

SCINTOMETRIC ANALYSIS OF RESEARCH OUTPUT IN SOYBEAN RESEARCH

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ABSTRACT

This paper deals with the relative growth rate and doubling time, authorship productivity and collaborative research output and document wise, institution wise, and journal wise publication output of soybean research. The whole study period sample mean relative growth rate of 0.25. The year group of 2002 to 2004 has 849 authors were produced 246 articles and the highest research output from the three authors products and the highest articles on two authors output.

Keywords: Relative growth rate, Doubling time, prolific authors, Authorship pattern, Soybean research. Scintometric analysis.

INTRODUCTION:

The source database is Web of Science - a renowned database published online by the Thomson International, formerly Institute for Scientific Information (ISI), Philadelphia. A total of 1737 items were downloaded marking the output of research publications by the scholars from the subject of soybean during 1999 to 2013 (fifteen years). It includes Science Citation Index (SCI), Social Science Citation Index (SSCI) and Arts and Humanities citation Index (AHCI) from web of science.

OBJECTIVES

- Relative growth rate and doubling time
- Year wise output of soybean research
- Authorship pattern
- Collaborative authors
- Document wise distribution of research output
- Journal wise distribution of soybean research
- Institution wise distribution of publication.

METHODOLOGY

Bibliometrics and Scientometrics tools and techniques are the application of statistical methods to written communication has been measured as appropriate and non-reactive tools for studying collaboration in every research. Hence, the investigators have employed this methodology for studying authorship pattern and collaborative research in soybean research productivity. Soybean research articles were downloaded the database in Web of Science during the period 1999 to 2013. It includes the databases of SCI (Science Citation Index), SSCI (Social Science Citation Index) and AHCI (Arts and Humanities Citation Index)). The search key term has 'Soybean' has been used for the purpose of collection of data, required for the study. Authorship data regarding the number of papers, number of authors for each paper in different types of documents was collected from the database. Further, the data was tabulated using by the software's of Histcite, and MS-Excel and further analyzed for the purpose of interpretation and discussion.

Relative Growth Rate and Doubling Time of Soybean Research Output

Table 1 predicts data of relative growth rate and doubling time for total research output on Soybean at national level. The analysis of Soybean research output at India visual aid the following facts: It is observed that its relative growth rates have shrunk gradually from 0.2 at 1999 to 1.63 in the year of 2013. The whole study period sample mean relative growth rate of 0.25. The Doubling Time for Soybean publications from all source output has decreased from the value of 3.47 in 1999 to 23.1 in 2012. However, its relative growth rate has shown a prosperous trend, which means the rate of increase is low in terms of proportion, and this has been highlighted by doubling time for publications, which is more than the relative growth rate. 12.8 years doubling growth rare value has calculated from this analysis.

Table 1. Relative Growth Rate and Doubling Time of Soybean Research Output

S.No	Publication Year	Recs	TCS	$\log_e 1^p$	$\log_e 2^p$	Rt(P)	Dt(P)
1	1999	88 (5.1)	579	-	4.47	-	-
2	2000	72 (4.1)	1043	4.47	4.27	0.2	3.47
3	2001	98 (5.6)	817	4.27	4.58	0.31	2.23
4	2002	71(4.1)	827	4.58	4.26	0.32	2.16
5	2003	96 (5.5)	1394	4.26	4.56	0.3	2.31
6	2004	79 (4.5)	1121	4.56	4.36	0.2	3.46
7	2005	100 (5.8)	1857	4.36	4.60	0.24	2.88
8	2006	121 (7.0)	1600	4.60	4.79	0.19	3.64
9	2007	156 (9.0)	1553	4.79	5.04	0.25	2.77
10	2008	153 (8.8)	1140	5.04	5.03	0.01	69.3
11	2009	155 (8.9)	1075	5.03	5.04	0.01	69.3
12	2010	173 (10.0)	978	5.04	5.15	0.11	6.3
13	2011	174 (10.0)	421	5.15	5.15	0	-
14	2012	168 (9.7)	173	5.15	5.12	0.03	23.1
15	2013	33 (1.9)	8	5.12	3.49	1.63	0.42
	Total	1737	14611	66.42	69.91	3.8(0.25)	191.3(12.8)

By seen from the below table result the years of 2011 and 2010 were having highest productivity of the subject of soybean research. The year of 2005 having highest citation scores has measured.

