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Scopus based bibliometric analysis of margarine for the period of 2012-2021

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Abstract

Margarine is an important fat-based food product widely consumed worldwide, and its formulation has evolved toward improved nutritional and functional properties. This study aimed to perform a bibliometric analysis of margarine-related scientific publications indexed in the Scopus database over the period 2012-2021. The data were collected using the keyword "margarine" in titles, abstracts, and keywords, followed by filtering based on subject area, language, and publication period. A total of 204 publications were selected and analyzed using Microsoft Excel and VOSviewer to evaluate publication trends, leading countries, authors, journals, funding organizations, and keyword co-occurrence networks. The results showed a gradual increase in publications, with a noticeable rise in 2020-2021. Research articles accounted for 87% of all publications, indicating the experimental nature of studies in this field. The United States and Brazil were identified as the leading contributors, while journals such as Food Chemistry and Nutrients demonstrated high citation impact. Co-authorship and keyword analyses revealed limited international collaboration and a strong focus on topics such as trans-fat reduction, functional ingredients, and fat substitutes. In conclusion, although the number of publications has increased in recent years, the overall volume of research remains limited. The findings highlight the need for stronger international collaboration, increased research funding, and further studies aimed at improving the quality and functionality of margarine products.

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Scopus database, Margarine, Bibliometric analysis.

1. Introduction

With the growth of the human population in the world, the consumption of food products, including food, is growing in parallel (1). One of the best digestible fatty foods is an analogue of butter is margarine (2,3). It is common knowledge that margarine itself is a water-in-oil emulsion product where the aqueous phase is dispersed as droplets in the oil (4). Since the invention of margarine is increasingly becoming a vital factor as much scientific work has been done to increase the nutritional and biological value of this product (1,5,6).

The initial studies of margarines were obtained from bovine fat, and in recent years it has been changed to various substitutes, i.e., modification products of vegetable oils, hard fats derived from vegetable production, interesterificators of hard fat and liquid oil, etc (7–9). Originally substitute for bovine fat was lard, i.e., hard fat obtained by hydrogenation of vegetable oil (1). However, after some time few researchers have addressed the issue of trans fatty acids in those fats in quite a lot of amount (10,11). One of the main issue in our

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knowledge of trans fatty acids are harmful to human health, which has led to a limitation on their amount in margarine products (8,12). With such limitations, the method of interesterification of solid fats with liquid vegetable oils was recommended, where fatty bases were obtained without the content of trans fatty acids (7,13). Such kind of interesterificators are also used today for the production of margarine (14). But with the development of science and the advice of nutritionists that fatty foods should be limited in the human diet, researchers have proposed fat substitutes as an alternative to obtaining emulsifiable products (15).

It is known that, margarine is an economically viable analogue of butter (2). Therefore, margarine should not only be high-calorie but also useful for consumption (16). A number of scientific works have been published, where margarine was produced for diabetics with the replacement of sugar with the juice of Jerusalem artichoke tubers (17). In recent years, margarines have been produced with an increased content of essential fatty acids such as ω-3, ω-6 and ω-9 (18,19).

In recent years, several review studies have addressed specific aspects of margarine and lipid-based products, including technological developments, nutritional properties, and the health effects of dietary fats (1,20–26). These studies primarily focus on formulation, fatty acid composition, and functional properties of margarine and related products. However, despite the growing number of publications, there is a lack of comprehensive bibliometric analyses that systematically evaluate the global research landscape in this field, including publication trends, leading countries, authors, journals, and funding organizations.

Therefore, there remains a clear gap in understanding the overall development, structure, and dynamics of margarine-related research at the global level. Bibliometric analysis is a powerful tool that allows the identification of research trends, collaboration networks, and emerging scientific directions. In this context, the present study aims to perform a bibliometric analysis of margarine-related publications indexed in the Scopus database over the past decade (2012-2021), thereby providing a comprehensive overview of the current state of research and identifying future research directions.

2. Materials and Methods

This study was carried out according to the standard operating procedure for the bibliometric analysis of scientific papers in the following way (27):

2.1. Design of the Study

As mentioned in the introduction, scientific work on the subject of margarine is of great importance in a person's daily life. Therefore, when searching, the words "margarine" was used in titles, abstracts, and keywords. As food quality requirements increase year by year, it has been covered in scientific papers over the past decade (2012–2021). With the selection of the keyword "margarine," the field of knowledge "Agricultural and Biological Sciences" was chosen since the main results of scientific work in the field of food products will be published here.

2.2. Sourcing of Data/Data Collection

The Scopus database was selected as the source for collecting scientific publications. The data collection process consisted of two main stages. At the first stage, a search was conducted in the Scopus database using the keyword “margarine” in the fields “article title”,

"abstract", and "keywords". As a result of the initial search, 4324 publications were identified. At the second stage, the obtained dataset was filtered simultaneously according to several criteria: publication years (2012–2021), subject area ("Agricultural and Biological Sciences"), keyword ("margarine"), and language ("English"). After applying these filters, a total of 204 publications remained. The final dataset was exported from the Scopus database in CSV format and used for further bibliometric analysis.

2.3. Investigation & data analysis

To process and analyze the obtained bibliometric data, Microsoft Excel was used. The CSV file exported from the Scopus database was imported into Excel for further data organization and analysis. At the first stage, the dataset was checked and cleaned to remove possible duplicate records and incomplete entries. Then, Excel tools such as sorting and filtering were applied to organize the publications according to different parameters. At the next stage, the data were grouped and analyzed by several indicators, including publication year, country of authors, journals, and keywords. Frequency analysis and counting functions were used to determine the number of publications for each category. The obtained results allowed the identification of publication dynamics over time, the most productive countries and journals, and the main research directions related to margarine. The processed data were then used to construct tables, graphs, and figures illustrating the bibliometric trends in the selected field of research.

