Journal of Animal & Plant Sciences, 35(5): 2025, Page: 1203-1211
ISSN (print): 1018-7081; ISSN (online): 2309-8694
https://doi.org/10.36899/JAPS.2025.5.0102

Review Article

BIBLIOMETRIC ANALYSIS OF ARTICLES IN THE CONTEXT OF PROPOLIS AND CHILDREN

S. İkiz[1] and M. Keskin[1*]

[1]Vocational School of Health Services, Bilecik Şeyh Edebali University, Bilecik, Türkiye
*Corresponding author's email: merveozdemirkeskin@gmail.com

ABSTRACT

Propolis is an important natural product and it positively affects health conditions with its bioactive compounds. Using propolis is getting popular in adults but, parents who want to improve their child's health should be used it carefully and consciously due to its side effects. In this respect, it is very important to examine the studies in the context of propolis and children to reveal the trends of the studies on the subject to understand the current situation and guide future studies. In this study, research and review articles in the context of propolis and children were examined. The research data were obtained from the Web of Science (WOS) database and the keywords "propolis*" and "child*" were entered in the relevant search section. The star symbol was used after the main word to include different word variations used in the articles' title, abstract, and author keywords. Within the scope of the research, a total of 140 articles on the concepts of propolis and child were identified. The articles were analyzed using R- programmer, Bibliometrix R-package. During the analysis, the articles were analyzed according to the year of publication, journals, keywords, countries, and frequently used concepts. The data showed that studies on propolis and child have increased since 1981. It was determined that the most publications on the subject were made in Italy (n= 80), Iran (n= 78), and China (n= 67) and that these countries carried out the most articles between 2024 and 2025. It was observed that the journals with the highest number of publications on the subject were Evidence-Based Complementary and Alternative Medicine (n= 6), Complementary Therapies Medicine (n= 5), and International Journal of Early Childhood Special Education (n= 4). It was determined that the most popular keywords used in the articles were propolis, children, honey, caffeic acid phenethyl ester, and oxidative stress. In line with the results obtained from the research, it is concluded that more studies should be carried out with different variables about propolis and children because the studies on the subject are quite limited.

Keywords: propolis, child, health, bibliometrics, Biblioshiny.

Published first online July 26, 2025 Published final September 30, 2025

INTRODUCTION

Propolis is a resinous natural product collected by honey bees (*Apis mellifera* L.) from different parts of plants such as buds and leafs, with low water solubility, pungent odor, and sticky properties (Keskin, 2020). Propolis shows high antioxidant and antimicrobial activity, anti-inflammatory, anticancer, antituberculosis, analgesic, tissue regenerating, antihepatotoxic, antiulcer effects and high enzyme inhibitory potential with the its bioactive components (Keskin, 2020; Zullkiflee *et al*., 2022; İkiz and Keskin, 2024). For this reason, propolis have been used as a natural medicine since ancient times to increase the body's defense mechanism against infections and to treat wounds (Ahn *et al*., 2007; Li *et al*., 2008; Aliyazıcıoglu *et al*., 2013). The quality criteria of raw propolis could be summarized as dry matter content (94%), water content (6%), balsam content (45%), and total phenolics (10%) (Keskin and Kolaylı, 2018).

In recent years, the increase in microorganisms resistant to antimicrobial agents has caused infections related to them to be an important health problem (Serwecińska, 2020). Infections can cause fatal consequences in groups such as premature and newborns, the elderly, those receiving immunosuppression therapy, those with malignancy and metabolic disorders, trauma and burn patients, whose immune system is inadequate or suppressed, as well as healthy people. The immune system has functions such as preventing infections, eliminating established infections, and initiating tissue repair (Tamer and Nalbant, 2021). For this reason, the use of natural products such as propolis could be stimulate the immune system and make the antimicrobial, antioxidant, etc. effects stronger. In literature, it was reported that propolis support treatments such as chronic

obstructive pulmonary (Guo *et al*., 2006), neurological disorders (Sawicka *et al*., 2012), diabetes mellitus (Kurek-Górecka *et al*., 2014), rheumatoid arthritis (Nattagh-Eshtivani *et al*., 2021), metabolic disorders (Balica *et al*., 2021), gastrointestinal disorder (Miryan *et al*., 2022), and cancer (Elumalai *et al*., 2022).

For a healthy life, individuals should be carry out their growth and development potential by protecting themselves from diseases. Propolis has been used as a food supplement in recent years with its bioactive compounds to protect and support their health (Santos *et al*., 2018). In a study conducted by Cardinale *et al*. (2024) the effect of propolis added food supplements on acute tonsillopharyngitis of children was determined. It was reported that propolis had potential for the treatment of the acute tonsillopharyngitis. In another study conducted by Kara *et al.* (2025), the effect of propolis on hand, foot, and mouth disease (HFMD) was determined. It was reported that propolis reduced the effect of HFMD. However, it is necessary to be careful and conscious about the use of propolis by children due to its side effects such as allergy and early puberty (Giusti *et al*., 2004). For this reason, amount of use, and procurement of propolis products from reliable and certified producers gain importance using it by children. In addition, poor-quality products may cause unknown side effects. There are various products such as mouthwash, cream, and toothpaste containing propolis in the market, but it was recommended that allergy tests should be performed before the first use of it (Giusti *et al*., 2004).

When the literature was examined, it was seen that although there were many studies on propolis and its health effects on adult health (Balica *et al*. 2021; Miryan *et al*. 2022; Zullkiflee *et al*. 2022), there was less study about propolis effect on children health. For this purpose, the study aimed to the bibliometric analysis of the studies on propolis in the context of child to provide a comprehensive overview of the propolis and children related studies.

