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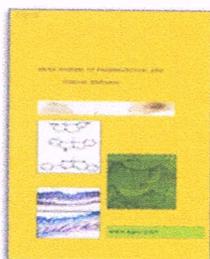
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## ANTIBACTERIAL ACTIVITY OF PAPUAN ANT-NEST (*MYRMECODIA PENDANS* L.M. PERRY) ETHANOL EXTRACT AGAINST *Z*

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### ABSTRACT

**Background:** *Shigella dysenteriae* continues to be a major health problem in Indonesia, which usually leads to death, due to diarrhoea and dysentery, predominantly in children below the age of 5. Bacterial invasion of the colonic epithelium leads to severe inflammation together with bacterial dissemination generates abscesses and ulcerations. *Myrmecodia pendans*, also locally known by indigenous Papuans as ant-nest is native to Southeast Asia. This tropical plant has proven to be rich in bioactive constituents and highly valued as an alternative choice for cancer/tumor treatments and an efficacious herbal drug to prevent and cure diarrhea.

**Objective:** This research aimed to determine antibacterial activity of Ant-nest extract against *S. dysenteriae* and to determine its minimum inhibitory concentration (MIC) – minimum bactericidal concentration (MBC) range of concentration.

**Methods:** Ant-nest dried plant were obtained from Wamena, Papua. The extract was obtained by using maceration method with 70% ethanol as solvent. Antibacteria activity test were then performed by using perforated agar method with various extract concentration (10, 20, 40, and 60% (g/mL)). MIC-MBC concentration determined by using microdilution method.

**Results:** From 500.42 g dried plant we can obtain 77.47 g dry extract (15.48% rendement). Phytochemical screening result showed that the ethanol extracts of ant-nest contains metabolites such as alkaloids, flavonoids, tanins, saponins, and steroids/terpenoids. Largest inhibition zone was shown by 60% extract concentration with  $1.74 \pm 0.021$  cm diameter. MIC – MBC concentrations lays in range of 14 – 16 % (w/v).

**Conclusion:** The results of the present investigation suggest that the extracts of the studied plants can be used as potential leads to discover new drugs to control some *S. dysenteriae* infections..

**Keywords:** Ant-nest, *Shigella dysenteriae*, Antibacteria.

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### INTRODUCTION

Bacilli-related dysentery was first demonstrated by Shiga during 1898, and subsequent research showed that four serogroups (species), *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii*, and *Shigella sonnei*, were responsible for causing this disease [1]. The World Health Organization estimates *Shigella* to cause at least 80 million cases of bloody diarrhea and 700,000 deaths each year [2]. Almost all infections caused by *Shigella* occur in developing countries, and the majority of cases and deaths occur among children <5 years old. Diarrheal disease associated with *Shigella* also occurs among travelers and military forces. *S. dysenteriae* type 1 is rarely endemic but can cause disease with severe complications and is historically associated with devastating pandemics with high case fatality rates in all age groups, described for Central America, Central Africa, and Southeast Asia [3].

*Shigella* ability to invade host cells involves attachment and internalization controlled by a large plasmid which contains multigene virulence factors. The organisms penetrate through the colonic mucosa, invade, and multiply in the colonic epithelium. Bacterial cells preferentially attach and enter through Peyer's patches by way of M-cells through membrane ruffling and macropinocytosis in a manner similar to *Salmonella* [4]. The bacteria also produce a very potent toxin (Shiga toxin) that adheres to small intestine receptors and blocks absorption of electrolytes, glucose, and amino acids from the lumen.

*Myrmecodia pendans* (a member of Myrmecophytes genus), which also locally known by indigenous Papuans as ant-nest plant, is a native plant that mostly grows in Southeast Asia region. Ant-nest has proven to be rich in bioactive constituents such as flavonoids, tocopherols, tannins,

and essential oils. This plant is highly valued as an alternative choice for cancer/tumor treatments and an efficacious herbal drug to prevent and cure various illnesses include hemorrhoid, ulcer, allergy, gout, uric acid disorder, stroke, coronary heart, lung tuberculosis, rheumatism, and diarrhea [5]. Many researchers in pharmaceutical field strongly believe that the nutritional values as well as powerful *in vitro* anticancer, antibacterial, and antioxidant properties of ant-nest are sourced from flavonoid compounds [6].

The objective of this research was to test antimicrobial activity of ant-nest plant extract and found its effective concentration against *S. dysenteriae*. A series of microbiology-based procedure were performed during the research, including perforated agar method for antibacterial activity test and microdilution method for determining minimum inhibitory concentration (MIC) - minimum bactericidal concentration range.

### MATERIALS AND METHODS

#### Chemicals and materials

The plant material used in this study was obtained from the stem tuber part of the plant. It is a traditional medicine plant from Wamena, Papua, Indonesia. Ethanol (Merck, Germany), ammonia (Merck, Germany), chloroform (Merck, Germany), hydrochloric acid (Merck, Germany), potassium iodide mercury (Merck, Germany), bismuth potassium iodide (Merck, Germany), magnesium (Merck, Germany), amyl alcohol (Merck, Germany), iron (III) chloride (Merck, Germany), gelatin solution (Merck), ether (Merck, Germany), 10% solution of vanillin in concentrated  $H_2SO_4$ , acetic acid anhydride in concentrated  $H_2SO_4$ , sodium hydroxide (Merck, Germany), distilled water, and dimethyl sulfoxide/dimethyl sulphoxide (DMSO) (Sigma Aldrich, Germany).