SHODH SAGAR®
International Journal for Research Publication and Seminar
ISSN: 2278-6848 | Vol. 15 | Issue 3 | Jul - Sep 2024 | Peer Reviewed & Refereed

Unveiling the Dynamics of Upcycled Food Research: A Citation Analysis

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DOI: https://doi.org/10.36676/jrps.v15.i3.1432
Published: 17/07/2024

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Abstract: *The present study aims to know the progress of upcycled food research in the current era by using bibliometric analysis. The citation analysis has been used to uncover the trends in the publications, key authors, institutions, countries, and sources. The findings of the study reveal that the authors are dominant from North America and Europe in the field of upcycled food. University of Reading (UK) is the prominent institution with the highest number of citations in the field of upcycled food research. The United Kingdom and the United States are the top countries in upcycled food research. Food Quality and Preference and Journal of Cleaner Production are the prominent journals in the field of upcycled food research. The present study provides vital insights for academics, policymakers, industry stakeholders, and consumers interested in encouraging sustainable agriculture methods.*

Keywords: Upcycled food, Bibliometric Analysis, Citation Analysis, Research Trends.

Introduction

The current consumption practices like the wastage of surplus parts of food put a burden on Mother Earth (Zhang et al., 2021). The disposal of wasted food is a challenge to every economy, as it produces harmful gases in landfilling. About 8% of the greenhouse gases (GHGs) are produced due to the wasted food (Kaur & Kaur, 2024). The world is experiencing a global food crisis, with nearly a third of all food produced worldwide being wasted or discarded (Ardra & Barua, 2022). This astounding number has serious ramifications for the environment and society in addition to enormous financial losses (Coderoni & Perito, 2021). Food waste exacerbates famine and malnutrition in many parts of the world, and the food business is a major contributor to greenhouse gas emissions, deforestation, and water pollution (Chang et al., 2023).

Upcycled food has gained popularity as a way to solve this problem (Bhatt et al., 2018). Upcycled food is produced with a surplus part of the food, which would otherwise be wasted (Spratt et al., 2021). Food production can be increased by converting the wasted part of the

food into upcycled food products (Coderoni & Perito, 2020). This can solve the problem of food shortage in the world. The research on upcycled food is increasing with time. The term upcycled food was first given by Bhatt et al. (2018). Despite the popularity of upcycled food research, there is a lack of research summaries on upcycled food. There are very few review studies on upcycled food (Ye, 2023). This knowledge gap impedes our comprehension of the current level of research in this field, making it difficult to identify opportunities for future research. There is lack of bibliometric studies on this topic, which can provide the detailed overview of the current research trends in upcycled food research.

Bibliometric analysis provides a potent tool for mapping the intellectual terrain of a certain area, by quantitatively examining publishing patterns, citation networks, and keyword trends (Yu et al., 2022). This study attempts to provide a thorough overview of the upcycled food research evolution and identify important authors and institutions driving innovation by applying bibliometric methodologies to the literature on upcycled foods.

The data for the analysis was collected from the Scopus database and were analysed with the help of VOSviewer software. The bibliometric analysis is used to answer the following research question:

RQ: What is the progress of upcycled food research in terms of publication volume, authorship patterns, and institutional affiliations?

This study adds to our understanding of the fast-changing landscape of upcycled food research by answering this question and providing vital insights for academics, policymakers, industry stakeholders, and consumers interested in encouraging sustainable agriculture methods.

Methodology

The study used a bibliometric technique to examine research performance on upcycled food. A bibliometric analysis involves evaluating research documents quantitatively and qualitatively. It assesses research's impact, trends, and influence in a specific field through various metrics. The data for the analysis was gathered from the Scopus database. Scopus, being the largest database of academic research articles, was utilized to find papers that met the selection criteria. The data collected encompassed bibliographic details, citations, author affiliations, and references related to upcycled food. The “Upcycled food” keyword was used to collect the sample from the database, which resulted in 82 research articles. The bibliometric analysis was performed using VOSviewer software.

