Effects of Extraction Method on Yield, Phenolic and Flavonoid Content of Leaf, Stem and Root of *Cassia alata* Linn.

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ABSTRACT

The study of medicinal plants has gained significant interest among researchers because of their potential for therapeutic purposes and the production of natural drugs. In Sarawak, *Cassia alata* is one of the native plants used for medicinal purposes, such as treatment for constipation, ringworm, and other skin diseases. This study determined the yield of extraction, total phenolic content (TPC), and total flavonoid content (TFC) of the leaf, stem, and root of *C. alata* using various extraction methods and solvent extractions. The extractions were performed using soxhlet extraction (SE) and ultrasonic-assisted extraction (UAE) with ethanol and chloroform. Among all, the extract obtained from SE with ethanol solvent (SE-EtOH) showed the highest yield in all plant parts (leaf: 28.62 %, stem: 10.06 %, and root: 9.79 %). Meanwhile, the TPC and TFC estimated using the Folin-Ciocalteu phenol reagent and aluminium chloride colorimetric assay methods showed that the highest TPC and TFC were from the leaf extract obtained using UAE and chloroform (UAE-Chlo-L) with a TPC value of 117.436 mg GAE/g DW and a TFC value of 568.778 mg QE/g DW, respectively. Overall, the findings demonstrated that chloroform was an effective solvent system for all plant parts on the TPC and TFC, with the leaf part containing the greatest value, and that ultrasonic-assisted extraction was the best approach. This exploration is beneficial for the determination of methods that produce optimum yield, phenolic, and flavonoid content in *C. alata*'s species.

Keywords: *Cassia alata*, TPC, TFC, solvent system, soxhlet extraction, ultrasonic assisted extraction

INTRODUCTION

Plants possess a wide range of organic substances that are classified as primary and secondary metabolites. Primary metabolites such as phytosterols, acyl lipids, nucleotides, amino acids, and organic acids are fundamental for photosynthesis, reproduction, respiration, growth, and development (Wang *et al.*, 2022). Secondary metabolites are molecules that help plants interact with their surroundings (Adedeji & Babalola, 2020). Phenolics, flavonoids, alkaloids, terpenes, saponins, lipids and carbohydrates are the classes of secondary metabolites (Hussein & El-Anssary, 2019). The determination of secondary metabolites in plant extracts is important as it helps in supporting the development of modern medicines and supplements. According to Rahman *et al.,* (2022), the determination of total phenolic content (TPC) and total flavonoid content (TFC) are significant parameters to evaluate the potential health benefits of plant extracts such as antimicrobial, antioxidant and anti-inflammatory activity.

Phenolics are secondary plant metabolites with over 8000 structures, including lignans, tannins, phenolic acids, stilbenes, and flavonoids. They are commonly found in plant tissues such as in fruits, seeds, leaves, stems and roots. These phenolics are associated with various health benefits, such as anti-ageing (Dhalaria *et al*., 2020), anti-proliferative activities, anti-inflammatory and antioxidant properties (Cianciosi *et al*., 2018; Cardoso *et al*., 2020). The flavonoid, on the other hand, is a member of a group of polyphenolic-structured secondary plant metabolites. It has a wide range of biological effects, including hepatoprotective, anti-inflammatory (Jiang *et al*., 2019), antibacterial, antioxidant (Li *et al*., 2019), and anti-hyperlipidemic effects (Bencheikh *et al*., 2021).

Cassia alata, also called *Senna alata*, is one