



Improving the Solubility of Algerian Olive Leaf Extract, Enhancing Antibacterial Activities, and Preserving Bovine Sperm Viability Through Optimized Cyclodextrins Encapsulation Process

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Abstract

Introduction: Olive leaf extract (OLE) possesses potent antioxidant properties crucial for safeguarding sperm, especially during cryopreservation. However, its limited solubility in aqueous solutions hampers optimal protective effects. This study aimed to optimize the extraction technique for OLE and enhance its solubility through the utilization of cyclodextrins.

Methods: The optimized extraction conditions were characterized, with a primary focus on solubility. Subsequently, the impact on both sperm motility protection and the antibacterial potential effect was assessed.

Results and Discussion: The optimal conditions involved using 20 g of olive leaves with an agitation duration of 60 minutes, yielding 368.509 EAG/mg dry extract of phenolic compounds. Encapsulation of OLE in cyclodextrins not only demonstrated an enhanced antibacterial effect but also showed a significant positive influence on sperm motility after 48 hours of preservation.

Conclusion: This study highlights the effectiveness of cyclodextrin preparation as a viable strategy to improve OLE solubility, offering significant protection to spermatozoa during cryopreservation, along with an enhanced antibacterial effect.

Keywords: cyclodextrins, encapsulation, olive leaves extract, optimization, sperm motility

Introduction

Medicinal plants hold significant value due to their abundant reservoir of therapeutic phytochemicals.¹ Olive leaves, harvested from the *Olea europaea* tree of the Oleaceae family, have a long history of traditional medicinal use in regions bordering the Mediterranean Sea and its adjacent islands. The chemical composition of olive leaves is subject to variations influenced by factors such as olive variety, climatic conditions, tree age, agricultural practices, genetics, temperature, and extraction methods.

Furthermore, the quantity and quality of phenolic compounds present in olive leaves are contingent on the biological cycle of the olive tree. Owing to their widespread availability and cost-effectiveness, olive leaves possess the potential to serve as a valuable source for the production of high-value-added products. These leaves contain bioactive compounds, including oleuropein, verbascoside, rutin, tyrosol, and hydroxytyrosol, known for their antioxidant, antimicrobial, and anti-proliferative properties.²

However, these bioactive compounds exhibit certain limitations, notably their hydrophobic nature and susceptibility

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