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A BIBLIOMETRIC APPROACH: THE STUDY OF THE EFFECTS OF DIATOMITES ON PARASITES

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ABSTRACT

Today, with the increase in the world population, the importance of food safety in animal husbandry has increased even more. In farm animal husbandry, the increase in parasites and low-quality feed also negatively affect growth rates and productivity. It is known that parasites in goats cause disease, reduce herd productivity, and are sometimes fatal. However, due to the development of resistance in parasites to commonly used anthelmintics, it has become necessary to use alternative control methods to chemical drugs to control parasites. Diatomite, an organic feed additive, is recognized as an effective biological substance for controlling parasites in sheep, goats, and other farm animals, as well as a growth promoter and an alternative natural anthelmintic.

This study uses bibliometric methods to analyze the academic literature on the subject, identifying key trends, influential publications, and emerging research areas in the field. By analyzing a comprehensive set of academic articles from the Web of Science database, the study identifies the most cited articles, leading authors, and important institutions contributing to research on the subject. Using the Web of Science database, we identified all original articles, reviews, books, and book chapters on the subject between 1980 and 2024. After collecting bibliographic and citation data, keywords, citation networks, and co-citations related to the subject, the analysis was performed using VOSviewer software. A total of 53 articles were retrieved from the Web of Science database. These articles received a total of 892 citations (873 citations excluding self-citations). The highest number of citations was 93 in 2 publications in 2023. The Hirsch index is 20. In terms of the number of articles published by country, the United States (n=12) was the leading country among 28 countries. Turkey (n=5) ranked fourth. Among 33 research areas, the most active research area was “Marine Freshwater Biology” (n=21). Among 23 publishers, the most prolific publisher was Springer Nature (n=9). Among

43 journals, the journal with the most published articles was Cellular Origin Life in Extreme Habitats and Astrobiology (n=3).

In conclusion, this bibliometric analysis not only provides a historical overview of the field's development but also offers valuable insights into future research directions and policy implications for reaching the global subject area.

Keywords: Bibliometrics, Diatomite, Parasite, Physiology.

BİBLİYOMETRİK BİR YAKLAŞIM: DİATOMİTİN PARAZİTLER ÜZERİNDEKİ ETKİLERİNİN ARAŞTIRILMASI

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ÖZET

Günümüzde dünya nüfusunun artmasıyla birlikte hayvancılıkta gıda güvenliğinin önemi daha da artmıştır. Çiftlik hayvancılığında parazitlerin artması ve düşük kaliteli yemler de büyüme oranlarını ve verimliliği olumsuz etkilemektedir. Keçilerdeki parazitlerin hastalığa neden olduğu, sürü verimliliğini düşürdüğü ve bazen ölümcül olduğu bilinmektedir. Ancak, parazitlerin yaygın olarak kullanılan antelmintiklere karşı direnç geliştirmesi nedeniyle, parazitleri kontrol etmek için kimyasal ilaçlara alternatif kontrol yöntemlerinin kullanılması gerekli hale gelmiştir. Organik bir yem katkı maddesi olan diAatomit, koyun, keçi ve diğer çiftlik hayvanlarındaki parazitleri kontrol etmek için etkili bir biyolojik madde olarak kabul edilmektedir. Ayrıca, büyüme uyarıcısı ve alternatif bir doğal antelmintik olarak da kullanılmaktadır.

Bu çalışma, bibliyometrik yöntemler kullanarak konuyla ilgili akademik literatürü analiz etmekte, bu alandaki temel eğilimleri, etkili yayınları ve yeni ortaya çıkan araştırma alanlarını belirlemektedir. Web of Science veritabanındaki kapsamlı akademik makaleleri analiz ederek, çalışma en çok atıf alan makaleleri, önde gelen yazarları ve konuyla ilgili araştırmalara katkıda bulunan önemli kurumları belirlemektedir. Web of Science veritabanını kullanarak, 1980 ile 2024 yılları arasında konuyla ilgili tüm orijinal makaleleri, incelemeleri, kitapları ve kitap bölümlerini belirledik. Konuyla ilgili bibliyografik ve atıf verilerini, anahtar