Discussion and Findings

RQ1: Analysis of Documents

Analysis of Documents by year

Figure 1, indicates the number of documents on upcycled food published each year from 2017 to 2024. The research article on upcycled food appeared in 2017 at first. Figure 1 shows a clear overall increase in the number of documents published from 2017 to 2024, peaking in 2023. The number of publications is 21 till July 2024, which is expected to rise till the year-end. This

trend likely indicates rising interest and research activity in the field of upcycled food during this period.

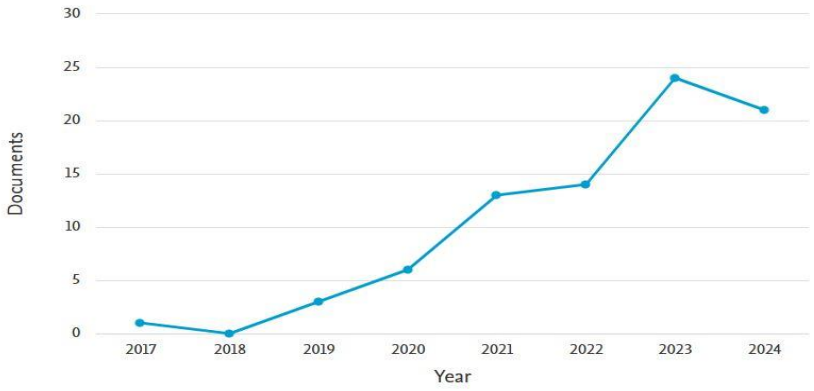

Figure 1: Documents by year

Analysis of Production of Documents by Authors

Figure 2, shows the number of documents on upcycled food published by various authors. German, J. is a prominent author with 9 research publications. Bhatt, S., Died, R., Goodman-Smith, F., Fat, S., Mirosa, M., and Ye, H., are active contributors in the field of upcycled food research with 6 publications each. Aschemann-Witzel, J., Asioli, D., and Moshtaghi, H., are also significant contributors with at least 4 publications each.

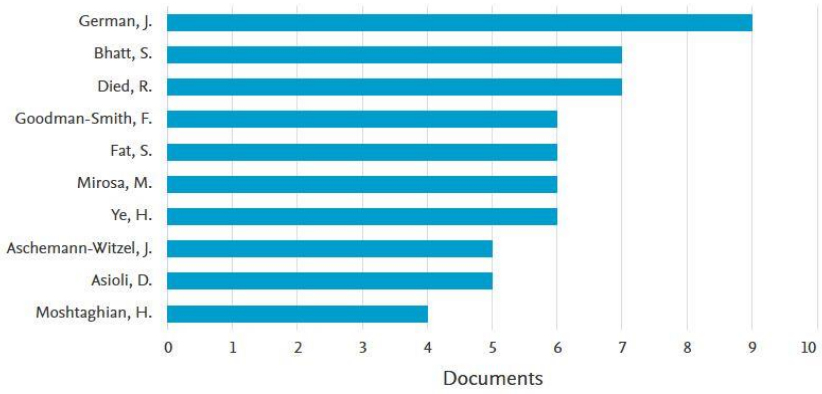

Figure 2: Documents by Author

Analysis of Documents by Affiliation

Figure 3, displays the number of documents on upcycled food published by various institutions. Drexel University (United States), is the top institution with 11 research publications on upcycled food. Further, the University of Reading (UK), Penn State Harrisburg (US), LeBow College of Business (US), and University of Otago (New Zealand) each with a minimum of 6 documents, are the active institutions. Furthermore, the significant contributors in the field of upcycled food are Aarhus Universitet (Denmark), Högskolan i Borås (Sweden), School of Business Administration, Center for Research in Environmental, University College Dublin (Ireland) each contributing 4-5 documents.

