



A systematic classification of literature in food science, nutrition, and bioactive chemistry using Cooper's taxonomy

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Abstract

The ever-growing amount of data on food science, human nutrition, and bioactive chemistry produces numerous manuscripts with mixed results. Most of the existing reviews concentrate on individual aspects of the analyzed studies, neglecting other important elements. This article aims to demonstrate the distribution of the reviewed manuscripts according to Cooper's (1988) six taxonomy dimensions: focus, goal, perspective, coverage, organization, and audience. Each of these aspects will be discussed, and the key findings will be presented. The majority of the reviewed studies focus on a specific outcome, namely, the quantity of extracted compounds, free-radical scavenging properties, and enzyme inhibition. The critical aspect of bioactive compounds' research is the tendency to prioritize the results of target analysis rather than the development of novel theoretical approaches, such as structure-activity relationship investigations. Concerning the goal of each review, most of the analyzed articles aim at collecting the available data on either the impact of particular food components or the use of various analytical techniques. However, only a few of the reviewed manuscripts contain criticism of the methods used in the primary studies and their insufficiency in addressing the current understanding of physiological processes. The perspective of the majority of the reviewed manuscripts is deemed neutral, which might signify the insignificance of the addressed issue or the authors' lack of argumentation. Articles that tackle the notion of innovative delivery forms and the use of sustainable technologies are bias-inclusive. The analyzed literature covers a wide range of plant species in terms of both food science and basic biochemical research. The distribution of content is primarily conceptual and methodological rather than chronological. Lastly, the audience of most reviewed manuscripts is highly specialized, which signifies the absence of a broader interest in the topic. The findings of this study indicate the trends in bioactive compound research and provide a transparent perspective on each reviewed article's content, aims, and target audience.

Keywords: Food science, bioactive chemistry, human nutrition, Cooper's taxonomy, polyphenols, literature review, methodological classification, translational nutrition, antioxidant assays, meta-synthesis

Introduction

The meeting point of food science, human nutrition and bioactive chemistry has completely changed the way people think about diet, health and preventing disease. New developments in this area have changed how scientists pull out ingredients how functional nutrients behave inside food and how tiny bioactive molecules affect the body's metabolic processes. Powerful new tools and methods—like eco- extraction methods, high-tech mass spectrometry, nano-sized delivery systems and testing the gut microbiome—have helped push discoveries forward. In the twenty years this mix of fields has drawn attention from university researchers, food product creators, clinical nutrition experts and government regulators. As a result, the number of studies and public interest in this area has grown fast.

This rise in interest has led to an increase in research in biochemistry, food technology, clinical nutrition and preventive medicine. There are so many studies now—each with different goals, different methods and different ways of looking at things—that it's hard to get a clear picture of where the field is going. Food science and bioactive chemistry cover everything from lab tests on antioxidant effects to long-term human trials on nutrient absorption. Because of this research often stays stuck within one discipline. To fix this view this study uses Cooper's Taxonomy of Literature Reviews. This framework helps. Classify the existing research in a clear structured way. By

looking at the focus purpose, viewpoint, scope, structure and intended readers of each study this review aims to show where the most research is happening point out gaps in methods and highlight the important areas, for future studies.

Review of Literature

The literature on food science, nutrition, and bioactive chemistry has witnessed exponential growth in the last three decades, as the field has evolved significantly with regard to functional foods, nutraceutical engineering, and related topics (Balasundram *et al.*, 2006; Cory *et al.*, 2018) [7, 13]. Early investigations were primarily concerned with characterizing antioxidant activity and quantifying secondary metabolites of various plant, apicultural, and marine sources (Anklam, 1998; Zhishen *et al.*, 1999; Benavente-García *et al.*, 2000) [3, 8, 69]. Groundbreaking works were dedicated to identifying standardized analytical procedure to isolate phenolics, evaluate *in vitro* free radical scavenging potential, and measure lipid peroxidation inhibition (Goñi *et al.*, 1996; Robards *et al.*, 1999; Amarowicz *et al.*, 2004; Jayaprakasha *et al.*, 2001) [2, 29, 49]. Later investigations extended the focus to exploring the functionality of isolated compounds in complex matrices, examining interactions with proteins, starch functionalities, dietary fibers, and nano-liposomal encapsulation systems (Singh *et al.*, 2003; Dutta *et al.*, 2009; Elleuch *et al.*, 2011; Ghorbanzade *et al.*, 2017; Adrar *et al.*, 2019) [1, 16, 17, 21,