2.4. Data Interpretation

The bibliometric analysis was conducted using publications indexed in the Scopus database. Initially, a search was performed using the keyword "margarine" in the fields "article title", "abstract", and "keywords". This initial search yielded 4324 publications. Subsequently, the dataset was refined by applying several inclusion criteria simultaneously: publication years from 2012 to 2021, subject area "Agricultural and Biological Sciences", keyword relevance to "margarine", and language limited to English. After applying these filters, a final dataset of 204 publications was obtained. The selected records were exported from the Scopus database in CSV format and included bibliographic information such as publication year, journal title, total citation count, authors, country of affiliation, source title, and author keywords. These data were used to analyze publication trends, citation performance of journals, and the contribution of countries and institutions. The main statistical analyses and graphical representations were prepared using Microsoft Excel and Microsoft Word 2019 (Microsoft Corporation, USA). In addition, bibliometric network analyses, including co-authorship and keyword co-occurrence mapping, were performed using VOSviewer version 1.6.18 (Leiden University, Netherlands). VOSviewer was used to construct visualization maps in which nodes represent authors or keywords, while the size of each node reflects the frequency of occurrence or citation impact. A detailed workflow of the data collection and filtering process, including the number of publications at each stage, is presented in Figure 1.

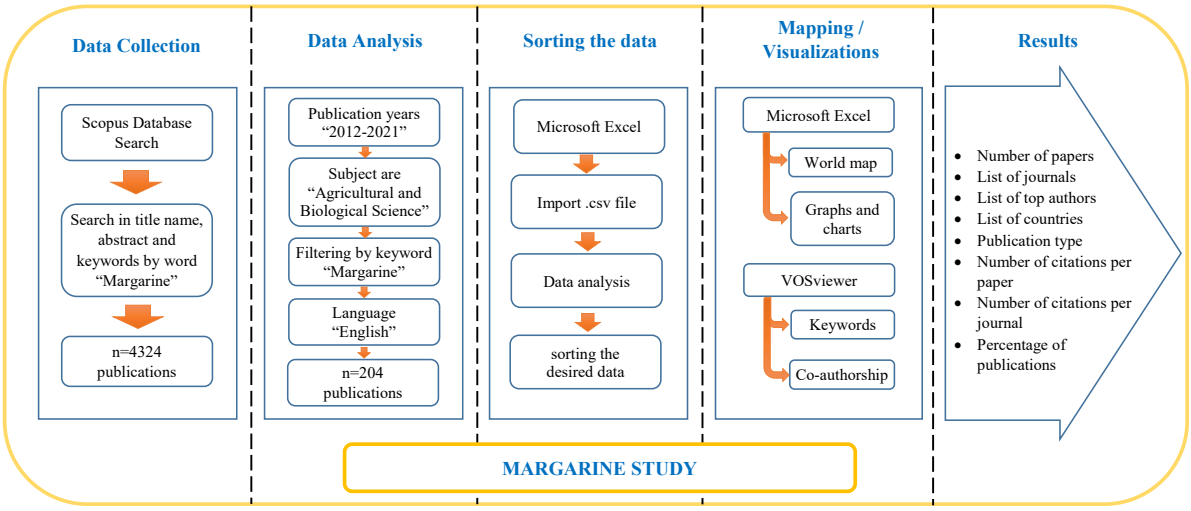

Figure 1. Flowchart of the methodology.

3. Results and discussion

3.1. General results

There were 4324 publications identified and analyzed. To find out available publications from the last decade, publications were sorted from 2012–2022, and they were in English. A total of 1137 scientific publications were found. It was selected as the direction of agricultural and biological science since it covers a wide range of food industries, and in total we have sorted 489 out of 1137 publications. The 204 most relevant articles were selected from the results obtained by entering the desired term, i.e., the keyword margarine, and selecting those related to the margarine products analyzed. When studying all 204 materials on the subject of "margarine," their analysis was carried out to determine to which subject area they belong in Figure 2. The publications were mainly classified into the agricultural categories and biological sciences, although out of the 204 publications received, 58 relate to chemistry, 56 to nursing, 29 to engineering, 25 to biochemistry, genetics, and molecular biology, 23 to medicine, 18 to pharmacology, toxicology, and pharmaceuticals, etc. This proves that the subject area of agricultural and biological sciences is closely related to other categories, especially chemistry and nursing.

Authors should discuss the results and how they can be interpreted in perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

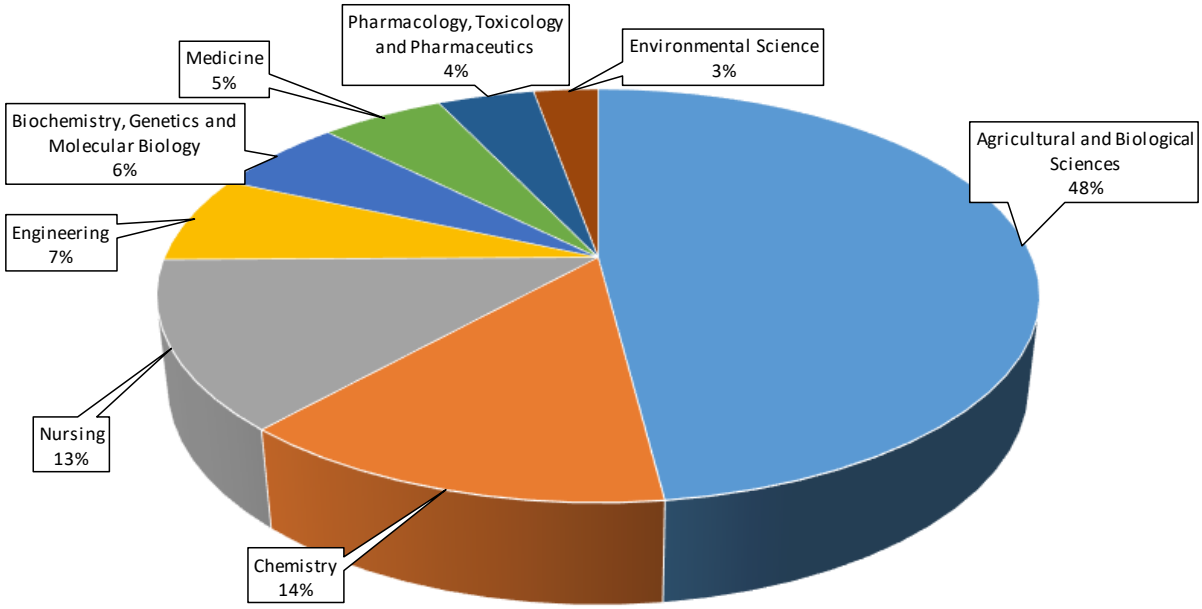

Figure 2. Distribution of received publications by subject area.