MATERIALS AND METHODS

In this study, the bibliometric analysis method was used to provide comprehensive information about the studies on propolis in the context of children. With the bibliometric analysis method, the characteristics of the publications in the subject area could be quantified and the change and development trends of the studies in the relevant field can be determined (Kasemodel *et al*., 2016). The Web of Science (WOS) is a bibliographic database that shows the impact of scientific journals in various disciplines, the number of citations received by published articles, and also lists the authors' articles and the articles' references. It is widely used in bibliometric analyses (Mançano *et al*., 2025). Thus, the data to be analyzed within the scope of the research were obtained from the WOS database. In the data collection process of the research; all articles published in all indexes in the WOS such as Arts and Humanities Citation Index, Science Citation Index, Social Sciences Citation Index in the type of "article (are detailed studies reporting new studies) and review article (structured to provide a summary of existing literature, analysis and comparison)" were included. Studies published in other types were determined as the exclusion criteria of the research. Propolis and child were determined as the keywords. A search was made by typing the keywords in the WOS database "propolis*" and "child*" were searched in the title, abstract, and author keywords on the WOS and the star symbol was used after the main words to include different word variations used in the articles. There was no year limit or subject limit in the research and 140 articles were identified in total. The articles obtained were downloaded as Bibtex files to be statistically analyzed in line with the purpose of the research. The data in the Bibtex file were transferred to the RStudio (2024.04.2+764) program. The analysis of the relevant data was carried out using the Bibliometrix program developed by Aria and Cuccurullo (2017), which was among the tools of the RStudio Programme. In the Bibliometrix programme, analyses were completed through Biblioshiny. The systematic search enabled an analysis of publication patterns and research themes that received significant attention. The visuals and graphs were obtained as a result of the analyses were interpreted.

RESULTS

In this study, it was aimed to an overall screening of propolis in the context of children and the articles (n=140) were identified by searching the WOS database with the keywords “propolis*” and “child*”. The data from 140 articles were analyzed with the RStudio program.

When the data set obtained within the scope of the research was analyzed, it was seen that the articles were published between 1981 and 2025 with an annual increase of 2.53%. It was seen that the articles in the relevant data set were carried out by 808 researchers in total, only 3 of the articles were single-authored, and 15% of the articles were carried out in international cooperation. In addition, it was determined that the analyzed articles were written by making use of 5645 sources in total. The line graph showing the distribution of the articles in the data set analyzed within the scope of the research according to years was given in Figure 1.

When Figure 2 was examined, it was seen that the number of articles on the subject had shown a significant increase over the years. The studies on the subject, which started to be carried out in 1981, reached the highest number in 2024. However, since this research was conducted in the first months of 2025 and the year

has not yet been completed, the number of articles in 2025 could not be clearly seen in the graph.

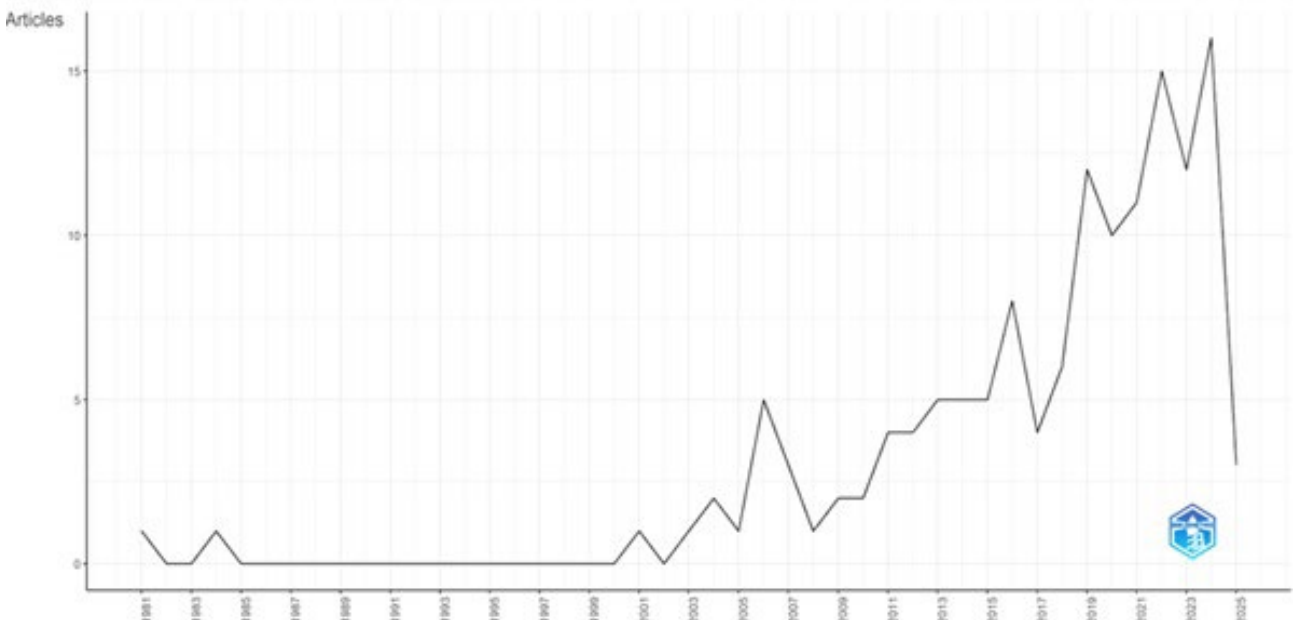

Figure 1. Distribution of the number of articles by years

The distribution of the countries where the articles in the data set analyzed within the scope of the research were made was presented in Figure 2.