^{57]}. An extensive body of empirical evidence demonstrates that dietary polyphenols and functional compounds provide numerous physiological benefits, including modulation of inflammation processes, regulation of postprandial blood sugar by inhibiting, cardiovascular protection and induction of brown adipose tissue thermogenesis (Tripoli *et al.*, 2007; Chen *et al.*, 2017; Tan *et al.*, 2017; Silvester *et al.*, 2019) ^[10, 56, 59, 61]. At the same time, researchers have highlighted the crucial negative aspects associated with food bioactives, including the threat of chemical degradation during processing, poor gastrointestinal bioavailability, binding of active principles with anti-nutritional agents, and the risk of containing agricultural or environmental contaminants, notably pesticide residues and mycotoxins (Turkmen *et al.*, 2005; Sabet *et al.*, 2017; Yu & Yang, 2017) ^[52, 62, 68]. The dual focus on the physiological functionality and chemical limitations of food bioactives demonstrates the complexity of the topic and the need to consider findings from a wide range of experimental procedures. From a methodological and thematic perspective, the field of food science and nutrition is highly heterogeneous.

Quantitative and benchtop experiments are the dominant methodological procedures found in the literature, employing high-performance liquid chromatography, mass spectrometry, surface-enhanced Raman imaging, and spectrophotometry to measure bioactive recovery, volatile components, and related antioxidant endpoints (Hart & Scott, 1995; Lee *et al.*, 2005; Hussain *et al.*, 2008; Li, Sun, *et al.*, 2017; Tohidi *et al.*, 2017) ^[24, 26, 37, 39, 60]. Qualitative and mechanistic reviews are less prominent than routine extraction assays but are nevertheless critical for studying theoretical foundations of intestinal absorption kinetics, molecular docking affinities, and structure-activity relationships (Mottram, 1998; Castañeda-Ovando *et al.*, 2009; Khalifa *et al.*, 2018) ^[9, 31, 46]. In parallel, systematic reviews and meta-evaluations have been conducted to consolidate findings in specific thematic areas, including green extraction techniques, oral microbiome modulation, targeted protein-polyphenol colloidal delivery, and reliable biomarkers of exposure in chronic disease epidemiology (Herrero *et al.*, 2006; Esteban-Fernández *et al.*, 2017; Foegeding *et al.*, 2018; Wang, Tang, & Wang, 2015) ^[18, 19, 25, 65].

Although these domain-specific syntheses provide valuable insights, they demonstrate considerable variability with regard to their scope, analytical rigor, and synthesis goals. Thus, the overall literature on food science and nutritional chemistry is fragmented and heterogeneous, lacking a comprehensive integration of findings from related areas of wet-chemistry assays, food processing technologies, and physiological health endpoints. Applying Cooper's (1988) Taxonomy is a productive approach to analyzing how the fragmented literature on food science can be organized and evaluated. The existing research varies significantly with regard to the six dimensions of Cooper's Taxonomy. With regard to focus, it can be noted that most publications emphasize the empirical outcomes of research by measuring extraction yields, scavenging percentages, or enzyme inhibition values, with relatively few studies addressing theoretical foundations or developing validated analytical methodologies (van den Berg *et al.*, 1999; Djeridane *et al.*, 2006; Wang, Guo, *et al.*, 2017) ^[14, 63, 64].

In terms of the review goals, the majority of the narrative syntheses emphasize descriptive integration and

