A Scientometric Analysis of Millet's Research Output in India

[1]Anandraj, K.C. and [2]Aravind, S.

[1]Dept. of Library and Information Science, Madurai Kamaraj University, India.
[1]anandrajkc@gmail.com
[2]Central Library & Dept. of Library and Information Science, G.T.N. Arts College (Autonomous), Dindigul, India.
[2]aravindlibrarian@gtnartscollege.ac.in

Abstracts

This study analyses the research output on millets Publications during 1989-2022 retrieved from Web of science database. The objective of the study was to perform a scientometric analysis of Millet's Research publication in India there were 11585 research literatures scattered over the world, Data for a study is a total of 3373 have been downloaded and analyzed according to objectives. Findings of the study reveal that the journal publications of the Indian millet's research literature are 3047 and the most preferred journal was Journal of food science and technology, Mysore and secured first position under source of publication. This paper also quantifies and evaluates various aspects of millet research, including citation patterns, research collaboration and Prolific authors and contributions etc. This scientometric analysis on millet's research may play a crucial role in advancing knowledge, addressing challenges, and promoting sustainable development in the agricultural sector.

***Keywords**: Millet's, Scientometric, Scientific Assessments, Authorship Pattern*

Introduction

The present study analyzes a scientific approach to study Indian millet research publications and its characteristics, publication patterns, citations, collaborations, and impact. The scientometric analysis provides insights into the scientific landscape, research trends, collaboration networks, and the impact of millet's research on the scientific community and society. By employing scientometric analysis of this study in millet's research, researchers, policymakers, and

stakeholders can gain a deeper understanding of the scientific landscape, identify research gaps, foster collaborations, inform policy decisions and promote the utilization of millets for food security, nutrition, and sustainable agriculture.

Aravind (2023) the researcher conducted a scientometric analysis of global research literature on El Nino and La Nina. This research was carried out between 2000 -2022. Maikely Luana Feliceti et.al (2023) studied the Genetic improvement of black oats: a scientometric review analysed the scientometric analysis of research on black oats' genetic improvement. Utilising information from the Web of Science from 1945 to 2020, a review of the literature was conducted. Initial study of 859 articles resulted in a reduction to 404 articles, which were then subjected to additional analysis. Xiaoyan Pane et.al (2022) examines the research focus on rice under drought, water logging, or both conditions has changed over the past three decades. Bin Liu (2019) carried out a bibliometric examination of rice research's development and history from 1985 to 2014.Krishnan (2019) evaluates the advancements in Indian pulse research developments in Indian research on pulses. Data on research productivity were taken from Web of Science for the years 2000 to 2017. Tripathi and Garg (2016) studied the scientometrics of cereal crop science research in India from 1965 to 2010 with five-year intervals as evidenced by Scopus international database coverage.

Objectives

- To study the Year wise growth analysis with annual Millet’s research publications in International perspective
- To Examine open access publications in Indian context

- To Analyse the Citation pattern of Indian Millet's Research Publications
- To identify the major subject areas of research
- To identify the various collaborative institutions and funding organizations
- To study Authorship pattern and Most prolific author with H index
- To prepare most productive journals and Geographical distribution publications

Materials and Methods

The Web of Science database was used to get the study's data. Using Web of Science's general search capabilities, 11585 publications data regarding the Millet's research paper output from the period of 1989 to 2022 is acquired and with the address field of the general search option used the phrase India for the for Indian millet research literature. There were 3373 Indian millet's research publications identified as the main object of the study. The retrieved information was saved in text files and loaded into Microsoft Excel for analysis. The data was then scientometrically examined with Histcite software.

Results and Discussion

The distribution of Indian millet's research articles listed in the Web of Science database from 1989 to 2022, as well as their average growth and citation trends, are shown year by year. The analysis reveals that a total of 3373 publications were extracted from the Web of science database. It is observed that the maximum number of publications have been

recorded in 2022 (8. 36%).Looking at the data regarding The annual ratio of growth observed that there is moderately fluctuation thought-out the study period where in 2007 ARoG recorded with (1.5). The changes in the annual growth of publications may be caused by a researcher's lack of interest, funding organisations' unwillingness to cooperate, or a lack of infrastructure facilities in the institution. Whereas, the data reflects a steadily growing citation pattern throughout the year with 51446 citations and an average citation rate of 1513.2.

Table 1 Document wise distribution of Millet Research Literature

Sl No.	Document Types	Record Count	% of 3,373
1	Article	2544	75.42
2	Article; Proceedings Paper	701	20.78
3	Note	57	1.69
4	Meeting Abstract	20	0.59
5	Article; Early Access	16	0.47
6	Editorial Material	16	0.47
7	Correction	6	0.18
8	Review; Book Chapter	6	0.18
9	Review; Early Access	4	0.12
10	Letter	2	0.06
11	Article; Book Chapter	1	0.03
TOTAL		3373	100.00

It is evident from table 1, the highest type of documents published in articles with 2544 records (75.42%) and Review of Article (701) 20.78% and Note (88) 2.061%.