kelimeleri, atıf ağlarını ve ortak atıfları topladıktan sonra, analiz VOSviewer yazılımı kullanılarak gerçekleştirildi. Web of Science veritabanından toplam 53 makale elde edildi. Bu makaleler toplam 892 atıf aldı (kendi kendine atıflar hariç 873 atıf). En yüksek atıf sayısı 2023 yılında 2 yayında 93 idi. Hirsch indeksi 20'dir. Ülkelere göre yayınlanan makale sayısı açısından, 28 ülke arasında Amerika Birleşik Devletleri (n=12) ilk sırada yer aldı. Türkiye (n=5) dördüncü sırada yer almıştır. 33 araştırma alanı arasında en aktif araştırma alanı "Deniz Tatlı Su Biyolojisi" (n=21) olmuştur. 23 yayıncı arasında en üretken yayıncı Springer Nature (n=9) olmuştur. 43 dergi arasında en çok makale yayınlayan dergi Cellular Origin Life in Extreme Habitats and Astrobiology (n=3) olmuştur.

Sonuç olarak, bu bibliyometrik analiz, alanın gelişimine ilişkin tarihsel bir genel bakış sunmakla kalmayıp, küresel konu alanına ulaşmak için gelecekteki araştırma yönelimleri ve politika çıkarımları hakkında da değerli bilgiler vermektedir.

Anahtar kelimeler: Bibliyometri, Diatomit, Parazit, Fizyoloji.

1. INTRODUCTION

Parasites are a significant problem in veterinary medicine, causing economic losses by hindering the host organism's nutrient absorption and disrupting physiological functions. The genetic resistance developing against synthetic anthelmintics and insecticides used in parasite control today gradually reduces the effectiveness of standard chemotherapeutic agents (Kaplan, 2004). The neurotoxic mechanism of action of synthetic molecules causes physiological adaptations in parasite populations over time. Therefore, it has become necessary to use alternative products that minimize the risk of resistance development, do not cause chemical accumulation in tissues, do not harm the host organism, and have a physical effect. One such alternative is diatomite, a natural biomaterial composed of the fossilized skeletal remains of diatoms, containing a high proportion of amorphous silica, with a unique structure and high porosity (Korunic, 1998).

The primary mechanism of action of diatomite on parasites relies on mechanical and desiccative (drying) processes that disrupt the integrity of the parasite's outer barrier, rather than systemic chemical toxicity. Diatomaceous earth particles, which have sharp and hard edges at the microscopic level, physically abrade the protective waxy lipid layer found in the exoskeleton or cuticle of parasites. Damage to this barrier rapidly reduces the parasite's water

retention capacity, leading to loss of body fluids and fatal dehydration (Subramanyam and Roesli, 2000). This disruption of the parasite's osmotic balance renders metabolic functions unsustainable and leads to the death of the organism. Diatomaceous earth support sustainable parasite control strategies by acting through physical desiccation rather than chemical means (Bennett et al., 2011).

Bibliometric analysis provides valuable insights into the evolution of research topics because it is a powerful tool for examining scientific literature through quantitative measurements (Xie et al., 2021). Bibliometric analysis provides a comprehensive understanding of how research topics have developed and highlights new areas of interest that could shape future research agendas by analyzing trends, themes, and influential works. The aim of this study is to conduct a bibliometric analysis of research topics, systematically examining the academic literature from a global perspective. Through this analysis, we aim to identify key research areas, highlight trends and shifts in focus, and identify those who have made significant contributions to the field.

In conclusion, this article provides information on studies conducted on the effects of diatomite on parasites, offering insights that can inform academic research and practical applications, and providing a clearer roadmap for future research on the subject.

2. MATERIALS AND METHODS

2.1. Research Design and Search Methodology

A bibliographic review, which is a retrospective study, was conducted using the bibliometric analysis method (Zhang et al., 2021). The Web of Science Core Collection (WoSCC) electronic database, which provides comprehensive and consistently exportable data and is widely used by scientists, was used to create the literature dataset. WoSCC was selected as the primary data source for the study due to its long history as a reliable source for biomedical research and its ability to provide a robust and reliable foundation for research. Its ability to provide comprehensive citation data was emphasized.

2.2. Data Collection.

The search terms were “Diatomite” and “Parasite” (A Bibliometric Approach to Studies on the Effects of Diatomite on Parasites). To eliminate bias and account for the frequent updates

of the WoSCC database, the literature search was conducted on a single day (November 27, 2025). The research was conducted between 1980 and 2024.