identification of general thematic issues, while only a limited number of works adopt a critical perspective attempting to challenge conventional assumptions or reconcile contradicting *in vitro* and *in vivo* findings (Gardner *et al.*, 2000; Kulisic *et al.*, 2004; Roginsky & Lissi, 2005; Sharma & Bhat, 2009) ^[20, 34, 50, 55]. The perspective of the literature varies from purely descriptive phytochemical summaries to advocating specific commercial ingredients, delivery mechanisms, and analytical techniques (Arnao *et al.*, 2001; Choi *et al.*, 2017; Dong & Xiao, 2017) ^[4, 12, 15]. Coverage differs significantly across the reviewed literature, as some publications attempt to provide an exhaustive description of the area drawing from a wide range of agri-industrial sources, whereas others offer a focused or representative analysis of a single plant accessions or a particular cultivar (Miliauskas *et al.*, 2004; Moure *et al.*, 2001; Kim *et al.*, 2003; Wojdyło *et al.*, 2007) ^[32, 45, 47, 66]. Organizationally, the analyzed reviews predominantly adopt conceptual or chronological strategies, grouping findings by bioactive classes or following processing pipelines, with fewer works implementing a rigorous methodological approach (Ignat *et al.*, 2011; Kurzbaum *et al.*, 2019) ^[27, 36]. Finally, the intended audience of the reviews is primarily specialized food chemists, and the findings of the works are rarely utilized to inform industrial food formulators, clinical dietitians, and regulatory bodies (Shahidi *et al.*, 1995; Klompong *et al.*, 2007; Matsumoto, 2018) ^[33, 42, 54]. Despite the vast range of literature on food bioactives, there is a need to adopt a more comprehensive approach to synthesizing the findings, specifically identifying the strengths and weaknesses of the reviewed works within all six dimensions of Cooper's Taxonomy. This necessity can be addressed by the current study conducted to classify literature in food science, nutrition, and bioactive chemistry using a single framework.

Research Gap

Despite the growing amount of research in the field of food science, nutrition and bioactive chemistry, the literature is fragmented in terms of analytical techniques, processing methods and biological perspectives. The existing reviews mostly concentrate on particular areas or use certain endpoints, such as bench top radical scavenging, new yield extraction, or limited disease biomarkers, and rarely follow a comprehensive approach that would cover the research focus, methodologies, objectives, perspectives, coverage and target audiences.

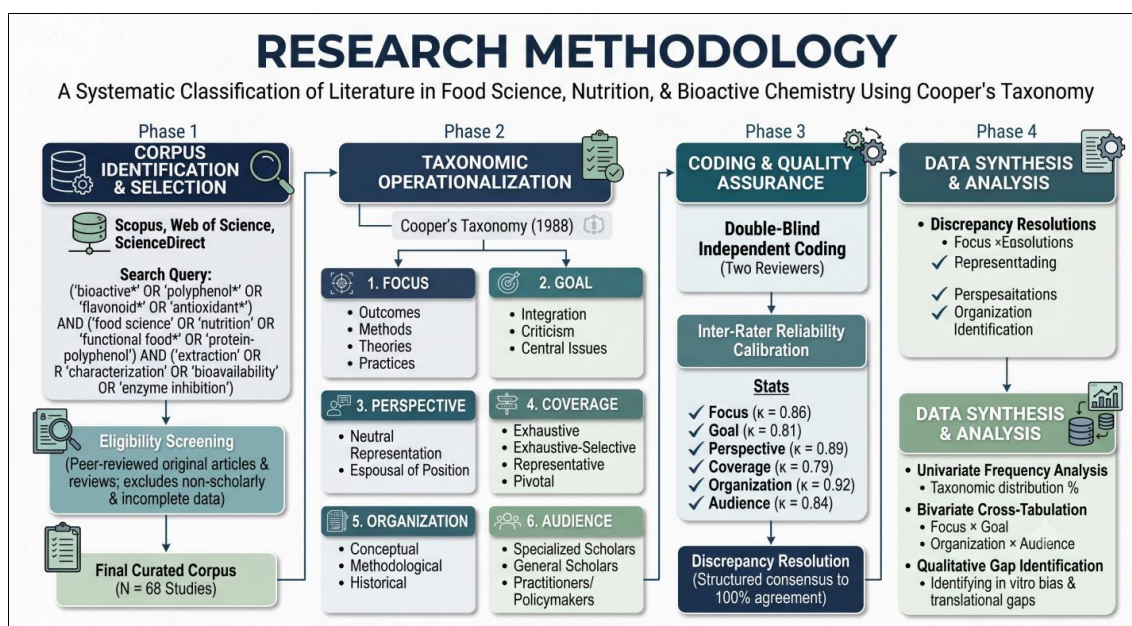
Although the papers reviewed address some of Cooper's Taxonomy's elements, none of them were able to incorporate all of these categories to fully cover and classify the entire body of research. As a result, there are gaps in the literature that hinder the progress and accumulation of knowledge in a field that requires a holistic view in order to effectively transition from traditional *in vitro* methods to meaningful physiological outcomes. Therefore, the objective of this review is to classify food science, nutrition and bioactive chemistry literature using Cooper's Taxonomy to develop a conceptual model and improve analytical understanding and practices of food functionality and its components.