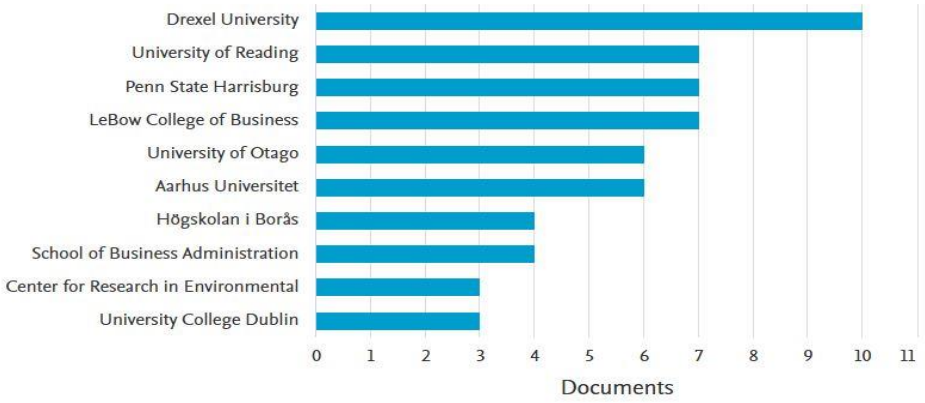

Figure 3: Documents by Affiliation

Analysis of Documents by Source

Figure 4, represents the documents on upcycled food per year by source. The journal Food Quality and Preference is the leading publisher in the field of upcycled food, with a total of 10 articles. It published 2 articles in 2020, 1 article each in 2021 and 2022, 5 articles in 2023, and 1 article in 2024. Further, Sustainability (Switzerland) is the second prominent journal in the field of upcycled food research with 7 documents. It published 5 documents in 2021, 1 document each in year 2022 and 2024. Additionally, the Journal of Cleaner Production and the Journal of Food Product Marketing are key publishers in the field of upcycled food, each contributing 5 documents.

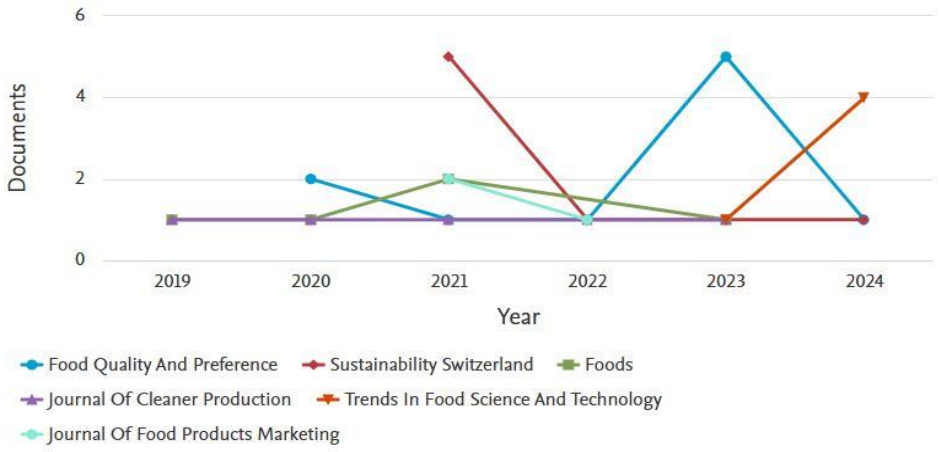

Figure 4: Documents per year by source

RQ2: Analysis of Citations of authors, institutions and country

Citation Analysis of Key Authors

Table 1, represents the top 15 authors in the field of upcycled food research. Deutch, J is the most influential and productive author in upcycled food research with 203 citations and 9 publications, followed by Suri, R., and Grasso, S. with 200 and 184 citations respectively.

Table 1: Top 15 Authors in upcycled food research

Sr. No.	Author	TC	TP	Sr. No.	Author	TC	TP
1.	Deutsch, J	203	9	8.	Peschel, A.O.	118	4
2.	Suri, R.	200	7	9.	Perito, M.A.	114	4
3.	Grasso, S	184	6	10.	Ayaz, H	96	2
4.	Asioli, D.	173	5	11.	Jeong, H.	69	2
5.	Bhatt, S.	170	7	12.	Banovic	63	3
6.	Ye, H.	157	6	13.	Moshitaghian	61	4
7.	Aschemann- Witzel, J	133	5	14.	Rousta, K.	61	4
				15.	Bolton, K.	57	3

Note: TC represents total citations, and TP represents total production

Citation Analysis of Key Institutions

Table 2, depicts key organisations in upcycled food research. The 'University of Reading' is a prominent institution in upcycled food research with 232 citations and 7 documents, followed by 'Drexel University' and LeBow College of Business with 209, and 200 citations respectively. However, 'Drexel University' has the most number of publications in upcycled food research.

