

Research trends related to Beluntas (*Pluchea indica* L.) in Indonesia during and post covid-19 based on scopus database

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ABSTRACT

This study aims to analyze important trends and information (findings) regarding *Pluchea indica* research in Indonesia during and after Covid-19 based on the Scopus Database. This research uses a systematic literature review (SLR) by adapting Moher's version of the PRISMA model to find the right articles. An interesting finding from this SLR is that the publication trend of *Pluchea indica* tends to increase in 2022-2024 even though the data ignores other types of publications (such as reviews, conference articles, chapters, books, and editorials, and in 2024 it is still ongoing so it is very likely that the number of articles will increase in end of year. There are several universities that are prominent in *Pluchea indica* research. Many universities in Indonesia are starting to be interested in focusing their research on *Pluchea indica*, in total, not per university and red) in the Scimago Journal & Country Rank. This shows that there have been no research articles on *Pluchea indica* that have made it into reputable journals or been included in major publishers. Eleven articles show that *Pluchea indica*, especially its leaves, have various medicinal properties and can be used in daily medical practice. days. *Pluchea indica* also has a connection or potential if it is associated with COVID-19.

Keywords: Indonesia, *Pluchea indica*, PRISMA, Scopus

INTRODUCTION

Pluchea indica L. commonly known as beluntas in Indonesia, is an herb that is rich in bioactive compounds with various health benefits (Aqil et al., 2023; Donowarti & Fidhiani, 2020; Ibrahim et al., 2022; Safriani et al., 2021; Suriyaphan, 2014). This plant has been used for generations in traditional medicine. This plant from the Asteraceae family is quite popular in society because of its medicinal value, antioxidant, anti-inflammatory and antimicrobial properties (Husaini et al., 2022; Mohanta et al., 2023; Wahyuni et al., 2022). Overall, *Pluchea indica* L. is a versatile plant with significant ecological, medicinal, and nutritional importance (Jiao et al., 2021; Periferakis et al., 2022). Nowadays, studies conducted by experts around the world regarding *Pluchea indica* L. for pharmaceutical purposes are starting to emerge.

If we look at the Scopus database, research on *Pluchea indica* L. was first carried out four decades ago (Mukhopadhyay et al., 1983). Research on *Pluchea indica* L. continues to develop and attracts the attention of many researchers, especially in Indonesia (Ariwibowo et al., 2021; Hikmawanti, Saputri, Yanuar, Ningrum, et al., 2024; Nahor et al., 2022; Ratnawati et al., 2023). Research on medicinal plants, such as *Pluchea indica*, has high urgency and significance for Indonesia. As a country with abundant biodiversity, Indonesia has great potential in the use of medicinal plants as a source of alternative medicine that is more affordable and sustainable. *Pluchea indica*, as an example of a local medicinal plant, has long been used traditionally by Indonesian people to treat various health conditions (Cahyaningsih et al., 2021; Husaini et al., 2022; Nursamsu et al., 2024; Sudarmono, 2018; Weking et al., 2023). In-depth research on this plant can reveal its

pharmacological activity, bioactive compounds, and potential development as a herbal medicine or source of pharmaceutical raw materials. This is not only beneficial for local industry, but can also increase Indonesia's sovereignty in the field of public health and reduce dependence on imported medicines. In addition, medicinal plant research can contribute to biodiversity conservation efforts and the development of a natural resource-based economy (Astutik et al., 2023; Liu, 2021; Sholikhah, 2016; Siregar et al., 2023).

Considering that research on plants is influenced by the experience of the COVID-19 pandemic, focusing on this issue is considered quite important (Chali et al., 2021; Falkowski et al., 2022; Labib et al., 2022; Villena-Tejada et al., 2021). Research trends regarding *Pluchea indica* L. both during the COVID-19 pandemic and post COVID-19 pandemic are very necessary to know the extent of the achievements of researchers and the extent of the contribution of *Pluchea indica* L. as a subject in the health/pharmaceutical field. According to Smela et al (2023) to understand trends and important information about each publication, one of the most recommended techniques for study and analysis is Systematic Literature Review (SLR).

We tried searching the Scopus database with the phrase "*Pluchea indica*" with search within "all fields". The results show that there are 1,167 documents found. This number is certainly very large and the search is not specific. Therefore, we chose to search within "article, abstract, keywords" which showed results of 197 documents found. The data obtained is suitable for processing, using the SLR technique.

