

# Novelty of Research on Utilization of Gambir Extract (*Uncaria Gambir*) as Ink Raw Material: Bibliometric and Study Analysis

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## ABSTRACT

One of Indonesia's leading commodities is gambier. Indonesia is the world's largest supplier of gambier at 80%, and 90% of Indonesia's gambier supply is produced from West Sumatra. Gambier production in West Sumatra in 2022 reached 13,887 tons. This high production figure must be accompanied by optimization of gambier utilization and diversification of gambier processed products. This study uses bibliometric analysis to review the existing literature on gambier and its utilization. The visualization mainly focuses on research and review articles filtered using the keyword Gambier extract utilization. Data was collected from Science Direct. In total, 110 articles published between 2014-2024 were selected for analysis. An important observation was that most of the research articles were published in 2021 and 2023. Interestingly, there were neither research publications nor review articles on using gambier as an ink raw material. However, gambier extract has been widely utilized in the health field as an antioxidant, anti-diabetic, anti-viral, and others.

**Keywords:** Gambier extract, Ink, Bibliometric, Vos viewers.

## INTRODUCTION

Gambir is an intermediate product that is an extract from gambier leaves. Gambir is obtained through a process of processing the leaves of the gambier plant to produce gambier products because gambier comes from leaf extracts, the main components are the main compounds contained in gambier leaves (Santoso et al., 2022). As is known, that gambier extract has been developed into a raw material for fingerprint ink that has been used in the general election of the Indonesian Republic in 2024. This is supported by the content of catechu tannic acid (20-55%) and catechin (7-33%) in Gambier. These two compounds are complex compounds that are classified into natural phenolics with flavonoid structures. Gambir in an alkaline atmosphere can give a blood-red color, while if added to saturated alcoholic  $FeCl_3$  and saturated  $NaOH$  will give a blue to black color (Muchtar et al., 2014).

Gambir production in West Sumatra in 2022 reached 13,887 tons, including those produced from District 50 Kota with a total production of 7,846 tons, Pesisir Selatan District 5,875 tons, Pasaman District 88 tons, Agam District 40 tons, and Padang City 38 tons (BPS, 2022). With the high availability of gambier in Indonesia, especially in West Sumatra, it will be a great opportunity to be able to produce marker ink products that use natural raw materials and come from within the country or have a high Domestic Content Rate (TKDN).

Bibliometric analysis is a research method that uses bibliographic data, such as scientific publications, to identify patterns, trends, and relationships in scientific research. It involves the use of statistical and computational techniques to quantitatively analyze the information contained in bibliographic sources, such as journal articles, books, and scientific websites. The main objectives are to understand the structure and development of a particular research field, identify key contributors, measure the impact of publications, and identify opportunities and challenges for future research. Bibliometric analysis is often used in research quality evaluation, academic performance assessment, identification of research trends, and scientific policy development.

In this study, the analysis focused on the field of agricultural product technology related to the utilization of gambier. This observation will be used as data support for the novelty of research related to the utilization of gambier as a raw material for making ink.

## MATERIALS AND METHOD

### Data sources and extraction

References were taken from review articles and research published in Science Direct. The keyword used was the utilization of gambier extract. From the search results, 110 publication articles were obtained. All documents were exported for metadata using RIS files. The reference range used is the publication of the last 10 years, starting from 2014 to 2024. This research focused on analyzing titles, abstract contents, and keywords. Further bibliometric analysis was conducted using VOS viewer 1.6.18 for Windows software. The minimum number of occurrences of a term was set at a minimum of 1 time and the number of terms to be selected was set at the maximum threshold.

### Term map

VOS viewer was used to visualize and analyze trends in the form of bibliometric maps. VOS viewer can create publication maps, country maps, or journal maps based on co-citation or build keyword maps based on shared networks. The frequency of keywords can be adjusted as desired and less relevant keywords can be removed. After the visualization results are obtained, a review of all articles is then carried out.