In addition, as illustrated in Figure 3, the document types of all publications in this field were analyzed. Out of 204 publications, 177 were research articles (87%). Furthermore, 15 publications (7%) were review articles, 10 (5%) were book chapters, and 2 publications (1%) were notes. The predominance of research articles can be explained by the applied and experimental nature of studies related to margarine production. Research in this field is mainly focused on experimental investigations, including the modification of fat compositions, the development of new formulations, improvement of technological processes, and evaluation of nutritional and physicochemical properties. Such studies typically require the presentation of original experimental data, which are most commonly published in the form of research articles. In contrast, review papers in this area are less common and are generally devoted to broader topics such as the historical development of margarine or the role of palm oil in the oil and fat industry, rather than statistical or bibliometric analyses of margarine production.

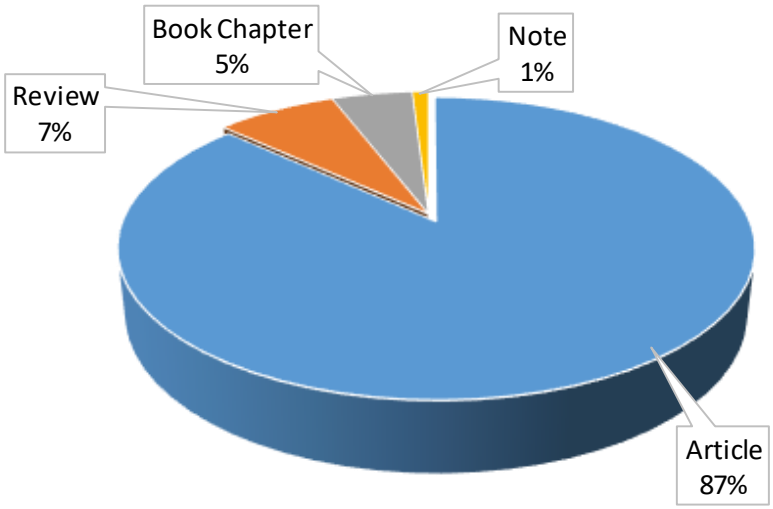

Figure 3. Distribution of publication types related to margarine research in the Scopus database (2012-2021).

3.2. Number of published articles

An analysis of the number of published materials in the past decade on the subject of "Margarine" shows the relevance of the selected topic. To do this, the number of published materials on the basis of Scopus over the past decade was determined in Figure 4. It can be seen from the figure that, year after year, the number of published materials increases. However, their number decreased by 12, 16, and 16 articles per year in 2015, 2017, and 2019, respectively. But, in the final two years of 2020 and 2021, their numbers jump by 28 and 30, respectively. This shows that in recent years, the demand for this topic has increased. As mentioned before, the analysis of the number of materials published over the past decade on the topic "Margarine" shows the relevance of the chosen topic, and for this, the number of published materials was determined according to Scopus data over the past decade in Figure 4. Figure 4 gives data about how, year by year, the number of published materials increased.

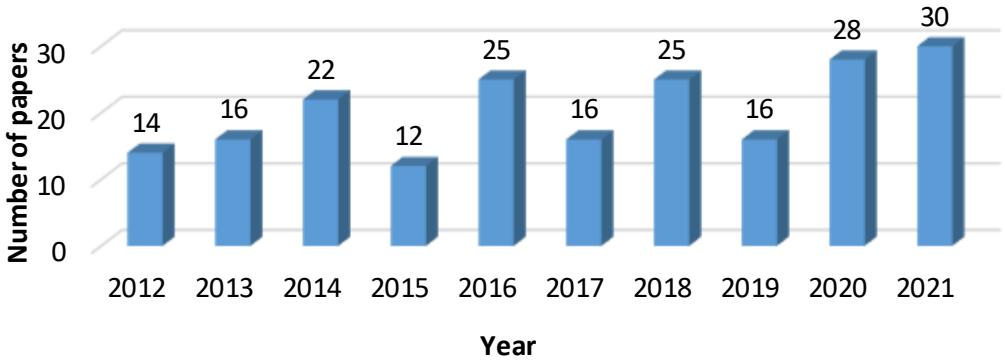

Figure 4. Number of papers on margarine by the year of publication.

The significant increase in publications in 2020 and 2021 coincides with the global focus on food safety and quality during the COVID-19 pandemic. The pandemic has heightened consumer interest in healthier fats and shelf-stable products, stimulating research into the development of functional and trans-free margarines.

3.3. Demand for the topic in various countries

It is possible to determine which countries have the most researchers working on this topic by analyzing published scientific papers. Over the past decade, 56 countries around the world have been working on the topic of margarine and have published their scientific results in the Scopus database, as can be seen from Table 1. From the data obtained, it is readily apparent that the United States leads in the number of published scientific results on this topic, which is 26. After the US, Brazil leads with 17 papers, followed by Turkey with 14 papers, Spain with 13, Great Britain with 13, the Netherlands with 12, China and Malaysia with 10, etc. Only one article on the topic "Margarine" from Central Asia was published in Kazakhstan.

Table 1. Leading countries in margarine-related scientific publications.

