HONEY CONSUMPTION: A BIBLIOMETRIC ANALYSIS AND SYSTEMATIC REVIEW[1]

Oliveira Neto, Waldomiro Mourão de[2]
Paiva, Roberto do Nascimento[3]
Novais, Jaílson Santos de[3]

Recibido: 27-06-2019 Revisado: 25-10-2021 Aceptado: 01-11-2021

ABSTRACT

Honey is the most widespread bee product in the world. Consumption-centered research supports the honey market, subsidizing marketing strategies focused on consumer's profile. The present manuscript was aimed at providing a bibliometric analysis and a systematic review of scientific production on honey consumption. The data comprise periodical articles indexed in the Web of Science - Clarivate Analytics, processed in the VOSviewer software. A total of 472 articles with the radicals honey* consum* in the bibliometric analysis were identified. The manuscripts come from 68 countries, published between 1958 and 2018, with the largest number of publications in 2016 (52). Of the 472 articles initially retrieved, the reading of titles and abstracts revealed 22 specific papers about honey consumption. These articles comprise 14 countries. Their objectives included: to characterize the profile of the consumers, reasons that lead to the purchase and consumption of honey, perceptions about the market price, socioeconomic effects on the consumption pattern, among other aspects. However, the low number of articles identified in the systematic review reveals a gap still present in the literature on honey consumption. Despite the large number of articles originally identified at WoS database, the systematic revision revealed out the scarcity of publications directly dealing with honey consumption in their objectives, the number of which has been increasing from 2006 onwards. The results also showed that most research on honey consumption were based on quantitative methods, especially the use of face-to-face interview for data collection, which reveals a potential for further studies focused on these approaches. Poland and the United States stood out with the major countries with articles on honey consumption, although the lack of such studies for countries with large honey production (such as China, Iran and Turkey). Finally, regarding to the country of origin of the authors, a low internationalization of scientific literature on this research issue was also observed.

Key words: VOSviewer, bibliometrics, honey production, consumption, consumer's behavior, honeybee

---

[1] This manuscript comprises part of the Master's dissertation authored by W. M. Oliveira Neto at the Graduate Program of Amazon Natural Resources from 2017 to 2019, at the Federal University of Western Pará. This study was financed in part by the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil* (CAPES), Finance Code 001.

[2] Bachelor of Science in Forestry Engineering (Universidade Federal do Oeste do Pará-UFOPA, Brazil); MS. in Environmental Sciences (Programa de Pós-Graduação em Recursos Naturais da Amazônia, PGRNA/UFOPA, Brazil). *Postal address*: Rua Vera Paz, s/n. Salé, Santarém, PA, Brasil. *ORCID:* http://orcid.org/0000-0003-3692-5868. *Phone:*+55 (93) 21016548; *e-mail:* wald.neto@hotmail.com

[3] Licentiate's degree in Letters – Portuguese and French (Universidade Federal do Pará-UFPA, Brazil); Specialist in Informatics in Education (Pontifícia Universidade Católica de Minas Gerais, PUC-MG, Brazil); MA and PhD in Communication and Semiotics (Pontifícia Universidade Católica de São Paulo, PUC-SP, Brazil). Professor at the Center for Interdisciplinary Training of the Federal University of Western Pará (UFOPA). *Postal address:* Rua Vera Paz, s/n. Salé, Santarém, PA, Brazil. *ORCID:* http://orcid.org/0000-0002-8854-9553. *Phone:*+55 (93) 21016548; *e-mail:* roberto.paiva@ufopa.edu.br

[4] BS and Licentiate's degree in Biological Sciences (Universidade Estadual de Feira de Santana, UEFS); MS in Botany (UEFS); PhD in Biological Sciences – Botany (Instituto Nacional de Pesquisas da Amazônia, INPA). Professor at the Sosígenes Costa Institute of Humanities, Arts and Sciences, and at the Graduate Program in Environmental Sciences and Technologies of the Federal University of Southern Bahia (UFSB). *Postal address:*Rodovia Porto Seguro – Eunápolis, BR 367, Km 10, Porto Seguro, BA, Brazil. *ORCID:* http://orcid.org/0000-0003-3080-8994.*Phone:*+55 (73) 32888400; *e-mail:* jailson.novais@ufsb.edu.br

RESUMEN

La miel es el producto apícola más difundido en el mundo. La investigación centrada en el consumo respalda el mercado de la miel, subvencionando estrategias de marketing centradas en el perfil del consumidor. El artículo sintetiza los resultados de un análisis bibliométrico y una revisión sistemática de la producción científica sobre el tema del consumo de miel. Los datos comprenden artículos periódicos indexados en *Web of Science-Clarivate Analytics*, procesados mediante el software VOSviewer. Se identificaron 472 artículos con los radicales *honey* consum** en el análisis bibliométrico. Los manuscritos provenían de 68 países, con el mayor número de publicaciones en 2016 (52). De los 472 artículos recuperados inicialmente, la lectura de títulos y resúmenes reveló 22 artículos específicos sobre el consumo de miel. Estos artículos comprenden 14 países. Sus objetivos incluían: caracterizar el perfil de los consumidores, las razones que llevaron a la compra y el consumo de miel, las percepciones sobre el precio de mercado, los efectos socioeconómicos sobre el patrón de consumo, entre otros aspectos. Sin embargo, el bajo número de artículos identificados en la revisión sistemática revela una brecha aún presente en la literatura sobre el consumo de miel. A pesar de la gran cantidad de artículos identificados originalmente en la base de datos WoS, la revisión sistemática reveló la escasez de publicaciones que tratan directamente sobre el consumo de miel en sus objetivos, cuyo número ha ido aumentando desde 2006 en adelante. Los resultados también indicaron que la mayoría de las investigaciones sobre el consumo de miel se basaron en métodos cuantitativos, especialmente entrevistas personales para la recopilación de datos, revelando así el potencial de estos enfoques para futuros estudios. Polonia y Estados Unidos destacaron entre los principales países con más artículos sobre el consumo de miel, aunque se echan en falta estudios de este tipo para países con gran producción de miel (como *e.g.* China, Irán y Turquía). Por último y en cuanto al país de origen de los autores, se observó una baja internacionalización de la literatura científica sobre este tema de investigación.
Palabras clave: VOSviewer, bibliometría, producción de miel, consumo, comportamiento del consumidor, abeja

