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Mapping of Synthetic Fibre Literature: A Scientometric Analysis

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Abstract - **A Quantitative study of research papers published in Synthetic Fibre research from 2008-2017 was undertaken to investigate the research output in this field. The study was done by applying various parameters for capturing the trend-growth pattern of the literature, relative growth Rate, doubling time, authorship pattern, prolific author and top ranking journals etc. The data was obtained from scopus database and the articles published from 2008 – 2017 were taken for this study. A total of 2594 articles were published in this field with a yearly average of 259.4 articles. Out of the 2594 articles, the majority of the articles 421 (16.23%) were published in the year 2017. The RGR in the year 2009 was found to be 2.05 and in the final year 2017 found to be 0.12. This shows that the RGR declining trend is linear. Among the authorship patterns, the major contribution of articles were from three authors 534 (20.59%). The Journal named "Advanced Materials Research" ranked first with 59 (2.28%) articles. The highly prolific author is Monteiro S.N who has contributed 41 articles (0.47 %).**
Keywords: **Synthetic Fibre, Publishing Trend, Relative Growth Rate, Authorship Productivity, Prolific Authors**

I. INTRODUCTION

This article analyses the performance of synthetic fibre research output. The growth rate, authorship pattern, journal coverage and author productivity and future scope of research in this field of Synthetic fibre are also studied. As far as the libraries are concerned, this quantitative research has a vital role in the decision making process of purchasing essential books on any growing field of knowledge. Synthetic fibre is a chain of small chemical units joined together. Each small unit is called a monomer and the large chain formed of many such monomers is called a polymer. Synthetic fibers are made up of such polymers. Synthetic fibres are made from petroleum based chemicals. Synthetic fibres are the result of extensive research by scientists to improve on naturally occurring animal and plant fibres. Nowadays there are many classes of fibres which are widely used.

Synthetic fibres such as nylon, polyester, acrylic and polyolefin – dominate the market. Synthetic fibre has wide range of applications from Textile industry to aerospace industry. High performance fibre such as carbon fibre, glass fibre are used in aerospace industries, automotive industries and engineering Industries and in making high end cars, bio-medical devices and sporting goods.

II. REVIEW OF LITERATURE

Gupta, Dhawan & Ritu (2017) examined 3779 global publications on mobile computing research covered in Scopus database during 2007-16. The study reveals that cloud computing research registered a high growth of 139.6% per annum. China was found to be the topmost productive country in the world in cloud computing research. The topmost 20 productive journals covering cloud computing literature accounts for 30% share of total publications output.

Naqvi (2017) investigated the literature trends of genetic engineering and observed that the growth rate was not constant during the study period. The RGR showed a decreasing trend. However the doubling time has increased from 1.23 in the year 2007 to 7.23 in the year 2015.

Sab, M. *et al*. (2017) analyzed the publication output in oceanography literature during 2011-15. Based on the study results most of the researchers preferred to publish in journals. National Institute of Oceanography has produced highest number of articles among the Indian Organizations. The maximum research concentrated on engineering areas in Oceanography research.

Pandey (2016) analyzed stem cell research output for the period of 25 years. The study observed a notable growth in stem cell research publication from India. US were found to be the largest collaborative partner of India in stem cell research. Various parameters were used for analysis such as growth rate, h-index, and impact per paper, citation analysis, and degree of collaboration. Pandey and Desai thus concluded that there exists a rapid growth in stem cell research in last 25 years.

Manimegalai and Ravi (2014) evaluated the research trend in fashion technology research for the period 1970-2013. It was found that there is a parabolic growth of publication output in the field of fashion technology. The ROG (Ratio of Growth) ranges between 0.97 and 2.02 which indicates that publications are increasing. Relative growth and doubling time are linear in nature.

Ashok Kumar and Gopalakrishnan (2013) analyzed textile research output in which the Indian publications on textile research and the relative growth rate were linear in nature.

The findings show negative growth in terms of RGR and DT for a certain period. Similarly the doubling time also shows linear trend with a few exceptions.

Baskaran (2013) examined the research publications of Alagappa University in which the study revealed that collaborative papers are more by this University. RGR was found to be fluctuating and there is a steady growth in research productivity.