Country	Number of publications	Country	Number of publications
United States	26	Romania	3
Brazil	17	Serbia	3
Turkey	14	Algeria	2

Country	Number of publications	Country	Number of publications
Spain	13	Argentina	2
United Kingdom	13	Czech Republic	2
Netherlands	12	Ireland	2
China	10	Lebanon	2
Malaysia	10	New Zealand	2
Poland	9	Pakistan	2
Belgium	9	Viet Nam	2
Denmark	9	Austria	1
Germany	8	Azerbaijan	1
Indonesia	7	Burkina Faso	1
Sweden	7	Estonia	1
South Korea	6	Ethiopia	1
Thailand	6	Ghana	1
Canada	5	Greece	1
Egypt	5	Iceland	1
Finland	5	Kazakhstan	1
Italy	5	Latvia	1
Japan	5	Portugal	1
Australia	4	Russian Federation	1
Iran	4	Saudi Arabia	1
Nigeria	4	Singapore	1
Norway	4	South Africa	1
France	3	Switzerland	1
India	3	Taiwan	1
Mexico	3	Undefined	4

Brazil's strong position, second only to the United States with 17 publications, reflects its cutting-edge research on tropical vegetable oils and the enzymatic interesterification of local raw materials such as palm, soybean, and Amazonian oils. This research emphasizes sustainable processing and the development of trans-fat-free margarine formulations, explaining the country's high scientific potential and growing influence in lipid research. Furthermore, numerous sponsorship and research grants are provided by Brazilian institutions, demonstrating that most of the leading funding organizations in this field are based in Brazil and actively support research related to margarine and lipid technology.

3.4. Demand for scientific journals and their success

One of the difficulties in research work is the selection of a scientific journal for publishing the results of scientific research. Since the right selection of journal is accompanied by the success of a scientific article and an increase in the citations of the published paper, all of the above 204 papers from the Scopus database were analyzed, including in which journals they were published and how many citations they received in Figure 5. It is clear that, from the 204 articles, 37 were published in Nutrients, where they had a total citation of 457. However, there were only 32 of 204 scientific articles in the journal Food Chemistry, but the number of citations for these materials was nearly two times that of Nutrients, i.e., 903. The next journal is the Journal of Food Science, with 14 published articles and 420 citations. The 11 articles available from Food Research had only 28 citations. The majority of journals had the fewest papers published, and some were not cited until recently. The journal Agricultural and Food Chemistry also published five articles, which is not much compared to the above, but these articles received 109 citations. In parallel, there is the journal Food Additives and

Contaminants, Part A, with four scientific articles and 110 citations. The best result was achieved by the journal Food and Nutrition Research, where he has 274 citations and only 3 requested articles. This shows that the choice of a journal is one of the main stages in the success of published materials.

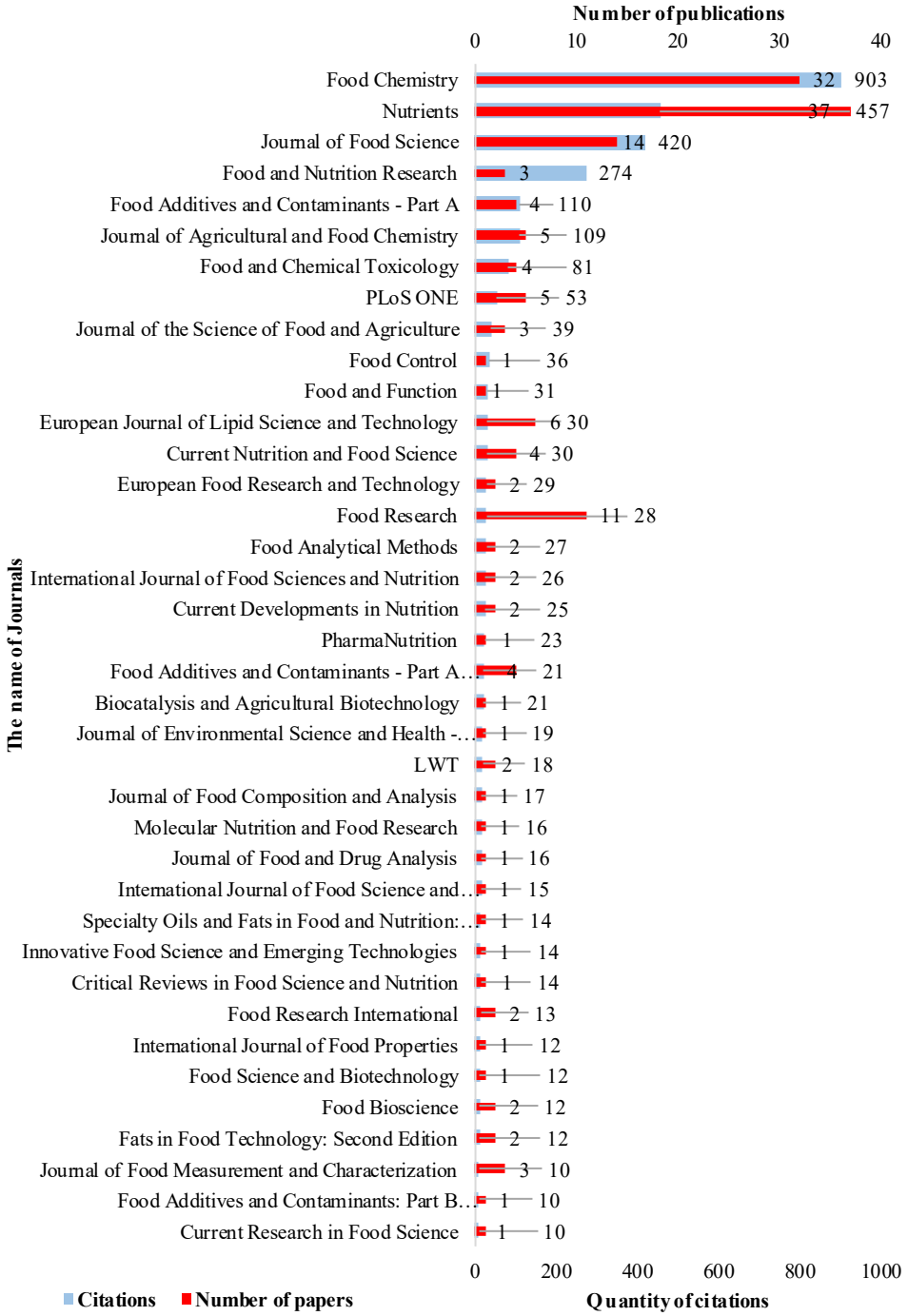

Figure 5. Journals with the number of publications and citations of articles on the topic margarine.

