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Mini Analysis of Time, Type, Language, Source Titles, Institutions, Countries and the Terms' Occurrences for Publications about Basil Oil using VOSviewer

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Abstract

Essential oils are oils obtained from plant parts such as seeds, leaves, bark, roots, flowers and fruits with aromatic variations due to their essential content. One of the plants that can be extracted to produce essential oil is basil. Basil oil has components such as linalool, 1,8-cineol and the eugenol that can be utilised for antioxidant, antimicrobial, antifungal, anti-inflammatory and immunomodulatory activities. The purpose of this study is to conduct a bibliometric analysis of basil oil using VOSviewer software. The data obtained came from the Scopus database with the keyword "basil oil" from 1964 to 2023. From the search results in the database obtained 316 documents about basil oil which were then carried out several analyses: 1) trend analysis of publication time, type, and language; 2) analysis of source titles, institutions, and countries that influence basil oil publications; and 3) analysis of the terms' occurrences. The bibliometric analysis of basil oil is expected to help in further research involving basil oil.

Keywords: *Bibliometric Analysis; Essential Oils; Basil Oil; VOSviewer*

1. Introduction

Essential oils are oils obtained from plant parts such as seeds, leaves, bark, roots, flowers and fruits with aromatic variations due to their essential content. This oil has high antibacterial and antioxidant activity so it is widely used in various industries ranging from the pharmaceutical industry to the food industry. Basil is a member of the Lamiaceae family, this family includes 7886 plant species of which more than 150 species are aromatic and medicinal plants. The plant is native to the Mediterranean, Africa, America and Asia, but is now widely grown in various countries around the world. Basil is often used in cooking due to its flavor and fiber content. In addition, basil has also been used by ancient people as a traditional medicine to treat various ailments such as microbial infections, wound dressings, fever, cough and constipation [1–3].

The percentage content of basil essential oil depends on the characteristics of each basil genotype and crop processing conditions, but generally, the content varies between 0.07 and 1.9% [4]. The main components in basil essential oil are linalool, 1,8-cineol, eugenol, methyl eugenol, methyl chavicol, methyl cinnamate, α-bergamotene, α-cadinol, camphene, camphor, β-elemene, βocimene, carvacroal and geranial [5]. The presence of these compounds makes basil essential oil have several pharmacological properties such as antioxidant,

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antimicrobial, antifungal, anti-inflammatory and immunomodulatory activities. The many compounds and benefits of basil essential oil encourage innovations that utilize the oil to manufacture several products. Therefore, there is a need for bibliometric analysis that examines various studies related to basil oil to describe an overview of research that can be developed using basil essential oil.

Bibliometric analysis is a quantitative review technique that uses data mining, statistics and maths to reveal emerging trends in a particular research area [6]. This analysis is used for large bibliometric data and covers literature reviews that are too extensive to review manually. In recent years, this analysis method is popularly used due to the advancement, availability and accessibility of bibliometric software such as Gephi, Leximancer, VOSviewer and scientific databases such as Scopus and Web of science. This bibliometric analysis was assisted by VOSviewer with the Scopus database. The scientific publications analyzed are scientific publications on basil oil from 1964 to 2023. In the span of 59 years, it is clear that there will be many developments in the science of basil essential oil. Therefore, this bibliometric analysis can investigate the progress and growth of knowledge and can track where the trend of basil oil investigation is going in the future.

2. Methodology

2.1. Data Sources

The data was retrieved from the online Scopus database on 12 February 2023 which indexes tens of thousands of journals in various scientific disciplines. Scopus is the world's largest collection of literature summaries, with citations providing abstracts of peer-reviewed scientific literature and research. Scopus can effectively help researchers track, analyze and visualize research.

2.2. Search Strategy

The Scopus database was used to identify research articles on the topic of basil essential oil. All documents with the keyword “basil oil” in “article title, abstract, keywords” were retrieved. The documents were published in Scopus from 1964 to 2023. A total of 316 documents containing the word “basil oil” have been recorded in that time span. Documents obtained from Scopus were then extracted in RIS format and analysed using the VOSviewer v.1.6.18 application. Visualisation of similarities (VOS) viewer was used to help facilitate the creation and visualisation of bibliometric maps that are easy to interpret [7].

