

Publication Trends in Groundnut and Mustard Research: A Scientometric Study

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Abstract

The paper examines groundnut and mustard research in the world and analyses 22968 papers published over 14 years. Yearly activity index of top five countries in the world has been calculated. Journals have been the most important channel for communication of research accounting for 94.78% of all research publications. Relative growth rate and doubling time have decreased during 2000 to 2013. Authorship pattern shows that 92.5% of papers published in collaboration.

Keywords: Activity Index, Authorship Patterns, Bibliometric Study, Groundnut, Mustard, Oilseeds, RGR&DT, World

1. Introduction

There are many oilseeds in the world whose oils are utilized for human consumption. Oilseeds, apart from being sources of oils, have a lot of importance as nutritious food items. Oilseeds like soybean, groundnut, mustard, palm oil and sesame etc. are utilized as food and in the preparation of various value-added and nutritious food products¹. The oilseeds play an important role in the agricultural economy. India stands fourth largest vegetable oil economy whereas USA, China and Brazil holds first, second and third places respectively. In many countries like India domestic consumption of edible oils has increased day by day. India has imported 12.4 million metric tons edible oils in the year 2014/15².

The sources of vegetable edible oils are groundnut, rapeseed-mustard, soybean, safflower, sunflower, sesame, niger linseed and castor etc. In India, Soybean (39%), groundnut (26%), and rapeseed-mustard (24%) contribute 88% of total oilseed production. All other edible oils like palm oil, sunflower oil, sesame oil, contribute the rest 11% share of oilseed production³.

The source data for research has been retrieved from CAB Direct which is an electronic platform of Commonwealth Agriculture Bureaux International (CABI). CABI is a non-for-profit inter-governmental organization based in the United Kingdom. It was

established as Commonwealth Agriculture Bureaux in 1910⁴.

2. Review of Literature

Many related studies have been reported in literature. The study by Bala & Gupta (2010)⁵ have attempted to analyze biochemistry, genetics and molecular biology research in India during 1998–2007 from *Scopus* database. The study focuses on the research output, publication share, countries rank and growth rate of India's publication productivity. Khatun & Ahmed (2011)⁶ have presented a quantitative analysis to identify the literature growth, publication pattern and journal distribution on diarrhoeal disease research in Bangladesh based on data obtained from Pubmed, Web of Science and Scopus databases. Kumar and others (2011)⁷ have attempted to highlight quantitatively the growth and development of world literature on nuclear waste management based on International Nuclear Information System (INIS) database for the period 1970–2009. Varaprasad & Ramesh (2011)⁸ have discussed activity and growth of chemical research in India during 1987–2007 using Scopus database. Gopalakrishnan (2013)⁹ has conducted a bibliometric study of global literature output in the field of textile research for the period of 30 years (1983-2012). Relative growth rate and doubling time of textile literature have been calculated. India

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contributed 5.2% of total world research output on textile and secured the fourth rank in study duration.

A co-author of this paper has many published papers on oilseeds. A few worth mentioning are Kumar & Kumar (2004)¹⁰ on the productometric study of scientists of NRCS. Many papers on oilseeds have been presented in reputed conferences also. Study of Kumar & Kumar (2014)¹¹ on collaboration pattern on oilseeds research institutes, the productivity of scientists of NRCS and collaboration in DSR are worth mentioning. Kumar & Jain¹² (2009) on patterns of Indian contributions in soybean oilseed in the world, Kumar & Jain¹³ (2010) on collaboration pattern among Indian scientists and Kumar & Jain¹⁴ (2011) on the research productivity of scientists in the field of soybean research are other worth mentioning papers.

3. Methodology

Data has been collected from CAB Direct available at Directorate of Soybean Research, Indore (M.P.). The data is collected using the search terms 'groundnut' and 'rapeseed & mustard', 'Arachis Hypogaea' and 'Brassica' etc., for the duration of 14 years (2000-2013). The data has been transferred to Microsoft Excel for statistical analyses. Publication trends of world groundnut and rapeseed and mustard research have been measured on many scientometric parameters.

4. Hypotheses

To check the performance of research activity in India and the world following hypotheses have been prepared and tested in this study.

- India has highest activity index in groundnut and mustard research.

- Relative growth rate of the world has decreasing trend and consequently doubling time has increasing trend.

