



## Antibacterial activity of Purified Gambier (*Uncaria gambir* Roxb.)

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### ABSTRACT

The bacterial resistance shown by the microorganisms in the presence of antimicrobial agents has prompted the search for new materials to overcome this public health problem. Gambir (*Uncaria gambir*, Roxb.) leaves extract has high catechin content thereby potentially antibacterial. This research aimed to examine the effect of purified gambir extract on inhibiting growth and killing bacteria. The antibacterial activity of Purified gambir extract (*Uncaria gambir* Roxb.) with concentrations of 32%, 16%, and 8% was tested against *S. aureus* and *P. aeruginosa* using the agar diffusion method. Purified gambir extract at concentrations of 8%, 16%, and 32% showed antibacterial activity against *Staphylococcus aureus* with an average inhibition zone diameter of 19.25 mm, 23.45 mm, and 26.25 mm, respectively. Purified gambir extract at concentrations of 8%, 16%, and 32% also showed antibacterial activity against *Pseudomonas aeruginosa* with an average inhibition zone diameter of 11.55 mm, 15.4 mm, and 18.5 mm, respectively. In conclusion, purified gambir extract (*Uncaria gambir* Roxb.) has very strong antibacterial activity against *Staphylococcus aureus* bacteria and strong antibacterial activity against *Pseudomonas aeruginosa*.

**Keywords:** Antibacterial, *Uncaria gambir*, Purified Gambier, Diffusion agar method.

### 1. Introduction

Antimicrobial agents are essentially important in reducing the global burden of infectious diseases. However, as resistant pathogens develop and spread, the effectiveness of the antibiotics is diminished. This type of bacterial resistance to antimicrobial agents poses a very serious threat to public health, and for all kinds of antibiotics, including the major last-resort drugs, the frequencies of resistance are increasing worldwide (Dadgostar, 2019). Therefore, antimicrobial drug discovery from alternative sources is gradually gaining importance, particularly related to antibacterial drug discovery. Secondary metabolites are a major reservoir of chemical diversity, therefore, they are considered a potential source of new drugs for combating the perils of drug resistance (Sen & Samanta, 2014). Previous research has discovered that various plants have a diverse range of pharmacological activities with the potential to treat a variety of diseases (Cahyo et al., 2021; Ifora et al., 2016, 2019, 2022; Mustika et al., 2021). One of the native plants in Indonesia which contain a large number of catechins is Gambir (*Uncaria gambir* Roxb.) (Kurniatri et al., 2019). Gambir leaf extract contains catechins as a major component as well as some other components such as catechu tannin acid, quercetin, red catechu, gambir fluorescent, fats, and waxes (Munggari et al., 2022). The presence of a high content of catechins in Gambir leaves makes it a potential plant to be used in traditional medicine. The *Uncaria gambir* Roxb. plant has long been used in traditional medicine to treat diarrhea, sore throat, swollen gums, dysentery, arteriosclerosis, and obesity (Ilmu et al., 2016). Previous studies reported that gambir extract has the potential for a wide range of pharmacological activities such as antioxidant (Amir et al., 2012), antihypertensive (Permatasari et al., 2022), anticancer (Syarifah et al., 2019), antifungal (Handayani et al., 2022), anti-inflammatory (Auliana et al., 2022; Munggari et al., 2022; Yunarto et al., 2020), anti-hyperglycemic (Yunarto et al., 2021), anti-hyperuricemia (Rismana et al., 2017), and antihyperlipidemic (Mita et al., 2022; Of et al., 2021). Therefore, these various bioactivities prove the potential of this plant to be applied in treating many diseases. This study aimed to examine the effect of purified gambir extract on inhibiting growth and killing bacteria.

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## 2. Materials and Method

### 2.1 Materials

Purified gambier was obtained from PT. Andalas Sitawa Fitolab, Padang, Indonesia which is equipped with CoA, SDA (Sabouraud Dextrose Agar) (Oxoid), NA (Nutrient Agar) (Merck), DMSO (Dimethylsulfoxide) (Merck), chloramphenicol disk 30 µg/disk (Oxoid)

### 2.3 Sample preparation

Purified gambier extract was dissolved with Dimethylsulfoxide (DMSO), then made dilutions with concentrations of 32%, 16%, and 8%.

### 2.4 Screening for antibacterial activity

The antibacterial activity from Purified Gambier extract (*Uncaria gambir* Roxb.) was tested against *S. aureus* and *P. aeruginosa* using the diffusion agar method. Briefly, sterilized disks with Purified Gambier were placed on nutrient agar plates with the test organisms and incubated at 37°C for 24 h. The presence of a clearance zone around the disk were used as an indicator of antimicrobial bioactivity. Chloramphenicol disc (30 µg) is a positive control, while DMSO is negative. The zone of inhibition was measured in mm. The diameter of the inhibition zone were used to categorize the strength of antibacterial activity according to Davis and Stout (1971) as follows: Very strong ( $\geq 20$  mm), strong (10 - 20 mm), moderate (5 - <10 mm), and weak ( $\leq 5$  mm)(Davis & Stout, 1971).

