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BIOACTIVE COMPOUND PROPERTIES OF KAPAL TERBANG PLANT VIA GC-MS ANALYSIS

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ABSTRACT

The Kapal Terbang plant, or *Chromolaena Odorata*, grows in forests and open spaces like shrubs. Many in our community are allergic to industrial medications and synthetic chemicals, seeking organic, ecologically friendly alternatives without adverse effects. Inspired by the Hadith, "There is no disease that Allah has created, except that He also has created its treatment" (Sahih Al-Bukhari, book #71, Hadith 582), this study aims to identify bioactive compounds in the Kapal Terbang plant to demonstrate its efficacy and compatibility as a natural substitute. The study uses Gas Chromatography-Mass Spectrometry (GC-MS) to analyse the plant's bioactive compounds. An acetone extraction was prepared and analysed using an AGILENT INTUVO 9000 GC-MS with ionisation voltage set at 70eV and a Restek column for gas chromatography. Several compounds were identified, including decane, 2,2-Dimethoxybutane, Cyclotrisiloxane, hexamethyl-, 2,4,6-Cycloheptatrien-1-one, 3,5-bis-trimethylsilyl-, Tris(trimethylsilyl)ester, Tris(tert-butyldimethylsilyloxy)arsane, and 1,4-Bis(trimethylsilyl)benzene. This plant offers safer, natural options for consumers and serves as an alternative source for chemical components in medical products. The results suggest that the Kapal Terbang plant could be used in therapeutic applications. Further evaluation of its metabolite pathways and additional studies on its medicinal properties and potential side effects are needed to confirm its efficacy and safety.

Keywords: Kapal Terbang plant; *Chromolaena Odorata*; gas chromatography-mass spectrometry; bioactive compounds.

1. INTRODUCTION

Chromolaena Odorata, a perennial shrub, grows rapidly, reaching heights of 3 to 7 metres (Jumaat et al., 2017; Zahara, 2019). Native to Central and South America, it has spread to Southeast Asia, Africa, and the Pacific Islands (Tanhan et al., 2007; Kouamé et al., 2013). This invasive species significantly impacts forestry, pasture, and plantation crops such as cashew, coconut, coffee, cocoa, and rubber (Akinmoladun et al., 2007). The plant is notable for its aromatic properties and wide-ranging ethnopharmacological uses, particularly in Asia and West Africa, where it is traditionally employed to treat malaria, wounds, and various infections (Omokhua et al., 2016). Recent studies have expanded its medical applications, including more effective antibacterial therapies for post-operative wound infections (Omeke et al., 2019) and antidiabetic treatments in diabetic-induced rats (Yusuf et al., 2020). While extensive research has been conducted on C. Odorata in Asia and Sub-Saharan Africa, there is a significant research gap regarding its presence in Malaysia, particularly in metabolite profiling, which is crucial for identifying bioactive compounds (Devi et al., 2018; Gyanaranjan et al., 2023). Techniques such as Gas Chromatography-Mass Spectrometry (GC-MS) have been employed to analyse these compounds, contributing to the understanding of its therapeutic potential (Aziz, 2020; Olawale et al., 2022).

2. MATERIALS AND METHODS

The approach used to analyse *C. Odorata* in this study was adapted from Meela et al. (2019). Fresh *C. Odorata* leaves were obtained from a bushy area near the lake at Kolej PERMATA Insan and processed in the Ar-Razi Halal Action Lab. The leaves were dried for 14 days and then pounded into a powder with a pestle and mortar. A Vortex Mixer was used to aggressively agitate approximately 1 g of powdered material with 10 cc of acetone for 30 minutes. The mixture was centrifuged at 3500 rpm for 10 minutes to separate the supernatant, which was saved for further analysis. The extraction process was done twice to guarantee accuracy before moving on to Gas Chromatography-Mass Spectrometry (GC-MS) analysis.

The metabolite chemicals were identified using an AGILENT INTUVO 9000 GC-MS instrument equipped with a 70 eV ionisation voltage. Gas chromatography was carried out on a Restek XTI-5 column (0.25 mm, 60 m) using temperature programming mode. The temperature was initially set at 80°C for 1 minute, then increased to 220°C at 70°C/min for 3 minutes, and finally to 290°C at 10°C/min for 10 minutes. The injection port and GC-MS interface temperatures remained at 290°C (Raju & Kumar, 2020). The sample was introduced using an all-glass injector in split mode, using helium as the carrier gas and a flow rate of 1.2 ml/min. The bioactive chemicals were identified based on retention time and spectral data, using the NIST mass spectral library (Cock & Kalt, 2012; Murad et al., 2020).