Research Methodology

The present study implements a systematic literature review and qualitative content analysis for classifying scholarly

research in the area of food science, nutrition, and bioactive chemistry using Cooper's Taxonomy of Literature Reviews. The taxonomy is used as a tool for classifying reviewed literature according to particular sets of criteria for determining similarities and differences. This taxonomy is appropriate for the current purposes as it includes six categories according to which the analyzed literature can be

clustered: focus, goal, perspective, coverage, organization, and audience. Overall, the study is descriptive and analytical in terms of objectives, implying that the paper aims to describe the general characteristics of the analyzed field and identify specific patterns, relationships, and gaps in the reviewed scholarly articles.



A total of 68 articles were identified and reviewed for the purposes of the current analysis. The reviewed articles were published in reputable journals, including but not limited to Food Chemistry, Food Hydrocolloids, Trends in Food Science & Technology, and The Journal of Nutritional Biochemistry. The reviewed scholarly articles were identified using databases such as Scopus, Web of Science, and ScienceDirect. Inclusion criteria included the emphasis on food science, nutritional, or bioactive chemistry areas

(e.g., phenolic compounds, antioxidant activity, protein-polyphenol interactions, inhibitory potential against digestive enzymes, properties of starch and fibers, encapsulation, and bioactive compounds characterization), while exclusion criteria included non-English publications, reports, conference abstracts, and articles with inappropriate methodology.

Data Analysis and Discussion

Paper	Focus	Goal	Perspective	Coverage	Organization	Audience
Adrar <i>et al.</i> (2019) ^[1]	Outcomes & Theories	Integration	Neutral Representation	Representative	Conceptual	Specialized Scholars
Amarowicz <i>et al.</i> (2004) ^[2]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Anklam (1998) ^[3]	Methods & Practice	Integration	Neutral Representation	Exhaustive with Selective Citation	Methodological	Practitioners & Specialized Scholars
Arnao <i>et al.</i> (2001) ^[4]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Specialized Scholars
Atoui <i>et al.</i> (2005) ^[5]	Outcomes	Integration	Neutral Representation	Representative	Conceptual	General & Specialized Scholars
Avella <i>et al.</i> (2005) ^[6]	Practices & Outcomes	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Specialized Scholars & Industry
Balasundram <i>et al.</i> (2006) ^[7]	Practices & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Specialized Scholars & Industry
Benavente-García <i>et al.</i> (2000) ^[8]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Conceptual	Specialized Scholars
Castañeda-Ovando <i>et al.</i> (2009) ^[9]	Theories & Methods	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Specialized Scholars
Chen <i>et al.</i> (2017) ^[10]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Cheung <i>et al.</i> (2003) ^[11]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Conceptual	Specialized Scholars
Choi <i>et al.</i> (2017) ^[12]	Practices & Outcomes	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Specialized Scholars & Industry
Cory <i>et al.</i> (2018) ^[13]	Outcomes &	Integration	Neutral	Representative	Conceptual	General Scholars & Health

