Eduvest – Journal of Universal Studies
Volume 5 Number 7, July, 2025
p- ISSN 2775-3735- e-ISSN 2775-3727

Herbal Monographs and Role of Physalis Angulata in Indigenous Herbal Systems: A Literature Review

Jonsen Subagio
Faculty of Medicine, Universitas Ciputra, Surabaya, Indonesia
Email: subagiojonsen@gmail.com

ABSTRACT

Physalis angulata L. is an edible and annual herb of the Solanaceae family, known in Indonesia as Ciplukan plant. In its application in the world of herbal medicine, Physalis angulata L. contains many bioactive compounds which are useful as antifungal, antioxidant, anti-inflammatory, etc. Not only in Indonesia, research related to the herbal application of Physalis angulata L. was also carried out by researchers in a number of tropical and subtropical countries such as Brazil, Vietnam and America. This article aims to summarize and provide a comprehensive review of the characteristics, contents, and various applications of Physalis angulata L. in traditional and modern medicine. This type of research is a literature review by looking for a series of similar studies related to Physalis angulata L. in the form of reports, original articles, and true experiments. This research is a descriptive analysis research and the sources used come from both national and international journals using published articles from Google Scholar, PubMed, and Elsevier with a publication year range from 2019-2024. Findings reveal that P. angulata contains diverse secondary metabolites such as flavonoids, alkaloids, and physalins, which exhibit antibacterial, anticancer, antiparasitic, anti-inflammatory, antifibrotic, and antidiabetic activities. For instance, physalin B demonstrated significant anticancer effects, while leaf extracts showed potent anti-inflammatory properties. The research underscores the plant's potential as a natural therapeutic agent, particularly in tropical and subtropical regions. It is hoped that this literature review will be able to provide a general overview and be a reference for further research, especially in the context of a deeper understanding of the characteristics, content of bioactive compounds, and benefits of Physalis angulata L. as one of the typical herbal plants in Indonesia.

KEYWORDS *ciplukan plant; herbal medicine; Physalis angulata L; Solanaceae*

INTRODUCTION

The trend of therapy using the "back-to-nature" principle is on the rise, as there have been numerous reports on the increasing prevalence of degenerative diseases and the growing number of side effects associated with modern medicine.

According to pharmacological principles, every drug must have a side effect (Wohl & Converse, 2020). The World Health Organization (WHO) states that 60% of people worldwide use herbal medicines, and 80% of those living in developing countries rely solely on these medicines to meet their basic medical needs (Novitasari et al., 2024). Synthetic drugs and traditional remedies differ significantly in both the frequency and severity of side effects. It is widely acknowledged that synthetic drugs pose a higher risk of adverse effects compared to traditional remedies, although they may offer stronger therapeutic effects (H. Ambo Lau & Herman, 2020). This distinction is understandable, as synthetic drugs are composed of pure active compounds, whereas traditional medicines are derived from plant extracts containing numerous compounds with complex chemical profiles. For these reasons, many people are turning to traditional medicine as a form of therapy or preventive measure, particularly against the emergence of degenerative diseases (H. Ambo Lau & Herman, 2020).

The *Physalis* genus belongs to the *Solanaceae* family and comprises approximately 120 species, widely distributed across subtropical and tropical regions worldwide. Several *Physalis* species are considered nutritionally important due to their edible fruits, along with their potential as ornamental plants and their pharmacological effects (Figueiredo et al., 2020). *Physalis angulata* L. is an edible annual herbaceous plant from the *Solanaceae* family, known in Indonesia as the *Ciplukan* plant. This fruit, internationally referred to as *groundcherry*, is frequently consumed by Indonesians due to its high nutritional value and pleasant taste (Habib & Suriyani, 2023). In herbal medicine, *P. angulata* contains numerous bioactive compounds that offer antifungal, antioxidant, and anti-inflammatory benefits, among others (Trisna Meyana Putra & Widi Astuti, 2023). Research related to the herbal applications of *P. angulata* has not only been conducted in Indonesia but also in several tropical and subtropical countries, including Brazil, Vietnam, and others (Daltro et al., 2021; Tuan Anh et al., 2021; Vieceli et al., 2021; Nguyen et al., 2021). Given the extensive research and usage of *P. angulata*, this article aims to compile a herbal monograph and provide a comprehensive review of its characteristics, constituents, and applications in traditional herbal therapy.

This research adopts a *literature review* methodology, collecting studies related to *P. angulata* in the form of case reports, original research articles, and experimental studies. It is a descriptive-analytical study, drawing on sources from national and international journals published between 2014 and 2024, obtained from databases such as Google Scholar, PubMed, and Elsevier. This review aims to offer a broad overview and serve as a reference for future research, particularly for deeper exploration of the characteristics, bioactive content, and benefits of *P. angulata* as one of Indonesia's valuable herbal plants.

The global shift toward natural therapies has intensified due to rising concerns over the side effects of synthetic drugs and the increasing prevalence of degenerative diseases. According to the World Health Organization (WHO), approximately 60% of the world's population relies on herbal medicine, with 80% in developing countries depending on it for primary healthcare (Novitasari et al., 2024). This trend underscores the need for scientifically validated herbal remedies, particularly those with minimal adverse effects. *Physalis angulata* L., a member of the *Solanaceae* family, has emerged as a promising candidate due to its widespread use in traditional medicine and its rich array of bioactive compounds, including physalins, flavonoids, and alkaloids (Tuan Anh et al., 2021). Recent studies have highlighted its antimicrobial, anti-inflammatory, and anticancer properties, positioning it as a viable alternative to conventional treatments.

Despite its therapeutic potential, existing research on *P. angulata* remains fragmented, with limited comprehensive reviews integrating its phytochemical, pharmacological, and ethnomedicinal profiles. While studies such as those by Daltro et al. (2021) and Vieceli et al. (2021) have explored its immunomodulatory and anti-inflammatory effects, gaps persist in understanding the mechanistic pathways of its bioactive compounds. Additionally, most research focuses on isolated plant parts or specific biological activities, neglecting a holistic analysis of its applications across various medical conditions. This fragmentation hinders the development of standardized herbal formulations and limits its integration into mainstream healthcare systems, particularly in regions where it is traditionally used.