The number of citations in published papers is one of the indicators of the scientific impact and relevance of research. Highly cited articles typically address globally significant scientific problems and provide comprehensive analyses that are valuable for a broad

scientific audience. When analyzing publications related to margarine over the past decade, the most cited articles were identified and are presented in Table 2. In total, 204 articles accumulated 3104 citations. As shown in Table 2, the most cited article is the systematic review entitled “Effect of the amount and type of dietary fat on cardiometabolic risk factors and risk of developing type 2 diabetes, cardiovascular diseases, and cancer.” This article has received 251 citations (8%), which is almost three times more than the next most cited article (95 citations). The high citation rate of this publication can be explained by several factors. First, the article addresses globally relevant public health issues related to the role of dietary fats in the development of major non-communicable diseases such as type 2 diabetes, cardiovascular diseases, and cancer. Second, it provides a comprehensive synthesis of scientific evidence regarding the effects of different types of dietary fats, including saturated and unsaturated fatty acids, on cardiometabolic risk factors. Finally, the topic is closely related to ongoing scientific debates on the nutritional quality of fat-containing food products, including margarine and other fat-based spreads, which increases its relevance for researchers in the fields of nutrition, food science, and public health.

Table 2. The list of top citations for a publication.

Title of publications	Citations	Title of publications	Citations
Effect of the amount and type of dietary fat on cardiometabolic risk factors and risk of developing type 2 diabetes, cardiovascular diseases, and cancer: A systematic review	251	A simple, rapid and green ultrasound assisted and ionic liquid dispersive microextraction procedure for the determination of tin in foods employing ETAAS	43
Recent Research Trends on the Enzymatic Synthesis of Structured Lipids	95	Muffins Elaborated with Optimized Monoglycerides Oleogels: From Solid Fat Replacer Obtention to Product Quality Evaluation	41
Can early omega-3 fatty acid exposure reduce risk of childhood allergic disease?	79	Rapid fingerprinting of sterols and related compounds in vegetable and animal oils and phytosterol enriched- margarines by transmission mode direct analysis in real time mass spectrometry	41
Stability of vitamin D in foodstuffs during cooking	77	Low resolution 1H NMR assignment of proton populations in pound cake and its polymeric ingredients	41
Determination of butter adulteration with margarine using Raman spectroscopy	64	Occurrence and exposure assessment of Fusarium mycotoxins in maize germ, refined corn oil and margarine	37
Preparation of margarines from organogels of sunflower wax and vegetable oils	62	Relationship between dietary habits, food attitudes and food security status among adults living within the united states three months post-mandated quarantine: A cross-sectional study	36
Zein based oil-in-glycerol emulgels enriched with β-carotene as margarine alternatives	61	Reproducibility of a questionnaire for dietary habits, lifestyle and nutrition knowledge assessment	36

Title of publications	Citations	Title of publications	Citations
		(KomPAN) in Polish adolescents and adults	
Comparative Analysis of Olive Oil Organogels Containing Beeswax and Sunflower Wax with Breakfast Margarine	60	Determination of 3-MCPD and 2-MCPD esters in edible oils, fish oils and lipid fractions of margarines available on Polish market	36
Properties of Cookies Made with Natural Wax-Vegetable Oil Organogels	56	A low trans margarine fat analog to beef tallow for healthier formulations: Optimization of enzymatic interesterification using soybean oil and fully hydrogenated palm oil	34
Degradation of phytosterols during storage of enriched margarines	56	Development of a new modelling tool (FACET) to assess exposure to chemical migrants from food packaging	33
Determination of toxic α-dicarbonyl compounds, glyoxal, methylglyoxal, and diacetyl, released to the headspace of lipid commodities upon heat treatment	56	Fortification of foods with vitamin D in India	32
Effects of chemical interesterification on the physicochemical, microstructural and thermal properties of palm stearin, palm kernel oil and soybean oil blends	54	Technological properties of amazonian oils and fats and their applications in the food industry	31
Chemical interesterification of blends with palm stearin and patawa oil	48	Characterisation of the lipidic components of margarines by 1H Nuclear Magnetic Resonance	31
Physicochemical properties and storage stability of margarine containing Opuntiaficus-indica peel extract as antioxidant	45	A spread containing bioactive milk peptides Ile-Pro-Pro and Val-Pro-Pro, and plant sterols has antihypertensive and cholesterol-lowering effects	31

3.5. Leading authors

The main role of research is to know which authors are working on this topic. This section will give an overview of how many authors have published articles on the subject of margarine over the past decade. When analyzing 204 articles obtained from the Scopus database, top authors who published more than three scientific papers were identified in Figure 6. From figure 6, it can be seen that the authors Ribeiro A. P. B., Frederiksen P., Heitmann B. L., Barrera-Arellano D., and Silva T. J. published 4 scientific articles, and the rest had less than 3. At the same time, it should be taken into account that we have selected the last decade for a systematic analysis of published articles on the Scopus database, and because of this, the authors have the least number of articles, and the main ones are successful in the field under study.