5. Formulae

For the purpose of analysing research publication activity following statistical formulae have been used:

a. Activity Index (AI): -

$$A.I. = \frac{\text{Given field's share in the country's publication output}}{\text{Given field's share in the world's publication output}} \times 100$$

b. Relative Growth Rate and Doubling Time (RGR & DT): -

$$RGR = \frac{\text{Log}_{e2} w - \text{Log}_{e1} w}{2^T - 1^T}$$

Where, $\text{Log}_{e1} w$ = log of initial number of articles; $\text{Log}_{e2} w$ = log of final number of articles after a specific period of interval; $2^T - 1^T$ = the unit difference between the initial time and the final time

$$DT = \frac{\text{Log}_e 2}{GR}$$

Where, GR = Growth rate; $\text{Log}_e 2 = 0.693$

6. Analysis

The paper mainly focuses on the distribution of publications and activity index of the world, calculation of RGR & DT.

6.1 Yearly Distribution

Table 1 shows the year wise distribution of paper on mustard and groundnut research. Total data collected

Table 1. Distribution of publications on groundnut and mustard research in the world

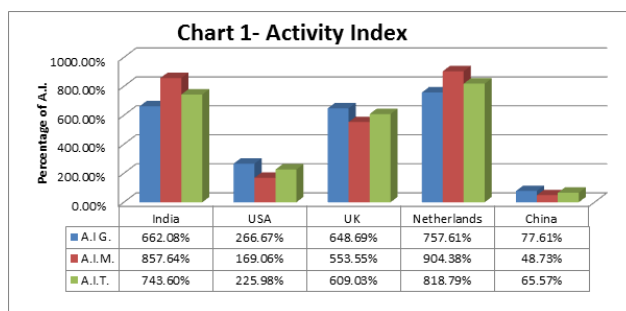
S.N	Year	Groundnut	%	Decrease/Increase	Mustard	%	Decrease/ Increase	Total	%	Decrease/ Increase
1	2000	745	5.56%		504	5.26%		1249	5.44%	
2	2001	772	5.76%	0.20%	527	5.50%	0.24%	1299	5.66%	0.22%
3	2002	841	6.28%	0.52%	673	7.03%	1.53%	1514	6.59%	0.93%
4	2003	757	5.65%	-0.63%	628	6.56%	-0.47%	1385	6.03%	-0.56%
5	2004	832	6.21%	0.56%	652	6.81%	0.25%	1484	6.46%	0.43%
6	2005	909	6.79%	0.58%	712	7.44%	0.63%	1621	7.06%	0.60%
7	2006	826	6.17%	-0.62%	670	7.00%	-0.44%	1496	6.51%	-0.55%
8	2007	962	7.18%	1.01%	715	7.47%	0.47%	1677	7.30%	0.79%
9	2008	1042	7.78%	0.60%	689	7.20%	-0.27%	1731	7.54%	0.24%
10	2009	1023	7.64%	-0.14%	670	7.00%	-0.20%	1693	7.37%	-0.17%
11	2010	1141	8.52%	0.88%	691	7.22%	0.22%	1832	7.98%	0.61%
12	2011	1101	8.22%	-0.30%	775	8.09%	0.87%	1876	8.17%	0.19%
13	2012	1192	8.90%	0.68%	882	9.21%	1.12%	2074	9.03%	0.86%
14	2013	1251	9.34%	0.44%	786	8.21%	-1.00%	2037	8.87%	-0.16%
	Total	13394	100 %		9574	100%		22968	100 %	

on mustard and groundnut is 9574 and 13393 records respectively in the world. The highest data 2074 is collected in the year 2012 and lowest 1249 in the year 2000. World publications in groundnut and mustard show increasing trend but less than 1% every year.

6.2 Activity Index

Table 2 shows the activity index of top five countries out of 95 countries of the world on the subject. Yearly publications in groundnut & mustard and total articles of the five countries in the CAB Direct have been collected for this purpose. India ranks first in research publications in both oilseeds. In groundnut and mustard research India has contributed 28.95% and 37.48% records respectively.

In the calculation of Activity Index values Netherlands has the highest activity index (818.79%) and China scores lowest values (65.57%) in the five countries. Activity Index values of groundnut and mustard is separately again highest for Netherland with 757.61% and 904.38% respectively, while India follows with 662 and 857 respectively.