The urgency of this research lies in addressing the growing demand for safe, effective, and accessible herbal therapies, especially in low-resource settings. With antibiotic resistance and chronic diseases on the rise, *P. angulata* offers a sustainable solution due to its broad-spectrum bioactivity and low toxicity (Hananto et al., 2021). Furthermore, climate change and habitat loss threaten wild populations of *P. angulata*, making it imperative to document its medicinal properties and encourage its cultivation. By consolidating existing knowledge, this study aims to bridge the gap between traditional use and scientific validation, ensuring that its potential is fully harnessed for global health benefits.

This study introduces novelty by synthesizing scattered research into a cohesive framework, highlighting underexplored aspects such as the synergistic effects of its compounds and comparative efficacy across various extraction methods. For instance, while physalin B has been studied for its anticancer properties (Wang et al., 2018), its interactions with other metabolites in *P. angulata* remain unclear. The review also examines regional variations in its usage, such as its application in Indonesian folk medicine for diabetes (Iwansyah et al., 2022), contrasted with Brazilian studies on its antiparasitic effects (Vieceli et al., 2021).

Such comparative analysis provides a foundation for future translational research and drug development.

The primary objective of this research is to compile and critically evaluate the ethnobotanical, phytochemical, and pharmacological evidence supporting *P. angulata*'s therapeutic use. By analyzing peer-reviewed studies from databases such as Google Scholar and Scopus, this review identifies patterns, contradictions, and opportunities for further investigation. Emphasis is placed on its efficacy in treating conditions such as inflammation, infections, and metabolic disorders, along with its safety profile. The study also explores challenges related to cultivation and sustainability, ensuring that its medicinal use aligns with environmental conservation.

The implications of this research extend beyond academic interest, offering practical benefits for healthcare practitioners, policymakers, and the pharmaceutical industry. By validating the traditional uses of *P. angulata*, this research empowers communities to preserve and leverage indigenous knowledge while promoting evidence-based integration of herbal medicine. For drug development, the identified bioactive compounds could serve as leads for novel therapeutics, particularly in combating drug-resistant pathogens and chronic illnesses. Ultimately, this study advocates for interdisciplinary collaboration to optimize *P. angulata*'s potential, bridging traditional wisdom and modern science to advance global health.

RESEARCH METHOD

This study employed a descriptive *literature review* methodology to systematically analyze existing research on *Physalis angulata* L. The research design involved gathering and synthesizing peer-reviewed articles, original research reports, and experimental studies from reputable databases such as Google Scholar, PubMed, and Elsevier. The focus was on publications from 2019 to 2024 to ensure the inclusion of recent advancements in the field. The population consisted of all available scientific literature on *P. angulata*, including studies on its phytochemistry, pharmacological activities, and ethnomedicinal applications. A purposive sampling technique was used to select relevant studies based on predefined inclusion criteria, such as full-text availability, clear methodology, and relevance to the research objectives.

The research instrument consisted of a structured data extraction form designed to capture key information, including study objectives, methodologies, findings, and conclusions. To ensure validity, the form was reviewed by experts in pharmacology and ethnobotany, and a pilot test was conducted on a subset of articles to refine the extraction criteria. Reliability was maintained through inter-rater agreement, wherein two independent researchers extracted data from the same

set of articles, and discrepancies were resolved through discussion. Data collection involved systematic searches using keywords such as *"Physalis angulata," "Ciplukan," "bioactive compounds,"* and *"therapeutic properties."* The procedure included screening titles and abstracts, followed by full-text review and data extraction. Reference lists of the selected articles were also examined to identify additional relevant studies, ensuring comprehensive coverage of the topic.

Data analysis was performed using qualitative content analysis and thematic synthesis techniques. The extracted data were categorized into themes such as phytochemical composition, pharmacological activities, and traditional uses. *NVivo* software was utilized to assist in organizing and coding the data, enabling the identification of patterns and trends across studies. Quantitative data, such as efficacy metrics and compound concentrations, were summarized using descriptive statistics. The findings were then synthesized to provide a cohesive overview of *P. angulata*'s therapeutic potential, highlighting gaps in the literature and areas for future research. This methodological approach ensured a rigorous and transparent review process, contributing to the reliability and validity of the study's conclusions.

RESULT AND DISCUSSION

Physical Characteristics of *P. angulata*

Physalis angulata Linn. (*P. angulata* L.) was identified and recorded for the first time in the flora of Libya (Mahklouf, 2019). *P. angulata* is a member of the Solanaceae (or Nightshade) plant family and is quite commonly found in various tropical and subtropical areas (Table 1). The Greek word '*physalis*', which translates to 'bladder' (Figure 1), is used to describe the shape of its inflated petals. *P. angulata* has several popular names, including camapu, cutleaf groundcherry, wild tomato, winter cherry, cow pops, Chinese Lantern, mullaca, koropo (in West Africa), wild gooseberry, and ciplukan (Indonesia) (Novitasari et al., 2024).

Figure 1. Illustration of *P. angulata* from Francisco Manuel Blanco (O.S.A.) (1880-1883) *Flora de Filipinas [...] Gran edicion [...] [Atlas I].*

Table 1. Scientific classification of *Physalis angulata L.*

Kingdom	Plantae
Clade	Tracheophyta
Order	Solanales
Family	Solanaceae
Genus	Physalis
Species	*Physalis angulata L*

The roots of *P. angulata* have a branched taproots and have dirty whitish to brownish fibers (Figure 2). Apart from the roots, this plant also has soft, grooved upright stems with a round, brownish and greenish shape. It is known that the stem of this plant is also ribbed with a sharp tip, has a hollow-forms, and has many branches (Mudaffar, 2022; Socfindo Conservation, 2024).