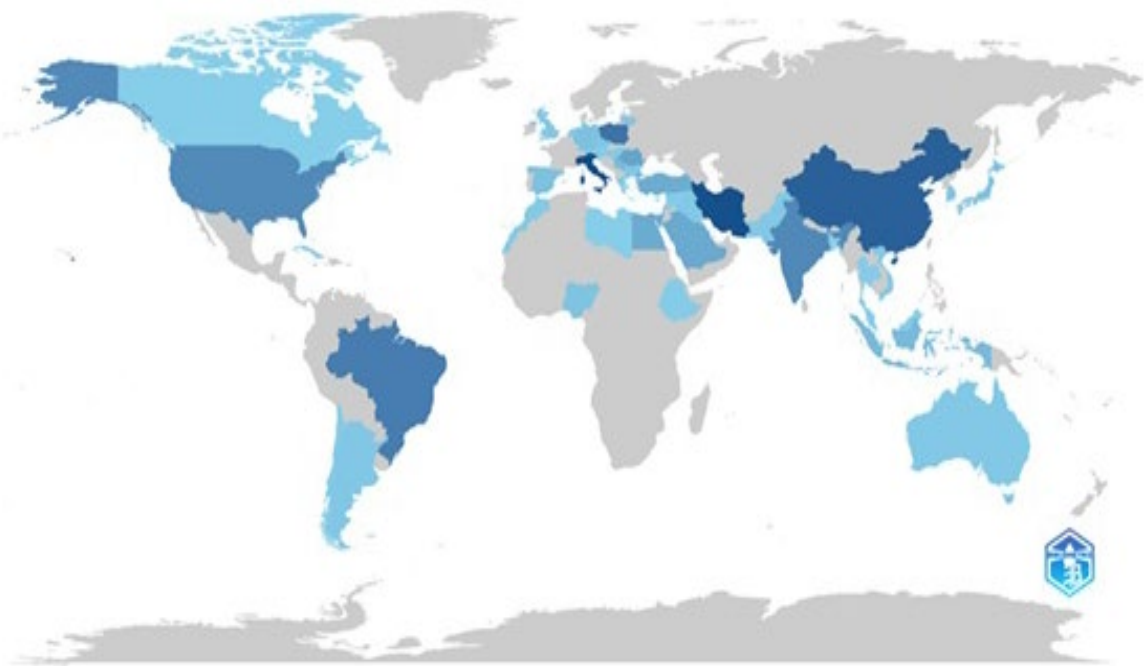

Figure 2. Distribution of articles according to countries

In Figure 2, the dark blue color shows the high number of articles on the subject. As the shade of blue color gets lighter, the number of studies conducted decreases. The areas in grey color show the countries where there was no research on the subject. When the number of articles according to countries is analyzed, it was determined that Italy (n= 80), Iran (n= 78), China (n= 67), Poland (n= 55), Brazil (n= 49), United States of America (n= 41) were the countries with the highest number of articles in the data set. Although it was not in the first place in the relevant data set, it was determined that 20 articles were also conducted in Türkiye.

The line graph showing the number of publications by year in the countries where the articles in

the data set analyzed within the scope of the research were made was given in Figure 3.

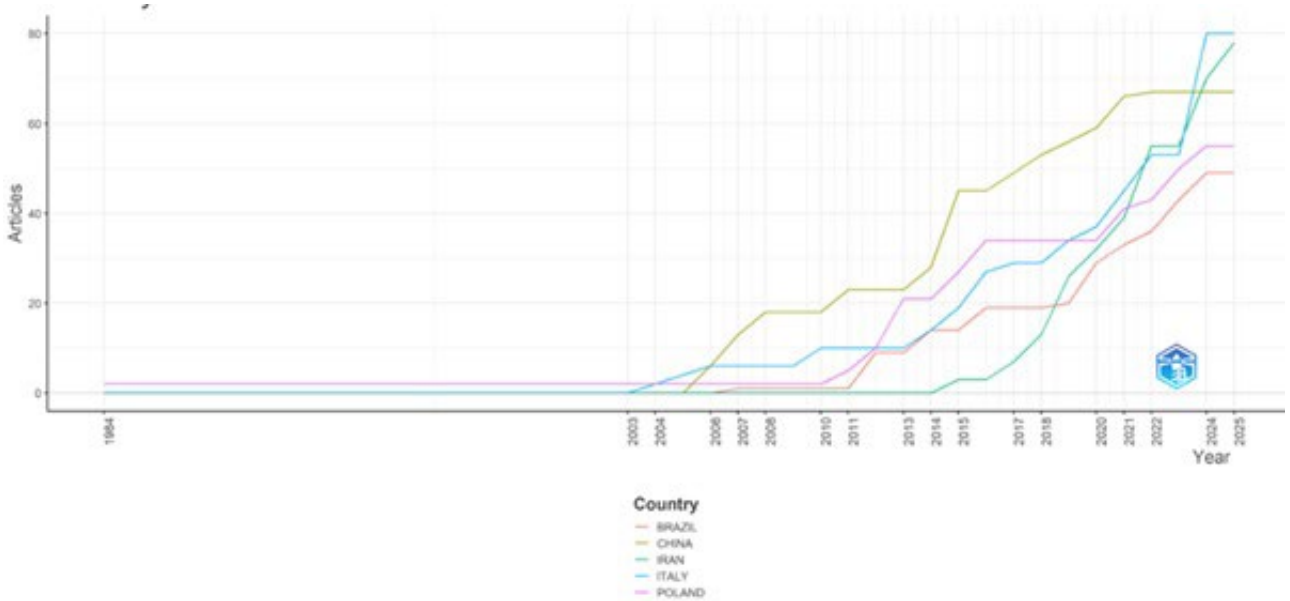

Figure 3. Distribution of the number of publications of countries by years

When Figure 3 was examined, it was seen that the countries that published articles on the relevant subject generally published the most articles between 2024 and 2025. The graph showing the distribution of the journals in which the articles in the data set analyzed within the scope of the research were published was given in Figure 4.