6.3 Relative Growth Rate and Doubling Time

Table 3 shows that relative growth rate has continuously decreased from 0.31 to 0.04 and doubling time have increased from 2.24 to 17.15 during the study period.

6.4 The Medium of Communication and Authorship Pattern

The paper, in short, also provides some basic facts on this

Table 2. Activity index of publications on groundnut and mustard research in the world

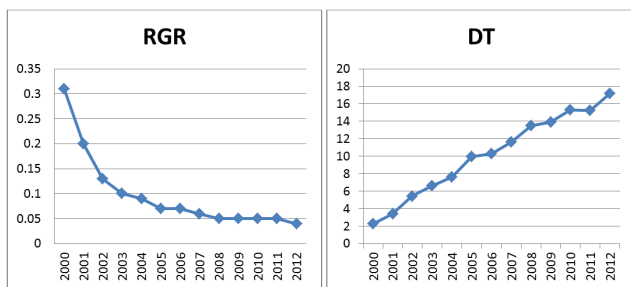
S.N	Country	Groundnut	Mustard	Total	TS	A.I.G.	A.I.M.	A.I.T.
1	India	3875	3588	7463	156919	662.08%	857.64%	743.60%
2	USA	2423	1098	3521	243605	266.67%	169.06%	225.98%
3	UK	1646	1004	2650	68031	648.69%	553.55%	609.03%
4	Netherlands	702	599	1301	24843	757.61%	904.38%	818.79%
5	China	811	364	1175	280179	077.61%	048.73%	065.57%
6	Others	3937	2921	16110	2817477			
Total		13394	9574	22968	3591054			

Total = sum of groundnut and mustard research, TS = Total of all subjects, A.I.G. = Activity index of groundnut, A.I.M = Activity index of mustard, A.I.T. = Activity index of total

Table 3. Relative growth rate and doubling time of publications on groundnut & mustard in the world

S.N.	Year	Mustard	Groundnut	Total	Cum. Total	W1	W2	RGR	DT
1	2000	504	745	1249	1249	-	3.0965		
2	2001	527	772	1299	2548	3.0965	3.4062	0.31	02.24
3	2002	673	841	1514	4062	3.4062	3.6087	0.20	03.42
4	2003	628	757	1385	5447	3.6087	3.7362	0.13	05.44
5	2004	652	832	1484	6931	3.7362	3.8408	0.10	06.63
6	2005	712	909	1621	8552	3.8408	3.9321	0.09	07.59
7	2006	670	826	1496	10048	3.9321	4.0017	0.07	09.96
8	2007	715	962	1677	11725	4.0017	4.069	0.07	10.30
9	2008	689	1042	1731	13456	4.0690	4.1287	0.06	11.61
10	2009	670	1023	1693	15149	4.1287	4.1801	0.05	13.48
11	2010	691	1141	1832	16981	4.1801	4.2300	0.05	13.89
12	2011	775	1101	1876	18857	4.2300	4.2753	0.05	15.30
13	2012	882	1192	2074	20931	4.2753	4.3207	0.05	15.26
14	2013	786	1251	2037	22968	4.3207	4.3611	0.04	17.15

research such as the medium of communication, channels of communication and authorship pattern as follows:



6.4.1 Communication Medium

Table 4 shows English is the most popular language in the research articles in the study. Total 20312(88.44%) records have been published in English followed by Chinese with 1104(4.81%) and Portuguese with 1104 (1.64%). Scientists have published only 17 articles (0.07%) in Hindi as per record in this study.

6.4.2 Communication Channels

Table 5 provides data on communication channels. Journals are most popular communication channels for research publications with 21768 (94.78%) papers. Other communication channels have published only 1200

(5.22%) papers.

6.4.3 Collaboration Pattern

Table 6 provides collaboration patterns in research articles. Highest 5489 (23.90%) papers have been published by three authors followed by 4688 (20.41%) papers by two authors and 4331(18.86%) papers by four authors. Authors also published 3935 (17.13%) articles with more than five authors. It reveals that scientists and researchers prefer to publish their work with two or three collaborators. 17.13% articles with 5+ authors are large number and can be predicted that the number of collaborators will increase in future. There are only 7.5% single authored papers.