Systematic literature reviews about *Pluchea indica* are still very rare. In the Scopus database, there are only three review articles (Hikmawanti, Saputri, Yanuar, Jantan, et al., 2024a; Hussain et al., 2013; Sen et al., 1993) and one SLR (Xu et al., 2021), spanning four decades. There have not been any SLR type articles that focus on *Pluchea indica* and

especially those that specifically select research carried out by scientists from Indonesia.

Therefore, this study aimed to analyze the trend and important information (findings) about research of *Pluchea indica* in Indonesia during and post Covid-19 based on Scopus Database. It is hoped that this SLR can contribute in two ways, namely (1) helping to comprehensively formulate research findings on *Pluchea indica* (2020-2024), thereby enabling researchers to understand developments (trends) and directions for further studies; (2) through this SLR, we can reveal important findings (valuable contributions: Important findings, journal status and recommendations and connection with COVID-19) so that they become inspiration for further research that is more focused and relevant.

METHOD

This study represents a SLR aimed at methodically recognizing, evaluating, and examining all distinct research queries, subjects, or domains. (Chigbu et al., 2023; Newman & Gough, 2020). A SLR is a type of assessment that utilizes a structured method to offer a dependable summary of existing literature centered around a specific and clearly defined research question. (Moosapour et al., 2021). A SLR is instrumental in advancing our comprehension of a specific topic by uncovering existing information as well as areas of knowledge deficiency, often providing greater insights than individual research endeavors (Owens, 2021).

The Research Question (RQ) is what are the trend and important information (findings) about research of *Pluchea indica* in Indonesia? This aspect is refers to previous researchs (Husamah et al., 2022a, 2022b, 2023, 2024; Nurwidodo et al., 2023). The scope outlines important information from each selected article, regarding the journal's quartile status, important findings, and recommendations for each research.

The search history in Scopus is as follows: TITLE - ABS - KEY ("*Pluchea indica*") AND

PUBYEAR > 2019 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (EXACTKEYWORD, "Pluchea Indica")) AND (LIMIT-TO (SUBJAREA, "MEDI") OR LIMIT-TO (SUBJAREA, "PHAR") OR LIMIT-TO (SUBJAREA, "BIOC") OR LIMIT-TO (SUBJAREA, "AGRI" OR LIMIT-TO (SUBJAREA, "IMMU") OR LIMIT-TO (SUBJAREA, "CHEM") OR LIMIT-TO (SUBJAREA, "CENG") OR LIMIT-TO (SUBJAREA, "HEAL") OR LIMIT-TO (SUBJAREA, "DENT")) AND (LIMIT-

TO (AFFILCOUNTRY, "Indonesia"))).

We use "Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)", consists of four stages, namely identification, screening, eligibility, and inclusion (Moher et al., 2009). Step by step process of inclusion and exclusion in this SLR is shown in Figure 1. The data shows that from the initial findings of 197 articles, after going through the inclusion-exclusion stage only 11 articles were selected.