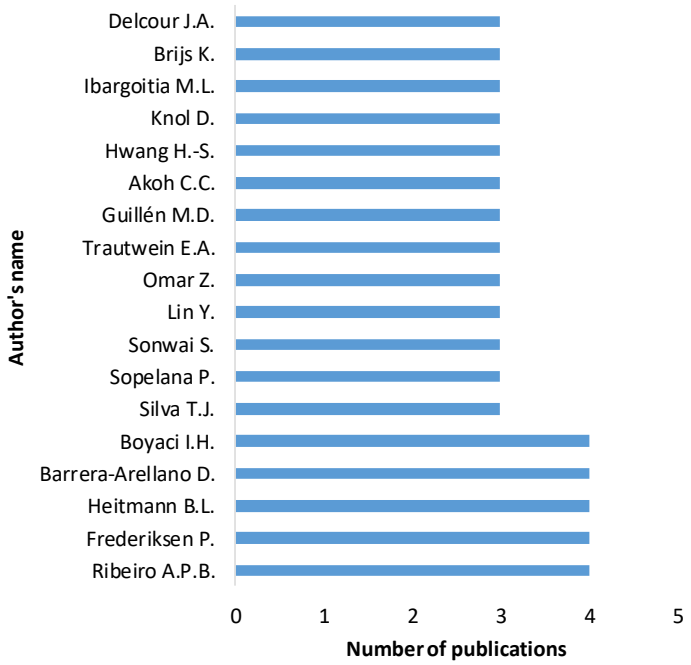

Figure 6.The list of the top authors.

3.6. Leading institutions

The organization is one of the main bodies that helps researchers work, research, and find scientific solutions on a working project. When the extracted data from the Scopus database was analyzed, 160 organizations where scientists worked and published scientific articles on the topic "margarine" were discovered in Figure 7. One of the leading ones is "Unilever Research & Development, Vlaardingen," and "Universidade Estadual de Campinas." Under these organizations, 7 scientific papers were published. The next one is "Kobenhavns Universitet," where there are six publications. "Malaysian Palm Oil Board", "Universiti Putra Malaysia," and "United States Department of Agriculture" have five publications each.

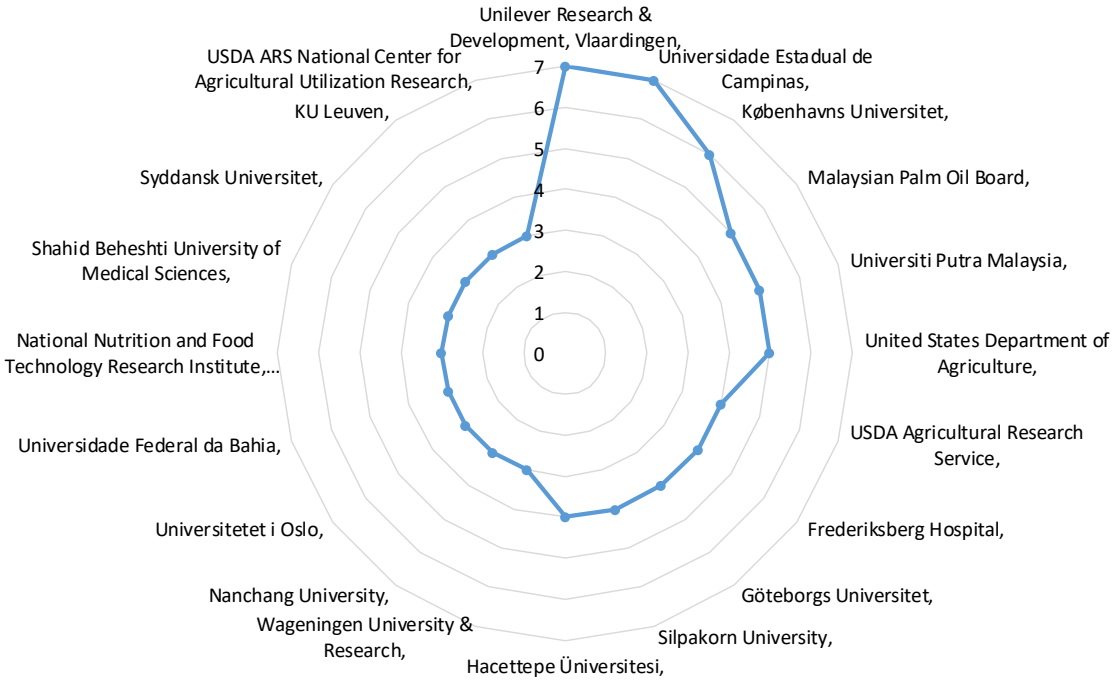

Figure 7. The list of top institutions.

3.7. Leading sponsor organization

It is obvious that, in many countries, the financial aspect of scientific work affects the reliability of the results. This can be explained by the fact that research requires equipment, reagents, monetary motivation, etc. As a result, such interested organizations sponsor scientific work and hire employees. In this case, the study's findings will be more trustworthy. In the analysis of 204 articles, we analyzed the sponsoring organizations of published materials in Figure 8, it was illustrated that the organization "Coordenaço de Aperfeiçoamento de Pessoal do Nvel Superior" sponsored nine scientific papers. Further, the "Conselho Nacional de Desenvolvimento Cientifico e Tecnológico" sponsored seven scientific papers. This shows that in today's world, these organizations are much more interested in the field of "margarine."