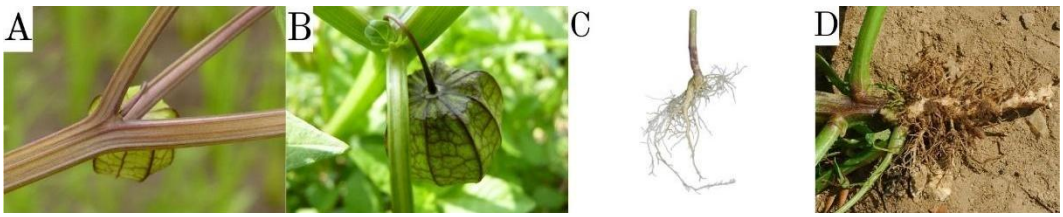

Figure 2. *P. angulata* stem with brownish color (A); *P. angulata* stem with greenish color (B); *P. angulata* roots cleaned from the soil (C); *P. angulata* roots shortly after being removed from the soil (D).

P. angulata has single leaves, multi-stemmed, located at the bottom, oval-shaped, and elongated alternately on leaf stalks 1-7 cm long (Figure 3). The base of

the leaf is tapered with even edges and the petiole is light greenish with whitish pinnate spines. The leaves of *P. angulata* are 3–6 cm long and 2–4 cm wide[12,13]. *P. angulata* flower is a single flower 1 cm wide that appears in the leaf axils with 5 divided petals and a 3-angled, tapering spur. The flowers of this plant have axillae with a stalk length of 5–12 mm, sepals measuring 4–5 mm, and ciliate lobes 1–2 mm long. Corolla is bell-shaped with five erect or spreading lobes, pale yellow to greenish yellow, with a dark spot on the throat. In addition, there are several fine hairs, and it has pale yellowish stamen stalks and light blue stamen heads (Mudaffar, 2022; Socfindo Conservation, 2024).

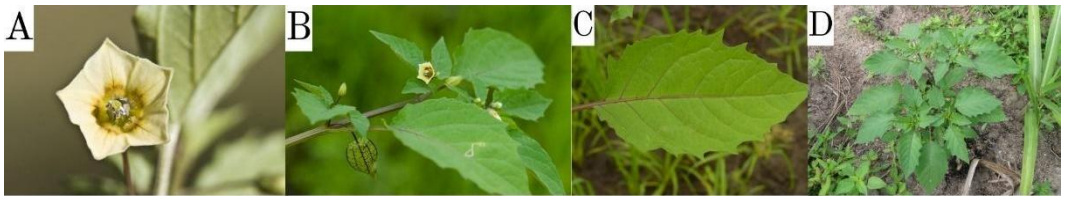

Figure 3. *P. angulata* flowers (A); Comparison of the size of *P. angulata* flowers and leaves (B); *P. angulata* leaves (C); *P. angulata* leaves attached to the tree (D).

The fruit of this plant has a subglobose to ovoid shape, light greenish to yellowish in color, 1.2 – 1.5 cm wide and wrapped in a balloon-like calyx with a diameter of up to 30mm (Figure 4). This fruit also has fine, whitish seeds inside which are covered in fine fibers and this fruit also has a sweet and sour taste. The seeds are small, white and have a thin round shape (Habib & Suriyani, 2023; Mudaffar, 2022; Socfindo Conservation, 2024).

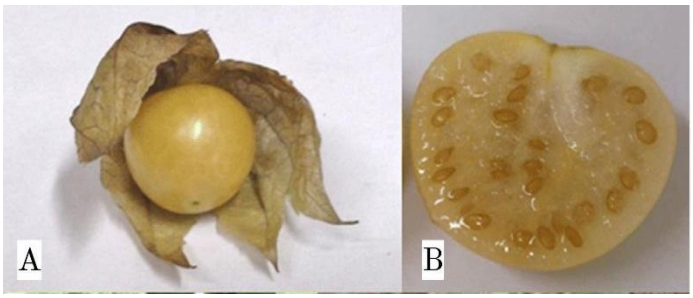

Figure 4. *P. angulata* fruit (A); *P. angulata* seeds (B)[16].

Secondary metabolites and bioactive ingredients in *Physalis angulata*

P. angulata is known to contain quite varied secondary metabolic compounds. In the fruit of *P. angulata* there are 12 types of secondary metabolic compounds, namely alkaloids, anthocyanins and betacyanins, cardioglycosides, flavonoids, glycosides, phenolics, quinones, saponins, steroids, terpenoids and tannins. The content of anthocyanins and betacyanins found in ciplukan fruit extract shows the ability of this plant to increase HDL cholesterol levels and reduce LDL cholesterol levels. *P.* angulata fruit is also a potential source of antioxidants with

toxic toxicity *(Helmi et al., 2021; Afriyeni & Surya, 2019).*

Phytochemical testing on the stems of the *P. angulata* plant shows that the stems of this plant contain secondary metabolic compounds in the form of quinones, flavonoids, saponins, and monosesquiterpeoids, and polyphenols. The type of flavonoid compound found in *P. angulata* stems are classified as Flavanone compounds *(Ridwanuloh & Syarif, 2019).* Then, another study using the ethanol maceration method on the leaf extract of the P. angulata plant proved that the leaves of P. angulata contain metabolic flavonoids, alkaloids, saponins (Ushie et al., 2019). All details related to the phytochemical content of the *P. angulata* plant parts are listed in the following table (Table 2).