RÉSUMÉ

Le miel est le produit apicole le plus répandu dans le monde. La recherche centrée sur la consommation soutient le marché du miel, en subventionnant des stratégies de marketing axées sur le profil du consommateur. Le présent manuscrit vise à fournir une analyse bibliométrique et une revue systématique de la production scientifique sur la consommation de miel. Les données comprennent des articles de périodiques indexés dans *Web of Science - Clarivate Analytics*, traités dans le logiciel VOSviewer. Les résultats montrent 472 articles avec les radicaux *honey* consum** dans l'analyse bibliométrique. Les manuscrits proviennent de 68 pays, publiés entre 1958 et 2018, avec le plus grand nombre de publications en 2016 (52). Sur les 472 articles initialement récupérés, la lecture des titres et des résumés a révélé 22 articles traitant spécifiquement sur la consommation de miel. Ces articles concernent 14 pays. Leurs objectifs comprenaient : caractériser le profil des consommateurs, les raisons qui ont motivé l'achat et la consommation de miel, les perceptions du prix du marché, les effets socio-économiques sur le modèle de consommation, entre autres aspects. Cependant, le faible nombre d'articles recensés dans la revue systématique révèle une lacune encore dans la littérature sur la consommation de miel. Malgré le grand nombre d'articles identifiés dans la base de données WoS, la revue systématique a révélé très peu de publications traitant directement la consommation de miel comme l'objectif principal, bien que ce nombre ait augmenté depuis 2006. Les résultats ont également indiqué que la plupart des recherches sur la consommation de miel reposaient sur des méthodes quantitatives, en particulier des entretiens personnels pour la collecte de données, révélant ainsi le potentiel de ces approches pour de futures études. La Pologne et les États-Unis se distinguent parmi les principaux pays avec le plus d'articles sur la consommation de miel, même si les études de ce type font défaut pour les pays à forte production de miel (comme la Chine, l'Iran et la Turquie). Enfin, et concernant le pays d'origine des auteurs, une faible internationalisation de la littérature scientifique sur ce thème de recherche a été observée.
Mots-clés : VOSviewer, bibliométrie, production de miel, consommation, comportement des consommateurs, abeilles mellifères

RESUMO

O mel é o produto apícola mais difundido no mundo. Pesquisas centradas na questão do consumo beneficiam o mercado de mel, propiciando a criação de estratégias de marketing com foco no perfil do consumidor.O presente trabalho objetivou prover uma análise bibliométrica e uma revisão sistemática da produção científica sobre o consumo de mel. Os dados compreendem artigos de periódicos indexados na Web of Science – ClarivateAnalytics, processados

no software VOSviewer. Os resultados mostram 472 artigos com os radicais *honey* consum** na análise bibliométrica. Os trabalhos são oriundos de 68 países, havendo sido publicados entre 1958 e 2018, com o maior número de publicações em 2016 (52). Dos 472 artigos inicialmente recuperados, a leitura de títulos e resumos revelou 22 publicações específicas sobre consumo de mel. Estes artigos representam 14 países. Os objetivos incluíram: caracterizar o perfil dos consumidores, os motivos que levam à compra e ao consumo do mel, as percepções sobre o preço de mercado, os efeitos socioeconômicos no padrão de consumo, dentre outros aspectos. Contudo, o baixo número de artigos identificados na revisão sistemática revela uma lacuna ainda presente na literatura sobre consumo de mel. Apesar da grande quantidade de artigos originalmente identificados na base de dados WoS, a revisão sistemática revelou a escassez de publicações cujos objetivos estão centrados diretamente no consumo de mel, sendo que o número de publicações identificados com essa ideia cresce a partir de 2006. Os resultados também indicaram que a maioria das investigações sobre o consumo de mel se baseou em métodos quantitativos, especialmente entrevistas pessoais para a recopilação de dados, revelando, assim, o potencial deste tipo de enfoque para futuros estudos. Polônia e Estados Unidos de América se destacam como principais países com mais artigos sobre esse assunto, sendo mais escassos pesquisas do gênero em países com grande produção apícola, a exemplo da China, Irã e Turquia. Em relação ao país de origem observou-se uma baixa internacionalização da literatura científica sobre o aludido objeto de pesquisa.
Palavras-chaves: VOSviewer, bibliometria, produção de mel, consumo, comportamento do consumidor, abelha

1. INTRODUCTION

Honey is the product derived from the work of the bees most widely distributed in the world, produced from the collection of nectar from flowers. Its composition can have different sensory characteristics, including carbohydrates, mainly fructose and glucose, and, in smaller amounts, proteins, enzymes, amino acids, vitamins, and polyphenols (Bogdanov, Jurendic, Sieber & Gallmann, 2008; Ćirić, Ignjatijević & Cvijanović, 2015). In addition, honey is considered a functional food because it combines flavor with the benefits derived from its composition, and is also used in the prevention and treatment of diseases. For example, positive results were found in the treatment of cancer patients who had gangrene and chronic wounds in Turkey and Belgium (Tahmaz, Erdemir, Kibar, Cosar & Yalcyn, 2006; Vandeputte & van Waeyenberge, 2003).

The characteristics mentioned above, linked to the search for a healthier life, boost honey consumption worldwide (Viuda-Martos, Ruiz-Navajas, Fernández-López & Pérez-Álvarez, 2008). China and the United States have per capita consumption that exceeds one kilo per capita per year (FAO, 2016). Meanwhile, the per capita consumption of honey in Brazil is low, turning around 250 g per person per year (Cheung & Gerber, 2009). In terms of production, China leads the world ranking with an average of 488 thousand tons of honey between 2012 and 2017, more than four times greater than the average production of Turkey, the second place with 102 thousand tons (FAO, 2017). Between 2011 and 2016, China (with 122,000 tons), Argentina (65,000 tons), and Mexico (33,000 tons) were the largest exporters of honey in the world, while the United States (155,000 tons), Germany (84,000 tons), and Japan (39,000 tons) were the largest importers (FAO, 2016).

The literature contains huge publications on honey consumption in different countries, such as Romania (Pocol & Bolboacă, 2013), the Democratic Republic of Congo (Gyau, Akalakou, Degrande & Biloso, 2014), Serbia (Ćirić *et al.*, 2015) and Italy (Cosmina, Gallenti, Marangon & Troiano, 2016). In general, the studies seek to identify the consumers' preferences about the purchase and consumption of honey. However, there are not yet studies that systematize such publications in the area, although the growing progress of the various areas of science stimulates the creation of mechanisms to quantify, control, trace, and disseminate the knowledge produced therein, especially the management of articles published in scientific journals (Santos, Oliveira, Viana & Araújo, 2012). The increase of publications reveals the need for studies that quantify them. In this context, bibliometric and scientometric studies appear as an important tool, aiming to quantify the process of written

communication through analyses that show the dynamics of the subjects in literature (Hood & Wilson, 2001).

