



Scientometric analysis of Coconut Literature: A Global Perspective

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Abstract

*The botanical name for the coconut is *cocos nucifera*. The tree is considered the most useful tree in the tropics. Coconut is highly nutritious and rich in fibre, vitamins, and minerals. This fruit is classified as a functional food. This study is focused on the growth pattern and overall trend and output on coconut literature during the period from 1995 to 2009, as per the data collected from SCOPUS databases based on several parameters like annual average growth rate, global publication ranks, top published institutes, authors etc.*

1. Introduction

The coconut provides a nutritious source of meat, juice, milk, and oil that has fed and nourished populations around the world for generations. On many islands coconut is a staple diet. This fruit provides a large portion of the edible food. Nearly one third of the world's population depend on coconut to some degree as food item. In addition to this, much of the economy of most of the coastal countries depend on coconut cultivation. Among these cultures the

coconut has a long and respected history.

Coconut is classified as a functional food because it provides many health benefits over and above its nutritional content. Coconut oil is highly valued because it possesses healing properties far beyond that of any other dietary oil and is extensively used in traditional medicines in the Asian and the Pacific countries. Pacific Islanders consider coconut oil as panacea. The coconut palm is so highly valued by them as a source of food and medicine and is called the tree of life. Only recently modern medical science has unlocked the secrets of coconut's amazing healing powers [1].

Scientometric is the study of the measurement of scientific and technological progress [2]. Scientometrics analysis received more attention in the recent years due to the rapid increase in science literature [3]. It also describes the output traits in terms of organizational research structure, resource inputs and outputs, and develop benchmarks to evaluate the quality of information output. It

Coconut research is presently showing upward trend, which has been confirmed based on the literature published in the past 15 years, especially between 1995 and 2009.

Among the countries, India occupies the first rank and the US the second rank in publishing research works.

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further characterizes the disciplines using the growth pattern and other attributes.

Research articles are one of the ways of quantitative analysis for the basic research activity in a country. It must be added however that what excite the common man, as well as the scientific community, are the peaks of scientific and technological achievement, not just the statistic on papers [4]. Advancement in these areas cannot be obviously measured by counting only the number of articles and hence it requires an in-depth analysis of other factors such as impact factor, H-index etc. In continuation of our study in Scientometric analysis the present study attempts to find out the publication pattern of researchers in the 'Literature of Coconut'.

2. Objectives and methodology of the study

The main objectives of the study were to present the growth of literature and the quantitative assessment of status of coconut research by analyzing the following critical features as research output:

- To find out year-wise growth of publications
- Comparative study of developing countries with developed countries
- Preference of journal for publications
- To find out most published authors
- To find out the highly productive Institutes
- To find out language-wise distribution
- Keyword analysis

Bibliographic data were collected from SCOPUS™ database [5] from July 1980 to December 2009, which gives details of this last three decades. SCOPUS™ database is an international multidisciplinary database indexing over 15000 peer-reviewed journals in Science and Technology. Besides it covers more than 500 international conference/seminar proceedings. Additionally it covers the records downloaded from the database and analyzed by Microsoft Excel®.

3.1 Year wise Growth of Publications

During 1995-2009 scientists all over the world have produced a total of 1850 publications on coconut. Although least preference was given in early 2000's, in the last ten years there was sudden rise in the publication rate, which reflects the importance of coconut and its impact on medical and commercial purpose in the whole world. The highest number of publications was 215 (11.62%) in 2009. The average number of publications per year was 123. (Table 1).

The lowest number of publications were produced between

Table 1. Year wise publications

S.No	Year	No of Publications	%
1	1995	71	3.83
2	1996	75	4.05
3	1997	69	3.72
4	1998	92	4.97
5	1999	72	3.89
6	2000	119	6.43
7	2001	103	5.56
8	2002	108	5.83
9	2003	118	6.37
11	2004	138	7.45
12	2005	130	7.02
13	2006	177	9.56
14	2007	177	9.56
15	2008	186	10.05
16	2009	215	11.62
Total		1850	100

1995 and 1999 which is below 5%. It is pertinent to note that coconut research trends show significant growth only in 21st century. (Fig. 1).