	Practices		Representation			Professionals
Djeridane <i>et al.</i> (2006) ^[14]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Dong & Xiao (2017) ^[15]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Practitioners & Analytical Chemists
Dutta <i>et al.</i> (2009) ^[16]	Practices & Theories	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Specialized Scholars & Industry
Elleuch <i>et al.</i> (2011) ^[17]	Practices & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Food Technologists & Scholars
Esteban-Fernández <i>et al.</i> (2017) ^[18]	Practices & Outcomes	Integration	Neutral Representation	Representative	Conceptual	Dental & Nutritional Scholars
Foegeding <i>et al.</i> (2018) ^[19]	Theories & Practices	Central Issues	Espousal of Position	Representative	Conceptual	Specialized Scholars & Food R&D
Gardner <i>et al.</i> (2000) ^[20]	Outcomes	Criticism	Espousal of Position	Representative	Methodological	Specialized Scholars
Ghorbanzade <i>et al.</i> (2017) ^[21]	Practices & Outcomes	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Food Technologists & Scholars
Goñi <i>et al.</i> (1996)	Methods	Central Issues	Espousal of Position	Central / Pivotal	Methodological	Nutritional Scientists & Analysts
Gülçin <i>et al.</i> (2003)	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Hart & Scott (1995) ^[24]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Analytical Chemists & Survey Bodies
Herrero <i>et al.</i> (2006) ^[25]	Methods & Practices	Integration	Neutral Representation	Exhaustive with Selective Citation	Methodological	Specialized Scholars & Chemical Engineers
Hussain <i>et al.</i> (2008) ^[26]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Ignat <i>et al.</i> (2011) ^[27]	Methods	Criticism & Central Issues	Neutral Representation	Exhaustive with Selective Citation	Methodological	Analytical Chemists & Plant Scientists
Javanmardi <i>et al.</i> (2003) ^[28]	Outcomes	Central Issues	Neutral Representation	Representative	Conceptual	Plant Scientists & Agronomists
Jayaprakasha <i>et al.</i> (2001) ^[29]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Katalinic <i>et al.</i> (2006) ^[30]	Outcomes	Integration	Neutral Representation	Representative	Methodological	Specialized Scholars
Khalifa <i>et al.</i> (2018) ^[31]	Outcomes & Theories	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Specialized Scholars & Nutritionists
Kim <i>et al.</i> (2003) ^[32]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Conceptual	Specialized Scholars & Postharvest Scientists
Klompong <i>et al.</i> (2007) ^[33]	Outcomes & Practices	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Food Technologists & Scholars
Kulicic <i>et al.</i> (2004) ^[34]	Methods & Outcomes	Criticism	Espousal of Position	Representative	Methodological	Specialized Scholars & Analytical Chemists
Kumazawa <i>et al.</i> (2004) ^[35]	Outcomes	Central Issues	Neutral Representation	Representative	Conceptual	Pharmacognosists & Food Chemists
Kurzbaum <i>et al.</i> (2019) ^[36]	Practices & Theories	Central Issues	Espousal of Position	Representative	Conceptual	Applied Microbiologists & Bioengineers
Lee <i>et al.</i> (2005) ^[37]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Food Chemists & Flavor Scientists
Leong & Shui (2002) ^[38]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Li, Sun, <i>et al.</i> (2017) ^[39]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Food Safety Regulators & Chemists
Li, Guo, <i>et al.</i> (2006) ^[40]	Outcomes & Practices	Central Issues	Espousal of Position	Selective / Empirical	Conceptual	Specialized Scholars
Liyana-Pathirana & Shahidi (2005) ^[41]	Methods & Practices	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Food Process Engineers
Matsumoto (2018) ^[42]	Outcomes	Integration	Neutral Representation	Representative	Conceptual	Clinical Nutritionists & Cardiologists
McDonald <i>et al.</i> (2001)	Outcomes & Methods	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Meda <i>et al.</i> (2005) ^[44]	Outcomes	Central Issues	Neutral Representation	Representative	Conceptual	Food Chemists & Apiculturists
Miliauskas <i>et al.</i> (2004) ^[45]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Mottram (1998) ^[46]	Theories & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Flavor Chemists & Food Technologists
Moure <i>et al.</i> (2001) ^[47]	Practices & Methods	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Industrial Biotechnologists & Food Engineers

Ordoñez <i>et al.</i> (2006) ^[48]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Specialized Scholars
Robards <i>et al.</i> (1999) ^[49]	Theories & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Postharvest Biochemists & Scholars
Roginsky & Lissi (2005) ^[50]	Methods	Criticism	Espousal of Position	Exhaustive with Selective Citation	Methodological	Free Radical Researchers & Chemists
Ruberto & Baratta (2000) ^[51]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Sabet <i>et al.</i> (2017) ^[52]	Methods & Practices	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Biosensor Specialists & Food Safety Teams
Sacchetti <i>et al.</i> (2005) ^[53]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Specialized Scholars
Shahidi <i>et al.</i> (1995) ^[54]	Practices & Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Seafood Processing Engineers
Sharma & Bhat (2009) ^[55]	Methods	Criticism	Espousal of Position	Central / Pivotal	Methodological	Analytical Biochemists & Scholars
Silvester <i>et al.</i> (2019) ^[56]	Theories & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Metabolic Researchers & Molecular Nutritionists
Singh <i>et al.</i> (2003) ^[57]	Outcomes & Methods	Central Issues	Neutral Representation	Representative	Conceptual	Starch Chemists & Rheologists
Škerget <i>et al.</i> (2005)	Methods & Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Chemical Engineers & Phytochemists
Tan <i>et al.</i> (2017) ^[59]	Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Nutritional Biochemists & Food Scientists
Tohidi <i>et al.</i> (2017) ^[60]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Botanists & Essential Oil Specialists
Tripoli <i>et al.</i> (2007) ^[61]	Theories & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Nutritionists & Pharmacologists
Turkmen <i>et al.</i> (2005) ^[62]	Practices & Outcomes	Central Issues	Neutral Representation	Selective / Empirical	Methodological	Culinary Scientists & Food Technologists
van den Berg <i>et al.</i> (1999) ^[63]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Redox Chemists & Food Analysts
Wang, Guo, <i>et al.</i> (2017) ^[64]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Horticulturalists & Food Chemists
Wang, Tang, & Wang (2015) ^[65]	Methods & Outcomes	Integration	Neutral Representation	Exhaustive with Selective Citation	Conceptual	Epidemiologists & Oncologists
Wojdyło <i>et al.</i> (2007) ^[66]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Pharmacognosists & Food Chemists
Wong <i>et al.</i> (2006) ^[67]	Outcomes	Central Issues	Neutral Representation	Representative	Methodological	Phytochemists & Food Chemists
Yu & Yang (2017) ^[68]	Methods	Central Issues	Espousal of Position	Selective / Empirical	Methodological	Residue Analysts & Regulators
Zhishen <i>et al.</i> (1999) ^[69]	Methods & Outcomes	Central Issues	Espousal of Position	Central / Pivotal	Methodological	Natural Product Chemist