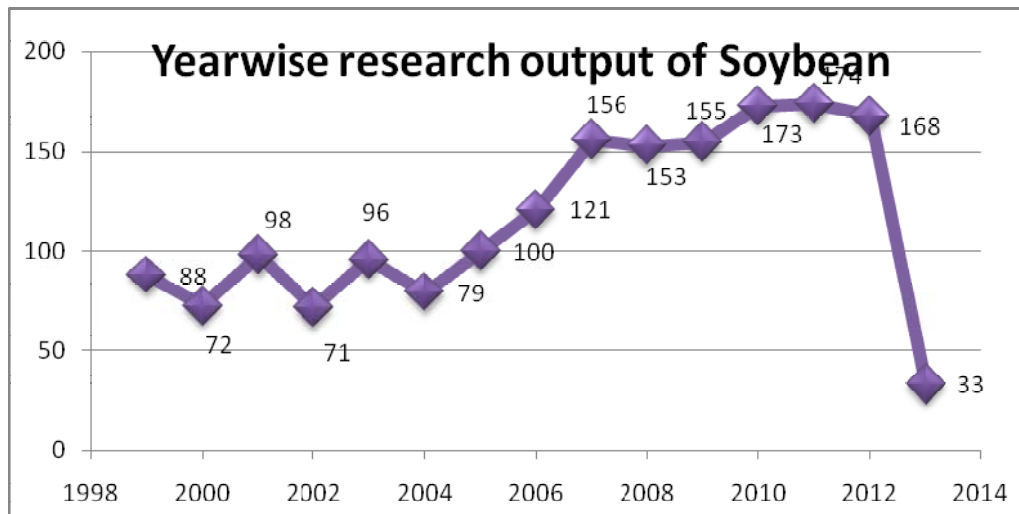


Figure 1. Year wise distribution of Soybean research output

Authorship pattern of Soybean Research Output

The researcher has divided the three year groups of five groups, such that 1999 to 2001; 2002 to 2004; 2005 to 2007; 2008 to 2010 and 2011 to 2013. Table 2 shows various facets of authorship patterns of Indian contributions in soybean output. Totally 6768 authors were produced 1737 articles related to the selected subject. Out of the 6768 Indian contributions, only 57 contributions (0.84%) are found with single authorship. The remaining 6711 contributions (99.1%) are of joint-authorship. This reveals higher collaboration among Indian scientists contributing to soybean research. The number of authors in collaborated papers ranges between two to ten. The year group of 2008 to 2011 has highest contributors of Soybean research. From this analysis, the researcher found the highest 1440 contributions (21.27%) have collaboration of four authors, followed by 1431 contributions (21.14%) having three authors, 945 contributions (13.96%) having five authors and 854 contributions (12.62%) having two authors were having priority positions respectively.

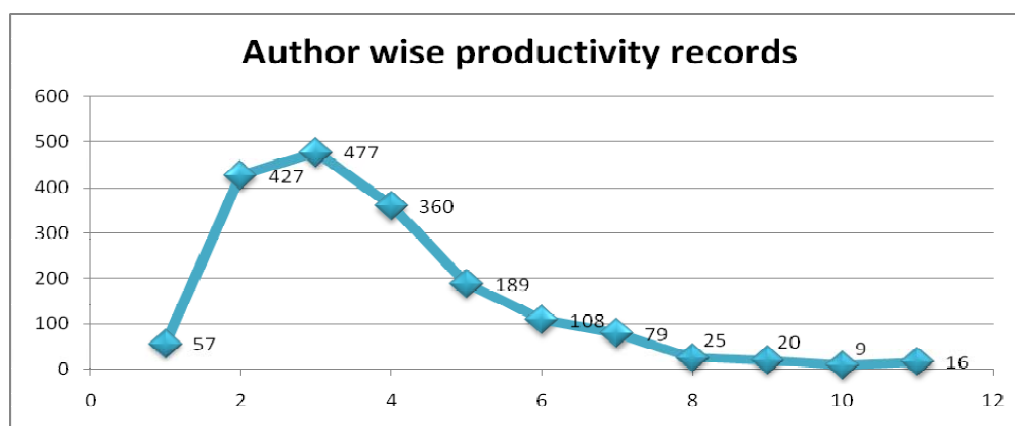
The year group of 2002 to 2004 has 849 authors were produced 246 articles and the highest research output from the three authors products and the highest articles on two authors output. Year group of 2005 to 2007 has 1374 authors were produced 377 articles and the highest research output from the three authors products and the highest articles on three authors output. Year group of 2008 to 2010 has 1895 authors were produced 481 articles and the highest research output from the four authors products and the highest articles on three authors output. Year group of 2011 to 2013 has 1860 authors were produced 375 articles and the highest research output from the four authors products and the highest articles on three authors output.

