



# Phytochemical, Heavy Metals and Antimicrobial Study of the Leaves of *Calopogonium mucunoides*

Ebuka Chizitere Emenike<sup>a, \*</sup>, Onyema Chukwuebuka<sup>a, \*\*</sup>

<sup>a</sup>Department of Pure and Industrial Chemistry, Nnamdi Azikiwe University, P. M. B. 5025, Awka, Nigeria.

## ARTICLE INFO

### Article history:

Received

Received in revised form

Accepted

Available online

### Keywords:

Phytochemical

Heavy Metal

Antibacterial; Antifungal

*Calopogonium mucunoides*

## ABSTRACT

In this study, the phytochemical, heavy metal, and antimicrobial characteristics of the leaves of *Calopogonium mucunoides*, a popular plant in Nigeria's folk medicine, were investigated in order to determine its therapeutic potential. The phytochemicals present in the leaves were extracted with n-hexane, methanol, and ethyl acetate, and the extracts were used to investigate the phytochemical constituents and antimicrobial activity. The content of five heavy metals was determined using the methanol extract. Several secondary metabolites were found in varied amounts, according to the results. Lead (0.08 mg/kg) and iron (0.08 mg/kg) were found to be well below the World Health Organization's permissible limits for heavy metals in plants, while cadmium, nickel, and zinc were found to be below detectable levels. Using the disk diffusion method, the extracts were evaluated against thirteen human pathogens (ten bacteria and three fungi). The extracts were shown to have a wide variety of antibacterial properties, with the methanolic extract having the largest zone of inhibition (31 mm) against *Bacillus* sp., while the n-hexane extract had no antimicrobial action in the entire test species. The results obtained revealed that the leaves of *C. mucunoides* have some therapeutic values and could be exploited in the preparation of herbal drugs for the treatment of various ailments.

## 1. Introduction

For thousands of years, nature has provided medicinal substances, and an astounding number of modern medications have been identified from natural sources [1]. Medicinal plants are the best natural source of drugs for traditional systems of medicine, modern medicine, food supplements, folk medicines, pharmaceutical intermediates, and chemical entities for synthetic drugs [2]. According to the World Health Organization, medicinal plants are used by 80% of the world's population to treat ailments, and 25% of medications are made from plants and their derivatives [3]. Herbal formulations have long been utilized in African countries to treat a variety of ailments, and they remain the most economical and accessible healthcare system [4]. Plant-derived medicines are relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment, hence the basic reason for the recent increase in the demand for herbal drugs [5]. Secondary plant metabolites, otherwise known as

phytochemicals, previously with unknown pharmacological activities, have recently been extensively investigated as a source of medicinal agents [6]. Phytochemicals are non-nutritive chemical compounds that occur naturally in plants and have protective or disease-preventive properties [7-9]. These compounds vary in plants depending on their growing conditions, plant species, location of the plant, extraction methods, soil topography, and age of the plant [8, 10].

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments [11, 12]. In most developing countries, such as Nigeria, where the locals do not have access to quite expensive synthetic drugs, traditional plants become the alternative, and investigations into the phytochemical and antimicrobial activities of these plants have been ongoing [13]. However, Onyema and Ajiwe [14] noted that the illegal use of these plant medications without a prescription coupled with the adaptability of bacteria has resulted in an increase in the number of drug-resistant organisms,

\*Corresponding author, Email address: [emenikechizitere@gmail.com](mailto:emenikechizitere@gmail.com) \*\*Corresponding author, Email address: [ct.onyema@unizik.edu.ng](mailto:ct.onyema@unizik.edu.ng)