaTekstil'noiPromyshlennosti	33	0.30	32
44	IOP Conference Series: Materials Science and Engineering	33	0.30	32

S. No	Title of the Journal	Count	Percentage	Ranking
45	Tinctoria	31	0.28	33
46	Technical Textiles International	30	0.27	34
47	Textile Horizons	29	0.26	35
48	PrzegladWlokienniczy	29	0.26	35
49	ATA Journal	29	0.26	35
50	Melliand International	29	0.26	35

4.5 Keyword analysis of the distribution

Table 6 and Figure3show the top 50 Keywords distribution in this field of Synthetic Fibre research. A total number of 1, 41,211 keywords were used in this research. The keyword "Synthetic Fibers" (3.50%) covers the highest number of 4944 publications, followed by "Fibers" 1022 (0.72%) publications, and "Synthetic Fiber" (0.71%) covers 996 publications. The study has been witnessed above 500 publications hold keywords Synthetic fibre (0.71%), Article (0.47%), Mechanical Properties (0.46%),Polyesters(0.41%), Natural fibre (0.39%), Tensile Strength (0.38%), Polymers (0.36%) and Fibre(0.36%) of the Publications.

Table 5. Keyword analysis of Synthetic fibre literature

S. No	Name of the Key words	Publications	Percentage
1	Synthetic Fibers	4944	3.50
2	Fibers	1022	0.72
3	Synthetic Fiber	996	0.71
4	Article	665	0.47
5	Mechanical Properties	643	0.46
6	Polyesters	572	0.41
7	Natural Fibers	556	0.39
8	Tensile Strength	532	0.38
9	Polymers	512	0.36
10	Fibre	512	0.36
11	Scanning Electron Microscopy	470	0.33
12	Textile Industry	453	0.32
13	Reinforcement	439	0.31
14	Synthetic	438	0.31
15	Textiles	415	0.29
16	Polypropylenes	410	0.29
17	Yarn	397	0.28
18	Priority Journal	377	0.27
19	Fabrics	351	0.25
20	Polyester	321	0.23
21	Human	321	0.23
22	Composite Materials	319	0.23
23	Fiber Reinforced Materials	293	0.21
24	Reinforced Concrete	286	0.20
25	Dyeing	285	0.20
26	Mathematical Models	280	0.20
27	Textile Fibers	280	0.20

S. No	Name of the Key words	Publications	Percentage
28	Mathematical Models	278	0.20
29	Cellulose	268	0.19
30	Cotton	268	0.19
31	Polyamides	257	0.18
32	Reinforced Plastics	253	0.18
33	Wool	249	0.18
34	Polypropylene	241	0.17
35	Production	236	0.17
36	Polyethylene Terephthalates	232	0.16
37	Composites	228	0.16
38	Morphology	222	0.16
39	Spinning	219	0.16
40	Strength Of Materials	215	0.15
41	Male	201	0.14
42	Synthetic Fibre	198	0.14
43	Melt Spinning	195	0.14
44	Nonhuman	195	0.14
45	Polyethylenes	194	0.14
46	Controlled Study	188	0.13
47	Silk	187	0.13
48	Polymer	181	0.13
49	Female	177	0.13
50	Humans	176	0.12

Figure. 3 Keyword Occurrence Mapping

4.6 Language-wise Distribution

Table 7 illustrates the language-wise distribution of Synthetic Fibre literature. As one might expect,English was found to be the most predominant language of communication in Synthetic Fibre research which constitutes 81.53 % of the total publications. The Russian language covers 632 (5.76%) publications. The German language gets the third position with 429 (3.91%) publications, Chinese 230 (2.10%), Japanese has 130 (1.18%) and Italian got 121 (1.10%) publications.From the above result,it is identified that the English language dominates in the field of Synthetic Fibre research.

Table 6. Language wise Distribution

Rank	Language	No. of Publications	Percentage of 10977
1	English	8949	81.53
2	Russian	632	5.76
3	German	429	3.91
4	Chinese	230	2.10
5	Japanese	130	1.18
6	Italian	121	1.10
7	French	95	0.87
8	Spanish	95	0.87
9	Polish	68	0.62
10	Slovak	36	0.33
11	Romanian	30	0.27
12	Serbian	27	0.25
13	Bulgarian	23	0.21
14	Korean	20	0.18
15	Slovenian	18	0.16
16	Hungarian	16	0.15
17	Czech	15	0.14
18	Portuguese	13	0.12
19	Croatian	12	0.11
20	Hebrew	5	0.05
21	Dutch	3	0.03
22	Turkish	3	0.03
23	Bosnian	2	0.02
24	Finnish	2	0.02
25	Arabic	1	0.01
26	Persian	1	0.01
27	Thai	1	0.01
	Total	**10977**	**100**

4.7 Source of the Documents

Table 8 observed that Document type contribution of Synthetic Fibre literature, Article plays the major role in this research and has (8738) 79.6% of the publications, Conference paper 1338 (12.19%) Review 367 (3.34%), and the book chapter holds 205 (1.87%). The Journal Articles reflect a major share in Synthetic Fibre research. The majority of the scientists have preferred to publish the articles in journals.

Table 7. Source of the Documents

S. No	Document -Type	No. of Publications	Percentage %
1	Article	8738	79.60
2	Conference Paper	1338	12.19
3	Review	367	3.34
4	Book Chapter	205	1.87
5	Book	114	1.04
6	Note	80	0.73
7	Conference Review	42	0.38

S. No	Document -Type	No. of Publications	Percentage %
8	Short Survey	38	0.35
9	Business Article	19	0.17
10	Editorial	15	0.14
11	Letter	7	0.06
12	Article in Press	7	0.06
13	Report	6	0.05
14	Erratum	1	0.01
Total		**10977**	**100**

5.Conclusion

This study presents the trends and products in the field of Synthetic Fibre. Predicted future growth shows a declining trend in this study. Indian contributions towards this field of Synthetic Fibre literature show an encouraging and commendable act in this study, which motivates for further research. It is recommended that government and non-government funding organizations should take efforts to ensure more research in syntheticFibre which gives future growth for Industries development and economic development. The research direction in this study would enhance future research and development. Fibre in biological systems is driving the Fibre science and technology; it is the climate in which the nano-fiberhas appeared. The new target is now high–tech Fibre. Fiberis important in our individual life, right from the beginning and has profoundly influenced the development of mankind for many thousands of years. Today, the development of advanced Fibre is gaining new significance as a motor for industrial innovation, particularly in composite materials and high-tech or medical applications. It is our goal to contribute to this research field to enhance the quality of life which will lead to a more sustainable living environment. Greater integration and research effort in this field of Fibre will ensure increasing contribution to new aspects of the environment and human life. To achieve these aims innovative technology is required. To promote innovative technology a study in this field is essential to direct specialist Fibre technologists, scientists and students in Fibre science, and others who are engaged in this Fibre industry and related research fields.

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