By noticed that the year group wise contribution of authors is, the year groups of 1999 to 2001 has 790 authors were produced 258 articles and the highest research output from the three authors products.

Table 2. Showing authorship patterns of Soybean research

Years		Single	double	triple	four	five	six	seven	eight	Nine	10 +	Total
1999	Articles	16	80	87	40	20	13	1	1	-	-	258
-2001	Authors	16	160	261	160	100	78	7	8	-	-	790
2002	Articles	11	68	61	56	27	12	6	1	3	1	246
-2004	Authors	11	136	183	224	135	72	42	8	27	11	849
2005	Articles	10	88	108	72	49	33	9	4	2	2	377
-2007	Authors	10	176	324	288	245	198	63	32	18	20	1374
2008	Articles	10	109	123	110	51	27	24	9	11	7	481
-2010	Authors	10	218	369	440	255	162	168	72	99	102	1895
2011	Articles	10	82	98	82	42	23	9	10	4	15	375
-2013	Authors	10	164	294	328	210	138	63	80	36	537	1860
Total	Articles	57	427	477	360	189	108	49	25	20	25	1737
	Authors	57	854	1431	1440	945	648	343	200	180	670	6768

It concludes from this analysis, four authors team has contributed in many times and three authors productivity is more than other collaborative teams. The year group of 2008 to 2010 has highest number of authors and articles. So this year group has been lead in the Soybean research output.

**Figure 2. Authors' wise productivity of Soybean research**

Status of authors in Soybean research output:

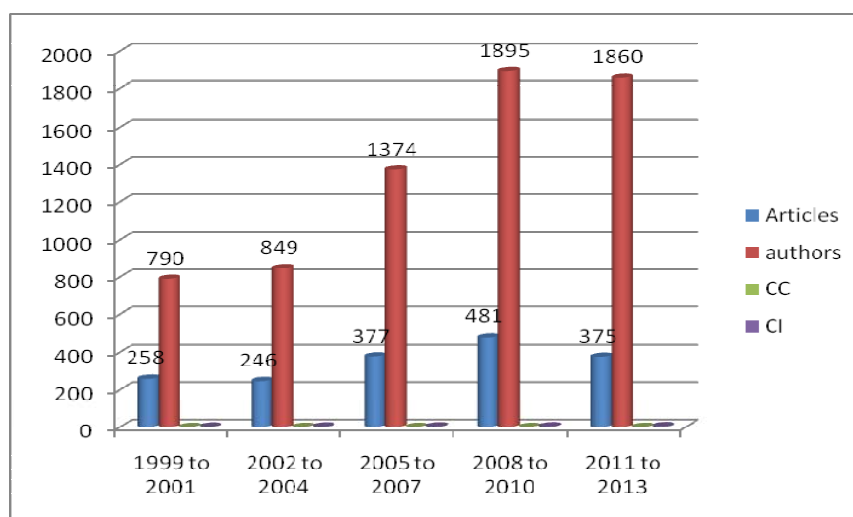
Non- collaborative (single contribution) author's contribution is just 57 (3.28%) of articles; 164 of citation scores were measured and 2172 times cited these articles by the other researchers. Year group of 1999 to 2001 having highest Number of authors, highest citation scores and the year group of 2008 to 2010 have highest cited references scores.

