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ANTIFUNGAL STUDY AGAINST *CURVULARIA* SP. FROM *UNCARIA GAMBIR* ROXB LEAF EXTRACT

STUDI ANTIFUNGAL TERHADAP *CURVULARIA* SP. DARI EKSTRAK DAUN *UNCARIA GAMBIR* ROXB

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Abstract

Isomitrafoline and Speciophylline show the strongest general Anesthetic (92.2) compared to other ligands. This study aims to determine the effect of gambir leaf extract on the growth of Curvularia sp. fungus and the concentration of extract that can inhibit 50% of the growth of fungal colonies. The research method used was a Completely Randomized Design (CRD) with 4 variations of extract concentration (0%, 5%, 10%, and 15%), each repeated 6 times. The results showed that the highest concentration of gambir leaf extract in inhibiting fungal growth was at a concentration of 15%. LC 50% analysis revealed that the concentration required to achieve 50% inhibition was 118.16%, indicating that the effectiveness of the extract against Curvularia sp. fungus is low or less toxic.

Keywords*: *Uncaria gambir Roxb leaves, curvularia sp., antifungal

Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh ekstrak daun gambir terhadap pertumbuhan Curvularia sp. jamur dan untuk mengetahui konsentrasi ekstrak yang mampu menghambat 50% pertumbuhan koloni jamur. Metode penelitian yang digunakan adalah Rancangan Acak Lengkap (RAL) dengan 4 variasi konsentrasi ekstrak (0%, 5%, 10%, dan 15%), masing-masing diulang sebanyak 6 kali. Hasil penelitian menunjukkan bahwa konsentrasi ekstrak daun gambir yang paling tinggi dalam menghambat pertumbuhan jamur berada pada konsentrasi 15%. Analisis LC 50% menunjukkan bahwa konsentrasi yang diperlukan untuk mencapai daya hambat 50% adalah 118,16% yang menunjukkan bahwa efektivitas ekstrak terhadap Curvularia sp. jamur rendah atau kurang beracun.

Kata Kunci : daun uncaria gambir roxb, curvularia sp., antijamur

INTRODUCTION

Curvularia sp. is one type of pathogenic fungus that is often found in plantation crops. This fungus is known as a causative agent of various plant diseases, such as leaf spots, which can have a negative impact on plant productivity. Control of this fungus is generally carried out using synthetic fungicides. However, long-term use of chemical fungicides can cause resistance in fungi and adverse side effects (Anugrah & Widiantini, 2018).

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Along with increasing awareness of the importance of environmentally friendly and sustainable agriculture, the search for alternative biological control is becoming increasingly important (Wyckhuys *et al*., 2024). One potential alternative is to use natural compounds from plants that have antifungal activity. One plant that shows potential as an antifungal is *Uncaria gambir* Roxb. which is known as gambir (Pramanik *et al*., 2023).

Gambir leaves have long been used in various traditional medicines in Southeast Asia, mainly due to their bioactive compounds such as catechins (Luo *et al*., 2024). Previous studies have shown that gambir leaf extract has various biological activities, including antifungal activity such as *Candida albicans* (Rosa, 2021). However, specific studies on the effectiveness of gambir leaves as an antifungal against *Curvularia* sp. are still limited (Santra *et al*., 2024). This study aims to explore the potential of gambir leaf extract as an antifungal in inhibiting the growth of *Curvularia* sp. with various extract concentrations.

RESEARCH METHODS

The design used was a Completely Randomized Design (CRD) with four treatments of gambir extract concentration: 0% (negative control), 5%, 10%, and 15%, which were repeated six times, resulting in 24 experimental units.

Tools

The tools used in this study were an autoclave, sieve, stirring rod, spray bottle, vial bottle, petri dish, porcelain dish, cork borer, Erlenmeyer flask, beaker, measuring cup, hammer mill, hotplate magnetic stirrer, incubator, vernier caliper, ose needle, refrigerator, laminar airflow (LAF), microscope, Bunsen burner, tweezers, dropper pipette, oven, rotary vacuum evaporator, spatula, test tube, digital scale, glass jar, vortex, and water bath.

Materials

The materials used in this study were agar, aluminum foil, distilled water, 70% alcohol, acetic acid (CH_3COOH), sulfuric acid (H_2SO_4), gambir leaves (*Uncaria gambir* Roxb.), 96% ethanol, 10% $FeCl_3$, granulated sugar, 2 N HCl, 0.1 M dilute HCl, Curvularia sp. isolate, cotton, potatoes, filter paper, 10% NaOH, heat-resistant plastic, plastic wrap, coulee reagent, Mayer reagent, Wagner reagent, spirits, and tissue.

Procedure

In Silico Test

Using the KNApSAcK website (http://www.knapsackfamily.com) and PASS Online (www.way2drug.com) to identify the antifungal potential of compounds in *Uncaria gambir* based on SMILES codes and biological activity probability (Singh *et al*., 2024).