Table 2: Open Accesses publication of Indian Millets Research

Sl No	Open Access	Record Count	% of 2,691
1	All Open Access	1,065	39.58%
2	Gold	427	15.87%
3	Gold-Hybrid	90	3.34%
4	Free to Read	112	4.16%
5	Green Published	477	17.73%

6	Green Accepted	405	15.05%
7	Green Submitted	115	4.27%

The Web of Science database has 2691 open access papers out of the 3373 Indian Millets research outputs. Total records in all open database publications are 1065. In the area of Indian Millets Research, there are 427 open papers that are Gold Open Access (it denotes that the final published version of your research is freely and indefinitely accessible online for readers worldwide). Gold Hybrid, (makes it quickly and entirely accessible for everyone; nevertheless, an article publication charge must be paid by the author, institution, or funder.) which has 90 records, Green (With open access, authors can choose to archive their own work on a website that they, their sponsor, or a third-party repository manages.) Open access is completely responsible for 997 records.

Table 3: Top 10 Research Areas on Indian Millet's literature

Sl No	Field	Record Count	% of 3,373
1	Agriculture	1,196	35.46%
2	Plant Sciences	828	24.55%
3	Food Science Technology	689	20.43%
4	Chemistry	258	7.65%
5	Science Technology Other Topics	246	7.29%
6	Biotechnology Applied Microbiology	228	6.76%
7	Biochemistry Molecular Biology	210	6.23%
8	Genetics Heredity	200	5.93%
9	Nutrition Dietetics	173	5.13%
10	Environmental Sciences Ecology	166	4.92%

It is evident from table 3, Indian Millets research output is divided into 79 broad subjects. The table 5 indicates the top 10 Subject fields of Millet's research. Agriculture subject field contributed 1196 research publications plant science area contributed 828 publications and 689

publications from Food and science technology.

Table 4: Top 10 Funding Sponsor of Indian Millet's Research

Sl No.	Funding Agencies	Record Count	% of 3,373
1	University Grants Commission India	165	4.89%
2	Department Of Biotechnology Dbt India	163	4.83%
3	Indian Council Of Agricultural Research Icar	148	4.39%
4	Department Of Science Technology India	125	3.71%
5	Council Of Scientific Industrial Research Csir India	96	2.85%
6	Consultative Group for International Agricultural Research	84	2.49%
7	Uk Research Innovation Ukri	38	1.13%
8	Indian Council Of Medical Research Icmr	28	0.83%
9	Biotechnology And Biological Sciences Research Council	25	0.74%
10	Bill Melinda Gates Foundation	24	0.71%

Table 4 indicates the top 10 Funding sponsors of Indian millets research. This table observed that University Grant Commission (UGC,) have provided more funding for the Indian millets research. Department of Biotechnology (163), ICAR (Indian Council of agricultural research (148) has come second and third positions.

Table 5: Top 10 Affiliated Institutions for the Indian Millet's Research

Sl No.	Affiliations	Record Count	% of 3,373
1	Indian Council of Agricultural Research ICAR	864	25.62%
2	Consultative Group for International Agricultural Research CGIAR	530	15.71%
3	International Crops Research Institute for The Semi Arid Tropics	511	15.15%
4	Council Of Scientific Industrial Research CSIR India	238	7.06%
5	ICAR Indian Agricultural Research Institute	213	6.32%
6	CCS Haryana Agricultural University	196	5.81%

7	CSIR Central Food Technological Research Institute CFTRI	180	5.34%
8	Tamil Nadu Agricultural University	155	4.60%
9	University Of Mysore	143	4.24%
10	Govind Ballabh Pant University of Agriculture Technology	126	3.74%

Table 5 reveals that the Indian Council of Agricultural Research (ICAR), at 864 research activities contributed in India. Consultative Group for International Agricultural Research (CGIAR) is the second-highest research contributor research activities, (530, followed by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), contributed with 511.

Table 6: Authorship Pattern of Contribution

Sl No.	Authors Pttern	No. of Records	Total No. of Authors	Percentage
1	Single authors	110	110	0.7%
2	Two Authors	803	1606	10.5%
3	Three Authors	594	1782	11.6%
4	Four Authors	484	1936	12.6%
5	Five Authors	424	2120	13.8%
6	Six Authors	292	1752	11.4%
7	Seven Authors	193	1351	8.8%
8	Eight Authors	127	1016	6.6%
9	ninth Authors	76	684	4.5%
10	Ten Authors	51	510	3.3%
11	More than 10 Authors	219	2492	16.2%
Total		3373	15359	100.0

Table 6 shows the pattern of authorship distribution. A total of 15359 authors contributed to 3373 publications under various authorship arrangements. The majority of authors favour team publications of their work over solo ones.110 (0.7%) of the publications in the Indian Millets

research have just one author, while 68.3% (2305) of the articles have two, three, four, or five authors. This indicates that rather than writing their papers as a single author, the majority of authors prefer to collaborate in groups of two to five.