The classification of the selected Food Science, Nutrition, and Bioactive Chemistry studies using Cooper's Taxonomy of Literature Reviews revealed a number of trends in the reviewed scholarly works. First of all, the majority of the analyzed articles belong to the category of research-focused studies. This implies that the scholars prioritize investigating the outcomes of their research subjects, such as phytochemical profiles, radical scavenging capacities, extraction yields, or enzyme inhibitions, rather than focus on the analytical or conceptual aspects of their study. As for the goal of the reviewed literature studies, the most common type of goal is the identification of focal issues and synthesis of empirical data, followed by criticism of non-physiological assays. Thus, the given literature reviews prioritize the integration of evidence related to the specific mechanisms of phytochemical activities rather than formulate a holistic theoretical framework outlining the general principles of the studied phenomena.

In terms of the perspective, most of the reviewed articles adopt a neutral perspective, which implies an objective presentation of the reviewed empirical data. At the same time, there is a significant number of papers that feature an

espousal perspective, aimed at presenting readers with the details of the newly developed green extraction procedures, innovative nanocarriers for phytochemicals, and optimized analytical methods. On the other hand, critical perspective studies are also numerous, primarily targeting the limitations of the reviewed methodology and experimental designs. In terms of coverage, the majority of the analyzed literature reviews belong to the category of representative-selective coverage. This could indicate that the scholars primarily utilize an empirical-sampling strategy for describing the characteristics of specific botanical products and side-streams. Articles that feature exhaustive-selective or pivotal coverage are primarily aimed at providing the readers with the comprehensive overview of the key methodological approaches or the entire body of related literature.

In terms of organization, the majority of the reviewed studies utilize a conceptual or methodological type of organization, which is primarily focused on discussing the specifics of experimental techniques, equipment, and classes of compounds. Finally, the majority of the analyzed articles are targeted toward a specific audience of food chemists,

phytochemists, and biochemists. Therefore, the reviewed literature is primarily geared toward advancing the specialized knowledge in the area of food science, chemistry, and nutrition, rather than addressing the general audiences of food industry product developers, clinical dieticians, or food safety administrators.

Findings of the Study

The classification of the food science, nutrition, and bioactive chemistry literature using Cooper's Taxonomy reveals that the existing body of research is predominantly outcome-oriented, with most studies concentrating on quantifying phytochemical concentrations, extraction yields, radical scavenging capacities, enzyme inhibition kinetics, and specific biological endpoints. Research focusing on theoretical development—such as predictive structure–activity relationships (SAR) and molecular docking models—or methodological innovation, although present, is comparatively limited. This indicates that bioactive scholarship has progressed rapidly in empirical data collection but remains less mature in terms of theoretical integration and mechanistic modeling.

With respect to review goals, the findings show that identifying central issues and integrating empirical findings dominate the literature. A significant number of studies aim to catalog bioactive compounds across botanical accessions or map the functional properties of food processing residues, reflecting the fragmented nature of natural product screening. However, fewer studies explicitly adopt a critical evaluative goal—such as directly challenging the physiological relevance of routine *in vitro* chemical assays or identifying discrepancies between cell models and clinical trials—suggesting a critical need for deeper analytical scrutiny and methodological rigor in future syntheses.