2.3. Analyzing Data through Bibliometric Analysis Method

The bibliometric analysis involves several key steps such as performance analysis, map mapping and network analysis. Work mapping is a description method Work mapping is a description method for evaluating publications and citation-related metrics. Science mapping or bibliometric mapping is a way of analysing the influence and strength of relationships among different document attributes represented by the item co-occurrence weight and total link strength. The bibliometric mapping used in this study is co-occurrence analysis which is a bibliometric analysis method used to examine the co-occurrence of keywords in published studies. The results of this bibliometric mapping can be improved through network analysis. The visualization method used in this research is a type of network visualization. This is because there are keywords that are interconnected with each other either in terms of co-occurrence of words, co-authorship, or the same country of origin. To clarify the visualization, it is color-coded depending on the popularity and similarity of the research.

3. Result and Discussion

3.1. Trend Analysis of Publication Time, Type and Language

From a total of 316 documents on basil oil that have been obtained from Scopus sources in the period 1964-2023, descriptive analysis was carried out with the help of Microsoft Excel. Figure 1 shows the number of basil oil publications from 1964 to February 2023. However, the years 1965, 1966, 1968-1972, 1980-1985, 1987 and 1993 were inactive years, indicating no publications of documents on basil oil. The lowest number of publications was 1 document which occurred in 1964, 1967, 1973, 1981, 1986, 1988, 1995 and 1999. The data peaked in 2021 with 36 documents published. This may be due to large-scale social restrictions caused by the spread of the COVID-19 virus in various countries so that people write articles more often to fill their spare time.

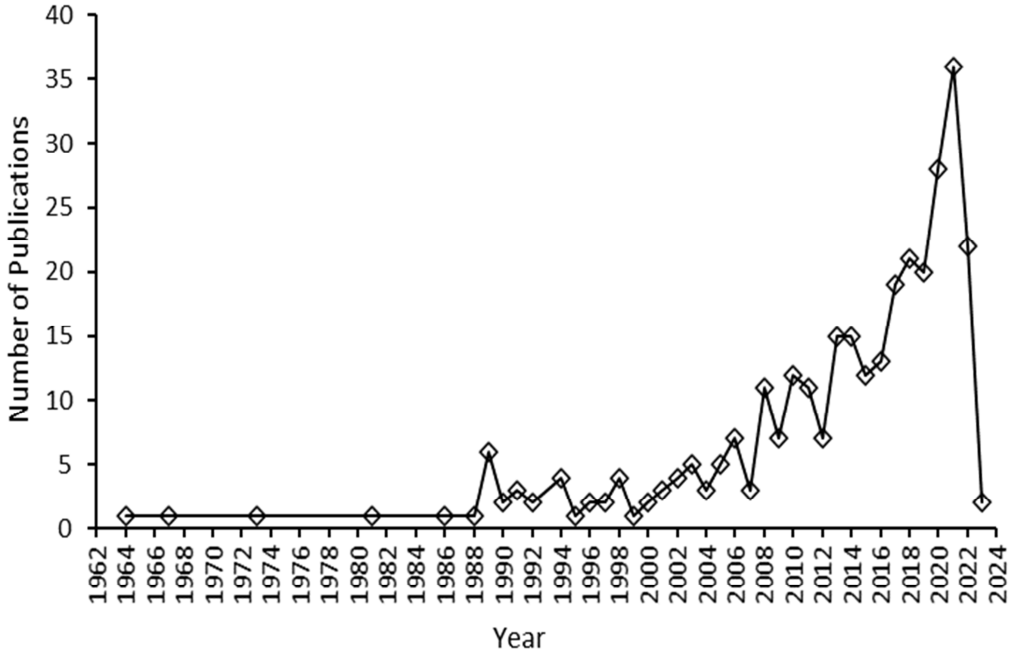

Figure 1: Total number of basil oil publications by year (1964-2023)

There are types of documents with the highest number being in the type of articles, namely 275 documents with a percentage of 87.03%. Followed by conference papers as many as 23 documents or 7.29%, reviews as many as 13 documents or 4.11%, book chapters of as many as 3 documents or 0.95% and each 1 document or 0.32% for the type of short survey and retracted. All documents published mostly use English, but there are also publications that use Portuguese, Turkish, German, Hungarian, Polish, Russian and Spanish.