3. RESULTS AND DISCUSSION

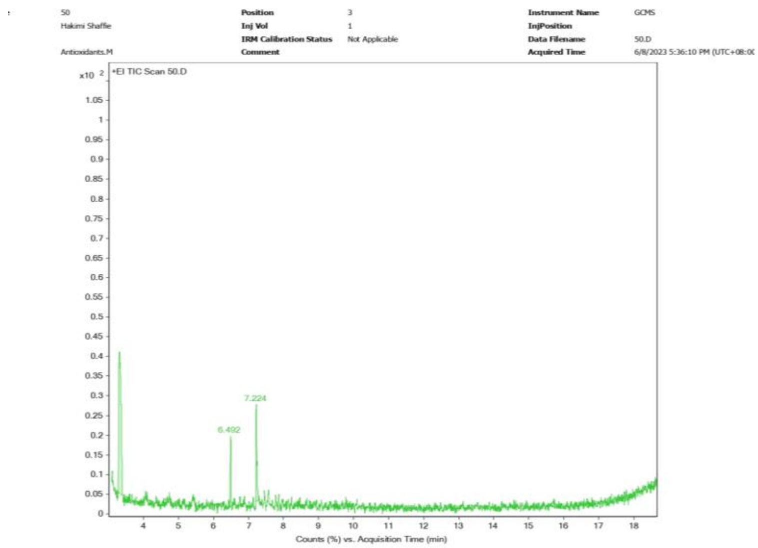

Figure 1. GC-MS report

The study conducted a GC-MS analysis of *C. Odorata* collected near a lake, identifying eight key compounds: Decane, 2,2-Dimethoxybutane, Cyclotrisiloxane, hexamethyl-, 2,4,6-Cycloheptatrien-1-one, 3,5-bis-trimethylsilyl, 3,3-Diisopropoxy-1,1,1,5,5,5-hexamethyltrisiloxane, Tris(trimethylsilyl) ester, Tris(tert95 butyldimethylsilyloxy)arsane, and 1,4-Bis(trimethylsilyl)benzene. Decane, a nonpolar solvent, was identified in the leaves, which is uncommon since it is generally found in the roots. It is known for its ability to dissolve lipophilic molecules and has potential applications in antimicrobial compounds (Dougnon & Ito, 2021) (Khan & Javaid, 2021).

2,2-Dimethoxybutane was also detected in *C. Odorata* , a compound previously found in the leaves of *Piper longum* and the roots of *Withania somnifera*. This compound exhibits antibacterial, anticancer, and antidermatophytic activities and is used in cryopreservation and tissue engineering (Das et al., 2012) (Lingfa et al., 2024).

Tris(trimethylsilyl) ester was identified and is recognized for its role in protecting functional groups and facilitating chemical reactions, with potential applications in metal detoxification and cancer therapy (Kifayatullah et al., 2016) (Farooq et al., 2020). 2,4,6-Cycloheptatrien-1-one, 3,5-bis-trimethylsilyl- and 1,4-Bis(trimethylsilyl)benzene have also been detected in *C. Odorata*. Both compounds have significant pharmaceutical potential, particularly in synthesizing bioactive compounds with antibacterial, antifungal, and other therapeutic properties (Bhama Devi et al., 2018) (Wiraswati et al., 2023) (Ayyakkannu et al., 2020).

4. CONCLUSION

The Gas Chromatography-Mass Spectrometer examination of the ethanolic extract of *C. Odorata* revealed the presence of seven bioactive compounds, including decane: 2,2-Dimethoxybutane; Cyclotrisiloxane, hexamethyl-; 2,4,6-Cycloheptatrien-1-one, 3,5-bis-trimethylsilyl; Tris(trimethylsilyl) ester; Tris (tert-butyldimethylsilyloxy) arsane, and 1,4-Bis(trimethylsilyl)benzene. *C. Odorata'*s traditional application in disease treatment will be enhanced as a result of the discovery of bioactive compounds. More pharmacological study on these phytocompounds is needed to develop innovative drugs for the treatment of specific disorders.

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