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Making Simplisia

Gambir leaves are dried using sunlight, ground into powder using a hammer mill, and stored in a container protected from direct sunlight.

Extract Preparation

Following the maceration method (Safitri *et al*., 2023), 500 grams of gambir leaf powder was soaked in 96% ethanol (1:4) for 72 hours, filtered, and concentrated using a rotary evaporator.

Ethanol-Free Test

To detect the presence of ethanol, 1 ml of extract was tested with acetic acid and sulfuric acid (Uddin *et al*., 2024).

Phytochemical Test

Screening for active compounds such as alkaloids, flavonoids, tannins, terpenes, and saponins was carried out to ensure the content of bioactive compounds (Faruq *et al*., 2024).

Sterilization of Tools and Materials

All tools and materials were sterilized by autoclaving at 121°C for 15 minutes or by Bunsen burner (Terrones-Fernandez *et al*., 2024).

Preparation of PDA Media

Potato dextrose agar (PDA) media was made by boiling potatoes, mixing them with agar and sugar, then putting them in an Erlenmeyer flask and sterilizing them (Kaswi *et al*., 2024).

Isolate Rejuvenation

Isolate Curvularia sp. rejuvenated on PDA media before toxicity test to ensure active metabolism (Faleye *et al.*, 2024).

Toxicity Test

The food poisoning technique was used by adding gambir leaf extract (5%, 10%, and 15%) to PDA media and measuring the growth of *Curvularia* sp. fungus after incubation.

Data Analysis

The data collected are primary data obtained by measuring the diameter of mushroom growth using a caliper (mm). The data are then tabulated and analyzed using Analysis of Variance (ANOVA) with Minitab software. If there is a significant difference, further analysis will be carried out using Tukey's multiple comparison test at a 99% confidence level *(*Mishra *et al*., 2019).

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RESULTS AND DISCUSSION

Analysis of Compound Potential through In Silico Test

The results of the in silico test show that most compounds in gambir leaves have moderate biological potential as antifungal agents, with an active probability (Pa) above 0.3. Compounds such as Cinchonain Ia, Gambiriin B1, and Catechin are among those that have the potential for further research, while Mitraphylline and Uncarine B show low potential.

Gambir Leaf Extract Yield

Gambir leaf extraction produces a yield of 16%, exceeding the minimum standard of 10% based on the Herbal Pharmacopoeia. This high yield indicates the optimal active substance content for further research as an antifungal agent.

Ethanol-Free Test Results

The ethanol-free test showed that the gambir leaf extract did not contain ethanol, ensuring that the antifungal activity produced came entirely from the active compounds in the gambir leaves, not from ethanol as a solvent.

Phytochemical Test

The phytochemical test showed the presence of phenols, terpenoids, and saponins in the gambir leaf extract, which are known to have antimicrobial activity. The absence of alkaloids and flavonoids is likely due to the excessive drying process. The presence of phenols, terpenoids, and saponins strengthens the potential of gambir leaves as an antifungal agent.

Antifungal Test

At a concentration of 15%, the highest inhibition was achieved with an average of 34.93% on the 2nd day after incubation, which then decreased to 23.59% on the 8th day. This is thought to be due to the degradation of active compounds over time or the adaptation of fungi to the environment.

The results of statistical tests showed that gambir leaf extract provided significant inhibition of *Curvularia* sp., with a significant effect on increasing extract concentration. Antifungal compounds such as terpenoids, saponins, and phenols in the extract play a role in disrupting cell membranes and the fungal reproduction process, although their effectiveness is limited.

Probit analysis showed that the LC 50% value of this extract reached 118.16%, indicating low toxicity and the need for high concentrations to inhibit 50% of fungal growth. The low effectiveness of the extract was due to the minimal number of active compounds such as alkaloids and flavonoids detected in the extract, indicating that the extraction process or preparation method may need to be refined to increase the bioactive content.

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CONCLUSION

This study examined the antifungal effects of gambir leaf extract on *Curvularia* sp. using the food poisoning method. The results showed that gambir leaf extract was able to inhibit the growth of Curvularia sp., with the highest inhibition at a concentration of 15%, although its overall effectiveness was relatively low. The concentration required to achieve 50% inhibition (LC50) was 118.16%, indicating that the extract has low toxicity and requires high concentrations for significant inhibition.

Based on these results, it is recommended that further research be conducted on other pathogenic fungi to explore the antifungal potential of gambir leaf extract on more sensitive species. In addition, it is necessary to make gambir leaf simplicia using the air or oven drying method to maintain the content of alkaloid and flavonoid compounds. This step is expected to increase the antifungal effectiveness of the extract so that it can provide more optimal results.

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