Table 2. Phytochemical content in *P. angulata*

Plant parts	Phytochemical contents
Leaf	flavonoids, alkaloids, saponins, glycosides, tannins, phenolics, terpenoids, steroids, polyphenols, and triterpenoids (Ushie et al., 2019; Tampie et al., 2023; Alam et al., 2022; Adewolu et al., 2021)
Stem	Alkaloids, polyphenols, flavonoids, saponins, tannins, triterpenoids, terpenoids, quinones, monosesquiterpenoids and steroids (Afriyeni & Surya, 2019; Ridwanuloh & Syarif, 2019; Alam et al., 2022; Julianti et al., 2019)
Fruit	Alkaloids, flavonoids, glycosides, quinones, steroids, terpenoids, tannins, phenolics and saponins (Afriyeni & Surya, 2019; Julianti et al., 2019; Iwansyah et al., 2022)
Root	Alkaloids, polyphenols, flavonoids, saponins, tannins and triterpenoids (Alam et al., 2022)
Flower	Tannins, glycosides, flavonoids, terpenoids and steroids (Julianti et al., 2019)
Herb	Alkaloids, flavonoids, saponins, tannins, phenols, tannins and quinones (Maliangkay et al., 2019; Widayat et al., 2022)

Furthermore, *P. angulata* also has bioactive ingredients, namely Physalin A in the roots, physalin B in the whole plant, physalin D, F, G in the whole plant, physalin E in the whole plant, physalin H in the roots, withangulatin A in the fruit, and physangulatin A in the leaves and stems[2].

Various properties of Physalis angulata as traditional herbal therapy

1. **Herbal Monographs and Role of Physalis Angulata in Indigenous Herbal Systems: A Literature Review**
2. **INTRODUCTION**

The trend of therapy using the "back-to-nature" principle is on the rise, as there have been numerous reports on the increasing prevalence of degenerative diseases and the growing number of side effects associated with modern medicine. According to pharmacological principles, every drug must have a side effect (Wohl & Converse, 2020). The World Health Organization (WHO) states that 60% of people worldwide use herbal medicines, and 80% of those living in developing countries rely solely on these medicines to meet their basic medical needs (Novitasari et al., 2024). Synthetic drugs and traditional remedies differ significantly in both the frequency and severity of side effects. It is widely acknowledged that synthetic drugs pose a higher risk of adverse effects compared to traditional remedies, although they may offer stronger therapeutic effects (H. Ambo Lau & Herman, 2020). This distinction is understandable, as synthetic drugs are composed of pure active compounds, whereas traditional medicines are derived from plant extracts containing numerous compounds with complex chemical profiles. For these reasons, many people are turning to traditional medicine as a form of therapy or preventive measure, particularly against the emergence of degenerative diseases (H. Ambo Lau & Herman, 2020).

The *Physalis* genus belongs to the *Solanaceae* family and comprises approximately 120 species, widely distributed across subtropical and tropical regions worldwide. Several *Physalis* species are considered nutritionally important due to their edible fruits, along with their potential as ornamental plants and their pharmacological effects (Figueiredo et al., 2020). *Physalis angulata* L. is an edible annual herbaceous plant from the *Solanaceae* family, known in Indonesia as the *Ciplukan* plant. This fruit, internationally referred to as *groundcherry*, is frequently consumed by Indonesians due to its high nutritional value and pleasant taste (Habib & Suriyani, 2023). In herbal medicine, *P. angulata* contains numerous bioactive compounds that offer antifungal, antioxidant, and anti-inflammatory benefits, among others (Trisna Meyana Putra & Widi Astuti, 2023). Research related to the herbal applications of *P. angulata* has not only been conducted in Indonesia but also in several tropical and subtropical countries, including Brazil, Vietnam, and others (Daltro et al., 2021; Tuan Anh et al., 2021; Vieceli et al., 2021; Nguyen et al., 2021). Given the extensive research and usage of *P. angulata*, this article aims to compile a herbal monograph and provide a comprehensive review of its characteristics, constituents, and applications in traditional herbal therapy.

This research adopts a *literature review* methodology, collecting studies related to *P. angulata* in the form of case reports, original research articles, and experimental studies. It is a descriptive-analytical study, drawing on sources from national and international journals published between 2014 and 2024, obtained from databases such as Google Scholar, PubMed, and Elsevier. This review aims to offer a broad overview and serve as a reference for future research, particularly

for deeper exploration of the characteristics, bioactive content, and benefits of *P. angulata* as one of Indonesia's valuable herbal plants.

The global shift toward natural therapies has intensified due to rising concerns over the side effects of synthetic drugs and the increasing prevalence of degenerative diseases. According to the World Health Organization (WHO), approximately 60% of the world's population relies on herbal medicine, with 80% in developing countries depending on it for primary healthcare (Novitasari et al., 2024). This trend underscores the need for scientifically validated herbal remedies, particularly those with minimal adverse effects. *Physalis angulata* L., a member of the *Solanaceae* family, has emerged as a promising candidate due to its widespread use in traditional medicine and its rich array of bioactive compounds, including physalins, flavonoids, and alkaloids (Tuan Anh et al., 2021). Recent studies have highlighted its antimicrobial, anti-inflammatory, and anticancer properties, positioning it as a viable alternative to conventional treatments.

Despite its therapeutic potential, existing research on *P. angulata* remains fragmented, with limited comprehensive reviews integrating its phytochemical, pharmacological, and ethnomedicinal profiles. While studies such as those by Daltro et al. (2021) and Vieceli et al. (2021) have explored its immunomodulatory and anti-inflammatory effects, gaps persist in understanding the mechanistic pathways of its bioactive compounds. Additionally, most research focuses on isolated plant parts or specific biological activities, neglecting a holistic analysis of its applications across various medical conditions. This fragmentation hinders the development of standardized herbal formulations and limits its integration into mainstream healthcare systems, particularly in regions where it is traditionally used.

The urgency of this research lies in addressing the growing demand for safe, effective, and accessible herbal therapies, especially in low-resource settings. With antibiotic resistance and chronic diseases on the rise, *P. angulata* offers a sustainable solution due to its broad-spectrum bioactivity and low toxicity (Hananto et al., 2021). Furthermore, climate change and habitat loss threaten wild populations of *P. angulata*, making it imperative to document its medicinal properties and encourage its cultivation. By consolidating existing knowledge, this study aims to bridge the gap between traditional use and scientific validation, ensuring that its potential is fully harnessed for global health benefits.