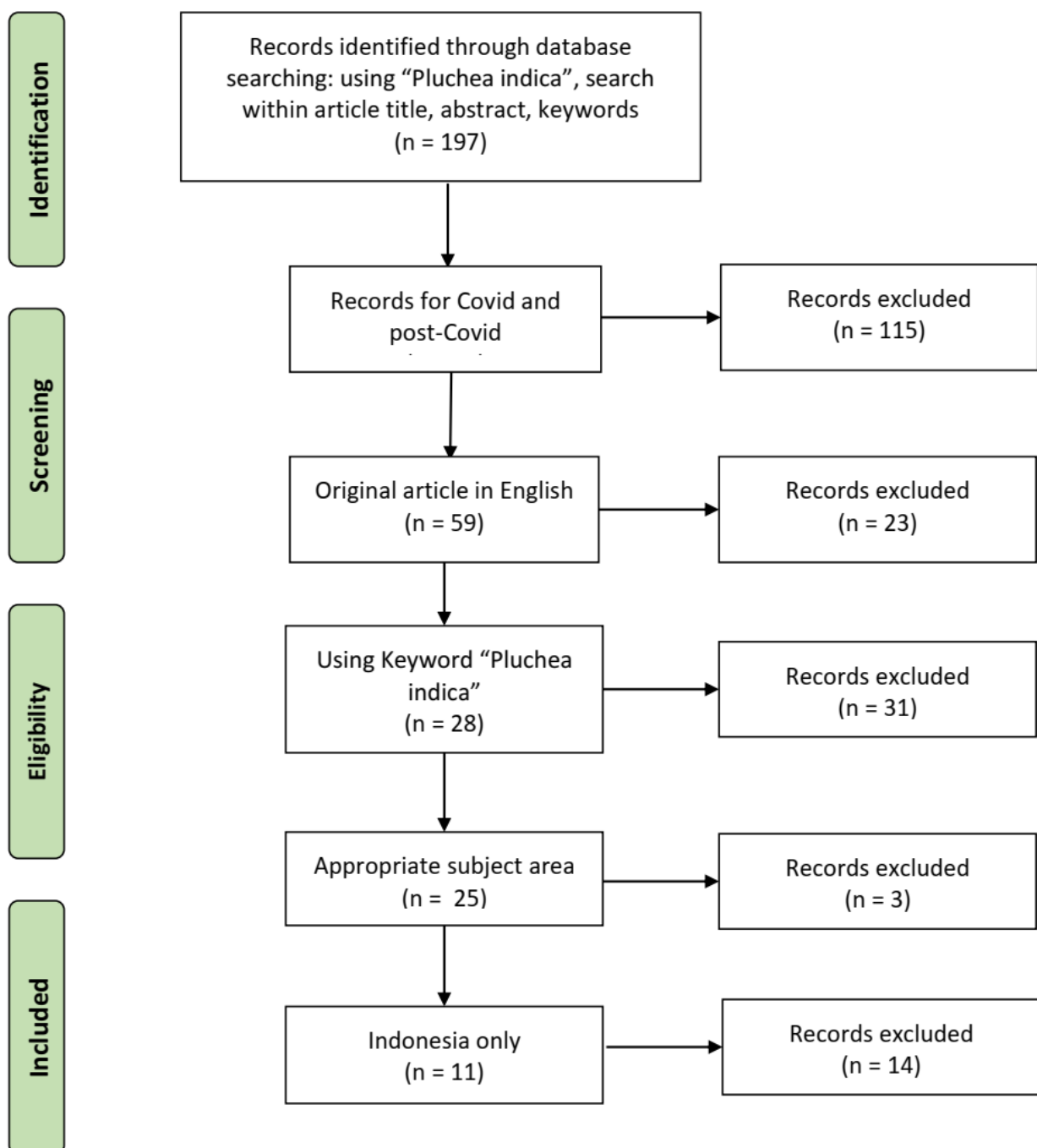


Figure 1. PRISMA flow diagram (Adapted from Moher et al., 2009).

RESULTS AND DISCUSSION

Document by year

Figure 2 shows the number of articles in the Scopus database, from 2020 to 2024. Based on Figure 2, the trend of publications on *Pluchea indica* L. tends to increase in 2022-2024. This data could be stronger if we include other types of publications, such as conference papers,

reviews, conference reviews, editorials and book chapters. Specifically in 2024, it is very possible that the number of articles will increase considering that the search for this data only reaches May 2024 (there are still seven months remaining, it is still very open to increase the number of articles entered into the Scopus database).