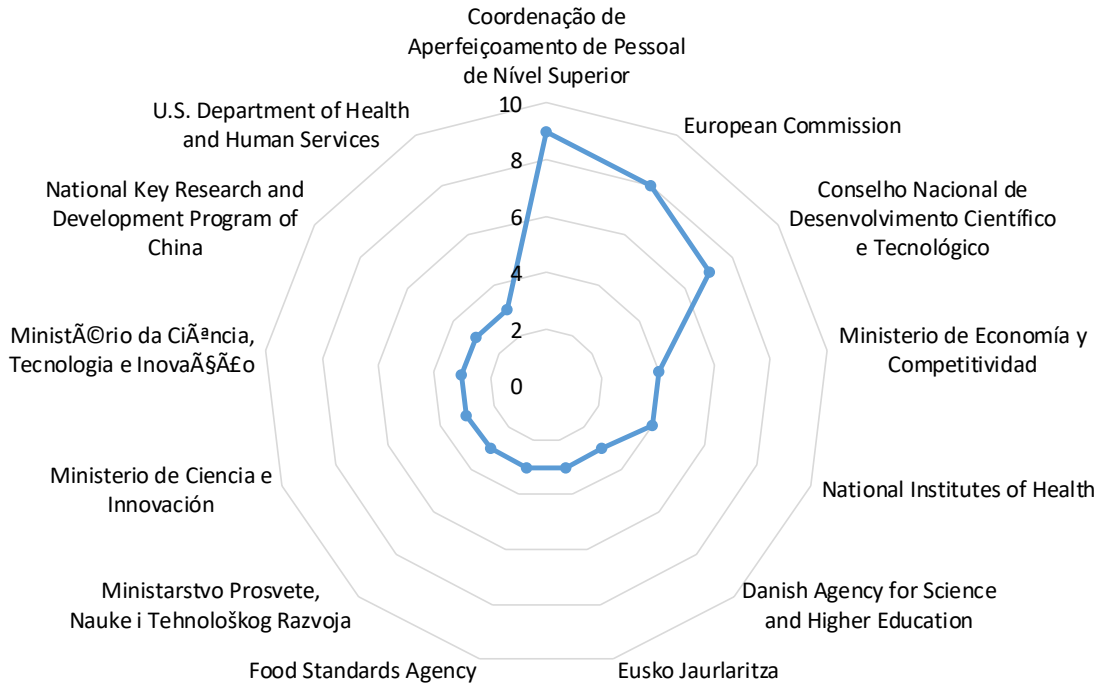

Figure 8. The list of top funding sponsor organization.

3.8. Leading publishers with the most articles

The publisher is also one of the predominant indicators because, when looking for scientific journals, you need to look for them in the largest publishing houses. In the analysis of data in the field of "margarine" over the past decade, 204 articles were published in 48 publishing houses. Elsevier Ltd published 36 of these, followed by MDPI AG with 31 articles and Rynnye Lyan Resources with 11. All three of these publishers have published about 43 percent of articles in the margarine field over the past decade.

Table 3. The list of top publishers with the most articles.

Name of publisher	Number of papers
Elsevier Ltd	36
MDPI AG	31
RynnyeLyan Resources	11
Taylor and Francis Ltd.	9
Blackwell Publishing Inc.	7
MDPI	7
Wiley-VCH Verlag	6
American Chemical Society	4
Elsevier Inc.	4
Public Library of Science	4
Springer Verlag	4
Wiley Blackwell	4
Blackwell Publishing Ltd	3
Oxford University Press	3
Springer	3

3.9. Visualization of co-authorship relationships

Collaboration in scientific research is one of the main indicators of how many groups are working and which of them are closely related to each other. To determine this, the relationship between groupings of co-authors who had closely published scientific results in the Scopus database was determined in Figure 9. When creating a map of co-authors in the VOSviewer program, at least 1 article and 0 citations for the author were selected. At the same time, three clusters were obtained from 881 authors. There are 7 authors in the first of them, 6 in the second, and 4 in the third. The figure shows that authors Li C. and Guo J. are linking authors, with only three clusters working together at least once. And another group of authors largely worked with their own groups and did not collaborate directly with others.

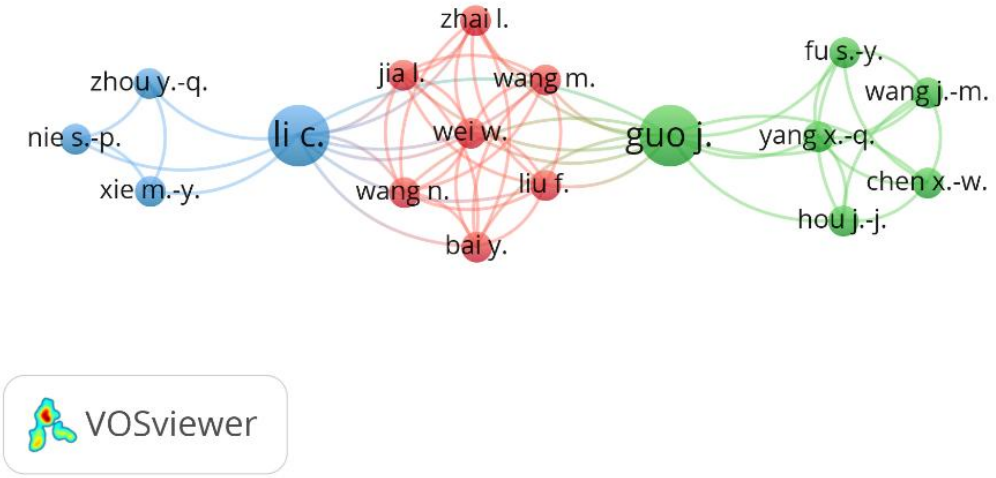

Figure 9. The analysis of co-authorships.

3.10. Publications by keywords

Keywords are one of the main indicators when searching for scientific papers. Therefore, when selecting keywords, it is necessary to highlight those words that are most often asked in the search line, which shows the main goal of scientific work. When analyzing the received data through the VOSviewer program, a keyword match map was created in Figure 10. At the same time, the minimum number of similar keywords selected was 15. A total of 53 closely related keywords that were related to each other were obtained. As a result, there were 7 clusters in it. There were 24 in the first cluster, 19 in the second, 4 in the third, 2 in the fourth and fifth, and 1 in the sixth and seventh. As can be seen from Figure 10, in the center is the keyword "margarine," showing that all the main topics of scientific work are on margarine products. Here, the rest of the keywords have been divided into 3 groupings, displayed in red, blue, and green colors and lines. This is explained by the fact that not all 204 published articles match, either in terms of keywords, or the purpose of scientific work.