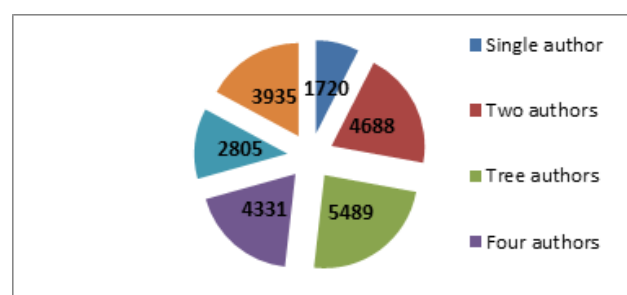


Figure 1. Authorship Pattern.

Table 4. Language-wise distribution of publications on groundnut and mustard research in the world

S.N.	Language	Mustard	Percentage	Groundnut	Percentage	Total	Percentage
1	English	8517	088.96%	11795	088.06%	20312	088.44%
2	Chinese	321	003.35%	783	005.85%	1104	004.81%
3	Portuguese	26	000.27%	351	002.62%	377	001.64%
4	Polish	266	002.78%	9	000.07%	275	001.20%
5	French	27	000.28%	143	001.07%	170	000.74%
6	German	74	000.77%	35	000.26%	109	000.47%
7	Others	343	003.58%	278	002.08%	621	002.70%
	Total	9574	100.00%	13394	100.00%	22968	100.00%
*	Hindi	14	000.15%	3	000.02%	17	000.07%

Table 5. Communication channels of publications on groundnut and mustard research in the world

S. N.	Publication Type	Mustard	Percentage	Groundnut	Percentage	Total	Percentage
1	Journal articles	9115	095.21%	12653	094.47%	21768	094.78%
2	Conference papers	286	002.99%	356	002.66%	642	002.80%
3	Book, book chapters	107	001.12%	236	001.76%	343	001.49%
4	Bulletins	29	000.30%	65	000.49%	94	000.41%
5	Miscellaneous	37	000.38%	84	000.62%	121	000.52%
	Total	9574	100.00%	13394	100.00%	22968	100.00%

Table 6. Author wise distribution of publications on groundnut and mustard in the world

S.N.	Year	Single author	Two authors	Tree authors	Four authors	Five authors	More than five authors	Total	%
1	2000	126	354	355	222	83	109	1249	5.44%
2	2001	146	329	328	223	137	136	1299	5.66%
3	2002	175	377	393	281	142	146	1514	6.59%
4	2003	139	312	355	249	134	196	1385	6.03%
5	2004	145	327	381	296	153	182	1484	6.46%
6	2005	126	356	429	302	176	232	1621	7.06%
7	2006	92	312	379	297	182	234	1496	6.51%
8	2007	118	331	420	333	216	259	1677	7.30%
9	2008	102	289	413	361	255	311	1731	7.54%
10	2009	97	320	399	309	225	343	1693	7.37%
11	2010	110	337	422	346	260	357	1832	7.98%
12	2011	116	330	377	357	274	422	1876	8.17%
13	2012	111	394	445	368	284	472	2074	9.03%
14	2013	117	320	393	387	284	536	2037	8.87%
Total		1720	4688	5489	4331	2805	3935	22968	100.00%
%		7.49%	20.41%	23.90%	18.86%	12.21%	17.13%	100.00%	

7. Test of Hypothesis

Two hypotheses have been tested as follows: -

- India has highest activity index in groundnut and mustard research.

Presumed mathematically as:

H_0 : A. I. India > A. I. of other countries

H_1 : A. I. India ≤ A. I. of other countries

Table 2 has analysed Activity Index of 5 top countries and it reveals that Netherland has highest activity index among these countries. So, the hypothesis is rejected.

- Relative growth rate of the world has decreasing trend and consequently doubling time has increasing trend.

Table 3 has revealed that RGR has decreased from 0.31 to 0.04 and at the same time DT has increased from 2.24 to 17.15. So, the hypothesis is accepted.

8. Conclusion

The study evaluates groundnut and mustard research outputs on various scientometric parameters and finds out that publications activity in the world on groundnut and mustard have a slow trend. India is second in the Activity Index with 744.911% though India is on top as far as a number of research publications on the subject are concerned. The relative growth rate has decreased year by year and consequently doubling time has increased.

Co-authorship trend of research publications is very high in the research. The research activities in the world need to be increased to increase yield to meet the demand of oils in the world which will increase in future due to the growth of populations and health consciousness. India should also take steps to increase its yield to meet domestic demand.

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