## RESULT AND DISCUSSION

### Publication trends

The research data was collected through Science Direct, which was accessed in June 2024. Based on the data retrieval, we collected 110 articles related to the utilization of gambier extract. The number of article publications continued to fluctuate from 2014 to 2024. As shown in Figure 1, from 2014 to 2015 there was an increase, but in 2016 and 2017 there was a significant decrease. The highest number of publications was published in 2021 and 2023, namely 17 articles.

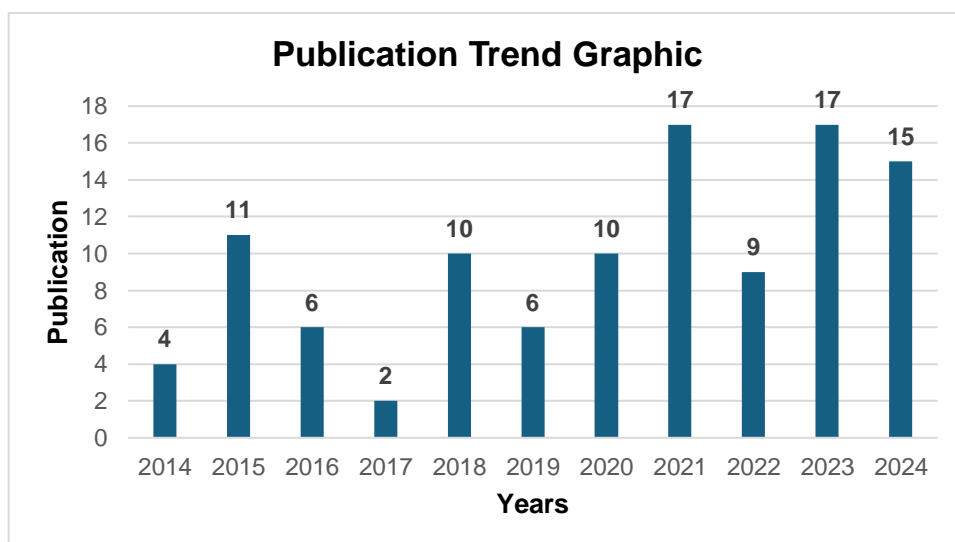


Figure 1. Bar Chart of Period Publishing

### Keyword co-occurrence network

Based on the results of the bibliometric analysis obtained, it can be seen from the visual representation in Figure 2, that the utilization of Gambier has been widely carried out, including those related to antioxidants, antimicrobials, type 2 diabetes mellitus, obesity, antiviral agents, and pharmacology, among others.

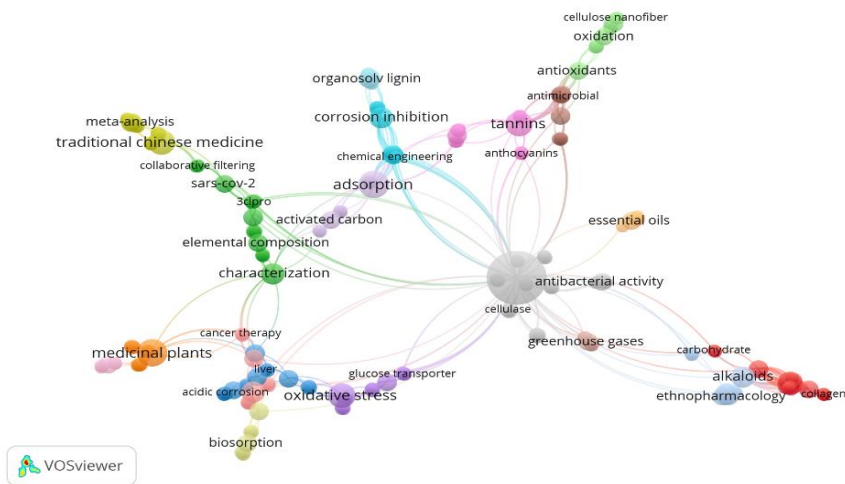


Figure 2. Network Visualization Using VOS viewer

Gambir (genus *Uncaria*) is a genus of plants belonging to the Rubiaceae tribe with active components consisting of catechins (7-33%), catechu tannic acid (20-55%), and pyrokatekol (20-30%) (Ferdinal, 2014). In Indonesia, gambier is generally used for weeding. According to Anggraini et al. (2013), gambier can also be utilized as an anti-acne gel formulation processed from gambier ethyl acetate extract.