Table 7: Top 10 Prolific Authors

Sl No	Author Name	Record Count	% of 3,373	H Index
1	Kumar A	118	3.50%	25
2	Shetty HS	84	2.49%	24
3	Hash CT	70	2.08%	30
4	Rai KN	67	1.99%	17
5	Prasad M	66	1.96%	33
6	Kumar S	57	1.69%	16
7	Singh S	57	1.69%	19
8	Upadhyaya HD	57	1.69%	19
9	Sharma R	52	1.54%	15
10	Yadav OP	49	1.45%	15

The analysis of most prolific authors in table 7 reveals that Author Kumar, A., is the most prolific author in Indian Millets research in India who published 118 papers followed by Shetty, H.S, published 84 papers and Hash, C.T. published 70 papers.

Table 8: Most productive Journal (Top 10 only)

Sl No.	Publication Titles	Record Count	% of 3,373
1	Journal of food science and technology mysore	184	5.46%
2	Indian journal of agronomy	68	2.02%
3	Annals of arid zone	60	1.78%
4	Current science	59	1.75%
5	Frontiers in plant science	59	1.75%
6	Crop science	56	1.66%
7	Food chemistry	55	1.63%
8	Indian journal of genetics and plant breeding	53	1.57%

9	Field crops research	44	1.30%
10	Euphytica	43	1.28%

The research articles on Indian millets are dispersed throughout 648 journals. Table 8 demonstrates the 184 records that the Journal of Food Science and Technology Mysore contributed. The Annals of Arid Zone magazine published 60 articles, and the Indian magazine of Agronomy provided 68 records.

Table 9: Country wise distribution of Indian Millet's research publication (Top 10 only)

Sl No.	Countries/Regions	Record Count	% of 3,373
1	INDIA	3,373	100.00%
2	USA	206	6.11%
3	ENGLAND	73	2.16%
4	AUSTRALIA	67	1.99%
5	GERMANY	59	1.75%
6	WALES	57	1.69%
7	JAPAN	41	1.22%
8	NIGER	38	1.13%
9	CANADA	29	0.86%
10	PEOPLES R CHINA	29	0.86%

In the Web of Science database's analysis of the country-by-country distribution of Indian millet research output spanning the years 1989 to 2022, 3373 research publications on the subject came from 97 different nations. It is clear from Table 9 that the United States has the top spot for Indian millet's research publications in the Web of Science database with 206 records. 73 papers came from researchers in Australia, and 73 from researchers in England.

Conclusion and Recommendations

- The distribution of document types in Indian millet's research shows that the highest contribution was made by articles (2,544),

followed by review articles (701) and notes (57). Out of the 3,373 Indian millet's research outputs, 2,691 are open access papers. Within the open access publications, 427 papers are Gold Open Access, 90 are Gold Hybrid, and 997 are Green Open Access.

- Indian millet's research output is divided into 79 broad subjects. The agriculture subject field contributed the most research publications (1,196), followed by plant science (828) and food science and technology (689).
- A total of 15,359 authors have contributed to the 3,373 articles on Indian millet's research. Collaborative publishing is preferred over single-author publications.
- There are 648 scholarly publications that have published research articles on Indian millets.
- A total of 97 different countries have contributed to the 3,373 Indian millet's research publications. The United States has contributed the most articles, followed by Australia and England, with 73 papers each.

The major objective of this study is to identify the dimension of Indian Millet's research outputs from the web of science database (WoS) during the period of 1989-2022. This scientometric analysis can offer insightful information about the research in terms of publishing output, citation pattern, and average ratio of growth with relative growth and doubling time. With the use of open access document distributions, funding sources, the most productive journals, and the identification of major subjects or themes within the field, researchers and research institutions

can benchmark their performance.

Reference

Aravind S and Anandraj K.C (2023) The researcher conducted a scientometric analysis global research literature on El Nino and La Nina.In proceedings of the National conference on Exploring the past, present and future of Library and information science May university of Mysore, Krnataka

Bin Liu, Lu Zhang and Xianwen Wang (2019) Scientometric Profile of Global Rice Research during 1985-2014, Current science, 112(5)

H. K. Tripathi and K. C. Garg (2016) Scientometrics of Cereal Crop Science Research in India as seen through SCOPUS database during 1965-2010 Annals of Library and Information Studies, 63(3)

Maikely Luana Feliceti et.al (2023) Genetic improvement of black oats: scientometric Review Acta Scientiarum., Agronomy. 45

P. Krishnan (2019) A Scientometric Analysis of Research on Pulses in India During 2000–2017, Agricultural Research 11(3)

Xiaoyan Pane el (2022) Scientometric Analysis on Rice Research under Drought, Waterlogging or Abrupt Drought-Flood Alternation Stress, Agriculture, 12(9)