Considering the expansion of the honey market worldwide, firstly, we performed a bibliometric analysis on honey consumption, using publications available in journals in the Web of Science - Clarivate Analytics database. Secondly, we carried out a systematic review based on the articles found to investigate the extent to which these works actually deal with honey consumption and the main objectives and research methods used in the area.

2. MATERIAL AND METHODS

We use papers published in periodicals available in the main collection of the Web of Science - Clarivate Analytics (WoS) database, whose content encompasses more than 12,000 journals of great importance in the scientific research world. The search was done with the key radical «*honey* consum**»*, according to the following algorithm: *«topic: (honey* NEAR/5 consum*) Refined by: document types: (article); Time span: all years. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI»*. This means that only works whose radicals *«honey* consum**»* were separated from each other by a maximum of five words were considered, considering publications in article format, published between 1945 and 2018, in all indices of the main collection of WoS.

The data obtained from WoS were processed in VOSviewer. This map overlay software simplifies the 224 categories (factors) of WoS into four, six, or 19 factors, which represent the large areas or groups of concentration of the sciences, developed by van Eck & Waltman (2009). The software distributes the articles found in groups that can be viewed in the form of network or density. For the present study, the network maps varied according to the presence or absence of the publications within the factors. Meanwhile, for the density map, we used the division into four variables, as it allows an objective and efficient visualization of the distribution of the studies.

Two co-citation analyses were performed, one for the articles and another for the first authors of the articles. Co-citation analyses are important tools for analyzing the authors' scientific domain. Another author in the scientific production studied bases them on the simultaneous occurrence of citation of two authors (or documents). When these authors or documents are cited together in a third work, there is a perspective of a relationship between them, that is, the greater the number of co-citations, the greater the similarity between the authors or works cited (Oliveira & Grácio, 2013).

After the bibliometric analysis, we performed a systematic review of the data to investigate the main objectives and methods used in studies that focus on the consumption of honey, as well as to characterize briefly such productions. We read the titles and abstracts of the 472 articles, to select those that actually dealt with honey consumption (Figure Nº 1). In this stage, the papers were characterized in this stage according to the following variables: year of publication, country of research, the journal where it was published, number of authors, country of the author's institutional affiliation, funding, objectives, and method used to obtain results.

3. RESULTS AND DISCUSSION

For the period studied (1945-2018), we found a total of 472 articles in WoS referring to the term *honey consumption*. The publications on this list began in 1958, with two published articles (Horguelin, 1958; Free & Spencer-Booth, 1958). The largest number of publications was registered in 2016, with 52 articles. We also observed that the publications of the last 15 years represented 77.96% of the total number of publications found (Figure Nº 2), suggesting the consolidation of research in the area, from then on. Most of the publications are concentrated in the area of Environmental Sciences, emphasizing the area of Entomology, which included 107 articles in the database.

The publications found are from 68 countries, with the United States standing out with 101 articles, at the center of the map (Figure Nº 3), with the greatest number of links to other publications. Then there are China (40 articles), Turkey (28), England (23), and Germany (22), highlighting the European continent. When comparing the scientific production ranking with the data on honey

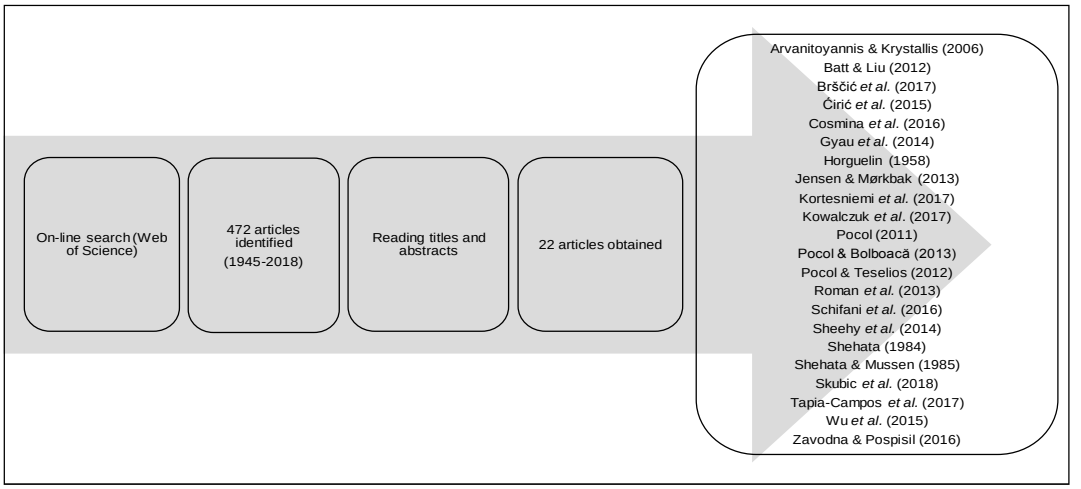

Figure 1. Flowchart of the sequence of steps in obtaining the studies for the bibliometric analysis and for the systematic review. Source: own elaboration

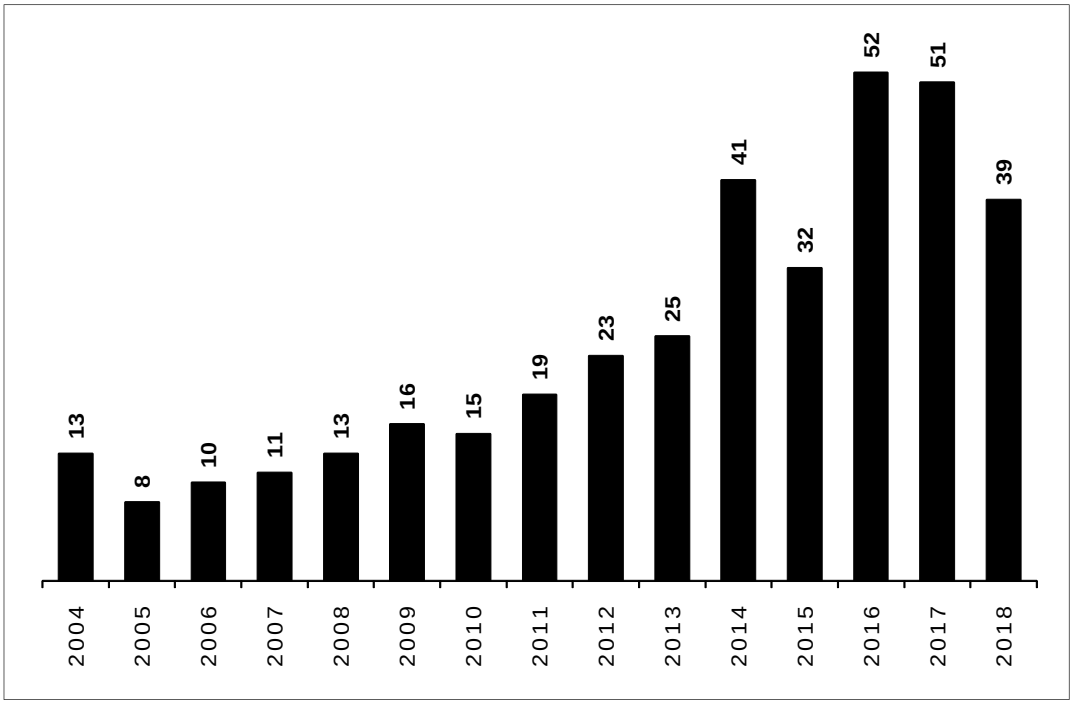

Figure 2. Distribution of the number of scientific articles retrieved with the term honey consumption in the Web of Science - Clarivate Analytics database in the last 15 years. Source: own elaboration