2.2.1 Standards for Study Selection

A comprehensive search using the terms “Diatomite” and “Parasite” (A Bibliometric Approach to Studies on the Effects of Diatomites on Parasites) in WoSCC identified a total of 65 studies. Subsequently, the search was refined by selecting Article or Book Chapters or Review Article or Book from the document type tab, yielding 53 records.

2.2.2. Data collection

Record titles, publication years, names of journals in which the research was published, author names, keywords, names of institutions affiliated with the authors, and countries of origin were accepted as basic data and extracted in plain text format. In the analysis, the total number of articles and total number of citations obtained from the WoSCC database were taken into account. WoS publications were saved as .txt files and then transferred to Microsoft Office Excel 2019 (Los Angeles, CA, USA) for further analysis.

2.3. Network analytics

In this study, VOSviewer (version 1.6.10, Leiden University, Netherlands) was used to import data and identify trends, collaborations, and key findings. The software was also used to collect and examine data related to authorship, connections, keywords, citations, and thematic words. The program assisted in the analysis of keywords, co-occurrences, citations, co-authorship, and co-citations.

3.RESULTS

During the study period from 1980 to 2024, publications were produced in three languages. The most common language used was English (Table 1).

Table 1. The languages in which articles were published.

Languages	RecordCount	% of 53
English	50	94340%
German	2	3774%
French	1	1887%

A total of 28 countries/regions have been published in the period from 1980 to 2024. The ten countries with the most publications are shown in Figure 1.

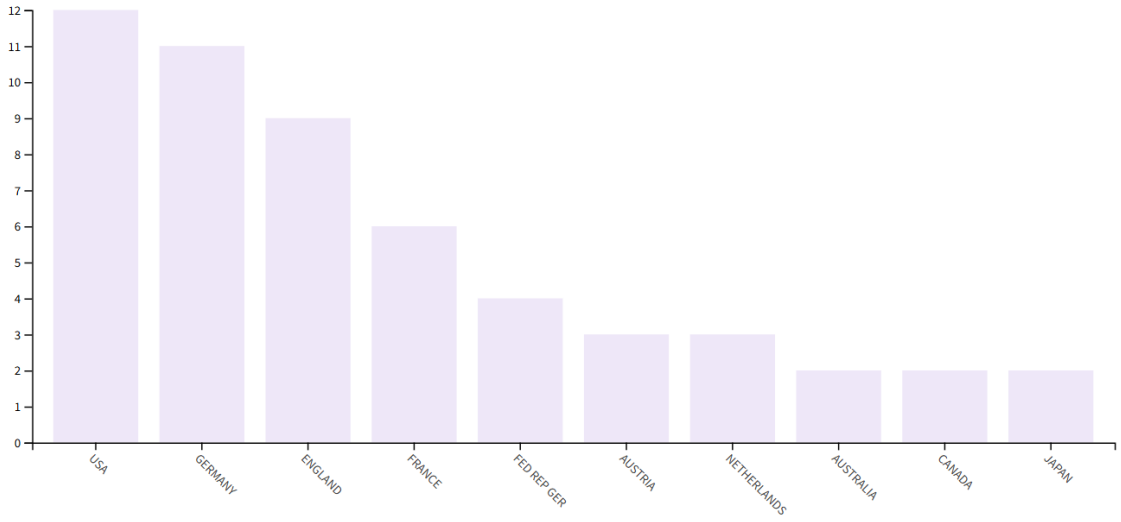

Figure 1. Most productive countries

Over the course of the study, which ranged from 1980 to 2024, 33 independent research areas were discovered. Table 2 shows the most intensively explored areas.

Table 2. Most active research areas

ResearchAreas	RecordCount	% of 53
Marine Freshwater Biology	21	39623%
Oceanography	10	18868%
Cell Biology	8	15094%
Environmental Sciences Ecology	8	15094%
Microbiology	6	11321%
Plant Sciences	6	11321%
Mycology	5	9434%
Life Sciences Biomedicine Other Topics	4	7547%
Chemistry	3	5660%
Legal Medicine	3	5660%

Showing first 10 out entries

In the years between 1980 and 2024, a total of 97 affiliations have been published. Figure 2 presents the affiliations of the ten journals with the highest number of publications.