3.2. Most Productive countries

The analysis of country-wise distribution of authors is an essential phenomenon to understand the progress of research in a particular field of study, overall economic growth and future of a country [6].

Table 2 provides the number of publications on coconut literature. India published highest number of papers 395 (21.35%), followed by United States 199 (10.75%), France 101 (5.45%), but other countries have produced less than 100 papers.

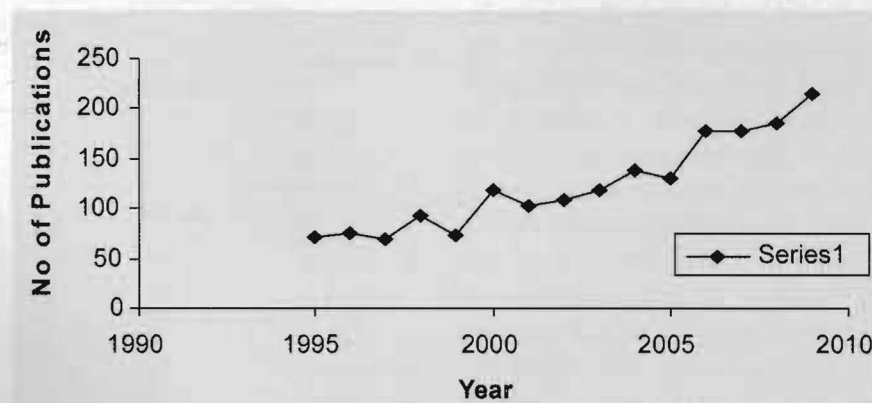


Fig. 1. Trends in Coconut Publications 1995-2009



Table 2. Most Productive countries

S.No	Name of Country	No of Publications	%
1	India	395	21.35
2	United States	199	10.75
3	France	101	5.45
4	United Kingdom	73	3.94
5	Nigeria	59	3.189
6	Japan	56	3.02
7	Malaysia	56	3.02
8	Philippines	45	2.43
9	China	42	2.27
10	Thailand	42	2.27
11	Sri Lanka	37	2.00
12	Australia	34	1.83
13	Others	711	3.84
	Total	1850	100.00

3.3 Preference of Journal for Publications

The impact factor best available for measuring the quality of a journal is the frequency with which the journal's articles are cited. Both the number of citations and the prestige of the citing journals should be considered for a better scientometric measure of journal quality [7]. The research articles in respect to coconut have been published in 160 journals (SCOPUS database allows the viewers to view max. of 160 records). The scientists have published the highest number of articles on coconut literature in the Journal of Bioresource Technology, which is about 41, followed by Nutrition Research-26, Lipids-24, Journal of Nutrition-24, JAOCs Journal of the American Oil Chemists Society published 23 articles and other journals less than that. Most of the coconut literatures were published in journals having moderate impact. It is a period demanding of the scientists to improve research standards and also to give priority pertaining to coconut research and its allied areas.

Table 3. Preference of Journal Publications

S. No	Journal	Number	Publications %	Impact Factor (2009)	Country
1	Bioresource Technology	41	2.21	4.253	The USA
2	Nutrition Research	26	1.40	1.197	The USA
3	Lipids	24	1.29	2.382	The UK
4	Journal of Nutrition	24	1.29	4.091	Pakistan
5	JAOCs Journal of the American Oil Chemists Society	23	1.24	1.803	The United States
6	Food Chemistry	22	1.18	3.146	The USA
7	African Journal of Biotechnology	22	1.18	0.565	Kenya
8	Journal of Nutritional Biochemistry	22	1.18	4.288	Netherlands
9	Indian Journal of Environmental Protection	21	1.13	0.168	India
10	Journal of Hazardous Materials	21	1.13	4.144	Netherlands
11	Philippine Agricultural Scientist	18	0.97	0.145	The US
12	British Journal of Nutrition	17	0.91	3.446	The UK
13	OCL Oleagineux Corps Gras Lipides	16	0.97	0	France
14	Neotropical Entomology	14	0.75	0.586	Brazil
15	Journal of Food Engineering	14	0.75	2.313	The USA
16	Journal of Colloid and Interface Science	12	0.64	3.019	The USA
17	Pestology	12	0.64	NA	India