This study introduces novelty by synthesizing scattered research into a cohesive framework, highlighting underexplored aspects such as the synergistic effects of its compounds and comparative efficacy across various extraction methods. For instance, while physalin B has been studied for its anticancer properties (Wang et al., 2018), its interactions with other metabolites in *P. angulata* remain unclear. The review also examines regional variations in its usage, such as its application in Indonesian folk medicine for diabetes (Iwansyah et al., 2022),

contrasted with Brazilian studies on its antiparasitic effects (Vieceli et al., 2021). Such comparative analysis provides a foundation for future translational research and drug development.

The primary objective of this research is to compile and critically evaluate the ethnobotanical, phytochemical, and pharmacological evidence supporting *P. angulata's* therapeutic use. By analyzing peer-reviewed studies from databases such as Google Scholar and Scopus, this review identifies patterns, contradictions, and opportunities for further investigation. Emphasis is placed on its efficacy in treating conditions such as inflammation, infections, and metabolic disorders, along with its safety profile. The study also explores challenges related to cultivation and sustainability, ensuring that its medicinal use aligns with environmental conservation.

The implications of this research extend beyond academic interest, offering practical benefits for healthcare practitioners, policymakers, and the pharmaceutical industry. By validating the traditional uses of *P. angulata*, this research empowers communities to preserve and leverage indigenous knowledge while promoting evidence-based integration of herbal medicine. For drug development, the identified bioactive compounds could serve as leads for novel therapeutics, particularly in combating drug-resistant pathogens and chronic illnesses. Ultimately, this study advocates for interdisciplinary collaboration to optimize *P. angulata's* potential, bridging traditional wisdom and modern science to advance global health.

3. RESULT AND DISCUSSION

4. Physical Characteristics of *P. angulata*

Physalis angulata Linn. (*P. angulata* L.) was identified and recorded for the first time in the flora of Libya (Mahklouf, 2019). *P. angulata* is a member of the Solanaceae (or Nightshade) plant family and is quite commonly found in various tropical and subtropical areas (Table 1). The Greek word 'physalis', which translates to 'bladder' (Figure 1), is used to describe the shape of its inflated petals. *P. angulata* has several popular names, including camapu, cutleaf groundcherry, wild tomato, winter cherry, cow pops, Chinese Lantern, mullaca, koropo (in West Africa), wild gooseberry, and ciplukan (Indonesia) (Novitasari et al., 2024).

Table 1. Scientific classification of *Physalis angulata* L.

Kingdom	**Plantae**
Clade	Tracheophyta
Order	Solanales
Family	Solanaceae
Genus	Physalis
Species	*Physalis angulata* L

The roots of *P. angulata* have a branched taproots and have dirty whitish to brownish fibers (Figure 2). Apart from the roots, this plant also has soft, grooved upright stems with a round, brownish and greenish shape. It is known that the stem of this plant is also ribbed with a sharp tip, has a hollow-forms, and has many branches (Mudaffar, 2022; Socfindo Conservation, 2024).

P. angulata has single leaves, multi-stemmed, located at the bottom, oval-shaped, and elongated alternately on leaf stalks 1-7 cm long (Figure 3). The base of the leaf is tapered with even edges and the petiole is light greenish with whitish pinnate spines. The leaves of *P. angulata* are 3–6 cm long and 2–4 cm wide (Mudaffar, 2022; Socfindo Conservation, 2024). *P. angulata* flower is a single flower 1 cm wide that appears in the leaf axils with 5 divided petals and a 3-angled, tapering spur. The flowers of this plant have axillae with a stalk length of 5–12 mm, sepals measuring 4–5 mm, and ciliate lobes 1–2 mm long. Corolla is bell-shaped with five erect or spreading lobes, pale yellow to greenish yellow, with a dark spot on the throat. In addition, there are several fine hairs, and it has pale yellowish stamen stalks and light blue stamen heads (Mudaffar, 2022; Socfindo Conservation, 2024).

The fruit of this plant has a subglobose to ovoid shape, light greenish to yellowish in color, 1.2 – 1.5 cm wide and wrapped in a balloon-like calyx with a diameter of up to 30mm (Figure 4). This fruit also has fine, whitish seeds inside which are covered in fine fibers and this fruit also has a sweet and sour taste. The seeds are small, white and have a thin round shape (Habib & Suriyani, 2023; Mudaffar, 2022; Socfindo Conservation, 2024).

5. Secondary metabolites and bioactive ingredients in *Physalis angulata*

P. angulata is known to contain quite varied secondary metabolic compounds. In the fruit of *P. angulata* there are 12 types of secondary metabolic compounds, namely alkaloids, anthocyanins and betacyanins, cardioglycosides, flavonoids, glycosides, phenolics, quinones, saponins, steroids, terpenoids and tannins. The content of anthocyanins and betacyanins found in ciplukan fruit extract shows the ability of this plant to increase HDL cholesterol levels and reduce LDL cholesterol levels. *P. angulata* fruit is also a potential source of antioxidants with toxic toxicity (Helmi et al., 2021; Afriyeni & Surya, 2019).

Phytochemical testing on the stems of the *P. angulata* plant shows that the stems of this plant contain secondary metabolic compounds in the form of quinones, flavonoids, saponins, and monosesquiterpeoids, and polyphenols. The type of flavonoid compound found in *P. angulata* stems are classified as Flavanone compounds (Ridwanuloh & Syarif, 2019). Then, another study using the ethanol maceration method on the leaf extract of the *P. angulata* plant proved that the leaves of *P. angulata* contain metabolic flavonoids, alkaloids, saponins (Ushie et al.,

2019). All details related to the phytochemical content of the *P. angulata* plant parts are listed in the following table (Table 2).