Figure 2. Most prolific affiliations

Between 1980 and 2024, ten entries were detected, representing 23 different publishers. Table 3 lists the most prolific publishers.

Tablo 3. Most prolific publishers

Publishers	RecordCount	% of 53
Springer Nature	9	16981%
Wiley	8	15094%
Elsevier	5	9434%
Taylor & Francis	4	7547%
Gebruder Borntraeger	3	5660%
Scrivener Publishing Llc	3	5660%
Biologische Anstalt Helgoland	2	3774%
Mdpi	2	3774%
Observatoire Oceanologique Banyuls	2	3774%
Oxford Univ Press	2	3774%

Showing first 10 out entries

A total of 43 dergi var. Table 4 includes the 10 journals with the most publications.

Table 4. Journals publishing the most articles

Journals	RecordCount	% of 53
CELLULAR ORIGIN LIFE IN EXTREME HABITATS AND ASTROBIOLOGY	3	5660%
DIATOM WORLD	3	5660%
DIATOMS FUNDAMENTALS AND APPLICATIONS	3	5660%
LIMNOLOGY AND OCEANOGRAPHY	3	5660%
NOVA HEDWIGIA	3	5660%
DIATOM RESEARCH	2	3774%
HELGOLANDER MEERESUNTERSUCHUNGEN	2	3774%
JOURNAL OF PLANKTON RESEARCH	2	3774%
PROTOPLASMA	2	3774%
VIE ET MILIEU LIFE AND ENVIRONMENT	2	3774%

Showing 10 out of entries

The evaluated articles generated a total of 892 citations (of which 873 were self-citations), giving an average h-index of 20. Highest number of citations (93) and publications (2) was found in 2023 (Figure 3).

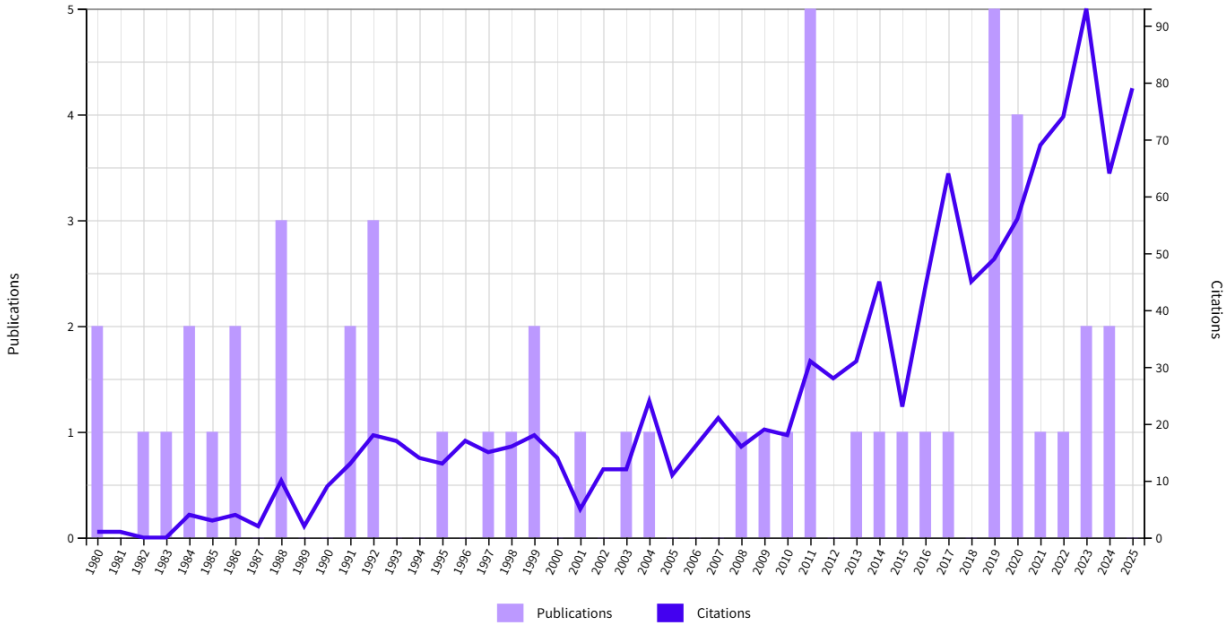

Figure 3. Publication and citation frequency

As shown in Figure 4, our bibliometric study has revealed the most frequently used keywords. It was found that the font size of the keywords was closely proportional to the frequency with which they were repeated in the articles.