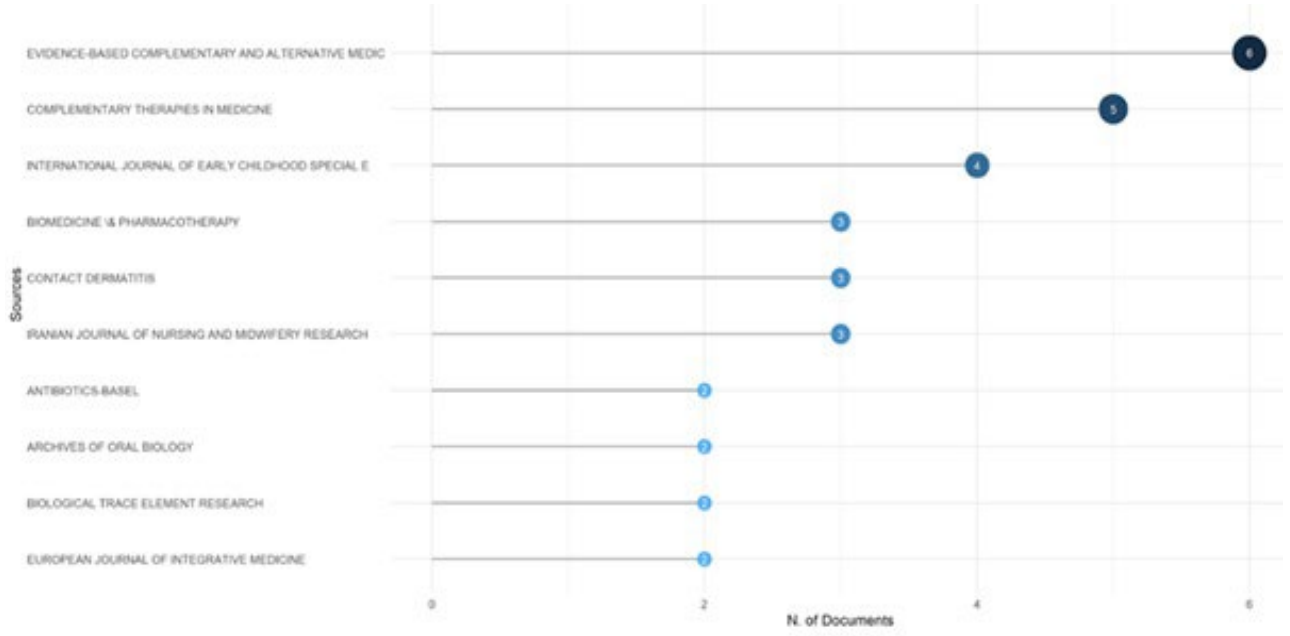

Figure 4. Distribution of the journals in which the articles were published

It was seen that the researches on the related subject were mostly published in Evidence-Based Complementary and Alternative Medicine (n= 6), Complementary Therapies Medicine (n= 5), International Journal of Early Childhood Special Education (n= 4). These journals were followed by the journals indicated in the graph in Figure 4.

The graph showing the most cited journals in the data set analyzed within the scope of the research was presented in Figure 5.

When Figure 5 was examined, it was seen that the journals with the highest number of citations in the data set examined were Contact Dermatitis with 138 citations, Evidence-Based Complementary and Alternative Medicine with 101 citations, and Journal Ethnopharmacology with 98 citations. It was seen that the other journals in the graph in Figure 5 follow these journals with the number of citations they receive on the subject.

The visual showing the cloud of keywords used in the data set analyzed within the scope of the research was presented in Figure 6.

