GC-MS Spectrums and Their Close Match Methyl Esters from Mushrooms of Papua New Guinea

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Abstract: The GC-MS spectrums of a sample from Amanitaceae family and Mycenaceae family were matched with their close match GC-MS spectrums from the spectrum library. The samples from Amanitaceae family (KMsp027) and Mycenaceae family (KMsp039) were found to contain fatty acid methyl esters (methyl palmitate and methyl linoleate). It is proposed that the presence of methyl linoleate and methyl palmitate in the samples may show antibacterial activities if tested against different bacterial strains.

Key words: Methyl esters, GC-MS spectrum, Papua New Guinea.

1. Introduction

Mycological research has not been well developed over many years due to inaccessibility of the country from outside researchers [1]. As a result, studies into the documentation of ethno-mycological knowledge, taxonomic identification and evaluation of their antibacterial properties have not covered the 90,000 fungal species estimated to be existing on the island of New Guinea [2]. Early mycological research was focused on taxonomic details of mushroom species [1, 3, 4]. It is evident that there is insufficient literature on the investigation of chemical constituents and their biological activities in the diverse mushroom fruit bodies in PNG. According to literature, GC-MS studies on fatty acid esters from Pleurotus eous mushroom showed antibacterial activities [5]. This study has confirmed that the antibacterial activities of the extracts are due to the presence of the fatty acid esters. The GC-MS close match for the samples (KMsp027 peak 4 and KMsp039 peaks 1 and 2) contain fatty acid esters (methyl palmitate and methyl linoleate). Those compounds were also found in plants and their antibacterial activities evaluated. They were able to inhibit bacterial growth [6-8]. Figs. 1 and 2 below give the structural representation of the methyl esters.

2. Methodology

2.1 Sample Collection and Identification

2.1.1 Sample Collection

Mushroom samples were collected from the local forest at a GPS reference point of 145.17722 °E and 6.17366 °S and extends further to 145.17673 °E and 6.16499 °S during fruiting season and were assigned special and unique collection codes (KMsp027 & KMsp039). The samples were weighed to constant wet weight of 500 to 1 kg of the same species for extraction.

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2.1.2 Sample Identification
The mushroom fruit bodies were collected and identified using a guide by Neale and Syme [11] which provides general details of identification tools according to certain important features. It includes features like gill attachment to stem, spore colors under microscope, spore print color, volva and ring attachments to the stipe. This guide was used to identify the mushroom family and genera. Internet was also used to compliment the identification tools.

2.2 Extraction and Concentration of Secondary Metabolites

2.2.1 Extraction of Secondary Metabolites
The fruiting bodies of mushrooms (about 500-1 kg) of the same species were milled into homogenous composition and pooled together in 1 L screw capped container. The chemical constituents (secondary metabolites) were extracted using EtOH (ethanol) and DCM (dichloromethane) in the ratio of 4:1 (EtOH:DCM) and the solvents were allowed to percolate for (24-48 h) before filtration.

2.2.2 Filtration and Concentration of the Extracts
The crude extracts were filtrated through gravity filtration by using a filter funnel. The crude extracts were filtered into a screw capped container and concentrated at 35 °C using a rotary evaporator rotating at 60 rpm (revolutions per minute). 2 mL of ethanol was added to the flask before the concentrated extracts were transferred into a small screw capped container for further GC-MS analysis to follow at CSIRO-Australia.

2.3 GC-MS Analysis
GC-MS analysis for the crude mushroom samples was done at CSIRO-Australia.

Fig. 3  GC-MS spectrum of KMsp027 peak 4.

Fig. 4  Close library match spectrum (methyl palmitate).
3. Results & Discussion

3.1 The Mushroom Sample and the Family

The mushroom sample KMsp027 is from the Amanitaceae family. It is non-edible and is regarded as poisonous as it causes vomiting when touched.

This sample contains fatty acid ester (methyl palmitate) as shown by the NIST (National Institute of Standards & Technology) library close match as shown by Figs. 3 and 4.

The other sample KMsp039 from Mycenaceae family is also found to contain fatty acid esters:
methyl palmitate (Figs. 5 and 6) and methyl linoleate (Figs. 7 and 8). This mushroom is edible and traditionally used as a food.

3.2 Bioactive Compounds Isolated from PNG Mushrooms

The literature has been scented on structural elucidative studies on compounds of mushrooms from Papua New Guinea. The recent work of Wossa et al. [2] and Castillo [9] has reported bioactive compounds from Bankaraceae and Amanitaceae family, respectively. Our research has reported the presence of methyl esters (methyl palmitate and methyl linoleate) from PNG mushrooms (Figs. 9 and 10) for the first time and propose that these compounds will prove to be bioactive if tested for its antibacterial properties.
4. Conclusions

It is evident from this work that further structural elucidative work and testing of the antibacterial properties of compounds (methyl esters) needs to be looked at in mushrooms of Papua New Guinea.

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References