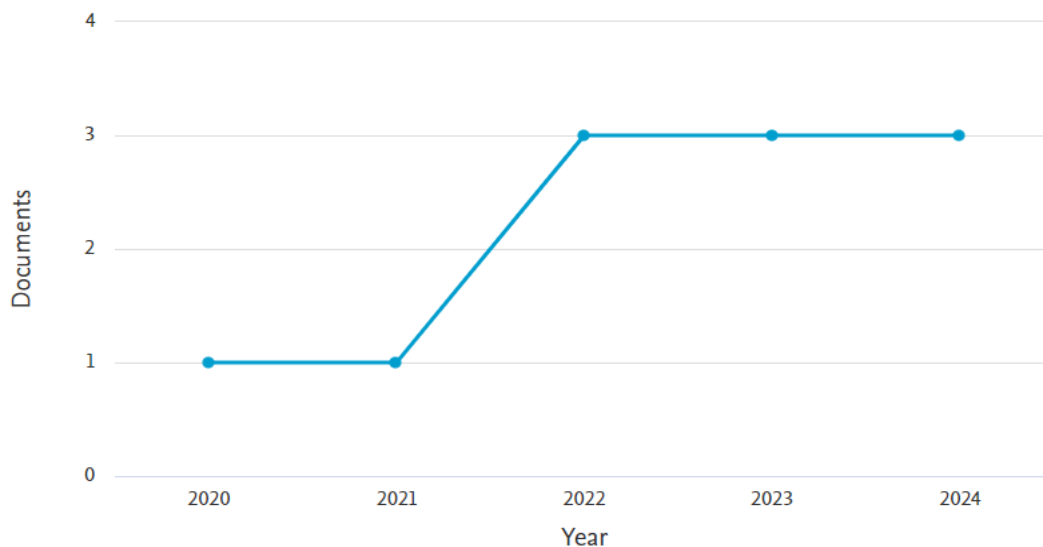


Figure 2. Documents by year in Scopus database

Research on *Pluchea indica* has increased in recent years, including during the COVID-19 pandemic and post COVID-19 pandemic. One of the driving factors is the increasing public interest in the use of traditional medicines and natural ingredients, many people are looking at various alternative treatments with a back to nature spirit, including *Pluchea indica* (Al-Askar et al., 2023; Ashrafi et al., 2022; Husaini et al., 2022; Paul et al., 2022; Wati et al., 2024). Research on the anti-inflammatory and antibacterial activity of *Pluchea indica* can help increase the general public's knowledge about its use as a traditional medicine (Buapool et al., 2013; Chiangnoon et al., 2022; Rismawati et al., 2022).

Researchers continue to explore various natural resources and riches that have the potential to be used as medicine during the COVID-19 pandemic and post COVID-19 pandemic. This can close the gap in limited resources, including medicines and medical

facilities (Dhungel et al., 2023; Filip et al., 2022; Hanney et al., 2022; Sachs et al., 2022; Vandebroek et al., 2020). Research on *Pluchea indica* can help increase access to alternative medicines that are more effective, safe and relatively affordable (Aishah Baharuddin et al., 2023; Ibrahim et al., 2022; Sirichaiwetchakoon et al., 2020). Various symptoms, manifestations and complaints that COVID-19 patients often complain about can be treated with herbal-based anti-inflammatory drugs (Al-Jamal et al., 2024; Chien et al., 2022; Fornari Laurindo et al., 2023; Villapol, 2020).

Affiliation

The trend of author's affiliation of research related to "*Pluchea indica*" are presented in Figure 3. Based on Figure 3, it can be seen that there are 15 affiliates from researchers in Indonesia, although it can be seen that there are several authors who have dual affiliations so that several universities outside

