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Evaluation of Antiproliferative Effect of *Moringa peregrina* Seed Against Prostate Cancer Cells

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Abstract: *Moringa peregrina* is a medicinal plant used in traditional practice in several regions of Asia and Africa, including the Arabian Peninsula. This study assessed the antiproliferative potential of an ethanolic seed extract of *M. peregrina* (MPSE) against LNCaP human prostate cancer cells using the MTT assay. Cells were exposed to MPSE at concentrations ranging from 12.5 to 200 µg/mL for 48 hours, and cell viability was determined by formazan absorbance at 570 nm. MPSE reduced LNCaP cell viability in a concentration-dependent manner, with an IC₅₀ value of 183.91 µg/mL. The finding indicates that MPSE has moderate cytotoxic and antiproliferative activity against LNCaP cells. However, further work involving bioassay-guided fractionation, compound identification, mechanistic assays, and comparison with normal prostate cells is required before any therapeutic relevance can be proposed.

Keywords: *Moringa peregrina*, Prostate cancer; LNCaP, MTT assay, Cytotoxicity; Antiproliferative activity

Introduction

Moringa peregrina is a plant species traditionally used for several health-related purposes, including the management of conditions such as hypertension, diabetes, malaria, skin disorders, and abdominal discomfort (Al Dhaberi et al., 2016; Ayoub et al., 2023; El-Sayed et al., 2021). The seeds of this plant have attracted scientific interest because they contain bioactive phytochemicals such as flavonoids, phenolic compounds, and tocopherols, which are commonly associated with antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and anticancer-related properties (Albaayit, 2024).

Prostate cancer remains a major health concern, and its burden is expected to increase substantially in the coming decades (Thwaini, 2024). Although surgery, radiotherapy, hormonal therapy, and chemotherapy are used in clinical management, treatment limitations and adverse effects continue to encourage research into supportive or alternative bioactive agents. Natural products are frequently investigated in this context because their chemical diversity provides a useful starting point for identifying compounds that may interfere with cancer cell growth (Abood et al., 2025).

Even though there are many studies concerning the biological activity of *Moringa peregrina* and *Moringa* species in general (Senthilkumar et al., 2018), the seed extract effect on androgen-sensitive LNCaP prostate cancer is still limited. Therefore, this study has evaluated the antiproliferative effect of *Moringa peregrina* ethanolic extract against LNCaP cells *in vitro* as well as estimated the IC₅₀ value through MTT assay.

Method

Preparation of *Moringa peregrina* Seed Ethanolic Extract

Moringa pergerina fresh seeds was washed & dried then it was grinded into powder. Maceration for three of 100gm of the powdered seeds in 500 ml ethanol then the fraction of solvent was collected, and the procedure of extraction has been done again to enhance the extract recovery process. The ethanolic extract was obtained after the filtrates were combined & concentrated using filter paper and rotary evaporator at 45-50°C respectively (Azwanida, 2020).

Cell Culture

Human prostate cancer cells (LNCaP) were obtained from ATCC then it was maintained in DMEM augmented with 10% fetal bovine serum and 1% penicillin- streptomycin. The culture was incubated in a humidified 5% CO₂ incubator at 37°C until the culture reached the treatment optimum required conditions.

MTT Antiproliferative Assay

Moringa pergerina ethanolic extract antiproliferative activity was detected using the MTT assay. Human prostate cancer cells (LNCaP) were seeded in a 96 well plates with a density of 5×10^3 cells per well then it was allowed to attach prior to treatment. LNCaP cells were exposed to MPSE with a concentration (12.5 to 200 µg/mL) for 48 hours. The plate was incubated for four hours at 37°C after adding the total of 20 µg/mL MTT solution (5mg/ml) to each well. The formazan crystals resulted after that were dissolved 100 µL dimethyl sulfoxide, then the absorbance was measured at 570 nm. Each of these experiments was triplicately performed (Kumar et al., 2021).

