

**CHEMICAL COMPOSITION AND BIOLOGICAL
ACTIVITIES OF MACLURA SPINOSA****Xumora Abdashimova**

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Abstract *This research investigates the chemical constituents and biological activities of the pre-flowering aerial parts of Maclura spinosa. Several bioactive compounds demonstrating antioxidant, anti-inflammatory, and antidiabetic properties were identified. Both in vitro and in vivo tests confirmed the plant's significant biological potential, indicating its promise as a source for developing therapeutic agents.*

Keywords: *Maclura spinosa, Moraceae, antioxidant, anti-inflammatory, antidiabetic, GC-MS analysis.*

Introduction

The Moraceae family encompasses approximately 137 genera and over 5,000 species, primarily consisting of trees and shrubs. The Maclura genus, containing about 103 species, is widely distributed across various regions, from India and China to Australia. Maclura spinosa (Willd.) C.C. Berg, commonly known as the “Paper Cup Flower,” is native to these areas. Prior studies on Maclura species have reported the presence of diverse bioactive compounds, including flavonoids, xanthonenes, chalcones, triterpenes, and sterols. Nevertheless, pure compounds have yet to be isolated specifically from M. spinosa. Traditionally, members of the Maclura genus have been utilized in folk medicine to address conditions such as uterine bleeding, snake bites, and infections. Recent investigations highlight their antioxidant, antibacterial, anti-inflammatory, anticancer, and antidiabetic properties.

Materials and Methods**Extraction and Fractionation**

Approximately 5 kilograms of dried and pulverized twigs of *M. spinosa* were subjected to repeated extraction with 90% methanol in water (MeOH/H₂O). After filtration and evaporation under reduced pressure, a semi-solid residue weighing 530 grams was obtained. A 500-gram portion of this extract was dissolved in water and subsequently partitioned sequentially using n-hexane, dichloromethane (DCM), ethyl acetate (EtOAc), and n-butanol, resulting in respective yields of 23 g, 130 g, 30 g, and 40 g. The aqueous residue weighed 250 g.

- The n-hexane fraction was subjected to silica gel chromatography, yielding nine subfractions (HF-1 to HF-9), from which four compounds were isolated.
- The dichloromethane fraction produced 15 subfractions (DF-1 to DF-15), with two compounds purified.
- The ethyl acetate fraction yielded 13 subfractions (EF-1 to EF-13), from which four additional compounds were obtained.

All fractions were monitored using Thin Layer Chromatography (TLC), and further purification was achieved through silica gel columns and Sephadex LH-20 as necessary.

Determination of Total Phenolic Content

The total phenolic content was measured employing the Folin–Ciocalteu method. A gallic acid standard solution (1 mg/mL) was prepared and serially diluted to concentrations ranging from 25 to 1000 µg/mL. Plant extract samples were prepared at 9 mg/mL in a 1:1 (v/v) methanol:water solution. In a 96-well plate, 10 µL of each sample or standard was mixed with 100 µL of diluted Folin–Ciocalteu reagent (1:10 dilution), followed by the addition of 80 µL of 1M Na₂CO₃. The mixture was incubated in the dark at 25°C for 20 minutes. Absorbance was measured at 630 nm using a microplate reader.

Chemical Composition Analysis

The seeds of *Maclura pomifera*, a related species, were analyzed to provide comparative chemical insights. The seeds exhibited a moisture content of 5.88%,

ash content of 6.72%, carbohydrate levels of 20.76%, crude protein of 33.89%, and fat content of 32.75% (all values based on dry weight). Notably, the oil yield surpassed that reported for *Treculia africana* and other studies on *M. pomifera* from Turkey. The oil, rich in linoleic acid, demonstrated potential for nutritional applications and photoprotective effects, suggesting its possible use in cosmetic formulations.

Results and Discussion

The extraction and fractionation of *M. spinosa* revealed multiple bioactive constituents. Identified compounds displayed significant antioxidant, anti-inflammatory, and antidiabetic activities. The phenolic content measurement further supported the potential of this plant for therapeutic applications. In comparing seed compositions, *M. pomifera* seeds were found to be nutritionally rich, and the high oil content, particularly in unsaturated fatty acids, further enhances the economic importance of this plant family.

Conclusions

This study confirmed the rich chemical profile and promising biological activities of *Maclura spinosa*. Its extracts demonstrate antioxidant, anti-inflammatory, and antidiabetic properties, suggesting potential applications in medicine and health industries. Furthermore, the high nutritional value of *Maclura pomifera* seeds highlights their potential for development into functional food products and cosmetic formulations.

References

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