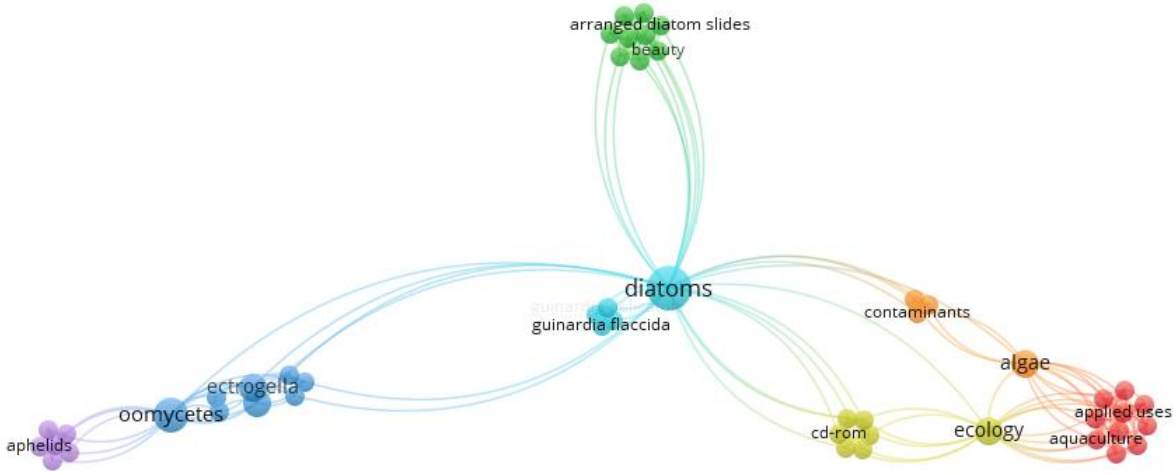

Figure 4. Keyword visualization map of articles

The size of the bubbles was proportional to the amount of research done in each country in the network representation of bibliographic coupling between nations. The width of the lines connecting the countries indicates the degree to which they are linked, while the colours of the lines indicate the cluster to which each country is assigned. For this study, we have included at least one document and one citation from each country (Figure 5).