production, we noticed some asynchrony. China, the world's largest producer of honey (FAO, 2017), ranks second in the number of publications, with less than half of the studies compared to the first place in this category (United States). The closer items represent similarity about the theme of the publications for each survey (van Eck & Waltman, 2014).

Another example is Turkey, which, according to FAO (2017) data, took the place of Argentina and became the country with the second largest honey production in the world, but is in third place concerning scientific production. Brazil presented 16 publications, occupying the 8th place, although, according to data from the FAO (2017), it occupies the 12th position in the world honey production ranking. The United States has the largest number of published studies containing *honey consumption* (101) and represents the fourth country with the highest honey production in the last five years (FAO, 2017). As for annual per capita consumption, the United States, China, and Turkey account for approximately 35% of world consumption (FAO, 2016), showing a consonance between the consumption of honey and the number of publications related to that term.

To access the most used terms in the articles found, we decided to adopt the minimum number of 10 terms per article, present in the titles and abstracts. This step lets to bring together the 116 most relevant terms in the search (Figure Nº 4), among which «sample» stands out with 91 occurrences, «product» with 89, «consumer» and «bee», with 87 occurrences each, and «content» (80). The fact that research on the term honey consumption appears in the search results in several areas of knowledge is related to the use of the product for various purposes, including research in the food industry, focused on economic aspects of production, as well as its pharmaceutical and medicinal properties (Aizen & Harder, 2009; Gallai, Salles, Settele & Vaissiere, 2009; Viuda-Martos *et al*., 2008). Although the term honey consumption appears in the articles and, therefore, was retrieved during the search in

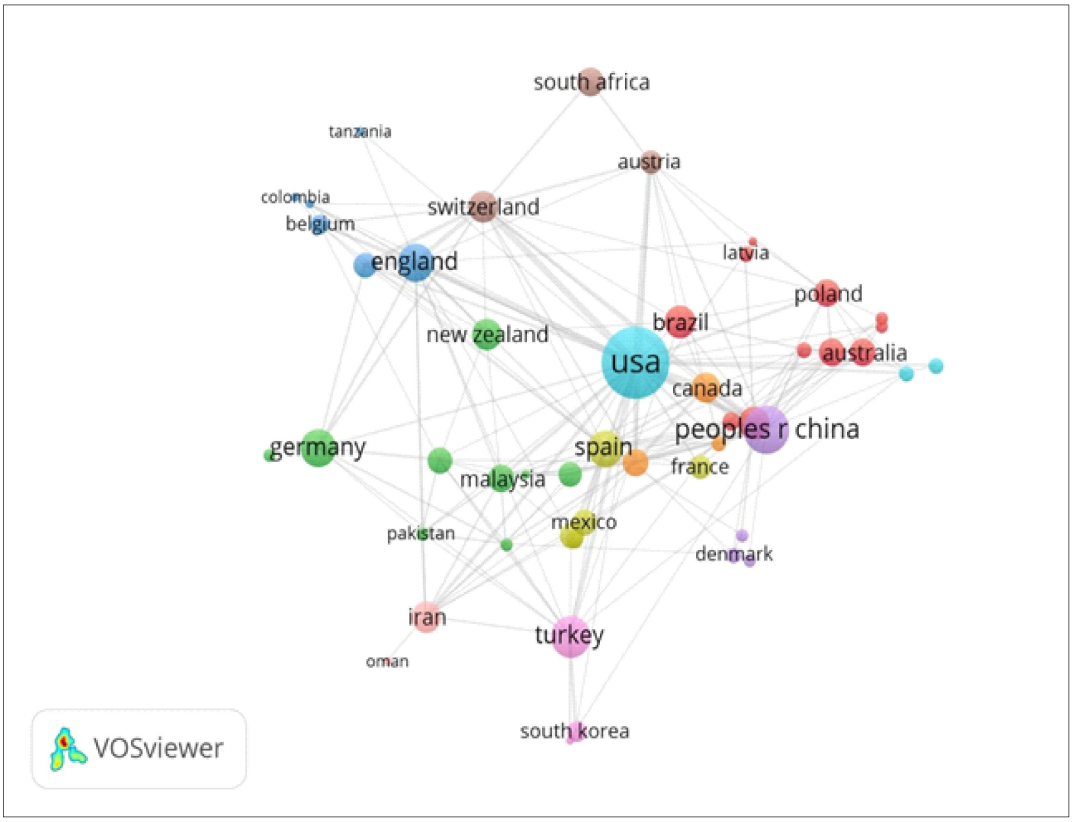

Figure 3. Network map of the 68 countries with publications on honey consumption available at the Web of Science - Clarivate Analytics (1945-2018). Source: own elaboration