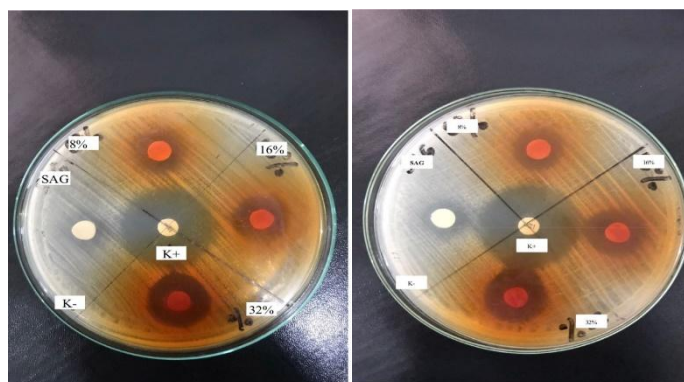
## 3. Results and Discussion

This study examines the performance of purified gambier in inhibiting the growth of *S. aureus* and *P. aeruginosa* bacteria using the agar diffusion method. The results of those studies are described in Table 1.

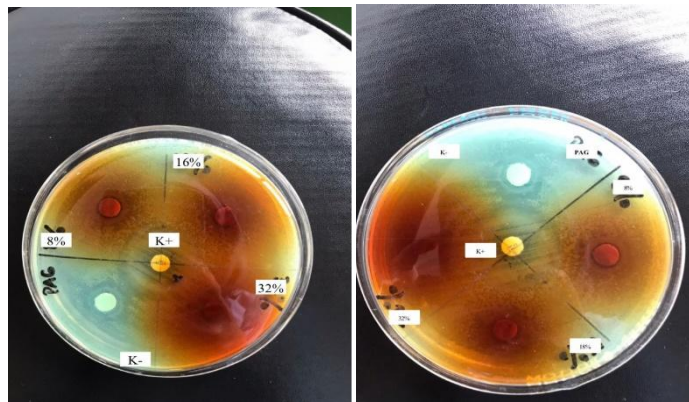
In the present study, a purified gambier extract with a concentration of 32%, 16%, and 8% was used. The antibacterial activity of the gambier extract was verified against *Staphylococcus aureus* bacteria. At concentrations of 8%, 16%, and 32%, the average diameter of the inhibition zone was 19.25 mm, 23.45 mm, and 26.25 mm, respectively. The concentration of 8% is included in the strong category, while the concentrations of 16% and 32% are in the very strong category. The positive control (chloramphenicol) resulted in an average inhibition zone diameter of 28.2 mm which was included in the very strong category (Figure 1).

**Table 1. Antibacterial activity of purified gambier**

| No. | Groups               | Diameter of inhibition zone (mm) (Mean $\pm$ SD) |                               |
|-----|----------------------|--|-------------------------------|
|     |                      | <i>Staphylococcus aureus</i>                     | <i>Pseudomonas aeruginosa</i> |
| 1   | 8%                   | 19,25 $\pm$ 0,35                                 | 11,55 $\pm$ 0                 |
| 2   | 16%                  | 23,45 $\pm$ 0,21                                 | 15,4 $\pm$ 0,141              |
| 3   | 32%                  | 26,25 $\pm$ 0,14                                 | 18,1 $\pm$ 0,29               |
| 4   | Chloramphenicol (K+) | 28,2 $\pm$ 0,35                                  | 26,45 $\pm$ 0,85              |



**Figure 1. Diameter of the inhibition zone against *Staphylococcus aureus***



**Figure 2. Diameter of the inhibition zone against *Pseudomonas aeruginosa***

The antibacterial activity of the gambier extract was verified against *Pseudomonas aeruginosa* bacteria. At concentrations of 8%, 16%, and 32%, the average diameter of the inhibition zone was 11.55 mm, 15.4 mm, and 18.5 mm, respectively. The concentration of 8%, 16%, and 32% are included in the strong category. The positive control (chloramphenicol) resulted in an average inhibition zone diameter of 26.45 mm which was included in the very strong category (Figure2).

The findings of this study are supported by several previous studies that demonstrated *Uncaria Gambier*'s ability to fight a variety of bacteria, including: Julinda et al 2021 reported that the combination of various *Uncaria gambier* solvents has been shown to inhibit and kill *E. faecalis*. The combination of Ethyl Acetate-water fraction is the best combination against *E. faecalis* (Julinda et al., 2021). Another study found the gambier extract exerted higher antibacterial activity against gram-negative bacteria *E. coli* and *Salmonella sp.* than *Staphylococcus aureus*, a gram-positive bacteria. Various classes of phytochemicals have been identified in *U. gambier* extracts such as alkaloids, flavonoids, and tannins (Auliana et al., 2022; Faiz et al., 2020). In addition, previous studies also reported that various isolates from *Uncaria gambier* have an antibacterial activity such as phenolic content from gambier which can inhibit the growth of *Staphylococcus aureus* (Pambayun et al., 2007), and catechins from gambier are also able to inhibit the growth of *S. epidermidis*, *S. mutans*, and *S. viridans* (Murdja et al., 2017). The current study has shown the promising potential of *Uncaria gambier* especially the purified gambier extract as a potential antibacterial drug candidate.

#### 4. Conclusion

Purified gambier extract (*Uncaria gambier* Roxb.) has very strong antibacterial activity against *Staphylococcus aureus* bacteria and strong antibacterial activity against *Pseudomonas aeruginosa*.

#### Conflict of interest

The authors declare that there are no conflicts of interest.

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