Table 2: Top 15 organisations in upcycled food research

Sr. No.	Institution	TC	TP
1	University of Reading	232	7
2	Drexel University	209	10
3	LeBow College of Business	200	7
4	Penn State Harrisburg	170	7
5	Aarhus Universitet	164	6
6	Wageningen University & Research	77	2
7	North Carolina Central University	69	2
8	Högskolan i Borås	63	4
9	Università degli Studi di Teramo	63	3
10	University College Dublin	58	3
11	School of Business Administration	45	4
12	University of Otago	42	6
13	Universidade Aberta	20	2
14	Center for Research in Environmental	19	3
15	Université Laval	19	3

Note: TC represents total citations, and TP represents total production

Citation Analysis of Top 15 Countries in upcycled food research

Table 3, shows the list of the top 15 countries researching upcycled food. The United Kingdom is the top country with 320 citations, followed by the United States, and Italy with 237, and

201 citations respectively. The United States has the highest number of publications on upcycled food i.e. 19 articles.

Table 3: Top 15 countries in upcycled food research

Sr. No.	Country	TC	TP	Sr. No.	Country	TC	TP
1	United Kingdom	320	12	8	Austria	70	1
2	United States	237	19	9	Switzerland	70	1
3	Italy	201	10	10	Sweden	61	5
4	Denmark	172	7	11	Spain	56	4
5	Singapore	89	3	12	France	51	1
6	Netherlands	77	2	13	Brazil	47	2
7	Ireland	72	5	14	China	43	6
				15	New Zealand	43	6

Note: TC represents total citations, and TP represents total production

Citation analysis of Top 15 Journals in upcycled food research

Table 4, lists the top 15 journals in upcycled food research publications. The Food Quality and Preferences, and Journal of Cleaner Production topped the list with 221 citations. The journals Foods and Sustainability (Switzerland) followed the sequence with 147, and 136 citations. The Food Quality and Preferences journal is the most productive journal with 10 research articles on upcycled food research.

Table 4: Top 15 Journals publishing upcycled food research

Sr. No.	Source	TP	TC
1	Food Quality and Preference	10	221
2	Journal of Cleaner Production	5	221
3	Foods	5	147
4	Sustainability (Switzerland)	7	136
5	Waste Management	1	51
6	Journal of Consumer Behaviour	1	48
7	Resources, Conservation, and Recycling: X	1	45
8	Journal of Food Products Marketing	3	41
9	Trends in Food Science and Technology	5	34
10	Journal of Culinary Science and Technology	1	30
11	Design Journal	1	27
12	Future Foods	1	19
13	Critical Reviews in Food Science and Nutrition	1	15
14	Materials Today: Proceedings	2	15
15	Journal of Agricultural and Food Chemistry	1	13

Note: TC represents total citations, and TP represents total production

Conclusion

The present study provides a detailed overview of the rapidly growing field of upcycled food research. The findings reveal that there is a significant rise in research publications on upcycled food over the past decade, with a notable increase in interest since 2018. One of the reason, behind the surge in upcycled food research is that the researchers are recognising the significance of upcycled food to reduce the wastage of food, and to promote nutritious and sustainable diet options (Ardra & Barua, 2022).

The study draws attention to the predominance of authors from North America and Europe in the field of upcycled food research, underscoring the need for more participation from scholars from other countries. The prominent authors, organisations, countries, and sources were identified, shed light on the major players advancing this topic. Based to the citation analysis, a large number of papers with a high number of citations have shown how influential publications on upcycled food have been in the scientific community.

This study identifies opportunities for further research and advances our knowledge of the state of the art in the field of upcycled food research. Scholars must never stop looking for novel solutions, such as upcycling, as the world community struggles with problems about food security, sustainability, and waste reduction. By combining expertise from many fields, we may try to build food systems that are more just and resilient.

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