In addition, tannin compounds found in gambier have a chemical structure rich in phenolic hydroxyl groups. When reacted with  $\text{FeSO}_4$ , these hydroxyl groups can react with iron (II) ions ( $\text{Fe}^{2+}$ ) in  $\text{FeSO}_4$  and form new colored complex compounds. The complex formed between gambier tannins and  $\text{FeSO}_4$  often has a dark or black color (Yeni, 2017). This is the basis for the utilization of gambier as a raw material for making ink pigments.

However, the results of the bibliometric analysis obtained show that the attention to the development of gambier extract is still very lacking. This can be seen from the absence of publications related to the utilization of gambier as ink raw material. This means that the utilization of gambier extract still needs to be improved to produce diverse products to optimize the potential of gambier as a superior Indonesian commodity.

Recent research shows that gambier extract has been developed into a raw material for fingerprint ink that has been used in the general election of the Republic of Indonesia in 2024. Therefore, it needs to be developed further whether gambier extract can also be developed into marker ink, printer ink, stamp ink, etc.

### Keyword co-occurrence overlay

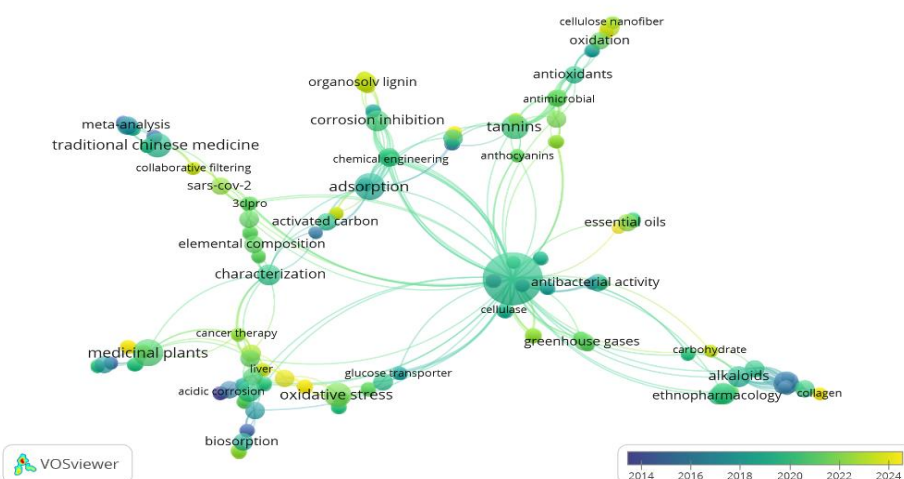


Figure 3. Overlay Visualization Using VOS viewer

In Figure 3, article novelty is visually depicted, with brighter nodes indicating more recent publications. The yellow nodes represent research and review articles published between 2022 and 2024, covering topics such as catechin, carbohydrates, natural products, oxidative stress, diabetes, PVA blend film, and UV shielding. These recent articles demonstrate the latest advancements and investigations related to the utilization of gambier extract.

On the other hand, purple-colored nodes indicate articles published in previous years, specifically from 2014 and later. These older publications may be the basis for research on the utilization of gambier extract. The green-colored nodes represent articles published in the intermediate period, around 2018 to 2021. These articles likely contribute to bridging the gap between previous research and more recent findings.

From an in-depth examination of Figure 3, we can conclude that most of the research related to gambier extract utilization mainly focuses on understanding its various components and their functional roles.

## CONCLUSION

Using bibliometric analysis and VOS viewer software, we conducted a thorough examination of research trends related to the utilization of gambier extract. A total of 110 articles published between 2014 and 2024 were carefully selected for this analysis.

It was noted that 2021 and 2023 saw a significant increase in the publication of research articles related to gambier extract utilization, indicating a growing interest and focus on this subject. Interestingly, we have not found any research or review articles related to the utilization of gambier extract as a raw material for making ink. However, it should be noted that gambier extract has been widely used in various fields, such as medicine, cosmetics, and others.

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