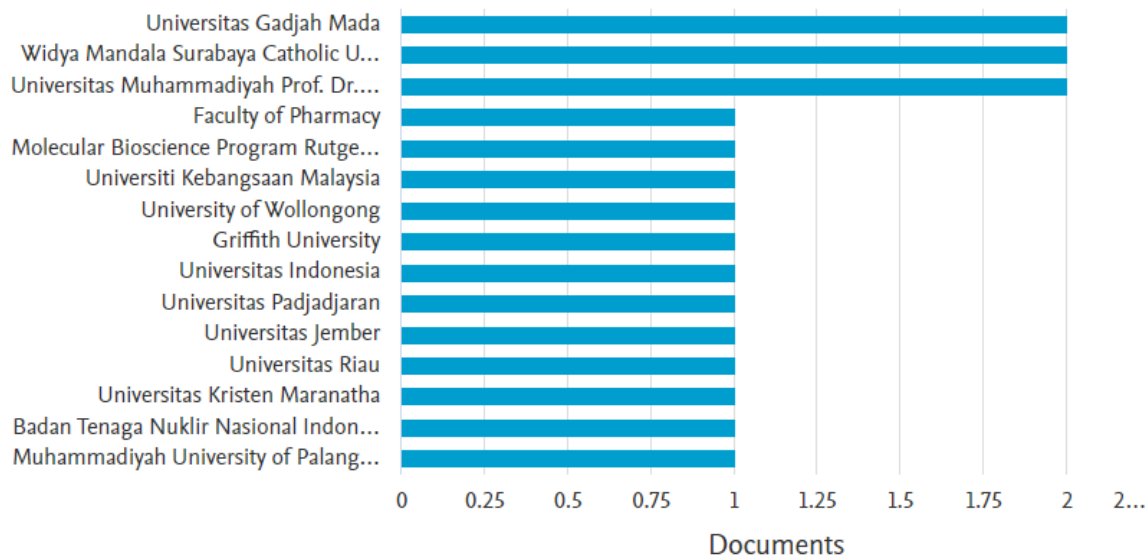


Figure 3. Author's affiliation

Indonesia are still included in the data by Scopus (for example, University Kebangsaan Malaysia, University of Wollongong, and Griffith University). Universities that have an interest in developing research based on *Pluchea indica* are Gajah Mada University (State University), Widya Mandala Catholic University, and Muhammadiyah University Prof. Dr. HAMKA (Private University). Several other universities can also be seen, both with the status of state universities (University of Indonesia, Padjadjaran University, Jember University, Riau University) and private universities (Maranatha Christian University, and Muhammadiyah University of Palangkaraya).

Many universities in Indonesia, both state and private, are interested in focusing their research on herbs, such as *Pluchea indica*, for several reasons (Machfiroh Setianing Hati et al., 2023; Wasito, 2008), although the number of articles in the Scopus database is still limited. If we look at general publications on Google Scholar, we will find enormous potential related to research or publications on *Pluchea indica*. First, herbs have become an integral part of the culture and traditions of Indonesian society. Indonesian people have used traditional medicines to treat various diseases, and research on their bioactive activities can help increase knowledge about their use as safer,

more effective and affordable alternative medicines (Embassy of The Republic Indonesia in Brussels, 2021; Febriyanti et al., 2024; Pratama et al., 2021; Sumarni et al., 2022; Widjaja, 2024). Second, herbs such as *Pluchea indica* have great potential as a source of herbal medicines, which have lower side effects than synthetic chemical medicines (Ibrahim et al., 2022; Sirichaiwetchakoon et al., 2020). Therefore, research on herbs can help increase access to alternative medicines that are more effective and safer.

Apart from that, research on herbs carried out by researchers at universities can also help increase knowledge about the active compounds contained in plants and how to use them. In particular, research on *Pluchea indica* can lead to the discovery of active compounds that have antioxidant, antibacterial, anti-inflammatory and antiseptic properties, which can be used to treat various diseases (Bhagawan et al., 2022; Sanusi et al., 2017). Thus, research on herbs such as *Pluchea indica* can help increase the ability of the Indonesian people to develop herbal medicines that are more effective and safer, as well as increase public awareness about the importance of using herbal medicines as an alternative treatment based on natural resources and local potential (Ekor, 2014; Karunamoorthi et al., 2012;

H. Wang et al., 2023).

Government policy also plays an important role in increasing universities' interest in herbal research. The government has issued several policies that support the development of herbal research, such as the herbal research development program and the herbal medicine development program. This is not only in the form of policy, but is supported

by open and competitive grants or research grants to support downstream research (Aziz & Mumtahanah, 2021; Dewandaru et al., 2021; Oey-Gardiner et al., 2017).

Important Findings and Recommendations

Important findings, journal status (quartile/Q) and recommendations from each article is presented in Table 1.

Table 1. Important findings, journal status and recommendations

No	Reference	Quartile (Scimago JR)	Important findings	Recommendations	Linkage to COVID-19
1	(Qamariah et al., 2020)	Q3	The most widely used part of the <i>Pluchea indica</i> is the leaves. Before being used as traditional medicine, medicinal plants are processed first.	This document offers a compendium of medicinal flora employed by the Dayak populace to impart knowledge to forthcoming generations regarding indigenous practices.	Not specifically linked to COVID-19, but many references link indigenous knowledge of medicinal plants with efforts to face the dangers of COVID-19 (Bienvenu et al., 2022; Maikhuri et al., 2024; Ngamsou Abdel et al., 2024; Villena-Tejada et al., 2021)
2	(Syarif et al., 2021)	Q4	It was observed in the research that the ethanolic extract derived from <i>Pluchea indica</i> leaf had the capability to elevate serum growth hormone levels in lactating rats.	Future investigations should be carried out to explore the mechanisms of action and various factors that impact the synthesis and release of milk. These studies are essential for acquiring the necessary scientific data needed to harness the therapeutic capabilities of <i>Pluchea indica</i> , an herbal medicine.	Not related to the discussion regarding COVID-19
3	(Milanda et al., 2022)	Q3	The findings of this research further bolster the existing evidence backing the conventional wisdom and application of edible plants (<i>Pluchea indica</i>) as a means to obtain natural dietary supplements aimed at preserving health and promoting well-being.	This research outcomes establish the groundwork for the subsequent exploration of every individual species and the possible discovery of new bioactive compounds possessing antibacterial and anticancer attributes.	Not specifically linked to COVID-19, but several references link antibacterial and cytotoxic activity to research on COVID-19 (Chaachouay et al., 2021; Khan et al., 2021).

