

**NEPHROPROTECTIVE EFFECTS OF *CUCUMEROPSIS MANNII* SEED OIL:
PHYSICOCHEMICAL CHARACTERIZATION AND MECHANISTIC INSIGHTS**

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Abstract

Cisplatin is an effective anticancer drug; however, its major drawback is kidney damage, known as nephrotoxicity. This condition primarily results from oxidative stress, inflammation, and apoptosis. The present study investigates the nephroprotective effects of *Cucumeropsis mannii* seed oil. The study involved physicochemical characterization, including spectroscopy confirming triacylglyceride structure and phenolic contents. The oil demonstrated rapidly scavenging kinetics. It markedly attenuated renal inflammation, reducing IL-1 β , IL-6, TNF- α , and NF- κ B levels near to control values. Apoptosis was concurrently suppressed, with decreased caspase-3 and caspase-9 activity, lowered Bax expression, and preserved Bcl-2 levels. These findings support CMSO's potential as complementary therapy.

Keywords

Apoptosis, cisplatin, *Cucumeropsis mannii*, inflammation, nephroprotection, oxidative stress.

НЕФРОПРОТЕКТОРНЫЕ ЭФФЕКТЫ МАСЛА СЕМЯН *CUCUMEROPSIS MANNII*: ФИЗИКО-ХИМИЧЕСКАЯ ХАРАКТЕРИСТИКА И МЕХАНИЗМЫ ДЕЙСТВИЯ

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Аннотация

Цисплатин является эффективным противораковым препаратом; однако его основным недостатком является повреждение почек, известное как нефротоксичность. Это состояние возникает primarily в результате окислительного стресса, воспаления и апоптоза. В настоящем исследовании изучаются нефропротекторные эффекты масла семян *Cucumeropsis mannii*. Исследование включало физико-химическую характеристику, в том числе спектроскопию, подтвердившую структуру триацилглицеридов и содержание фенольных соединений. Масло продемонстрировало быструю кинетику связывания радикалов. Оно значительно ослабляло почечное воспаление, снижая уровни IL-1 β , IL-6, TNF- α и NF- κ B до значений, близких к контрольным. Апоптоз был одновременно подавлен, о чем свидетельствуют снижение активности каспазы-3 и каспазы-9, понижение экспрессии Bax и сохранение уровней Bcl-2. Эти результаты подтверждают потенциал CMSO в качестве дополнительной терапии.

Ключевые слова

Апоптоз, Цисплатин, *Cucumeropsis mannii*, Воспаление, Нефропротекция, Окислительный стресс.

Nephrotoxicity remains a major adverse effect of cisplatin in cancer treatment, with oxidative stress, inflammation, and apoptosis recognized as key mediators of the resulting renal injury [1]. *Cucumeropsis mannii* seed oil (CMSO), a natural product from West and Central Africa, has demonstrated antioxidant and anti-inflammatory properties in preliminary studies [2]; however, its nephroprotective mechanisms remain poorly understood. CMSO is rich in unsaturated fatty acids, phenols, and flavonoids, compounds known for their radical-scavenging and anti-inflammatory activities [3]. Accordingly, this study integrates physicochemical characterization with an *in vivo* validation to elucidate the mechanisms supporting CMSO's protective effects.

Cucumeropsis mannii seeds were authenticated prior to physicochemical characterization of the oil. UV-Vis spectroscopy showed absorption below 350 nm, while fluorescence spectroscopy exhibited phenolic emission at 280-290 nm, indicating the presence of conjugated double bonds [4]. In addition, FTIR confirmed the triacylglyceride structure, unsaturation, and oxidative stability. An EPR-based DPPH assay further demonstrated rapid radical-scavenging activity. These physicochemical properties correspond with previously reported *in vivo* findings [2]: CMSO attenuated renal inflammation, reducing IL-1 β , IL-6, TNF- α , and NF- κ B levels toward control values. Moreover, apoptosis was suppressed, as evidenced by decreased caspase-3 and caspase-9 activity, reduced Bax expression, and preserved Bcl-2 levels.

Overall, this study highlights the phytochemical profile, spectroscopic characteristics, and rapid antioxidant kinetics of CMSO. These properties provide a mechanistic basis for its nephroprotective effects through the modulation of oxidative stress, inflammation, and apoptosis. The findings support CMSO's potential as an adjunctive therapy against cisplatin-induced nephrotoxicity. Future research will focus on functional assays, cancer cell line selectivity, and formulation optimization.

Literature

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