Kamal Lochan Jena (2006) analyzed the Journal Indian Journal of Fiber and textile research for the period 1996-2004. The year wise distribution of publication, citation pattern of articles, authorship pattern and geographical distribution of contributors of articles were studied.

The results revealed that there was an increasing trend in the publication output from the year 1996, with respect to the bibliographical distribution of citation, journal form is predominant, while considering the authorship pattern, three authored paper were found to be higher. Subject wise analysis of article shows that the areas of study has been more concentrated on production and properties of fibre, yarns and fabrics and their chemical process.

Mohan, Gupta & Dhawan (2003) analyzed material science research in India and found that most of the works were a result of bilateral collaboration. The preferred areas of collaboration were found to be superconductivity, metals and alloys, and electronic and magnetic materials.

III. METHODOLOGY

The data about literature on Synthetic Fibre was downloaded from "Scopus" database which is an international indexing and abstracting database using the search term "Synthetic Fibre".

For this study, literature published from 2008 to 2017 has been used. A total of 2594 articles were retrieved. The collected data has been classified using Excel.

For the purpose of analysis, scientometric techniques such as authorship pattern, relative growth rate and doubling time were used for the study.

A. Limitations

The following are the limitations of the study:

1. This study is confined to the Scopus database alone.
2. Literature published from 2008 - 2017 were only taken up for the study.

IV. RESULTS AND DISCUSSION

A. Year Wise Distribution of Publications

Table I shows the year wise distribution of articles. Out of the total 2594 articles, the highest number of 421(16.23%) articles was published in 2017. The minimum number of 198(7.63%) articles was published in 2010.

TABLE I YEAR WISE DISTRIBUTION

Year	No. of articles	Percentage	Cumulative	Cumulative %
2008	297	11.45	297	11.45
2009	241	9.29	538	20.74
2010	198	7.63	736	28.37
2011	207	7.98	943	36.35
2012	230	8.87	1173	45.22
2013	223	8.60	1396	53.82
2014	228	8.79	1624	62.61
2015	254	9.79	1878	72.40
2016	295	11.37	2173	83.77
2017	421	16.23	2594	100
Total	2594	100		

B. Relative Growth Rate and Doubling Time

Table II depicts the relative growth rate and doubling time. The relative growth rate is the increase in the number of articles per unit of time. It can be seen from the table that the relative growth is linear and declining in nature. The RGR decreased from 2.05 in 2009 to 0.12 in 2017. The doubling time shows an increasing trend. The data in the table shows that the DT has increased from 0.34 in 2009 to 5.97 in 2017.

TABLE II RELATIVE GROWTH RATE AND DOUBLING TIME.

Year	No. of articles	Cumulative	W1	W2	RGR	DT
2008	297	297		5.69		
2009	241	2306	5.69	7.74	2.05	0.34
2010	198	4316	7.74	8.37	0.63	1.11
2011	207	6327	8.37	8.75	0.38	1.81
2012	230	8339	8.75	9.03	0.28	2.51
2013	223	10352	9.03	9.24	0.22	3.20
2014	228	12366	9.24	9.42	0.18	3.90
2015	254	14381	9.42	9.57	0.15	4.59
2016	295	16397	9.57	9.70	0.13	5.28
2017	421	18414	9.70	9.82	0.12	5.97
Total	2594					

C. Authorship Pattern

The pattern of authorship has been presented in Table III. It is observed from the table III that most papers (99.96%) are contributed by multiple authors. Only 17.54 % of the papers are contributed by single author. Highest number of papers were contributed by three authors (20.59%) followed by two authors (20%). Only one paper has been contributed with highest number of authors (28). The team research has dominated in the field of Synthetic fibre.

TABLE III PATTERN OF AUTHORSHIP

Authorship	No. of articles	Percentage	Cumulative	Cumulative %
1	455	17.54	455	17.54
2	524	20.20	979	37.74
3	534	20.59	1513	58.33
4	461	17.77	1974	76.10
5	293	11.30	2267	87.39
6	150	5.78	2417	93.18
7	82	3.16	2499	96.34
8	51	1.97	2550	98.30
9	17	0.66	2567	98.96
10	13	0.50	2580	99.46
11	5	0.19	2585	99.65
12	3	0.12	2588	99.77
13	2	0.08	2590	99.85
15	1	0.04	2591	99.88
18	1	0.04	2592	99.92
26	1	0.04	2593	99.96
28	1	0.04	2594	100
Total	2594	100		

D. Ranking of Authors

Table IV shows the ranking of authors. In this analysis, top 10 authors have been listed out based on the number of contribution. Author Monteiro, S.N topped the rank with 41 publications. Margem F.M has contributed 28 articles followed by Zhang Y with 16 contributions.