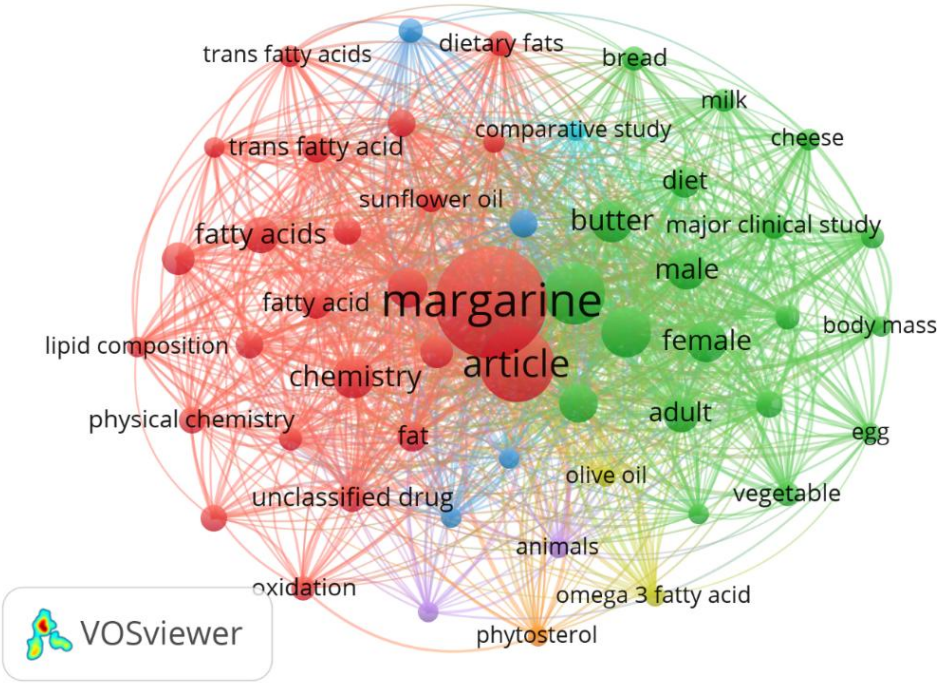

Figure 10. The analysis of keywords.

3.11. Discussion

When analyzing all the articles, there are different review articles with high and low citations, which shows their relevance in this field (1,21,23,24,28–30). For example, the authors published a review article about the effect of the amount and type of dietary fat on human health (31). And the authors published a review article about the effect of omega-3 fatty acids on reducing allergic diseases in children (32). A review article was published on the fortification of food products with vitamin D in India, including margarine (33). There is one good review article about the development of the margarine industry and global trends, which shows the role of the product and technological aspects (1). All these published review articles are mainly aimed at individual reviews, i.e., the effects of fat, omega-3 fatty acids, or vitamin D on human health. There are a number of other review articles where statistical data have also been studied. One of them was devoted to the study of scientific articles on the evolution and trends of vitamin D and reproductive health (34). Another review article is devoted to research articles that have the largest number of citations on the subject of nutraceuticals and functional foods (35).

A notable difference in citation impact was observed between journals such as Food Chemistry and Nutrients. Articles published in Food Chemistry tend to be cited more frequently because the emphasize analytical chemistry, physical and chemical characterization, and formulation technology – areas of interdisciplinary interest. In contrast, Nutrients focuses primarily on applied nutrition research and human subjects, which, despite their importance, attract a narrower audience within a specialized field. This suggests that fundamental research on margarine composition and structure provides broader scientific visibility.

As far as we know, this study is the first bibliometric analysis on the topic of margarine. But we must take into account that there were several restrictions. First of all, only the Scopus database was selected, and Microsoft Excel and VOSviewer were used to analyze the data

obtained. Secondly, only articles published in the last decade (2012–2021) were selected. And finally, the year 2022 was not chosen since it is still not finished and the literature that is published this year may not be in the Scopus database.

4. Conclusions

Over the past decade, from 2012 to 2021, only 204 scientific papers have been published in the Scopus database. At the beginning, the number of articles per year fluctuated from 14 to 25, raising and lowering, but since 2020 there has been an increase to 30 articles. This can be explained by the fact that in recent years, more and more attention has been paid to improving the quality of food products, including margarines. Analyzing all the articles published over the past decade, there have been many different developments in the field of margarine. The main ones are the impacts of various added products on human health, such as reducing the amount of trans fats, replacing fat bases with their substitutes, etc. At the same time, review articles receive more citations than research articles. This can be explained by the fact that review articles have general data on this topic. At the same time, we must not forget that researchers mostly look for articles in top-level journals. This will also affect the readability of the published article. These published articles are few, given that today's focus is on food quality and safety. There are a number of sponsoring organizations associated with this. At the same time, it should be taken into account that all these 204 articles were published in journals that are in the Scopus database, but there are other journals where quite a few also publish various scientific results, including in the field of "margarine."

Summarizing all the results of this bibliometric review article on the topic "margarine," as conclude that there are still few scientific developments or solutions to obtain a better product. To further increase the quality of margarine, it is necessary to do the following aspects:

- it is necessary to increase the quality and quantity of scientific papers and publish their findings in scientific journals because 204 articles in the field of margarine over the last decade is insufficient;
- it is necessary to reach the international level of relations between authors because many of them work without knowing about each other. If they work together, then the solutions to many scientific problems would be solved faster.;
- it is necessary to increase the sponsorship organizations and the allocated money. This will also affect the number of published scientific results and be a motivation for researchers.

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Author Contributions

S.K. : Conceptualization, Data analyzed, Writing–original draft, Data curation, Validation, Resources, and Writing–review & editing. S.S : Conceptualization, Writing–original draft, Methodology, Data curation, Validation, Writing– review & editing. M.K. : Writing– review & editing, Data curation, Validation. A.F : Writing– review & editing, Conceptualization, Supervision, Validation.

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Conflicts of Interest

There are no conflicts of interest among the authors.

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