No	Reference	Quartile (Scimago JR)	Important findings	Recommendations	Linkage to COVID-19
4	(Demolsky et al., 2022)	Q2	Ethanol extract of <i>Pluchea indica</i> has the potential of being an antifungal agent with inhibitory activity.	<i>Pluchea indica</i> can be used as a traditional medicine for oral candidiasis	Not specifically linked to COVID-19, but several references link antifungal activity to research on COVID-19 (Bienvenu et al., 2022; Gurunathan et al., 2022; Morton et al., 2022; Pruthi, 2022)
5	(Nugraha et al., 2022)	Q3	In the use of <i>Pluchea indica</i> , no cytotoxicity was observed against Human Embryonic Kidney cells at a concentration of 40 µM	Intensive scrutiny of phytochemical and pharmacological properties pertaining to Indonesian medicinal flora <i>Pluchea indica</i> has resulted in the successful identification of five distinct constituents.	Not related to the discussion regarding COVID-19
6	(Syarif et al., 2023)	Q4	<i>Pluchea indica</i> leaves revealed lactogenic activity in lactating rats	Additional investigations are required pertaining to the safety and suitable product compositions in order to guarantee the safety.	Not related to the discussion regarding COVID-19
7	(Widyawati et al., 2023)	Q3	The use of pluchea leaves increases the content of phytochemical compounds, in this case flavonoids, in wet noodles.	The leaves of <i>Pluchea indica</i> offer the potential to enhance the functional attributes of wet noodles, encompassing the phytochemical composition and functional characteristics.	Not related to the discussion regarding COVID-19
8	(Paini Sri et al., 2023)	Q3	Hot water extract of <i>Pluchea indica</i> leaf powder influenced physical, chemical and sensory properties of wet noodles.	The increased concentration of <i>Pluchea indica</i> extract led to the amplification of these parameters of Pluchea wet noodles.	Not related to the discussion regarding COVID-19
9	(Hikmawanti, Saputri, Yanuar, Jantan, et al., 2024b)	Q2	The results revealed that 3,4-di-O-caffeoylquinic acid has the potential to act as an inhibitor of the binding between HIV-1 gp120 and CD4. On the other hand, 5-O-caffeoylquinic acid and apigenin exhibited significant antioxidant properties by inhibiting	Extensive investigations, involving both in vitro and in vivo experimental analyses, are necessary to confirm the effectiveness of these compounds against HIV	Not specifically linked to COVID-19, but several references say that Chlorogenic acid (CGA) is a potential inhibitor of COVID-19 (Abomughaid et al., 2022; Wang et al., 2022)

No	Reference	Quartile (Scimago JR)	Important findings	Recommendations	Linkage to COVID-19
10	(Zebua et al., 2024)	Q3	NOX-2 and CYP2E1. Medicinal plants have an important role in the traditional medicine system, which has been passed down from generation to generation.	The majority of the empirical evidence provided by the indigenous Nias population aligns with existing research findings, yet there are 13 plant species warranting further investigation due to discrepancies between the empirical data and research outcomes.	Not specifically linked to COVID-19, but many references link ethnomedicine of medicinal plants with efforts to face the dangers of COVID-19 (Bienvenu et al., 2022; Maikhuri et al., 2024; Ngamsou Abdel et al., 2024; Villena-Tejada et al., 2021)
11	(Hikmawanti, Yumita, et al., 2024)	Q4	The extracts of <i>Pluchea indica</i> provided better antioxidant activity	It is important to search for phenolic substances besides chlorogenic acid that function as antioxidants in <i>Pluchea indica</i> stems	Not specifically linked to COVID-19, but many references link caffeoylquinic acids and flavonoids in treating or dealing with the dangers of COVID-19 (Bhargav et al., 2022; Gonçalves et al., 2022; Kowalczyk et al., 2021; Lombardo et al., 2022)