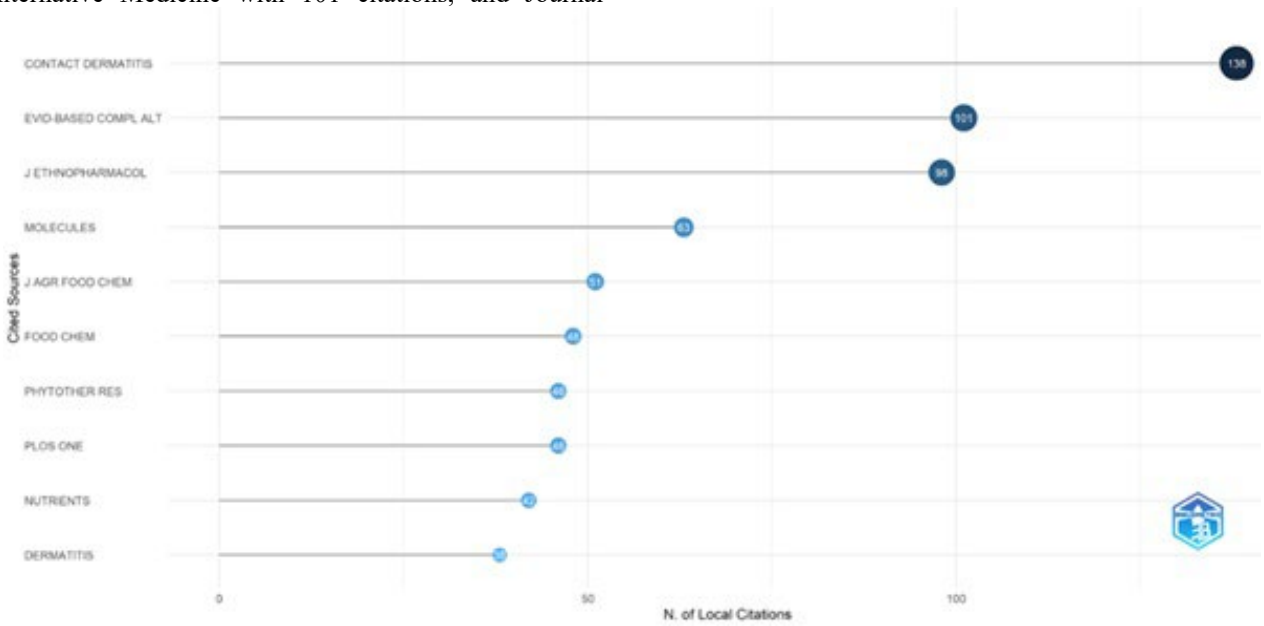

Figure 5. Distribution of journals cited on the subject

Figure 6. Distribution of keywords used in the articles (word cloud)

Figure 6 shows the word cloud related to the keywords used in the articles analyzed. The larger size of the words in the word cloud indicates that those words were frequently used. As the size of the words decreases, it shows that the frequency of the word used as a keyword is low. In this direction, when Figure 6 was examined, it was seen that the words propolis, children, honey, caffeic acid phenethyl ester, and oxidative stress were mostly used as keywords in the articles on the subject.

The thematic graph showing the co-use of the keywords used by the authors in the articles published on the subject in the research was given in Figure 7.

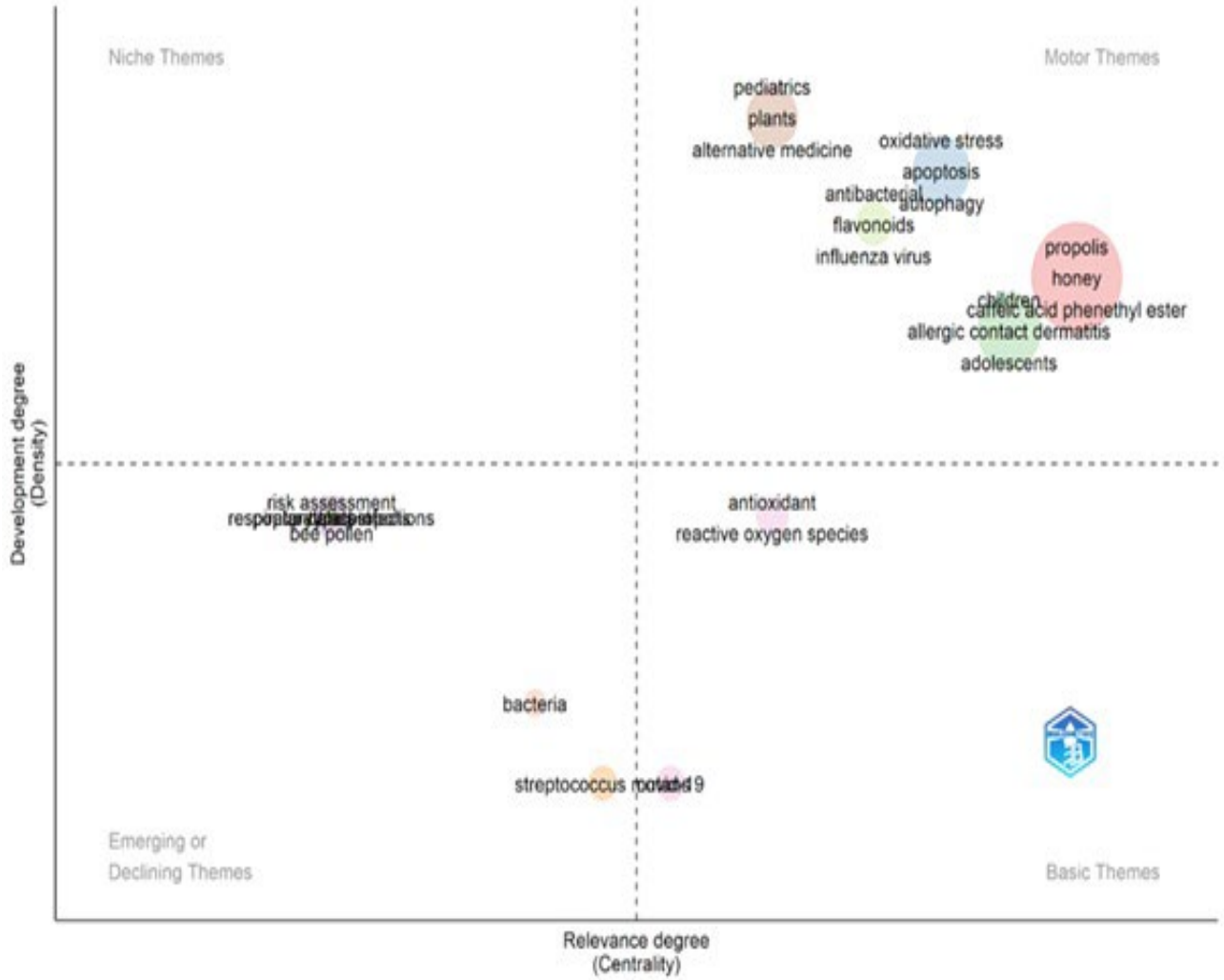

Figure 7. Thematic distribution of the keywords used by the authors in the articles

When the thematic graph in Figure 7 was examined, it was seen that there were four themes in the graph: Niche Themes, Motor Themes, Emerging or Declining Themes, and Basic Themes. In the related graph, there was a thematic distribution showing the co-use of keywords used by the authors in the articles. According to Figure 7, it was seen that honey, propolis, and caffeic acid phenethyl ester were popular keywords used together. In addition, it was understood that the words children, allergic contact dermatitis, and adolescents were also popular keywords used together. It was seen that pediatrics, plants, and alternative medicine were also popular keywords that were currently used. While the words antioxidant and reactive oxygen species were concepts that were used together, it was seen that words such as risk assessment and bee pollen were not concepts that are currently used together.

