



## IN VITRO ANTIMICROBIAL ACTIVITY OF THE STEMS AND LEAF EXTRACTS OF *Paederia foetida* Linnaeus (*Kantutai*), family *Rubiaceae*

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### Abstract

Reportedly, *Poederia foetida* locally known as ‘kantutai’ has long been used in traditional medicine in the Philippines in the treatment of rheumatism, ulcers, diarrhea, dysentery, inflammation of the spleen, indigestion and flatulence. However, these reports were anecdotal, thus the need to provide scientific basis to traditional healing practices of marginalized and geographically isolated communities. This study aimed to investigate the antimicrobial properties of *P. foetida* extracts from stems and leaves against *S. aureus*, *E. coli*, and *C. albicans*. The extracts exhibited antimicrobial activity against bacteria but not against the fungus. Ethyl alcohol extracts showed larger inhibition zones compared to ethyl acetate extracts. Phytochemical screening revealed the presence of alkaloids, saponins, and tannins. Further research is suggested to optimize extraction protocols and explore the full potential of *P. foetida* as an antibacterial agent.

Keywords: antimicrobial, extract, *Candida albicans*, *Escherichia coli*, *Paederia foetida*, *Staphylococcus aureus*

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### 1. Introduction

*Paederia foetida*, a plant species known for its unpleasant odor resembling sulfur or fetid aroma, possesses various common names such as *kantutai* or *otot-bagtik* in Northern Samar. This unique smell is attributed to the presence of sulfur compounds, particularly dimethyl disulfide, in the oils of its leaves and stems. Belonging to the Rubiaceae family, this herbaceous plant features slender vines that can be hairy or smooth, allowing it to climb over shrubs and trees and reach the canopy. Notably, the leaves of *Paederia foetida* are rich in carotene, vitamin C, and proteins with various essential amino acids.

The versatile leaves of this plant have multiple medicinal uses. They are effective in treating gastrointestinal issues like diarrhea, dysentery, and flatulence-related distension. Additionally, they can alleviate intestinal problems such as cramps and colic dysentery, and external application can aid in healing bruises and reducing swelling. *Paederia foetida* leaves are also beneficial for nose ulcerations, earaches, swollen eyes, and abdominal swelling. Bathing with crushed leaves can provide anti-rheumatic treatment, and leaf decoctions are helpful in relieving urinary retention and urinary bladder stones. Moreover, the decocted leaves can be used internally or externally for fever relief.

The roots of this plant have emetic properties and are utilized in the treatment of piles, spleen inflammation, chest pain, and liver discomfort. The fruits are used for toothaches and restoring the color of darkened teeth, while the bark is known for its effects on constipation, asthma, urethral calculi, and aiding in placenta removal after a miscarriage.

*Paederia foetida* has been extensively studied for its therapeutic properties. It has shown antioxidant, antinociceptive, antiviral, cough suppressant, anti-cancer, antidiarrheal, anti-arthritic, analgesic, anti-helminthic, anti-inflammatory, hepatoprotective, and testosterone-boosting effects. The plant has also demonstrated positive results in the treatment of colitis, shigellosis, and chemolithotripsy. However, further research is needed to explore its antibacterial activity.

With this, *Paederia foetida* proves to be a remarkable plant with diverse applications in traditional medicine, highlighting its potential as a valuable natural resource for various health conditions. Hence, this study will try to evaluate its antimicrobial properties.

## 2. METHODOLOGY

### Sample preparation

Fresh leaves of *P. foetida* from Palapag, Northern Samar, underwent taxonomic authentication at the Natural History Museum, Philippines. Around 150g of leaves were washed, dried, and manually juiced. The dried material was mixed with a 1:2 ratio of ethyl alcohol and ethyl acetate and left to sit for 24 hours at 32°C in an oven.

The mixture of extract and solvent underwent filtration using cheesecloth and Whatman no 41mm filter paper. The filtered extract was then distilled to remove the solvent. After distillation, the resulting extract was transferred to a sterilized bottle and labeled for identification.

The detection of secondary metabolites was carried out using the protocols of Guevara (2005), and some from the study Dagalea *et al.* (2022).