Statistical Analysis

The data were expressed as mean $\pm$ standard error. The IC₅₀ and the statistical analysis were estimated using GraphPad Prism version 6.0. Treated and untreated cells difference was considered statistically significant at $p < 0.001$.

Results and Discussion

The viability of human prostate cancer cells (LNCaP) was significantly reduced using *Moringa pergerina* ethanolic extract. With an approximate IC₅₀ value of 183.91 µg/mL after exposure for 48 hours. Firmly indicating that the crude ethanolic extract possesses noticeable antiproliferative effect. Nevertheless the antiproliferative effect was obtained from crude, non fractionated compound. The outcome is firmly aligned with the scientific interest in plants as an active medicinal compound source. Studies have proven that plants are a valuable source of natural products affecting oxidative stress, inflammatory signaling as well as cell viability and many other aspects in the biology of cancer (Atanasov et al., 2021; Sharifi-Rad et al., 2020; Seca & Pinto, 2021). The confirmed reports of the presence of tocopherols, phenolic compounds and flavonoids in *Moringa pergerina* explains the reduction of human prostate cancer LNCaP cell viability in this study (Kashyap et al., 2022; Saleh et al., 2020). The antioxidant effect may contribute to the biological activity, while a clear interpretation for the relationship between the phytochemicals rich in antioxidants and the inhibition of cancer cells should be performed (Forman & Zhang, 2021; George et al., 2021). The reduction in cellular viability mechanism cannot be identified by MTT assay only. Growth arrest, cytotoxicity and reduced metabolic activity might reflect reduced absorbance. Therefore, assays such as cell-cycle analysis, apoptosis detection and caspase activation studies are highly required to clarify this mechanism of action. Observations on *Moringa* species effect against prostate cancer is strongly supported by present studies, previous studies have proven the cytotoxic effect of *Moringa oleifera* against prostate cancer cells (Adebayo et al., 2017), suggesting that this genus contains an anticancer activity. Direct and clear comparison between these studies should be made because the potency of plant extract varies depending on species, parts of the plant, solvent used, phytochemical composition, geographical source, duration of treatment and the targeted cell line. Several limitations should be considered. First, MPSE was tested as a crude extract; therefore, the active constituent or combination of

constituents responsible for the effect remains unknown. Second, only one prostate cancer cell line was used, which limits the interpretation of cancer-type specificity.

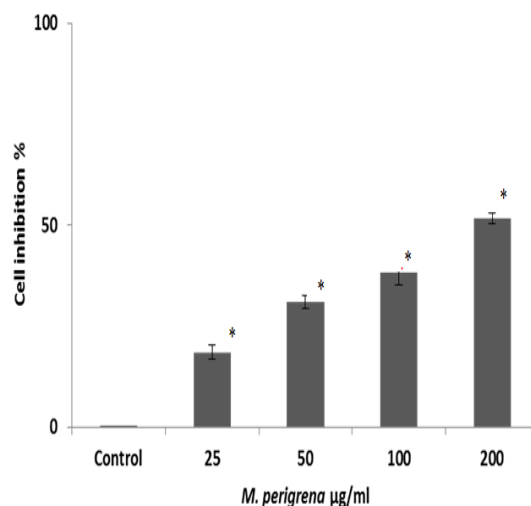


Figure 1. Inhibition effects of *Moringa perigrina* seeds on LNCaP

Conclusion

The ethanolic seed extract of *Moringa peregrina* demonstrated moderate antiproliferative activity against LNCaP prostate cancer cells, with an IC_{50} value of 183.91 $\mu\text{g/mL}$. The result suggests that MPSE contains bioactive constituents that may interfere with prostate cancer cell viability *in vitro*. Future studies should focus on polarity-based fractionation, identification of active compounds, mechanism-of-action assays, and selectivity testing against normal prostate cells before the extract can be considered for further preclinical development.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

Conflict of Interest

* The authors declare no conflict of interest.

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