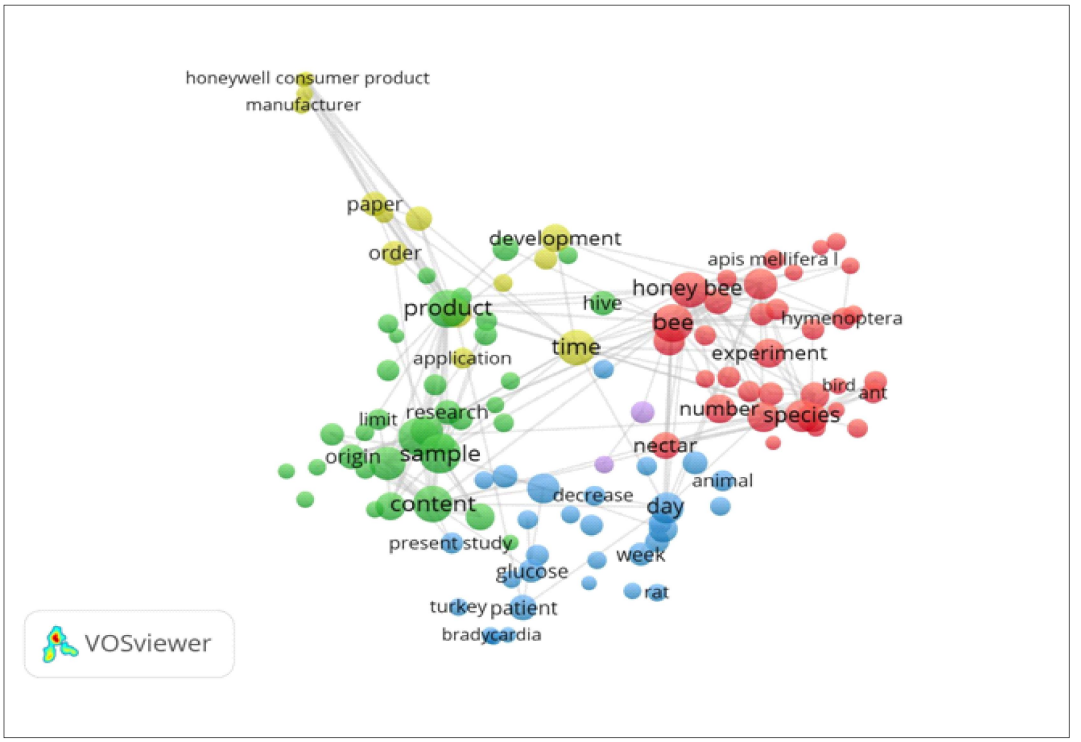

Figure 4. Network map showing the most commonly found terms in the titles and abstracts of articles on honey consumption available at the Web of Science - Clarivate Analytics (1945-2018). Source: own elaboration

WoS, this does not mean that all the results represent articles that deal with the profile of honey consumers or related topics.

4. ANALYSIS OF CO-CITATIONS

Based on a minimum of 10 citations, we performed a co-citation analysis on articles and journals. A total of 229 items were identified within seven different groups (Figure Nº 5). The journals with the highest citations were *Food Chemistry* (439) and *Apidologie* (326). *Food Chemistry* publishes studies that encompass the advancement of food chemistry and biochemistry, including, among several factors, chemistry related to food composition, nutritional and taste aspects, which are the targets of research related to honey. On the other hand, *Apidologie* covers research related to the biology of bees and, in that scope, include the practical use and exploitation of products from these insects, including honey. The scope of the journals may explain why the number of co-citations was high for both.

An analysis of the co-citation network by the first author was also performed (Figure Nº 6), where we adopted the criterion of at least ten citations per author. A total of 9,451 authors were identified, of whom 104 (1.10%) had links between their publications. These authors were divided into 8 distinct groups, revealing a strong link between those belonging to the same groups. The closer the graph, the greater the relationship between the surveys. Here we highlight authors Bogdanov (Sweden), Crailsheim (Austria), and Wackers (Belgium), with 71, 57, and 48 citations, respectively. We emphasize that, despite the importance of these authors regarding bee-related research and honey production, none of them are directly involved in research on honey consumption.

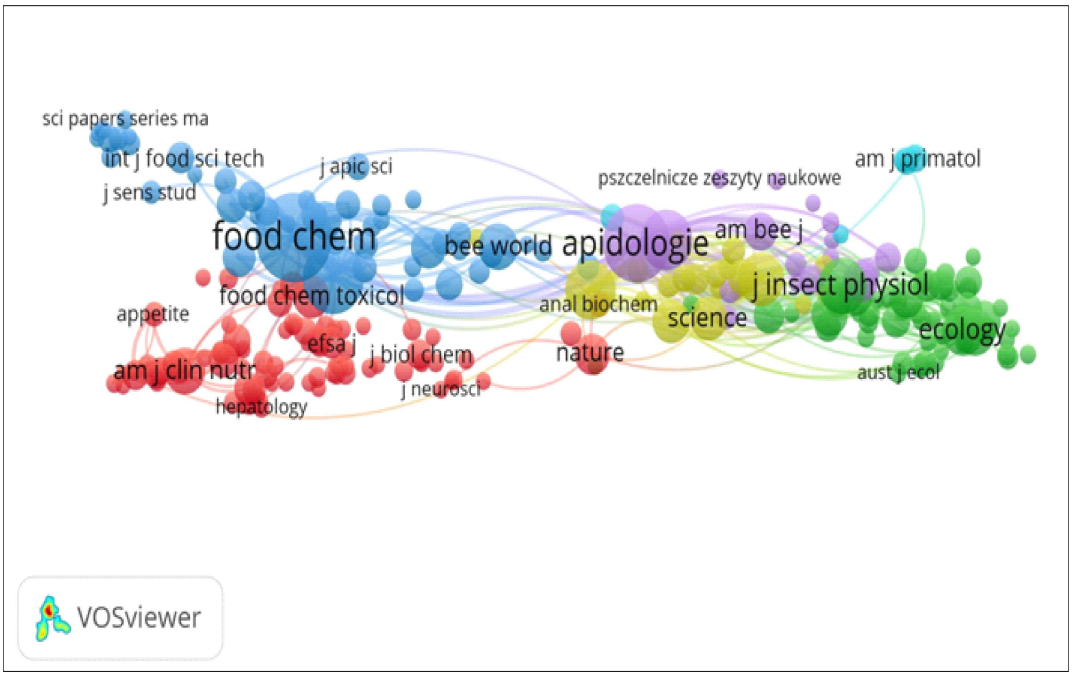

Figure 5. Network map with analysis of co-citation by journals present in WoS from 1945 to 2018. Source: own elaboration

