

**Title :** Cosmetic Efficacy of Nanoemulsified *Cordyceps militaris* Extract in Facial Cream Formulation

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## ABSTRACT

*Cordyceps militaris* is a valuable natural resource with diverse applications in medicine, foods, and cosmetics. In cosmetics, it demonstrates significant potential by inhibiting key enzymes such as tyrosinase and elastase, which are associated with skin pigmentation and aging. However, the incorporation of crude *C. militaris* extract into cosmetic formulations presents challenges, including instability, browning, and unpleasant odor. To address these issues, a nanoencapsulation strategy was employed to enhance the stability of the bioactive compounds and preserving the color and odor of the formulation. This study aimed to optimize the preparation of a nanoemulsion of *C. militaris* extract, evaluate its cosmetic bioactivities, stability, and applied for facial cream formulation. The 95% ethanolic extract of *C. militaris* was prepared and assessed for its antioxidant, anti-tyrosinase, and anti-elastase activities. The extract was then encapsulated using a nanoemulsion protocol, and its bioactivities and physical properties were compared with those of the crude extract. Stability was evaluated under accelerated conditions prior to formulating the facial cream. The results demonstrated that the crude extract exhibited antioxidant, anti-tyrosinase, and anti-elastase activities with  $IC_{50}$  values of  $2.611 \pm 0.155$ ,  $2.980 \pm 0.262$ , and  $1.567 \pm 0.130$  mg/ml, respectively. The nanoemulsified extract showed significantly improved antioxidant activity ( $IC_{50}$  of  $2.094 \pm 0.067$  mg/ml) and maintained comparable anti-tyrosinase and anti-elastase effects. It also exhibited superior stability in color and odor, though bioactivity slightly decreased. These findings address the initial challenges of instability and sensory degradation, labeling the way for the development of a stable and efficacious facial cream formulation.

**Keywords:** Bioactive stability, *Cordyceps militaris*, Cosmetic formulation, Nanoencapsulation, Skin aging