Collaborative (team) author's contribution is 6711 (99.15%) of authors were produced 1680 (96.72%) article; 14422 of citation scores were measured and 53984 times cited these articles by the other researchers. Year group of 2008 to 2010 having highest number of authors, 2005 to 2007 having highest citation scores and the year group of 2008 to 2010 have highest cited references scores.

Table 3. Status of authors in Soybean research output

Year	No. of Author	No. of Article	No. of non collaborative author			No. of collaboration			CI	AAPP	CC
			NA	CS	CR	NA	CS	CR			
1999 to 2001	790	258	16	60	360	774	2379	4463	3.06	0.33	0.98
2002 to 2004	849	246	11	18	225	838	3324	7238	3.45	0.29	0.99
2005 to 2007	1374	377	10	36	348	1364	4974	11504	3.64	0.27	0.99
2008 to 2010	1895	481	10	40	676	1885	3153	15772	3.94	0.25	0.99
2011 to 2013	1860	375	10	10	563	1850	592	15007	4.96	0.20	0.99
Total	6768	1737	57	164	2172	6711	14422	53984	3.81	0.27	0.99

Note: NA – No. of Authors, CS – Citation Scores, CR – Cited References, CI – collaborative Index, AAPP – Average number of Authors Per Paper, CC- Collaboration Coefficient

**Figure 3. Status of authors in Soybean research output**

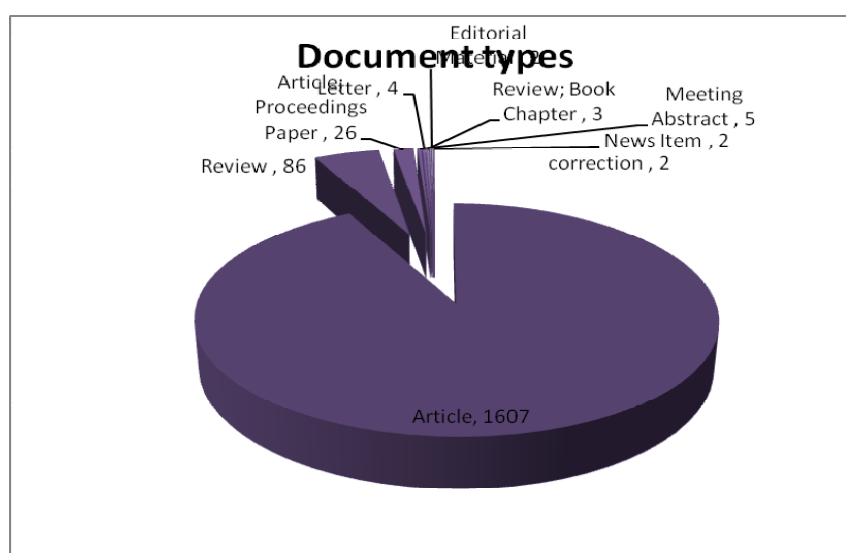
Distribution of different type Documents in Soybean research

The study reveals that the major source of publications covered by web of science on Soybean research in journal articles (92.5%), while review comprises (5%), conference proceedings with (1.5%), Abstracts (0.3%) of the remaining literature.

Table 4. Document wise Distribution of Publications

S.No	Document Type	Recs	Percent	TLCS	TGCS
1	Article	1607	92.5	797	10675
2	Review	86	5.0	97	2744
3	Article; Proceedings Paper	26	1.5	8	268
4	Meeting Abstract	5	0.3	0	0
5	Letter	4	0.2	0	10
6	Review; Book Chapter	3	0.2	0	6
7	correction	2	0.1	0	0
8	Editorial Material	2	0.1	0	3
9	News Item	2	0.1	0	3

It concludes from the above analysis most of the articles were brought from the sources of articles in journals format. Just 5 percent of articles were in the form of Review and .5 percent of articles were in the form of proceeding articles. Another six forms were contributed below 0.3 percent of articles. Remaining eight types of document sources were having just 7.5 percent of articles.