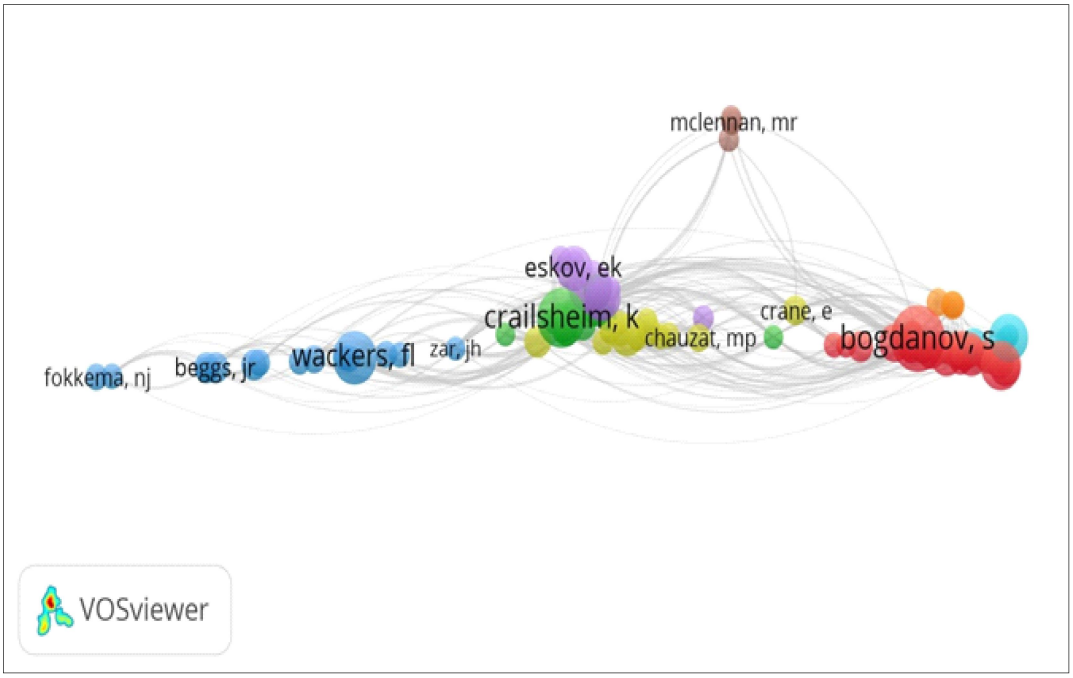

Figure 6. Network map with co-citation analysis for the first author of articles published in journals present in the WoS from 1945 to 2018. Source: own elaboration

5. SYSTEMATIC REVIEW

Among the 472 papers surveyed in the bibliometric study, we identified 22 articles dealing specifically with honey consumption. The goals of the studies varied around the characterization of the profile of honey consumers, including the reasons that lead them to purchase and consume honey (Pocol & Bolboacă, 2013), perceptions about the market price (Roman, Popiela-Pleban & Kozak, 2013), analysis of the socioeconomic effects on the pattern of honey consumption (Pocol, 2011), among others. The quantitative method was the predominant, including the use of questionnaires, the majority (17) with face-to-face interviews (Cosmina *et al*., 2016; Schifani, Romeo, Guccione, Schimmenti, Columba & Migliore, 2016; Zavodna & Pospisil, 2016), online questionnaires (Jensen & Mørkbak. 2013; Wu, Fooks, Messer & Delaney, 2015) and a study that sought to relate production / import to exports to define variation in honey consumption (Horguelin, 1958) (Table Nº 1).

In addition to the method, five studies detail the sampling of participants, providing data such as confidence interval and sampling error, allowing greater replicability of the methods adopted (Batt & Liu, 2012; Pocol, 2011; Pocol & Bolboacă, 2013; Pocol & Teselios, 2012; Roman *et al*., 2013). However, all studies (except for Horguelin, 1958) inform the number of interviewees. For interviews face-to-face, the method of approach and selection of respondents were also revealed, emphasizing the random selection method.

The work of Horguelin (1958) marks the beginning of publications in the area of honey consumption, seeking to analyze the changes in the amount consumed in Canada through a statistical model that relates the volume of production and imports with the decrease of exports in the country to justify variations in consumption. On the other hand, Skubic, Erjavec & Klopcic (2018) represented the most recent study using an online questionnaire to investigate Slovene consumers' preferences for honey. We highlight in this range of publications the year 2017 since it presented the largest number of published works (4), all to identify the preferences of the consumer on honey (Table Nº 1). It is interesting to note two major gaps in the period of the surveyed publications: the first from 1958 to 1984 and the second from 1985 to 2006, which explains the reduction in the number of bibliometric analysis works (472) for the systematic review (22).

A total of 14 countries were surveyed for honey consumption, most notably Romania, with four articles, followed by the United States, which is the largest importer of honey, with three, Canada, Italy, and Poland, each with two published articles. Thus, the European continent was represented by nine countries, North America with three and Africa and Oceania with one country. In the search, we did not find studies referring to China, Turkey, and Iran, the three countries that produced the most honey in the last five years (FAO, 2017), respectively, showing the disparity between production and knowledge about the consumption of honey. In this perspective, research on the subject could contribute to subsidizing strategies that increase the domestic consumption of the product, such as Cosmina *et al*. (2016) in Italy, who have outlined the profile of consumers to illustrate the best marketing opportunities for local honey producers. Similarly, Ćirić *et al.* (2015), in Serbia, realizing the large presence of imported products in the local market, used the research to elucidate ways that would help to market better the honey produced in the city of Vojvodina.

The papers were published in 18 different journals. These included the *British Food Journal*, *International Journal of Consumer Studies*, *Applied Economics*, and *American Bee Journal*, each with two articles (Table Nº 1). Thus, we can divide the journals into four major study groups: food and nutrition (6), consumer preference and behavior (5), economics (4), and bee biology (3). However, although we perceive standards regarding the scope of journals, most of them are interdisciplinary and encourage publication in several areas of knowledge.

Only three papers have a single author (Horguelin, 1958; Shehata, 1984; Pocol, 2011). The other articles have more than one author, ranging from 2 to 7 authors, with most papers having two authors. Besides the study of 2011, Cristina Pocol was the author of two other

Table 1
Characterization of 22 articles focused on honey consumption: Reference, number of authors, journal of publication, country, funding, aims and the methodology

Reference [Author (year)]	Nº of authors	Journal of publication	Country	Funding	Aims of the study	Method / techniques
Horguelin (1958)	1	L'Actualité Économique	Canada	No	Investigate the changes on honey consumption and price	Evaluated according to a statistical manipulation
Shehata (1984)	1	American Bee Journal	United States	No	Determine characteristics of consumers' awareness and preferences for honey products	Questionnaire by phone interview
Shehata & Mussen (1985)	2	American Bee Journal	United States	No	Determine characteristics of consumers' awareness and preferences for honey products	Questionnaire used as the main research tool
Arvanitoyannis & Krystallis (2006)	2	International Journal of Food Science and Technology	Romania	No	Investigate consumers behavior as regards honey	Personal interviews with questionnaire at respondents' place
Pocol (2011)	1	African Journal of Agricultural Research	Romania	Yes	Analyze the socio-economic effects on the honey consumption pattern	Survey with questionnaire
Batt & Liu (2012)	2	British Food Journal	Australia	No	Explore the factors influencing the consumers' decision to purchase honey	Face-to-face interviews using a structured questionnaire
Pocol & Teselios (2012)	2	Journal of Food, Agriculture & Environment	Romania	Yes	Aimed to identify the socio-economic determinants of honey consumption in Romania	Questionnaire as a main research tool
Jensen & Mørkbak (2013)	2	International Journal of Consumer Studies	Denmark	No	Investigate the role of gastronomic, externality, and feasibility characteristics in consumers' demand for local and for organic foods	Internet questionnaire survey
Pocol & Bolboacă (2013)	2	International Journal of Consumer Studies	Romania	Yes	Investigate tendencies related to the purchasing and consumption of honey	Face-to-face interviews with questionnaire
Roman *et al*. (2013)	3	Journal of Apicultural Science	Poland	No	Present the most important factors influencing consumer honey purchasing behavior	Face-to-face survey using a questionnaire