The graph showing the trend topics in the articles and their distribution according to years was presented in Figure 8.

In Figure 8, the years in which the trend topics in the articles were used most frequently were indicated by the size of the circles. In this context, when the relevant Figure was examined, it was seen that the

concepts of propolis and children, which were also the keywords of this research, were most frequently used in 2019 and 2020. As we approach the present day, it was understood that the words products and sensitization were used more frequently.

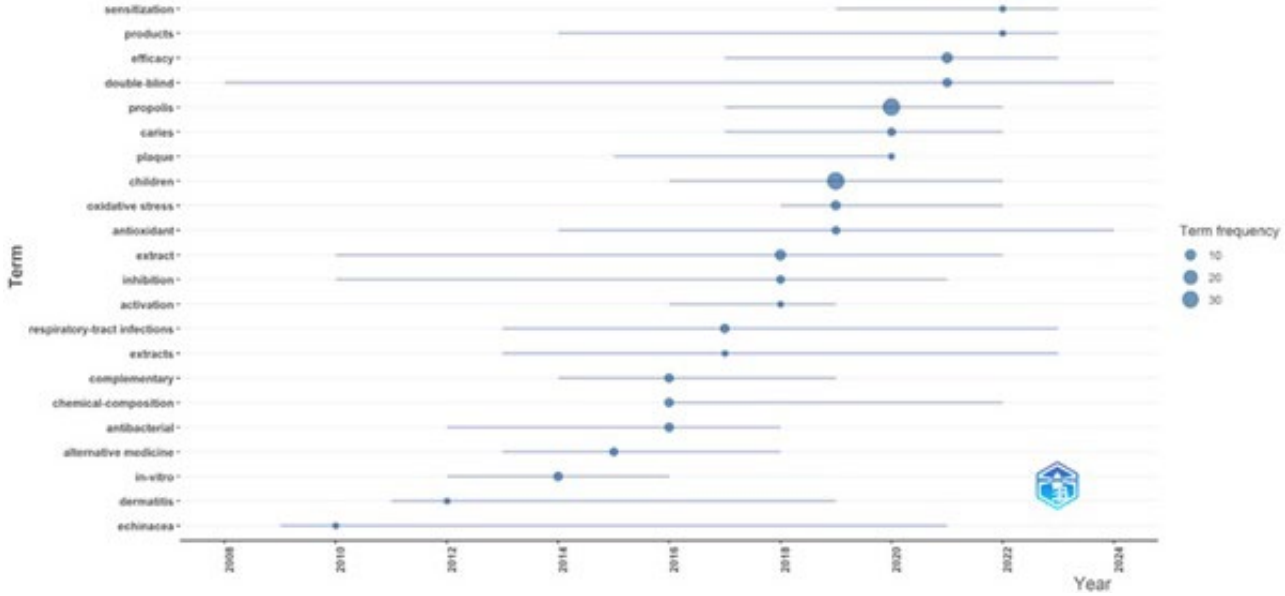

Figure 8. Distribution of the concepts used in articles according to years

DISCUSSION

With the Covid-19 pandemic, interest in natural food supplements to strengthen the immune system has increased. In addition to the use of plant-based food supplements, bee products have also become among the products used to strengthen the immune system (İkiz and Keskin, 2024). Propolis is a natural product with strong antioxidant (Keskin, 2020), antimicrobial (Özkök *et al.,* 2023), and anti-inflammatory (Nattagh-Eshtivani *et al*., 2021) properties, which have become increasingly known among bee products in recent years. Propolis, which was widely used by adults, was also could be used by children.

Considering the high metabolic rate of children, their high weight-to-surface area ratio compared to adults, their underdeveloped organ systems, and the rapid development and growth of tissues such as bone and brain (Forbes, 1962), it is necessary to scientifically determine the effect of natural food supplements such as propolis on children before the use of children. For this reason, in this study, the status of the existing research in the WOS indexed journals, which addressed the propolis issue in the context of children, was determined. Bibliometric R-package was used for in-depth statistical analysis of existing research (Aria and Cuccurullo, 2017).

Although propolis production was widespread in many countries (Popova *et al*., 2007; Santos *et al*., 2020), it was seen that Italy, Iran, and China were the countries that deal with propolis in the context of children and conduct research on this subject. It could be stated that this situation was related to the propolis production capacity, population density, and propolis market capacity of the countries.

It was seen that the first study dealing with propolis in the context of children was carried out by Shub *et al*. in 1981. In this study, the antimicrobial activity of propolis on *S. aureus* microorganism, which commonly causes infections in children, was determined. In a study conducted by Marti *et al*. (2017), a propolis-containing nasal spray was developed for use in acute rhinitis and general colds in children, and a pilot study was conducted. In the study conducted by Jolly *et al*. (2013), the effect of propolis on the dental health of children was determined. In a study conducted by Cardinale *et al*. (2024), the effect of propolis on children affected by acute tonsillopharyngitis was determined. Although most of the studies were carried out based on the antimicrobial activity of propolis, it was reported that propolis had an effect on adults with different diseases (Zullkiflee *et al*. 2022). It was reported by Abbosh and Behjet (2024) that propolis was caused facial contact dermatitis in adults. In another study, it was reported that propolis could be a good agent for the cleaning dental plaque in children (Bogovska-Gigova *et al*., 2025).