3.4 Most Productive authors

H-Index is widely used as an indicator to quantify an individual scientific research output. The H-Index is computed automatically in commercial database-Index based on lifetime citations of the research article. The H-Index has rapidly become an alternative to more traditional metrics of journal impact factor in the evaluation of the impact of the work of a particular researcher [8]. The H-index is becoming a reference tool for career assessment and it is considered by Government

agencies and institutions in promotion, allocation, and funding decisions [9-11].

Based on the number of publications and H-Index, Prof. P.C. Calder, University of Copenhagen Denmark, has published 18 papers. This scientist is considered to be the highest coconut literature research contributor followed by Prof. T. Rajamohan, University of Kerala (India) who has to his credit 16 publications.

As Prof. Calder, has published 18 research articles, he has highest

Table 4. Most productive authors

S.I. no	Authors	No of publications	H-Index	Institute
1	Calder, P.C.	18	50	University of Copenhagen Denmark
2	Rajamohan, T.	16	6	University of Kerala India
3	Garcia-Peregrin, E.	15	N.A	University de Granada Spain
4	Nicolosi, R.J.	14	16	University of Massachusetts Lowell US
5	Wilson, T.A.	13	17	Stony Brook University US
6	Dollet, M.	12	6	Centre de Recherche de Montpellier France
7	Curi, R.	12	29	University of Sao Paulo Brazil
8	Gil-Villarino, A.	12	5	University de Granada, Spain
9	Zafra, M.F.	11	5	University de Granada, Spain
10	Lokesh, B.R.	10	12	Central Food Technological Research Institute India
11	Oropeza, C.	10	9	Centro de Investigacion Cientifica de Yucatan Mexico
12	Puertollano, M.A.	10	3	University de Jaen Japan



H-index value of 50. Hence it may be concluded that Prof. P.C. Calder, University of Copenhagen Denmark is one of the best coconut researchers in the scientific world.

3.5 Institutions

The number of publications is probably the best measure of academic research productivity [12]. CIRAD Centre de Recherche de Montpellier France occupies the first rank (2.54%) in terms of number of publications during 1995 – 2009. University of Sao Paulo (2.43%) Brazil ranks the second position followed by Central Plantation Crops Research Institute, India (2.00%). It is observed that among the top twenty institutes, six positions are occupied by the Indian institutes. Analysis of these data shows that there is a commendable contribution from Indian institutions.

3.6 Language

Table 6 presents language-wise distribution of the literature. It is

clear from table 6 that English (1715-92.70%) is the predominant medium for the authors for publishing their research papers. Portuguese language has been used by 62 publications (3.31%) over the period of study followed by Chinese 24 (1.29%), French 23 (1.28%). Other languages like Spanish, German, Japanese, Korean, Thai fall below one percent.

Table 6. Language distribution of the Coconut literature, 1995 - 2009

Sl. No	Language	No of Publications	%
1	English	1,715	92.70
2	Portuguese	62	3.31
3	Chinese	24	1.29
4	French	23	1.28
5	Spanish	14	0.75
6	German	5	0.27
7	Japanese	3	0.16
8	Korean	3	0.16
9	Thai	1	0.054
Total		1,850	100

3.7 Keywords Analysis

Keywords are believed to be one of the best scientometric parameters to identify and also to understand

content of the publications. Analyzing the keywords appearing either in the title or assigned by the authors to indicate their research interest, will help in popularizing and in predicting the future direction of the research area. On analysis of SCOPUS database the following keywords have been retrieved from the articles referred above.