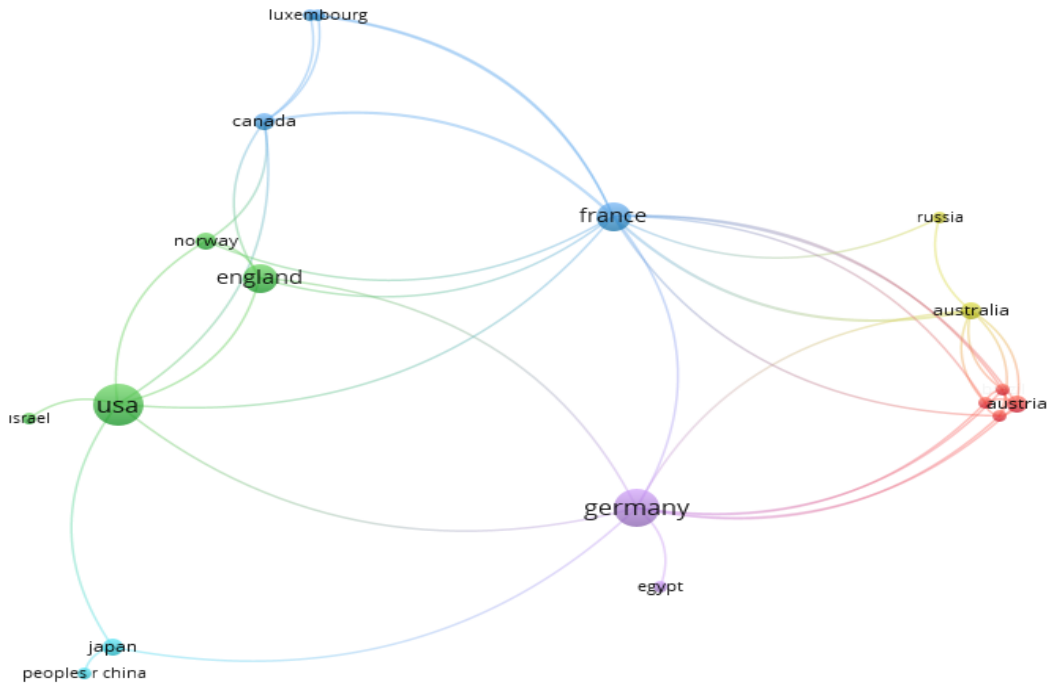

Figure 5. Network visualisation of bibliographic coupling between countries

The relationship between authors with at least five publications and at least five citations is shown in Figure 6.

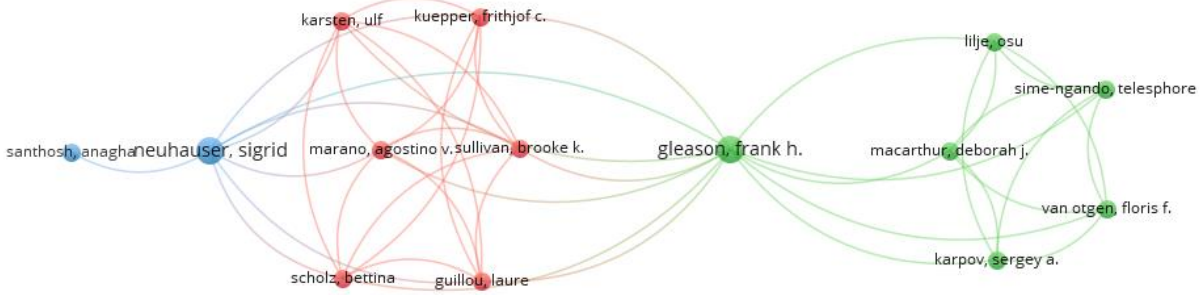

Figure 6. The relationships between authors

4. DISCUSSION

This study presents a bibliometric and content analysis of the literature examining the effects of diatomaceous earth on parasites, as found in the Web of Science (WoS) database between 1980 and 2024. The data obtained show that, despite the limited number of publications (n=53), the high citation rates and h-index (h=20) confirm the strategic importance and impact value of the subject.

Bibliometric Trends and Regional Focuses

According to the analysis results, the United States' (n=12) leadership in publications is consistent with the country's organic farming policies. However, Turkey's ranking fourth among 28 countries (n=5) is one of the most striking findings of the study. In countries like Turkey, where small ruminant livestock farming (sheep and goat breeding) is widespread, economic losses due to parasitic infections are directing researchers towards low-cost alternatives that are accessible using local resources (diatomite reserves).

Biological Mechanism of Action and Resistance Problem

The focus of studies in the literature appears to be the search for solutions to the problem of resistance developing against synthetic antihelminthics, as highlighted by Kaplan (2004). Wachter, Lechleitner et al. (1998), Martel-Kennes, Lévesque et al. (2016), Ikusika, Mpendulo et al. (2016), Mpendulo et al. (2019), and Nkwana, Hoon et al. (2019) report that diatomite causes a decrease in fecal egg counts when used as a feed additive in farm animals and humans.

While the chemicals used exert their effects through neurotoxic pathways, the effect of diatomite is entirely physical, as noted by Korunic (1998). The sharp silica particles of diatomite mechanically abrade the waxy layer on the parasite's cuticle, causing water loss and desiccation. The high number of citations in our bibliometric analysis can be attributed to the advantage that parasites cannot develop genetic resistance to this “physical attack” mechanism. This makes diatomite an indispensable candidate for sustainable parasite control programs.

Growth Promotion and Dual Benefits

Philip (2003) notes that diatomite is discussed not only as an antiparasitic agent but also as a "growth promoter." Diatomaceous earth can increase feed utilization by slowing down the transit time in the digestive system and can support the animal's overall metabolism with the trace minerals it contains. The fact that a significant portion of the publications are concentrated in the fields of "Veterinary Sciences" and "Agriculture" shows that diatomite is positioned not only as a therapeutic agent but also as a feed additive for preventive medicine and productivity enhancement.