3.2. Analysis of the Title of Sources, Institutions and Countries that Influence the Publication of Basil Oil

Table 1 shows the ranking of 10 out of 160 source titles that have been obtained through Scopus sources. The highest source title is Journal of Essential Oil Research with 10 documents. Then followed by Journal of Agricultural and Food Chemistry (9 documents), Acta Horticulturae (7 documents), Flavour and Fragrance Journal (6 documents), Industrial Crops and Products (6 documents), Journal of Essential Oil Bearing Plants (6 documents), Food and Chemical Toxicology (4 documents), International Journal of Aromatherapy (4 documents), Journal of Asia Pacific Entomology (4 documents) and the 10th position is occupied by Environmental Science and Pollution Research which publishes 3 documents.

Table 1
Top 10 source title according to the highest number of documents issued related to basil oil

Position	Source Title	Total Publication
1	Journal of Essential Oil Research	10
2	Journal of Agricultural and Food Chemistry	9
3	Acta Horticulturae	7
4	Flavour and Fragrance Journal	6
5	Industrial Crops and Products	6
6	Journal of Essential Oil Bearing Plants	6
7	Food and Chemical Toxicology	4
8	International Journal of Aromatherapy	4
9	Journal of Asia Pacific Entomology	4
10	Environmental Science and Pollution Research	3

Table 2 shows the top 20 ranked research institutions that published documents on basil oil. As can be seen in Table 2, the National Research Centre took first place in publishing 14 documents, followed by the USDA Agricultural Research Service and Central Institute of Medicinal and Aromatic Plants India with 7 documents and then Chiang Mai University, University of Ioannina, Cairo University, Mahidol University and Aristotle University of Thessaloniki which published 6 documents each.

Table 2
Top 20 institutions according to the highest number of documents issued related to basil oil

Position	Institution	Total Publication
1	National Research Centre	14
2	USDA Agricultural Research Service	7
3	Central Institute of Medicinal and Aromatic Plants India	7
4	Chiang Mai University	6
5	University of Ioannina	6
6	Cairo University	6
7	Mahidol University	6
8	Aristotle University of Thessaloniki	6
9	University of Hawai‘i at Mānoa	5
10	Agricultural Research Center	5
11	Indian Council of Agricultural Research	5
12	University of Patras	5
13	Mississippi State University	4
14	USDA ARS Natural Products Utilization Research Unit	4
15	Vellore Institute of Technology	4
16	Kyushu University	4
17	Technion - Israel Institute of Technology	4
18	Jamia Hamdard	4
19	Chulalongkorn University	4
20	Università degli Studi di Milano	4

To analyse the global distribution of basil oil research, it is necessary to have data on the publication of basil oil documents for each country. Table 3 shows the 20 highest-ranked countries that published documents on basil oil. The country that published the most documents in India with a total publication of 56 documents. This is followed by the United States (32 documents), Thailand (30 documents), Egypt (29 documents), Brazil (17 documents), Greece (13 documents), Iran and Italy (11 documents) and 10 documents for Indonesia and Poland.

Table 3
Top 10 countries according to the highest number of documents issued related to basil oil

Position	Country	Total Publication
1	India	56
2	United States	32
3	Thailand	30
4	Egypt	29
5	Brazil	17
6	Greece	13
7	Iran	11
8	Italy	11
9	Indonesia	10
10	Poland	10

3.3. Analysis of the Terms' Occurrences

The results of the co-occurrence analysis using VOSviewer can be seen in Figure 2. The size of the circles or nodes in the image is directly proportional to the number of occurrences of terms in the article. Thus, the larger the circle size indicates the more terms that appear in an article. From the results of data analysis, 265 items were obtained which were divided into 5 clusters with 15058 links and a total link length of 41437.

The largest circle in **Cluster #1** is an unclassified drug with a total link strength of 1816. An unclassified drug is a type of medicine that does not pass the testing stage so it can not be used in official medicine. In terms of item branching, unclassified drugs are closely related to essential oils. So it can be said that essential oils are unclassified drugs that are usually used in traditional medicine. One type of essential oil used comes from the *Ocimum basilicum* plant extract.