**Figure 4. Document wise distribution of Soybean research output**

Journal Wise Distribution of Soybean Publications

The study found that the total research output of the Soybean for the study period (1999-February 2013) published in 519 journals. The 519 journals were produced 1607 articles in the subject of Soybean research. As the major portion of the research productivity (92.5 %) covered by 50 journals that is coincide with the theory of Bradford's Law of scattering of journals in research productivity. The selected 50 journals were produced 875 articles in this selected filed. The journal "Indian Journal of Agricultural Science" topped with 140 publications with the Global Citation Score of 151, next "Journal of Food Science and Technology" 74 publications with the Global Citation Score of 138, "Indian Journal of Agronomy" with 60 publications with the Global Citation Score of 88, "Indian Journal of Animal Science" 52 publications with the Global Citation Score of 40, "Bioresource Technology" 34 publications with the Global Citation Score 754 respectively. Remaining journals were having below 25 articles in the subject of Soybean research.

Table 5. Distribution of Soybean in Publications

S.No	Journal	Recs.	%	TLCS	TGCS	TLCR
1	Indian Journal of Agricultural Sciences	140	8.1	46	151	39
2	Journal of Food Science and Technology-Mysore	74	4.3	30	138	22
3	Indian Journal of Agronomy	60	3.5	31	88	4
4	Indian Journal of Animal Sciences	52	3.0	7	40	15
5	Bioresource Technology	34	2.0	41	754	26
6	Legume Research	26	1.5	0	2	5
7	Asian-Australasian Journal of Animal Sciences	25	1.4	8	83	5
8	Food chemistry	23	1.3	17	340	10
9	Journal of the American oil Chemists Society	23	1.3	22	191	10
10	Current Science	21	1.2	5	94	8

From the above table analysis to conclude the journal of “Indian Journal of Agricultural Science” has indicated the most productive journal in the subject of Soybean research output. The journal of “Renewable & Sustainable Energy Reviews” has highest citation scores measured.

Institution Wise Distribution of Soybean Publications

The below table analysis indicates Institution-wise research productivity. It is noted that 917 institutions were contributed of the total research productivity in the subject of Soybean. It is noted that “Indian Agriculture Research Institution” contributed the highest number of research publications (88) at the same time it ranks first in terms of Global Citation Score 499, next “Indian Institute of Technology” with (74) publications with the Global Citation Score 1729; “Centre for Food Technology Research Institution” with (62) publications with the Global Citation Score 709; “Indian Institute Soil Science” with (58) publications with the Global Citation Score 549 ; “Council of Scientific and Industrial Research(CSIR)” with (52) publications with the Global Citation Score 140 and remaining institutions were producing below 50 articles and low citation scores were measured.

Table 6. Institution wise Distribution of Publication (Top 50)

S.No	Institution	Recs.	%	TLCS	TGCS
1	Indian Agriculture Research Institution	88	5.1	39	499
2	Indian Technology Institution	74	4.3	71	1729
3	Central Food Technological Research Institute (CFTRI)	62	3.6	45	709
4	Indian Institute Soil Science	58	3.3	60	549
5	Council of Scientific and Industrial Research(CSIR)	52	3.0	22	563
6	National Research Center Soybean	50	2.9	42	140
7	Govind Ballabh Pant University Agrecultural & Technology	49	2.8	15	135
8	Indian Veterinary Research Institute	45	2.6	19	141
9	Banaras Hindu University	43	2.5	40	541
10	Punjab Agricultural University	43	2.5	14	166

It is found that the journal of “Indian Agriculture Research Institution” is identified the most productive journal.

CONCLUSION

The researcher has derived conclusion from the above facts that Indian scientists of Soybean research; the relative growth rate has shown a wealthy trend, 2011, 2010 and 2012 has highest productivity and 2005 has highest citation scores. USA is the most collaborative country and Kumar V has active author in Soybean research. The authorship pattern shows majority of joint authorship contributions with 99 percent and high collaboration coefficient (0.99) which reveals that team research is predominant. Out of 6768 authors, which 2923 authors have single contribution. The value of dominance factor found low (less than 0.5) which should be a good sign for collaboration. This kind of study may be useful for understanding the importance of R & D activities, measuring the productivity of scientists and performance of specific research team. It supports in constructing research and development policies for improving the productivity of scientists in various fields.

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