Table 7 lists the top 25 keywords used by scientists. The most widely studied research topics by the researcher include Article, Coconut oil, Coconut, Nonhuman, Controlled study. It is noteworthy to mention that widely used research topic unique to scientists in this field is Coconut oil.

Table 7. Keyword analysis

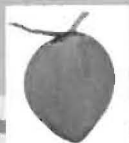
S.L.No	Keywords	Frequency
1	Article	1,157
2	Coconut oil	693
3	Coconut	637
4	Nonhuman	576
5	Controlled study	537
6	Male	413
7	Animals	403
8	Priority journal	379
9	Animal experiment	345
10	Cocos	271
11	Plant Oils	270
12	Cocos nucifera	213
13	Rat	210
14	Animal tissue	203
15	Unclassified drug	201
16	Female	199
17	Human	191
18	Dietary Fats	178
19	Humans	176
20	Fat intake	169
21	Adsorption	167
22	Cholesterol	167
23	Rats	165
24	Animalia	161
25	Animal model	155

4. Conclusion

In this study, publication trends in coconut literatures based on data retrieved from the SCOPUS™ database has been analyzed. We

Table 5. Data of highly productive Institutes

S. No	Institute	Number of Publication		Country
		Numbers	%	
1	CIRAD Centre de Recherche de Montpellier	47	2.54	France
2	University de Sao Paulo	45	2.43	Brazil
3	Central Plantation Crops Research Institute India	37	2.00	India
4	University of Kerala	32	1.79	India
5	Central Food Technological Research Institute India	27	1.45	India
6	University Federal do Rio de Janeiro	22	1.18	The United Kingdom
7	University Putra Malaysia	21	1.13	Malaysia
8	Centro de Investigacion Cientifica de Yucatan	20	1.08	Mexico
9	University of Southampton	20	1.08	UK
10	Coconut Research Institute of Sri Lanka	19	1.02	Sri Lanka
11	University of the Philippines Los Banos	19	1.02	Philippines
12	University of Federal do Ceara	18	0.97	The USA
13	University Estadual de Campinas	18	0.97	Brazil
14	University de Jaen	15	0.81	Spain
15	Tamilnadu Agricultural University	15	0.81	India
16	University of Massachusetts Lowell	15	0.81	The USA
17	Annamalai University	14	0.75	India
18	University Sains Malaysia	13	0.70	Malaysia
19	University de Granada	13	0.70	Spain
20	Bharathiar University	12	0.64	India
21	University of Florida	12	0.64	The USA



obtained significant outcome about the coconut's research performance throughout this study period (from 1995 to 2009) Coconut research is presently showing upward trend, which has been confirmed based on the literature published in the past 15 years, especially between 1995 and 2009. Among the countries, India occupies the first rank and the US the second rank in publishing research works. Bioresource Technology published the largest number of articles - 2.21%. Prof. P.C. Calder, has published 18 papers and occupies the top position as the highest contributor and also as the best researcher. CIRAD Centre de Recherche de Montpellier France is the most productive institute. Most of the coconut literature is published in English language. Coconut and its oil are widely used globally. Hence there is a need to give high priority for coconut research by the scientists.

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Medicinal properties of tender coconut water

- Good for feeding infants suffering from intestinal disturbances.
- Contains organic compounds possessing growth promoting properties.
- Keeps the body cool.
- Application on the body prevents prickly heat and summer boils and subsides the rashes caused by small pox, chicken pox, measles, etc.
- Kills intestinal worms.
- Presence of saline and albumen makes it a good drink in cholera cases.
- Checks urinary infections.
- Excellent tonic for the old and sick.
- Cures malnourishment.
- Diuretic.
- Effective in the treatment of kidney and urethral stones.
- Can be injected intravenously in emergency case.
- Found as blood plasma substitute because it is sterile, does not produce heat, does not destroy red blood cells and is readily accepted by the body.