The test for the presence of alkaloids was done with the reaction of dragendorff's reagent and mayer's reagent. The test for the presence of saponins was determined using capillary tube. The test for the presence of flavonoids was performed using a test tube screening technique. Lastly, the test for the presence of tannins was performed using the plant sample and was centrifuged.

### Preparation of culture media and sensitivity discs

To prepare bacteria culture media, 19g of Nutrient Agar (NA) was dissolved in 500mL distilled water. For fungi culture media, 9.5g of Potato Dextrose Agar (PDA) was dissolved in 250mL water. The mixtures were agitated and sterilized at 121°C and 15 psi. After cooling to 50°C, the media was dispensed into petri dishes and solidified at room temperature.

Round discs for sensitivity testing were created by using filter paper (Whatman No.41) and a puncher. Each disc was then positioned in a petri dish and subjected to pressure sterilization at 121°C and 15 psi pressure. Subsequently, the discs were soaked in the crude extracts of *P. foetida*.

### Antimicrobial Screening

The Kirby Bauer antibacterial sensitivity test was used to evaluate the antimicrobial activity of *P. foetida* extract against *S. aureus* and *E. coli*. Positive controls, chloramphenicol and tetracycline, were used. Bacterial inoculation was done on sterile culture media plates, and *P. foetida* extract-soaked filter paper discs were placed in the center. Plates were incubated at

37°C for 24 hours. Measurement of the zone of inhibition using a vernier caliper indicated the inhibition of microorganism growth. The absence of a zone indicated resistance to *P. foetida* extract.

### 3. RESULTS

#### Phytochemical screening

Table 1 reveals the presence of tannins, alkaloids, and saponins in the leaf extracts of *P. foetida*. However, regardless of the solvent used, flavonoids were not detected in the extracts. Notably, saponins and alkaloids were exclusively present in the extracts obtained using ethyl alcohol as the solvent.

**Table 1.** Chemical Presence of the Extract from the Leaf of *Paederia foetida*

Chemical properties	Leaf Extract	
	Ethyl alcohol	Ethyl acetate
Alkaloids	+	-
Flavonoids	-	-
Saponins	+	-
Tannins	+	+

Legend: (+) = present; (-) = not detected

#### Antimicrobial Property

In Table 2, ethyl alcohol-based extracts showed larger zones of inhibition for *S. aureus* and *E. coli*. The extracts exhibited inhibitory activity only against bacteria, with no significant difference in antimicrobial activity between leaf extracts against *E. coli* and *S. aureus*.

The study found no significant difference in antimicrobial resistance or activity between the solvents used. Both solvents exhibited significant antimicrobial activity, indicating their suitability as sources for inhibiting or killing microorganisms.

**Table 2.** Zone of inhibition (mm) formed in Nutrient Agar with crude extracts from leaves of *P. foetida*.

Leaf Extract	*chlorampenicol / **tetracycline	
	Test microorganism	
	<i>S. aureus</i>	<i>E. coli</i>
Ethyl alcohol	22.70 mm	21.00 mm
Ethyl acetate	13.95 mm	14.20 mm
Control	21.00* mm	19.70** mm

#### 4. DISCUSSION

Positive results were obtained for the presence of alkaloids, tannins, and saponins in the ethyl alcohol leaf extracts of *Paederia foetida*. The considerable structural diversity of these natural compounds discovered in *P. foetida* offers promising opportunities for the exploration of new drugs. Regarding the antibacterial activity of the extract, no significant relationship was found between the extract's effect and the microorganisms utilized in the study. However, the leaf extracts of *P. foetida* exhibited notable antimicrobial resistance and activity, suitability as sources for inhibiting or killing microorganisms.

*P. foetida* leaf extracts demonstrated the ability to inhibit the growth of *E. coli* and *S. aureus*, suggesting its potential as an organic antibacterial source. Further research is recommended to test the extracts against other bacteria and fungi to assess their susceptibility.

#### 5. ACKNOWLEDGMENT

The author expresses her gratitude to the CEU Microbiology Lab for the help in acquiring the bacteria needed in this study and also the National Museum for the resources used in this study.

#### 6. CONFLICT OF INTEREST

None.

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