Table 1 shows that the majority of articles were published in journals with Q3-Q4 status (orange and red) in the Scimago Journal & Country Rank. There are only two articles that have been successfully published in journals with Q2 (yellow) status. Nothing has been published in journals with Q1 (green) status. This shows that there have been no research articles on *Pluchea indica* that have succeeded in entering reputable journals or entering major publishers. Quartile indicates a journal's reputation and quality (Falagas et al., 2008) as well as its impact on science (García et al., 2012).

Based on the data in Table 1 we can know that *Pluchea indica*, specifically its leaves has various medicinal properties and can be used as a natural dietary supplement, antifungal agent, and lactogenic agent, among others. Additionally, *Pluchea indica* extracts exhibit significant antioxidant activity.

Pluchea indica extract, originating from the foliage of the botanical specimen, presents a range of plausible health advantages. Studies

indicate that this extract is abundant in phytochemical constituents like tannins, alkaloids, phenolics, flavonoids, and sterols, which contribute to its antioxidative and antidiabetic attributes (Widyawati et al., 2023). Investigations have illustrated that the utilization of *Pluchea indica* extract may aid in the regulation of lipid metabolism, reduction of dyslipidemia, and prevention of hepatic steatosis, thus emerging as a promising avenue for addressing conditions such as dyslipidemia induced by a high-fat, high-fructose diet (Al-Askar et al., 2023; Singdam et al., 2022). Moreover, this extract has been effectively employed in the creation of zinc oxide nanoparticles, showcasing antimicrobial efficacy against diverse pathogens and demonstrating photocatalytic capabilities for environmental uses (Adiwijaya et al., 2023). Furthermore, *Pluchea indica* extract has exhibited antibacterial characteristics against *Streptococcus sanguinis*, underscoring its potential in combatting oral ailments like

recurrent aphthous stomatitis with minimal adverse effects (Rismawati et al., 2022).

Although much of the research on *Pluchea indica* does not directly focus on COVID-19, the themes the research focuses on can be related to the pandemic. This is because research on medicinal plants such as *Pluchea indica* has broad implications and can contribute not only to overcoming COVID-19, but also to strengthening the health system as a whole (Ibrahim et al., 2022; Villena-Tejada et al., 2021). For example, research into the antioxidant, anti-inflammatory and immunomodulatory activities of *Pluchea indica* can help develop supportive strategies to increase body resistance and minimize disease complications related to COVID-19 (Ahmad et al., 2021; Jha et al., 2021; Mohanta et al., 2023; Pisoschi et al., 2022; Zielinska-Blizniewska et al., 2019). Likewise, research on bioactive compounds and the potential for developing *Pluchea indica* as a herbal medicine can provide treatment alternatives that are more affordable and accessible to the wider community, especially during a pandemic that demands independence and resilience of the health system.

CONCLUSION

This SLR obtained several interesting findings. The publication trend of *Pluchea indica* L. is likely to increase in 2022-2024 although the data ignores other types of publications, such as conference papers, reviews, conference reviews, editorials and book chapters. Especially in 2024, it is very likely that the number of articles will increase considering that data searches only reach. There are several universities that are prominent in *Pluchea indica* research. Many universities in Indonesia, both state and private, are interested in focusing their research on herbs, such as *Pluchea indica*. The majority of articles were published in journals with Q3-Q4 status (orange and red) in the Scimago Journal & Country Rank. This shows that there have been no research articles on *Pluchea indica* that have

succeeded in entering reputable journals or entering major publishers. Eleven articles show that *Pluchea indica*, specifically its leaves have various medicinal properties and can be used in daily medicinal practice. We also found that many published articles, although indirectly, could be linked to discussions about COVID-19.

The recommendation that can be given based on the formulation of the results of examining the eleven articles found is that there is the importance of studying the medicinal flora, particularly focusing on *Pluchea indica*. Further research is needed to explore the therapeutic potential and safety of this herbal medicine, as well as its potential applications in various fields such as traditional medicine and food enhancement.

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