Table 1 *(Continuation)*

Reference [Author (year)]	Nº of authors	Journal of publication	Country	Funding	Aims of the study	Method / techniques
Gyau *et al* . (2014)	4	Journal of Food Products Marketing	Democratic Republic of Congo	No	Identify key consumer characteristics that influence the preferences of honey consumers	Interview with a questionnaire
Sheehy *et al* . (2014)	4	Food and Nutrition Bulletin	Canada	Yes	To assess the current frequency of consumption of foods and beverages	Quantitative food frequency questionnaire
Ćirić *et al* . (2015)	3	Economics of Agriculture	Serbia	Yes	Identify the motives, attitudes, and buying habits of honey consumers	Survey with a questionnaire
Wu *et al* . (2015)	4	Applied Economics	United States	No	Evaluates consumer behavior related to informational messages about honey	Online survey
Zavodna & Pospisil (2016)	2	Environmental & Socio-economic Studies	Czech Republic	Yes	Examine the relationship between consumers and honey and beekeepers	Face-to-face interviews using a questionnaire
Cosmina *et al* . (2016)	4	Appetite	Italy	No	Determine which factors influence consumers' purchase intentions	A face-to-face questionnaire survey
Schifani *et al* . (2016)	6	Food Safety Management	Italy	No	Identify the quality characteristics which most influence the purchase of locally produced honey	Face-to-face questionnaire
Brščić, Sugar & Poljuha (2017)	3	Applied Economics	Croatia	Yes	Determine consumer preferences for honey	Online questionnaire and a face-to-face survey using the same questionnaire
Kowalczuk *et al.* (2017)	3	Acta Scientiarum Polonorum Technologia Alimentaria	Poland	No	Identify consumers' behaviors and preferences towards honey	Quantitative survey
Kortesniemi *et al* . (2018)	7	Food Chemistry	Finland	Yes	Creating sensory, chemical honey profiles and providing consumer preference data	Questionnaire
Tapia-Campos *et al* . (2017)	7	Interciencia	Mexico	No	Characterize honey and identify consumer preference	Face-to-face interview with a questionnaire
Skubicet al. (2018)	*3*	*British Food Journal*	*Slovenia*	*No*	*Investigate consumer preferences about cheese, ham, and honey*	*Online survey*

Source: Own elaboration

papers present in the review, appearing as the most frequent author in the survey (Pocol, 2011; Pocol & Teselios, 2012; Pocol & Bolboacă, 2013) (Table Nº 1). Still in this scope, in all articles with more than one author, the authors belong to different institutions.

However, only four articles (Batt & Liu, 2012; Gyau *et al*., 2014; Kortesniemi *et al*., 2018; Sheehy, Kolandooz, Roache & Sharma, 2014) had the participation of authors from different countries, which reflects a low internationalization of scientific production in the area.

It is important to emphasize that only eight articles presented explicit acknowledgments to development agencies in the text, allowing us to infer the lack of external funding in the other studies or, less probably, the lack of concern in making financing information transparent in publications (Table Nº 1).

6. CONCLUSION

Although the initial bibliometric analysis reveals a considerable number of articles indexed in the WoS database and which present the key radical *honey* consum** (472), the systematic review has signaled the scarcity with regard to publications dealing with honey consumption in their objectives (22 articles). The results show an increase in publications from 2006 onwards.

Based on the systematic review, most research on honey consumption employs quantitative methods, especially face-to-face interview for data collection. This reveals a potential for further studies focused on qualitative approaches. The investigations deal with the profile of honey consumers, perceptions about price, socioeconomic effects on honey consumption etc. Poland and the United States stood out with four and three studies on honey consumption, respectively. However, similar studies are lacking for countries with high honey production, such as China, Iran and Turkey.

From Romania, Cristina Pocol authored the high number of studies in the review (3). Still regarding authorship, the analysis highlighted a low internationalization of scientific literature on honey consumption. Therefore, studies from multinational research groups are encouraged. The results also serve as a basis for giving greater attention to consumer preferences. Consequently, this subsidizes strategic planning and marketing actions to make the honey market more competitive in different countries through knowledge of purchasing and consumption patterns of the product.

REFERENCES

Aizen, M. A., & Harder, L. D. (2009). The global stock of domesticated honey bees is growing slower than agricultural demand for pollination. *Current Biology*, *19*(11), 915-918.

Arvanitoyannis, I., & Krystallis, A. (2006). An empirical examination of the determinants of honey consumption in Romania. *International Journal of Food Science and Technology*, *41*(10), 1164-1176. https://doi.org/10.1111/j.1365-2621.2006.01174.x

Batt, P. J., & Liu, A. J. (2012). Consumer behaviour towards honey products in Western Australia. *British Food Journal*, *114*(2-3), 285-297. https://doi.org/10.1108/00070701211202449

Bogdanov, S., Jurendic, T., Sieber, R., &Gallmann, P. (2008). Honey for Nutrition and Health: A Review. *Journal of the American College of Nutrition*, *27*(6), 677-689. https://doi.org/10.1080/07315724.2008.10719745

Brščić, K., Sugar, T., & Poljuha, D. (2017). An empirical examination of consumer preferences for honey in Croatia. *Applied Economics*, *49*(58), 5877-5889. https://doi.org/10.1080/00036846.2017.1352079

Cheung, T. L.,& Gerber, R.M. (2009).Consumo de mel de abelhas: análise dos comportamentos de comensais do Estado de Santa Catarina. *InformaçõesEconômicas*, *39*(10), 22-31.

Ćirić, M., Ignjatijević, S., & Cvijanović, D. (2015). Research of honey consumers' behavior in province of Vojvodina. *EkonomikaPoljoprivreda-Economics of Agriculture*, *62*(3), 627-644. https://doi.org/10.5937/ekoPolj1503627C

Cosmina, M., Gallenti, G., Marangon, F.,& Troiano, S. (2016). Attitudes towards honey among Italian consumers: A choice experiment approach. *Appetite*, *99*, 52-58. https://doi.org/10.1016/j.appet.2015.12.018

Free, J. B., & Spencer-Booth, Y. (1958). Observations on the temperature regulation and food consumption of honeybees (*Apis mellifera*). *Journal of Experimental Biology*, *35*(4), 930-937.