Table 2. Phytochemical content in *P. angulata*

Plant parts	Phytochemical contents
Leaf	flavonoids, alkaloids, saponins, glycosides, tannins, phenolics, terpenoids, steroids, polyphenols, and triterpenoids (Ushie et al., 2019; Tampie et al., 2023; Alam et al., 2022; Adewolu et al., 2021)
Stem	Alkaloids, polyphenols, flavonoids, saponins, tannins, triterpenoids, terpenoids, quinones, monosesquiterpenoids and steroids (Afriyeni & Surya, 2019; Ridwanuloh & Syarif, 2019; Alam et al., 2022; Julianti et al., 2019)
Fruit	Alkaloids, flavonoids, glycosides, quinones, steroids, terpenoids, tannins, phenolics and saponins (Afriyeni & Surya, 2019; Julianti et al., 2019; Iwansyah et al., 2022)
Root	Alkaloids, polyphenols, flavonoids, saponins, tannins and triterpenoids (Alam et al., 2022)
Flower	Tannins, glycosides, flavonoids, terpenoids and steroids (Julianti et al., 2019)
Herb	Alkaloids, flavonoids, saponins, tannins, phenols, tannins and quinones (Maliangkay et al., 2019; Widayat et al., 2022)

Furthermore, *P. angulata* also has bioactive ingredients, namely Physalin A in the roots, physalin B in the whole plant, physalin D, F, G in the whole plant, physalin E in the whole plant, physalin H in the roots, withangulatin A in the fruit, and physangulatin A in the leaves and stems (Novitasari et al., 2024).

Various properties of Physalis angulata as traditional herbal therapy

The benefits of *P. angulata* as a traditional herbal therapy have been proven both in vitro and in vivo, through studies and research regarding the antibacterial, anticancer, antiparasitic, anti-inflammatory, antifibrotic and antidiabetic properties of this plant (Novitasari et al., 2024).

A study to look at the antibacterial effect showed that ethanol extract of *P. angulata* petals suppressed the growth of *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (Rivera et al., 2015). The growth of *S. aureus* was also suppressed by ethanol extract of *P. angulata* fruit (Hananto et al., 2021). In addition, the aqueous extract of *P. angulata* leaves showed activity against *S. aureus* and the aqueous extract from its aerial parts was effective against *S. aureus* and *Listeria monocytogenes* (Gagare et al., 2021; Dias et al., 2020).

In its function as an antibacterial, Physalin B as an bioactive component in *P. angulata* is considered to play an important role in anticancer therapy (Novitasari et al., 2024; Yang et al., 2018). There are previous studies showing that physalin B has anticancer activity in various human solid tumors, including lung, breast, colon, melanoma and prostate tumors (Fang et al., 2022). By altering mitochondrial function, physalin B causes G2/M cell cycle arrest and cell death in human non-small cell lung cancer cells (A549) and a cell line for human breast cancer (MCF 7) affecting p5334-dependent signaling (Wang et al., 2018).

Next, there are several antiparasitic activity studies in in vitro research with *Trypanosoma cruzi* using the active ingredients physalin B, D, F and G from the ethanol extract of *P. angulata* as candidate antiparasitic agents. Other research said that after 24 hours of treatment, 3.7 g/ml *P. angulata* stem extract significantly reduced the percentage of cells infected with *T. cruzi*. In addition, compared with untreated controls, the anti-leishmanial effect of 3.7 g/ml increased after 48 h, and the number of infected macrophages containing amastigotes of *Leishmania amazonensis* parasites decreased by 91.8% (Novitasari et al., 2024). Its use in proving antifungal activity is also proven by previous research which shows that the ethanol extract of *P. angulata* leaves has compounds that have the potential to act as antifungals and can be formulated into loose powder preparations (H. Ambo Lau & Herman, 2020).

The anti-inflammatory effect of methanol extract of *P. angulata* leaves on carrageenan-induced leg edema was shown to be dose-dependent, with 62.71% inhibition at 400 mg/kg compared with 34.31% inhibition for the standard drug (ibuprofen 100 mg/kg) (Ukwubile & Oise, 2016). The results showed that the average maximum swelling at 2 hours was significantly ($P<0.01$) reduced from 69.77±3.83% in the control group experiencing inflammation to 64.08±1.75, 60.91±0.62 and 59.12±3.34% in the control group 30, 100 and 300 mg/kg treatment groups, respectively. The extract significantly reduced mean maximal swelling ($P<0.001$) when administered 2 and 6 hours after carrageenan-induced leg edema (curative) (Abdul-Nasir-Deen et al., 2020).

Furthermore, Physalin B derived from *P. angulata* has been proven to be an antifibrosis agent. Physalin B has a potent antifibrotic effect on activated hematopoietic stem cells (HSCs), as demonstrated in in vitro and in vivo studies. The antifibrotic activity of physalin B on LX 2 cells was examined using the Cell Counting Kit 8 viability assay, and the results showed that the IC50 was 5 μM. Transforming growth factor β 1-induced HSC proliferation was also inhibited by physalin B. Furthermore, in vivo studies revealed that physalin B reduced liver injury, as measured by decreased levels of aspartate aminotransferase and alanine transaminase (ALT) which was supported by histopathological examination. also

showed that physalin B could improve liver fibrosis (Zhu et al., 2021; Rohmawaty et al., 2021).

Finally, to see the antidiabetic activity of *P. angulata*, previous studies showed that the fruit of *P. angulata* reduced blood sugar levels at doses of 25 and 50 mg/kg. Methanol extract of *P. angulata* roots reduces blood glucose levels at a dose of 200-400 mg/kg body weight (Raju & Mamidala, 2015). The withangulatin A content isolated from *P. angulata* fruit has hypolipidemic action and reduces blood sugar levels (Reddy et al., 2014).

CONCLUSION

In conclusion, this study underscores the significant therapeutic potential of *Physalis angulata* L., highlighting its diverse bioactive compounds, including physalins, flavonoids, and alkaloids, which exhibit antibacterial, anti-inflammatory, anticancer, and antidiabetic properties. The comprehensive review of existing literature demonstrates its efficacy in both traditional and modern medicinal applications, validating its role as a promising natural alternative to synthetic drugs. This herbal monograph provides a detailed review of the characteristics, constituents, and activities of *P. angulata* (*Ciplukan*) as a traditional herbal therapy. Through various previous studies, the active ingredients and secondary metabolites in *P. angulata* have been proven to possess antibacterial, anticancer, antiparasitic, anti-inflammatory, antifibrotic, and antidiabetic properties.