Limitations and Standardization Issues

On the other hand, the limited number of publications (53) and the fact that the most active research area is "Marine Freshwater Biology" indicate that full standardization has not yet been achieved in diatomite studies. The literature discusses the variability in effectiveness levels depending on the source of the diatomite used, its silica content, and particle size. Since it is known that humid environments reduce the drying effect of diatomite, it has been observed that results obtained in field studies (in vivo) may differ from laboratory (in vitro) results.

In conclusion, the current literature supports diatomite as a powerful alternative to chemical pesticides. However, to fully realize this potential, the dose-response relationships for different parasite species need to be clarified, and standard protocols (dosage, application frequency) for field applications need to be established. Future studies should focus not only on parasite mortality rates but also on the effects on animal productivity parameters and meat/milk quality, which will contribute to the advancement of the field.

5. CONCLUSION

This bibliometric analysis provides valuable insights into the evolving field of the effects of diatomites on parasites research from 2015 to 2024. Influenced by factors such as climate change, socio-economic disparities and political instability, the significant increase in publications and citations reflects the growing global attention to the effects of diatomites on parasites issues. The study highlights key research areas such as environmental health, food system resilience and how the effects of diatomites on parasites intersects with sustainable

development, suggesting a shift towards more interdisciplinary approaches. Going forward, fostering global collaboration and focusing on emerging challenges will be essential to address the complex and interconnected nature of the effects of diatomites on parasites and ensure a sustainable and equitable food system for the future.

Limitations

A limitation of this study is its reliance on the Web of Science database, which may have excluded some relevant articles from other databases or grey literature, and thus may have omitted important perspectives on the effects of diatomites on parasites research. The exclusion of review articles, case reports and other document types may have resulted in the under-representation of certain research trends or reviews that could complement primary research findings. In addition, the study only includes publications in English and a few other languages, which may exclude important contributions from non-English speaking regions. The use of citation counts and h-indexes as key metrics may not fully capture the qualitative impact of research. These metrics tend to favour older, widely cited studies over newer, innovative work. Finally, the analysis period of 2015 to 2024 limits the study's ability to provide a comprehensive view of the long-term development of the field, as it may not fully account for historical shifts in the effects of diatomites on parasites research.

6. REFERENCES

Bennett, D. C., Yee, A., Rhee, Y. J., & Cheng, K. M. (2011). Effect of diatomaceous earth on parasite load, egg production, and egg quality of free-range organic laying hens. Poultry Science, 90(7), 1416-1426.

Ikusika, O. O., C. T. Mpendulo, T. J. Zindove and A. I. Okoh (2019). "Fossil shell flour in livestock production: A Review." Animals 9(3): 70.

Kaplan, R. M. (2004). Drug resistance in nematodes of veterinary importance: a status report. Trends in Parasitology, 20(10), 477-481.

Korunic, Z. (1998). Diatomaceous earths, a group of natural insecticides. Journal of Stored Products Research, 34(2-3), 87-97.

Martel-Kennes, Y., J. Lévesque and C. Decaux (2016). "Effect of crystalline silicon dioxide in piglet feed on growth performance with different levels of growth promoters." Journal of Animal Science 94: 488-488.

Mwale, M., & Masika, P.J. (2015). In vivo anthelmintic efficacy of diatomaceous earth against gastrointestinal nematodes in sheep.

Nkwana, A., J. Hoon and P. Fourie (2019). "The effect of different inclusion levels of diatomaceous earth in feedlot diets on the performance of lambs." Grootfontein Agric 19(1): 66-72.

Subramanyam, B., & Roesli, R. (2000). Inert dusts. In Alternatives to pesticides in stored-product IPM (pp. 321-380). Springer, Boston, MA.

Wachter, H., M. Lechleitner, E. Artner-Dworzak, A. Hausen, E. Jarosch, B. Widner, J. Patsch, K. Pfeiffer and D. Fuchs (1998). "Diatomaceous earth lowers blood cholesterol concentrations." European journal of medical research **3**(4): 211-215.

Xie, H., Wen, Y., Choi, Y., & Zhang, X. (2021). Global trends on subject research: A bibliometric analysis. Land, 10(2), 119.

Zhang, J. Z., Srivastava, P. R., Sharma, D., & Eachempati, P. (2021). Big data analytics and machine learning: A retrospective overview and bibliometric analysis. Expert Systems with Applications, 184, 115561.