The analysis of perspective reveals a strong predominance of neutral positions, indicating an objective, descriptive reporting of laboratory and analytical measurements. Advocative perspectives are more common in studies presenting novel extraction protocols, green technologies, functional delivery systems, and commercial nutraceutical claims, where authors actively promote the efficacy or utility of specific formulations. Conversely, critical perspectives are largely restricted to analytical papers addressing assay artifacts, reaction kinetics, or bioavailability bottlenecks. This distribution highlights an imbalance in the literature, where studies routinely celebrate *in vitro* antioxidant potentials while relatively few critically assess the barriers of digestive degradation, low bioaccessibility, and *in vivo* efficacy.

In terms of literature coverage, the findings indicate that a notable proportion of benchtop and characterization studies rely on representative or selective empirical sampling, focusing on specific plant varieties, local cultivars, or single agricultural by-products. While this provides detailed localized insight, it may limit the broad generalizability of findings across wider food matrices. Conversely, exhaustive and pivotal coverage patterns are primarily concentrated within foundational methodology papers and comprehensive thematic reviews, demonstrating a clear divide between narrow experimental investigations and broad academic overviews.

Regarding the organization of studies and syntheses, methodological and conceptual frameworks are the most

prevalent, reflecting a strong preference for structuring research around analytical instrumentation, extraction workflows, compound chemical families, and specific bioactivities. Historical and chronological organization is virtually absent, demonstrating that bioactive food research prioritizes immediate technical utility and functional categorizations over evolutionary or historical timelines.

Finally, the findings indicate that specialized academic scholars in food chemistry, phytochemistry, and biochemistry constitute the overwhelming majority of the intended audience. Studies explicitly translating findings for food industry product developers, regulatory authorities, or clinical nutritionists remain scarce. This persistent divide underscores the translational gap in the field, pointing to an urgent need for literature that connects benchtop chemical characterization to applied food formulation, dietary guidelines, and safety regulation.

Conclusion of the Study

The intersection of food science, human nutrition and bioactive chemistry has fundamentally changed how we think about diet, health and disease prevention. Food science, human nutrition and bioactive chemistry now help us isolate food components see how functional nutrients work inside food mixtures and understand how small molecules in food can influence the body's metabolic pathways. New tools such as extraction, advanced mass spectrometry, nanoencapsulation and gut microbiome studies have sped up these discoveries. Over the twenty years food science, human nutrition and bioactive chemistry have drawn interest from universities, food companies, nutritionists and regulators raising both public and scientific focus.

This study gives a systematic map of research in food science, human nutrition and bioactive chemistry using Cooper's Taxonomy. By looking at 68 peer-reviewed papers in six areas the work shows that scholarship in chemistry is mostly focused on results on bringing ideas together and on academic work. There is focus on building predictive theory on deep critical reviews of methods or on turning science into practical advice for people. Even though many studies are well organized and cover plant sources and by-products big gaps remain. These gaps are between laboratory tests that measure antioxidants and real-life tests that look at how food behaves in the body how it is absorbed how it changes inside the body and whether it meets safety rules. The taxonomy view makes the field of food science, human nutrition and bioactive chemistry more coherent and shows a path for future research that wants deeper theory, real bodily effects and useful results, for the food industry.

Future Scope of the Study

In terms of future research, the present work provides a solid basis for further investigations on the topic, as well as serves as an important source of information for stakeholders. Subsequent studies may build upon the proposed framework by including additional topics, such as precision nutrition, microbiome-focused functional foods, AI-driven molecular docking simulation for the identification of bioactive compounds, and quantitative bibliometric analysis to evaluate the dissemination of findings and recognition trends. Investigations in different geographic regions may also be conducted to benchmark the findings and identify variations in research foci between the

countries with well-established food processing sectors and those with emerging agricultural economies and by-product valorization interests. In terms of applications, the work may help academia to prioritize theoretical or practice-oriented gaps that require further in-depth mechanistic studies instead of conventional bench trials, position food formulators toward stable delivery forms, such as nanoencapsulation, identify regulatory bodies' testing guidelines to standardize the evaluation of commercial functional health claims, and highlight relevant animal models for *in vivo* validation of proposed mechanisms.

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