When the data examined, it was seen that children-focused propolis research tends to prioritize safety, immune support, and infection prevention, with careful dosing and limited intervention studies. In contrast, adult-focused research explores a broader range of therapeutic applications, including chronic disease management and cancer adjunct therapy, with more

clinical trials and mechanistic insights. Despite promising results in both groups, standardization, dosage regulation, and long-term safety assessments remain critical issues—particularly for pediatric populations. On the other hand, propolis may play a role on endocrine system and it can cause high estrogen levels. It was reported that this risk could be depended on the dosage. There is no standardized dosage for propolis using in children. However, some clinical studies could be used as guide. Thus, the studies on children and propolis had importance. But, when the literature was examined in detailed, it was clear that there is no unity on using propolis on children. For this reason, more studies should be performed to inform both parents and health professionals about using propolis for the children. If there is not enough literature data, the use of propolis on children will continue to be limited for the health practitioners due to problems in dosage.

Conclusion: Propolis has antimicrobial, anti-inflammatory, antioxidant activities with its biocomponents. This makes the use of propolis popular for the parents both themselves and their children health's. But when the literature examined, it was seen that the studies on child and propolis were quite limited. Since the bioactive compounds of propolis varies depending on the flora where it is collected, the effects of propolis on children need to be determined. Therefore, it was clear from the results that different countries need to conduct more research on this subject. The limited studies were a problem for the parents who prefer to use propolis on their child health. Due to the resistance of microorganisms on antibiotics for children, strengthen the immune system and contribute to the healthy development process are important by using propolis (a natural product). Propolis has allergic effects, as a result of this it should be used after the allergy tests. Using it without health professional's directions, this side effect could be cause dangerous for the children. On the other hand, another side effect that has not yet been confirmed in the literature is early puberty. This effect of propolis is an important topic and more studies, especially animal studies, should be carried out for a healthy development process.

Author Contributions: Conceptualization, formal analysis, writing- review and editing M.K. and S.İ. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Abbosh, J. and N. Behjet (2024). Propolis: emerging allergen in facial contact dermatitis. J. Allergy Clin. Immunol. 153(2): AB18. https://doi.org/10.1016/j.jaci.2023.11.079

Ahn, M.R., S. Kumazawa, Y. Usui, J. Nakamura, M. Matsuka, F. Zhu and T. Nakayama (2007). Antioxidant activity and constituents of propolis collected in various areas of China. Food Chem. 101: 1383-1392. https://doi.org/10.1016/j.foodchem.2006.03.045

Aliyazıcıoglu, R., H. Sahin, O. Erturk, E. Ulusoy and S. Kolayli (2013). Properties of phenolic composition and biological activity of propolis from Turkey. Int. J. Food Prop. 16: 277-287. https://doi.org/10.1080/10942912.2010.551312

Aria, M. and C. Cuccurullo (2017). Bibliometrix: an R-tool for comprehensive science mapping analysis. J. Informetrics. 11(4): 959-975. https://doi.org/10.1016/j.joi.2017.08.007

Balica, G., O. Vostinaru, C. Stefanescu, C. Mogosan, I. Iaru, A. Cristina and C.E. Pop (2021). Potential role of propolis in the prevention and treatment of metabolic diseases. Plants. 10(5): 883. https://doi.org/10.3390/plants10050883

Bogovska-Gigova, R. and K. Hristov (2025). Effect of probiotics and propolis on plaque index, plaque pH, and salivary pH values. J. IMAB. 31(2): 2. https://doi.org/10.5272/jimab.2025312.6159

Cardinale, F., D.F. Barattini, V. Martinucci, M.M. Bordea, L. Barattini and S. Rosu (2024). The effectiveness of a dietary supplement with honey, propolis, pelargonium sidoides extract, and zinc in children affected by acute tonsillopharyngitis: an open, randomized, and controlled trial. Pharmaceuticals. 17(6): 804. https://doi.org/10.3390/ph17060804

Elumalai, P., N. Muninathan, S.T. Megalatha, A. Suresh, K.S. Kumar, N. Jhansi, K. Kuppuswamy Kalaivani and G. Krishnamoorthy (2022). An insight into anticancer effect of propolis and its constituents: a review of molecular mechanisms. Evid. Based Complement. Altern. Med. 2022: 5901191. https://doi.org/10.1155/2022/5901191

Forbes, G.B. (1962). Methods for determining composition of the human body: with a note on the effect of diet on body composition. Pediatrics 29(3): 477-494. https://doi.org/10.1542/peds.29.3.477

Giusti, F., R. Miglietta, P. Pepe and S. Seidenari (2004). Sensitization to propolis in 1255 children undergoing patch testing. Contact Dermatitis 51(5-6): 255-258. https://doi.org/10.1111/j.0105-1873.2004.00455.x

Guo, R., M.H. Pittler and E. Ernst (2006). Herbal medicines for the treatment of COPD: a systematic review. Eur. Respir. J. 28: 330-338. https://doi.org/10.1183/09031936.06.00119905

İkiz, S. and M. Keskin (2024). Bee products as a food supplement in childhood nutrition and health.