However, gaps remain in understanding the mechanistic pathways of its bioactive compounds, their synergistic effects, and the development of standardized dosage formulations. Future research should focus on isolating and characterizing specific bioactive molecules, conducting clinical trials to validate their safety and efficacy in humans, and exploring sustainable cultivation methods to meet growing demand. Additionally, interdisciplinary studies integrating ethnobotanical knowledge with pharmacological advancements could further bridge the gap between traditional use and scientific validation, ensuring *P. angulata*'s potential is fully realized in global healthcare.

REFERENCES

1. Wohl V, Converse D. Medication and massage therapy: Introduction to pharmacology. Elite Continuing Education. 2020;

2. Novitasari A, Rohmawaty E, Rosdianto A. *Physalis angulata* Linn. as a medicinal plant (Review). Biomed Rep. 2024 Jan 24;20(3):47.

3. H. Ambo Lau S, Herman H. Formulasi dan Uji Stabilitas Fisik Sediaan Bedak Tabur Ekstrak Etanol Daun Ciplukan (Physalis angulata L.) Sebagai Anti

Fungi di Desa Tammatto Kabupaten Bulukumba. jiskh. 2020 Nov 17;12(2):1117–26.

4. Figueiredo MCC, Passos AR, Hughes FM, Santos KSD, Silva ALD, Soares TL. Reproductive biology of Physalis angulata L. (Solanaceae). Scientia Horticulturae. 2020 Jun;267:109307.

5. Habib, Suriyani. Efektivitas Teh Ciplukan (Physalis angulata) Sebagai Minuman Herbal untuk Menurunkan Kadar Gula Pada Darah (Diabetes Melitus). Jurnal Cendekia Sambas. 2023 Nov 4;1(2):55–65.

6. Trisna Meyana Putra IGN, Widi Astuti NM. Review: Studi Kandungan Fitokimia, Aktivitas Antioksidan, dan Toksisitas Ciplukan (Physalis angulata L.). comserva. 2023 Oct 25;3(06):2168–79.

7. Daltro SRT, Santos IP, Barros PL, Moreira DRM, Tomassini TCB, Ribeiro IM, et al. In vitro and In Vivo Immunomodulatory Activity of Physalis angulata Concentrated Ethanolic Extract. Planta Med. 2021 Feb;87(01/02):160–8.

8. Tuan Anh HL, Le Ba V, Do TT, Phan VK, Pham Thi HY, Bach LG, et al. Bioactive compounds from *Physalis angulata* and their anti-inflammatory and cytotoxic activities. Journal of Asian Natural Products Research. 2021 Aug 3;23(8):809–17.

9. Vieceli PS, Juiz PJL, Lauria PSS, Couto RD, Tomassini TCB, Ribeiro IM, et al. Physalis angulata reduces the progression of chronic experimental periodontitis by immunomodulatory mechanisms. Journal of Ethnopharmacology. 2021 Jun;273:113986.

10. Nguyen KNH, Nguyen NVT, Kim KH. Determination of phenolic acids and flavonoids in leaves, calyces, and fruits of Physalis angulata L. in Viet Nam. PHAR. 2021 Jun 22;68(2):501–9.

11. Mahklouf MH. The first record of *Physalis angulata* L. (Solanaceae) for the flora of Libya. Biodiversity Research and Conservation. 2019 Mar 1;53(1):67–71.

12. Mudaffar RA. Identifikasi Morfologi dan Ekologi pada Tumbuhan Liar yang Berpotensi Sebagai Sumber Vitamin C: Identification of Morphology and

Ecology in Potential Wild Plants as Sources of Vitamin C. Perbal. 2022 Feb 8;10(1):100–11.

13. Socfindo Conservation. Physalis angulata [Internet]. Morel Berry. 2024 [cited 2024 Jul 19]. Available from: https://www.socfindoconservation.co.id/plant/368?lang=en
14. Plantnet Project. Solanaceae - Physalis angulata L. [Internet]. Plantinvasivekruger - Solanaceae - Physalis angulata L. 2024 [cited 2024 Jul 19]. Available from: http://publish.plantnet-project.org/project/plantinvasivekruger/collection/collection/synthese/details/PHYAN
15. WIKTROP. Physalis angulata L. | Species [Internet]. WIKTROP - Weed Identification and Knowledge in the Tropical and Mediterranean areas. 2024 [cited 2024 Jul 19]. Available from: https://portal.wiktrop.org/species/show/257
16. De Oliveira AM, Malunga LN, Perussello CA, Beta T, Ribani RH. Phenolic acids from fruits of Physalis angulata L. in two stages of maturation. South African Journal of Botany. 2020 Jul;131:448–53.
17. Helmi HR, Yulianti E, Malihah E, Elhapidi NZ, Dewi MA, Ferdinal F. Kapasitas Antioksidan dan Toksisitas Acaiberry (Euterpe oleracea), Ciplukan (Physalis angulata) dan Kurma Ajawa (Phoenix dactylifera). JMSTKIK. 2021 Oct 30;5(2):361.
18. Afriyeni H, Surya S. Efektivitas Antihiperkolesterolemia Ekstrak Etanol Dari Bagian Batang Dan Buah Tumbuhan Ciplukan (Physalis Angulata L.) pada Tikus Putih Hiperkolesterolemia. Jurnal Farmasi Higea. 2019 Mar 25;11(1):49–61.
19. Ridwanuloh D, Syarif F. Isolasi dan Identifikasi Senyaway Flavonoid dari Batang Ciplukan (Physalis angulata L.). Pharma Xplore : Jurnal Sains dan Ilmu Farmasi. 2019 Sep 2;4(1):288–96.
20. Ushie OA, Neji PA, Abeng FE, Okpashi VE, Baba NH, Azuaga TI. Phytochemical Screening and Antimicrobial Activities of Chloroform and Ethyl Acetate Extracts of Physalis angulata. Journal of Chemical Society of Nigeria. 2019 Nov 4;44(6).