Food and Agriculture Organization, FAO. (2016). *Faostat – Statistics database.* Rome, Italy: FAO. Retrieved from http://www.fao.org/faostat/en/#data/QL

Food and Agriculture Organization, FAO. (2017). *Faostat – Statistics database.* Rome, Italy: FAO. Retrieved from http://www.fao.org/faostat/en/#data/QL/FBS

Gallai, N., Salles, J., Settele, J., &Vaissiere, B. E. (2009).Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological Economics*, *68*, 810-821.

Gyau, A., Akalakou, C., Degrande, A., &Biloso, A. (2014). Determinants of consumer preferences for honey in the Democratic Republic of Congo. *Journal of Food Products Marketing*, *20*(5), 476-490. https://doi.org/10.1080/10454446.2013.807405

Hood, W. W., & Wilson, C.S. (2001). The literature of bibliometrics, scientometrics, and informetrics. *Scientometrics, 52*, 291. https://doi.org/10.1023/A:1017919924342

Horguelin, M. (1958). Trend of consumption and pricing of honey in Canada. *Actualité Économique*, *33*(4), 675-679.

Jensen, J. D., & Morkbak, M. R. (2013). Role of gastronomic, externality and feasibility attributes in consumer demand for organic and local foods: The case of honey and apples. *International Journal of Consumer Studies*, *37*(6), 634-641. https://doi.org/10.1111/ijcs.12049

Kortesniemi, M., Rosenvald, S., Laaksonen, O., Vanag, A., Ollikka, T., Vene, K., &Yang, B. (2018). Sensory and chemical profiles of Finnish honeys of different botanical origins and consumer preferences. *Food Chemistry*, (246), 351-359. https://doi.org/10.1016/j.foodchem.2017.10.069

Kowalczuk, I., Jezewska-Zychowicz, M., & Trafialek, J. (2017). Conditions of honey consumption in selected regions of Poland. *Acta Scientiarum Polonorum-Technologia Alimentaria*, *16*(1), 101-112. https://doi.org/10.17306/j.afs.2017.0446

Oliveira, E. F. T. de, & Grácio, M. C. C. (2013). Cocitation Analysis: A Bibliometric Approach for Domain Analysis. *IRIS Recife, 2*(1), 12-23. Retrieved from http://hdl.handle.net/11449/115461

Pocol, C. B. (2011). Modelling the honey consumption behaviour in Romania by using socio-demographic determinants. *African Journal of Agricultural Research*, *6*(17), 4069-4080.

Pocol, C. B., & Bolboacă, S. D. (2013). Perceptions and trends related to the consumption of honey: A case study of North-West Romania. *International Journal of Consumer Studies*, *37*(6), 642-649. https://doi.org/10.1111/ijcs.12046.

Pocol, C. B., & Teselios, C. M. (2012). Socio-economic determinants of honey consumption in Romania. *Journal of Food Agriculture & Environment*, *10*(2), 18-21.

Roman, A., Popiela-Pleban, E., & Kozak, M. (2013). Factors influencing consumer behavior relating to the purchasing of honey Part 1. The buying process and the level of consumption. *Journal of Apicultural Science*, *57*(2), 159-172. https://doi.org/10.2478/jas-2013-0026

Santos, T. M., Oliveira, B. R. R., Viana, B. F.& Araújo, C. G. S. (2012).Reflexões sobre a utilização de indicadores cienciométricos. *Motricidade*, *8*(S2), 15-22.

Schifani, G., Romeo, P., Guccione, G. D., Schimmenti, E., Columba, P.,& Migliore, G. (2016). Conventions of quality in consumer preference toward local honey in Southern Italy. *Quality-Access to Success*, *17*(153), 92-97.

Sheehy, T., Kolandooz, F., Roache, C., & Sharma, S. (2014). Changing dietary patterns in the Canadian Arctic: Frequency of consumption of foods and beverages by Inuit in three Nunavut communities. *Food and Nutrition Bulletin*, *35*(2), 244-252. https://doi.org/10.1177/156482651403500211

Shehata, S., & Mussen, E. (1985). Determination of consumer preferences and attitudes toward honey in the united-states market. *American Bee Journal*, *125*(7), 500-505.

Shehata, S. A. (1984). Who likes honey? - A determination of consumer awareness and preferences for honey in the Fresno markets. *American Bee Journal*, *124*(1), 26-29.

Skubic, M. K., Erjavec, K., & Klopcic, M. (2018). Consumer preferences regarding national and EU quality labels for cheese, ham and honey: The case of Slovenia. *British Food Journal*, *120*(3), 650-664. https://doi.org/10.1108/bfj-04-2017-0236

Tahmaz, L., Erdemir, F., Kibar, Y., Cosar, A., &Yalcyn, O. (2006).Fournier's gangrene: Report of thirty-three cases and a review of the literature. *International Journal of Urology*, *13*(7), 960-967.

Tapia-Campos, E., Castaneda-Saucedo, M. C., Ramirez-Anaya, J. D., Macias-Macias, J. O., Barajas-Perez, J. S., Tapia-Gonzalez, J. M., & Alaniz-Gutierrez, L. (2017). Physical-chemical characterization, phenolic content and consumer preferences of *Apismellifera* honey in southern Jalisco, Mexico. *Interciencia*, *42*(9), 603-609.

Vandeputte J., &van Waeyenberge P. H. (2003). Clinical evaluation of L-Mesitran(R), a honey based wound ointment. *European Wound Management Association Journal, 3*, 8-11.

Van Eck, N. J., & Waltman, L. (2009). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*, 523-538.

Van Eck, N. J., & Waltman, L. (2014). Visualizing bibliometric networks. In Y. Ding, R. Rousseau, & D. Wolfram (Eds.), *Measuring scholarly impact: Methods and practice* (285-320). New York, USA: Springer.

Viuda-Martos, M., Ruiz-Navajas, Y., Fernández-López, J., & Pérez-Álvarez, J. A. (2008). Functional properties of honey, propolis, and royal jelly. *Journal of Food Science*, *73*(9), 117-124.

Wu, S., Fooks, J. R., Messer, K. D., & Delaney, D. (2015). Consumer demand for local honey. *Applied Economics*, *47*(41), 4377-4394. https://doi.org/10.1080/00036846.2015.1030564

Zavodna, L. S., & Pospisil, J. Z. (2016). Honey bee: a consumer's point of view. *Environmental & Socio-Economic Studies*, *4*(3), 26-32. https://doi.org/10.1515/environ-2016-0015