Emirates J. Food Agri. 36: 1-7. https://doi.org/10.3897/ejfa.2024.135690

Jolly, M., N. Singh, M. Rathore, S. Tandon and S. Sharma (2013). Propolis and commonly used intracanal irrigants. Comparative evaluation of inflammatory potential. J. Clin. Pediatr. Dent. 37(4): 373-376. https://doi.org/10.17796/jcpd.37.4.l4t31237p5723784

Kara, M., M. Sütçü, Ö. Kılıç, D. Gül, T. Tural Kara, G. Akkoç, A. Baktır, Ş.E. Bozdemir, Ö.Ö. Gündeşlioğlu, F. Yıldız, C.Yanar Ayanoğlu, M. Bozacı Kılıçoğlu, R. Yıldız and A. Kara (2025). Propolis as a treatment option for Hand, Foot, and Mouth Disease (HFMD) in children: a prospective randomized clinical study. Children. 12(6): 695. https://doi.org/10.3390/children12060695

Kasemodel, M.G.C., F. Makishi, R.C. Souza and V.L. Silva (2016). Following the trail of crumbs: a bibliometric study on consumer behavior in the food science and technology field. Int. J. Food Studies 5(1): 73-83. https://doi.org/10.7455/ijfs/5.1.2016.a7

Keskin, M. (2020). Determination of chemical composition and α-amylase inhibitory effect of new propolis extracts. Combinatorial Chem. High Throughput Screening 23(9): 939-944. https://doi.org/10.2174/1386207323666200402080557

Keskin, M and S. Kolaylı (2018). Standardization of propolis, Is it possible? Uludag Bee J. 18(2): 101-110. https://doi.org/10.31467/uluaricilik.485080

Kurek-Górecka, A., A. Rzepecka-Stojko, M. Górecki, J. Stojko, M. Sosada and G. Swierczek-Zieba (2014). Structure and antioxidant activity of polyphenols derived from propolis. Molecules. 19: 78-101. https://doi.org/10.3390/molecules19010078

Li, F., S. Awale, Y. Tezuka and S. Kadota (2008). Cytotoxic constituents from Brazilian red propolis and their structure-activity relationship. Bioorg. Med. Chem. 16: 5434- 5440. https://doi.org/10.1016/j.bmc.2008.04.016

Mançano, R.R., L.R. Matheus, L.E.N. Castro, T.L.C.T. Barroso, R. G. da Rosa, V. C. Ferreira, T. Forster-Carneiro and L.M.S. Colpini (2025). Extraction techniques for propolis and its utilization in silver nanoparticle synthesis: a comprehensive review. Eur. Food Res. Technol. 1-37 https://doi.org/10.1007/s00217-025-04712-2

Marti, J., F. López, I. Gascón and J. Julve (2017). Propolis nasal spray effectively improves recovery from infectious acute rhinitis and common cold symptoms in children: a pilot study. J. Biol. Regul. Homeost. Agents 31(4): 943-950.

Miryan, M., D. Soleimani, P. Alavinejad, M. Abbaspour and A. Ostadrahimi (2022). Effects of propolis supplementation on irritable bowel syndrome with constipation (IBS-C) and mixed (IBS-M) stool pattern: a randomized, double-blind clinical trial. Food Sci. Nutr. Nutr. 10: 1899-1907. https://doi.org/10.1002/fsn3.2806

Nattagh-Eshtivani, E., N. Pahlavani, G. Ranjbar, J.G. Navashenaq, A. Salehi-Sahlabadi, T. Mahmudiono, M.N. Shalaby, M. Jokar, M. Nematy, H. Barghchi, S. Havakhah, M. Maddahi, M. Rashidmayvan and M. Khosravi (2021). Does propolis have any effect on rheumatoid arthritis? A review study. Food Sci. Nutr. 10: 1003-1020. https://doi.org/10.1002/fsn3.2684

Özkök, A., S. Karlıdağ, M. Keskin, S. Bayram, Ş. Keskin, E. Karabulut, F. Çiçek and İ. Yılmaz (2023). Palynological, chemical, antimicrobial, and enzyme inhibition properties of Cannabis sativa L. propolis. Eur. Food Res. Technol. 249(8): 2175-2187. https://doi.org/10.1007/s00217-023-04284-z

Popova, M.P., V.S. Bankova, S. Bogdanov, I. Tsvetkova, C. Naydenski, G.L. Marcazzan and A.G. Sabatini (2007). Chemical characteristics of poplar type propolis of different geographic origin. Apidologie 38(3): 306-306. https://doi.org/10.1051/apido:2007013

Santos, L.M., M.S. Fonseca, A.R. Sokolonski, K.R. Deegan, R.P. Araújo, M.A. Umsza-Guez, J.D. Barbosa, R.D. Portela and B.A. Machado (2020). Propolis: types, composition, biological activities, and veterinary product patent prospecting. J. Sci. Food Agric. 100(4): 1369-1382. https://doi.org/10.1002/jsfa.10024

Santos, M.S., M.L.M.F. Estevinho, C.A.L. de Carvalho, R.F. Schwan and R.C. de Castro Almeida (2018). Propolis as natural additive: a systematic review. Afri. J. Biotechnol. 17(41): 1282-1291. https://doi.org/10.5897/AJB2017.16105

Sawicka, D., H. Car, M.H. Borawska and J. Nikliński (2012). The anticancer activity of propolis. Folia Histochem. Cytobiol. 50: 25-37. https://doi.org/10.5603/FHC.2012.0004

Serwecińska, L. (2020). Antimicrobials and antibiotic-resistant bacteria: a risk to the environment and to public health. Water 12(12): 3313. https://doi.org/10.3390/w12123313

Shub, T.A., K.A. Kagramanova, S.D. Voropaeva and K. GIa (1981). Effect of propolis on Staphylococcus aureus strains resistant to antibiotics. Antibiotiki 26(4): 268-271.

Tamer, A. and A. Nalbant (2021). Nutrition and the immune system. Sakarya Medical J. 11(2): 458-466. https://doi.org/10.31832/smj.896467

Zullkiflee, N., H. Taha and A. Usman (2022). Propolis: its role and efficacy in human health and diseases. Molecules 27(18): 6120.https://doi.org/10.3390/molecules27186120.