TABLE IV PROLIFIC AUTHORS

S. No	Author name	Publications	Percentage
1	Monteiro S.N	41	0.47
2	Margem F.M	28	0.32
3	Zhang Y	16	0.18
4	Sapuan S.M	14	0.16
5	Wang H	14	0.16
6	Jawaid M	13	0.15
7	Wang X	13	0.15
8	Altoé G.R	11	0.13
9	Li H	11	0.13
10	Simpson P.	11	0.13
11	Anonymous	68	0.77
12	Others	8559	97.27
	Total	8799	100

E. Most Productive 25 Journals in Synthetic Fibre Research During 2008-2017

Journals are the major sources of research publication. Table V shows the top 25 Journals which published papers on Synthetic fibre research during 2008-2017 as per Scopus database. The study shows that Advanced Materials research is the most productive journal which published 59 articles followed by the Journal Construction and Building Materials with 51 articles (1.92%). The Advanced materials Research and Construction and Building Materials Journals were found to be the most preferred journals for Synthetic fibre research. On the whole, the journals Bio Resources and International Fibre Journal published the least number of journals.

TABLE V MOST PRODUCTIVE 25 JOURNALS

S.No	Top 25 Journals	Publications	Percentage
1	Advanced Materials Research	59	2.28
2	Construction and Building Materials	51	1.97
3	Journal of Applied Polymer Science	45	1.74
4	Textile Outlook International	40	1.55
5	Fibre Chemistry	34	1.31
6	IOP Conference Series: Materials Science and Engineering	33	1.28
7	Applied Mechanics and Materials	28	1.08
8	Journal of Membrane Science	28	1.08
9	Textile Research Journal	25	0.97
10	Fibers and Polymers	24	0.93
11	Journal of the Textile Institute	22	0.85
12	Chemical Fibers International	21	0.81
13	Journal of Reinforced Plastics and Composites	20	0.77
14	Procedia Engineering	20	0.77
15	American Concrete Institute, ACI Special Publication	19	0.73
16	Colourage	18	0.7
17	International Journal of Applied Engineering Research	18	0.7
18	Fibres and Textiles in Eastern Europe	17	0.66
19	Journal of Fiber Science and Technology	16	0.62
20	Materials Science Forum	16	0.62
21	AIP Conference Proceedings	15	0.58
22	Materials Today: Proceedings	15	0.58
23	BioResources	14	0.54
24	International Fiber Journal	14	0.54
25	TMS Annual Meeting	14	0.54
26	Others	1960	75.79
	Total	2586	100

V. CONCLUSION

A total of 2594 records on synthetic fibre literature were retrieved during the period 2008 - 2017. The study revealed that the growth trend of the literature gradually increased from 2012, except for a sudden decline during the year 2010 and 2011. RGR was found to decline during the study period, The DT observed an increasing trend. Multi authored contributions dominated in the field of Synthetic fibre research. Author Monteiro, is the most prolific author, and contributed to the highest number of publications (41 papers). The first three highly productive journals are advanced material research with 59 publications, Construction and Building Materials journal contributed 51 publications and Journal of Applied Polymer Science published 45 papers. This study on synthetic fibre literature provides an overall picture of the trends and productivity in the field of Synthetic fibre research. This analysis shows a tremendous growth in synthetic fibre research literature for a decade. A growing tendency of collaborative nature of research could be observed in this field. The contemporary research direction in this study can be used to formulate policies to foster future research and development. It is desirable that government and other funding agencies should give high priority to research in this area. Synthetic fibre has wide range of applications in different fields such as textile industry, automotive, engineering and aerospace industries in which the research in this field could further develop programmes which can compliment expertise between theoretical, experimental and applications of synthetic fibre research.

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