Cluster #2 According to Figure 2, this cluster is depicted in green colour. The largest circle is on the article keyword which has a total link strength of 2267. This shows that basil oil has been widely published in the form of scientific articles on various platforms. One of these platforms is Scopus which has 275 articles that have been published from 1964-2023. When viewed from its branching, the article is closely related to nonhuman keywords. According to research conducted by Al-Okbi et al. (2020) [8], basil oil and basil oil modified with nanoemulsion have been used to reduce the development of nanoalcoholic steatohepatitis in rats. In addition, basil oil can also be used as an ingredient in making insecticides to manage agricultural moth pests [9]. The article shows that basil oil can not only be applied or used for humans but can also be used in animals.

Cluster #3 According to Figure 2, this cluster is depicted in blue. The largest circle is on the essential oil keyword with a total link strength of 2769. If

connected to the topic of discussion in this study, it is found that basil oil is a type of essential oil with the main content of methyl chavicol (38.2%) and linalool (28.7%). Basil essential oil can be obtained by extracting *Ocimum basilicum* leaves using hydrodistillation [10]. In addition to the simple method of hydro-distillation, *Ocimum basilicum* can also be extracted using modern methods such as solvent-free microwave extraction and ultrasonic method.

Cluster #4 According to Figure 2, this cluster is depicted in yellow. The largest circular item is located on the keyword linalool with a total link strength of 1000. Linalool along with several other major components such as methyl eugenol, estragole and citronellal are active chemicals in basil oil [11]. According to research conducted by Senthoorraja et al. (2021) [12], linalool can cause a nervous response in adult female flies of *M. domestica.*

Cluster #5 According to Figure 2 this cluster is depicted with purple colour. The largest circular item is located in the keyword oils and volatile with a total link strength of 1399. Essential oil from the *Ocimum basilicum* plant can be used as an insecticide to eradicate moth animals [13]. When viewed from the branching, these oils are related to basil oil and clove oil, where if these two essential oils are combined it will create a bio-additives formulation that can be used for lathe machine fluids [14].

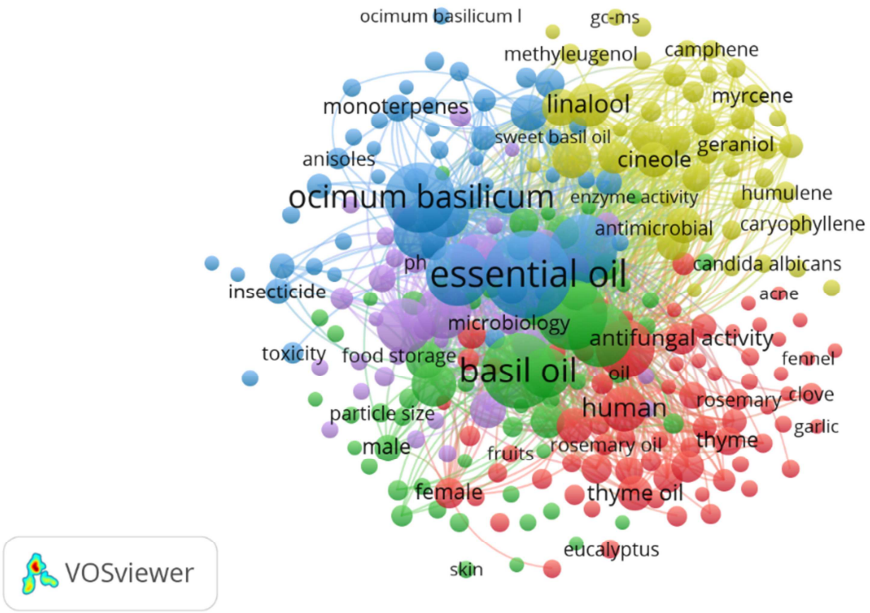

Figure 2: Terms co-occurrence network

4. Conclusion

Bibliometric analysis of basil oil in the time span from 1964 to 2023 (February) shows a fluctuating curve. The highest number of publications was in 2021 with 36 documents. Journal of Essential Oil Research is the title of the most sources with a total publication of 10 documents. The National Research Centre is the institution that publishes the most documents about basil oil with 14 publications. India is the most productive country in publishing basil oil documents with 56 publications, followed by the United State and Thailand. This article uses Visualisation of Similarities (VOSviewer) with co-occurrence type to find out the relationship between one keyword and another keyword in a network. The results of the analysis from 1964-2023 show that research on unclassified drugs, articles, essential oils, linalool, and oils and volatile are the most widely used topics in basil oil publications and are still interesting to be used as inspiration in making publications about basil oil.

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