21. Tampie B, Damiana R Astuti, I Ketut M Adnyane, Aryani S Satyaningtijas. The Potential of Ciplukan Leaf Extract (Physalis Angulata L.) to Improve Kidney Function. Acta Vet Indones. 2023 Mar 30;11(1):9–16.

22. Alam T, Ekayanti M, Permana N, Hadissabil Z. The potential antioxidant activity of ethanol extract and fraction of ciplukan (Physalis angulata) on DPPH (1,1-diphenyl-2-picrylhydrazyl). Jurnal Farmasi Indonesia. 2022 Apr 30;19(1):193–9.

23. Adewolu A, Adenekan AS, Uzamat OF, Ajayi OO. Ameliorative Effects of Ethanolic Leaf Extract of Physalis angulata (Ewe Koropo) on Diabetic-Induced Wistar Rats in South West Nigeria. Med chem. 2021;11.

24. Julianti WP, Ikrawan Y, Iwansyah AC. Pengaruh Jenis Pelarut terhadap Kandungan Total Fenolik, Aktifitas Antioksidan dan Toksisitas Ekstrak Buah Ciplukan (Physalis angulata L). Jurnal Riset Teknologi Industri. 2019 Jul 1;13(1):70.

25. Iwansyah AC, Luthfiyanti R, Ardiansyah RCE, Rahman N, Andriana Y, Hamid HA. Antidiabetic activity of Physalis angulata L. fruit juice on streptozotocin-induced diabetic rats. South African Journal of Botany. 2022 Mar;145:313–9.

26. Maliangkay HP, Rumondor R, Kantohe M. Skrining Fitokimia dan Potensi Antidiabetes Ekstrak Etanol Herba Ciplukan (Physalis Angulata L) pada Tikus Putih (Rattus Novergicus) yang Diinduksi Aloksan. J-Pendidikan Biologi. 2019 Dec 31;4(3):98–107.

27. Widayat U, Chaidir C, Setyahadi S. Optimasi Dan Identifikasi Fitokimia Serta Uji Efek Hipoglikemik Kombinasi Ekstrak Daun Dandang Gendis (Clinacanthus nutans) Dan Ekstrak Ciplukan (Physalis angulata L.) Secara In Vitro. IJPF. 2022 May 11;9(1):24–9.

28. Rivera DE, Ocampo YC, Castro JP, Caro D, Franco LA. Antibacterial activity of Physalis angulata L., Merremia umbellata L., and Cryptostegia grandiflora Roxb. Ex R.Br. - medicinal plants of the Colombian Northern Coast. Orient Pharm Exp Med. 2015 Mar;15(1):95–102.

29. Hananto H, Rahman A, Fahmi M. Antibacterial Activity of Ethanolic Extract of Morel Berry (Physalis angulata L.) towards Staphylococcus aureus. Malaysian Journal of Medicine and Health Sciences. 2021;17(2):132–5.

30. Gagare SB, Chavan SL, Sagade AB. Antibacterial Potential And Phytochemical Screening Of Physalis angulata And Solanum virgianum. IJRBAT. 2021 Jan 30;1(9):36–40.

31. Dias FGB, Ferreira MJG, Silva LMRD, Menezes RCDS, Figueiredo EATD. Bioaccessibility of the bioactive compounds and antimicrobial activity of aqueous extracts of Physalis angulata L. REVISTA CIÊNCIA AGRONÔMICA [Internet]. 2020 [cited 2024 Jul 19];51(3). Available from: http://periodicos.ufc.br/revistacienciaagronomica/article/view/88814

32. Yang Y, Yi L, Wang Q, Xie B, Sha C, Dong Y. Physalin B Suppresses Inflammatory Response to Lipopolysaccharide in RAW264.7 Cells by Inhibiting NF- κ B Signaling. Journal of Chemistry. 2018 Jun 6;2018:1–6.

33. Fang C, Chen C, Yang Y, Li K, Gao R, Xu D, et al. Physalin B inhibits cell proliferation and induces apoptosis in undifferentiated human gastric cancer HGC-27 cells. Asia-Pac J Clncl Oncology. 2022 Jun;18(3):224–31.

34. Wang A, Wang S, Zhou F, Li P, Wang Y, Gan L, et al. Physalin B induces cell cycle arrest and triggers apoptosis in breast cancer cells through modulating p53-dependent apoptotic pathway. Biomedicine & Pharmacotherapy. 2018 May;101:334–41.

35. Ukwubile CA, Oise IE. Analgesic and Anti-inflammatory Activity of Physalis angulata Linn. (Solanaceae) Leaf Methanolic Extract in Swiss Albino Mice. 2016;

36. Abdul-Nasir-Deen AY, Boakye YD, Osafo N, Agyare C, Boamah D, Boamah VE, et al. Anti-inflammatory and wound healing properties of methanol leaf extract of Physalis angulata L. South African Journal of Botany. 2020 Sep;133:124–31.

37. Zhu X, Ye S, Yu D, Zhang Y, Li J, Zhang M, et al. Physalin B attenuates liver fibrosis via suppressing LAP2α–HDAC1-mediated deacetylation of the transcription factor GLI1 and hepatic stellate cell activation. British J Pharmacology. 2021 Sep;178(17):3428–47.

38. Rohmawaty E, Mardanarian Rosdianto A, Aminah Usman H, A. M. Saragih W, Zuhrotun A, Hendriani R, et al. Antifibrotic effect of the ethyl acetate

fraction of ciplukan (Physalis angulata Linn.) in rat liver fibrosis induced by CCI4. Journal of Applied Pharmaceutical Science. 2021 Dec 5;

39. Raju P, Mamidala E. Anti diabetic activity of compound isolated from Physalis angulata fruit extracts in alloxan induced diabetic rats. AJSMR. 2015 Apr 9;1(1):40–3.

40. Reddy P, Vijay Kumar R, Reddy G, Reddy M, Reddy Y. Anti-diabetic and Hypolipidemic Effect of Aqueous and Methanolic Root Extracts of Physalis angulata in Streptozotocin (STZ) Induced Diabetic Rats. International Journal for Pharmaceutical Research Scholar. 2014;3(1):402–9.