

Editorial

Cordyceps: A Natural Himalayan Viagra with Promising Aphrodisiac Potential

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Received: October 15, 2016; **Accepted:** October 21, 2016; **Published:** October 24, 2016

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Natural dietary supplements with promising therapeutic effects are emerging collaterally as decisive agents against multiple clinical and pathological manifestations [1–3]. Findings from several studies on phytochemicals, contributing to their remarkable role in prevention and cure of cancer, cardiovascular, neuro-degeneration, and sex or reproduction-related disorders without or with minimal side effects [4–7]. *Cordyceps* is among the category of such medicinally important genus of ascomycete fungi (sac fungi) having worldwide distribution of approximately 400 species, that parasitizes on the insects and other arthropods mainly from Lepidoptera order, thus called entomopathogenic fungi [8–13]. Firstly this mushroom came into limelight during 1993 sports championship, when few of the winner athlete's committed that they were utilizing *Cordyceps* mushroom based ingredients in their diet. Its life cycle starts with infection to the insect, mainly in the early months of winter thereafter, fungus emerges out from the insect's body in March-April which justifies its name i.e. winter worm summer grass [14]. In the last few decades, the pharmacological potential of this fungus has been extensively implicated in the treatment of various lethal diseases including diabetes, and cancer [11]. In addition to the above mentioned medicinal values, *Cordyceps* genus is also known as Himalayan Viagra due to its positive effects on sexual stamina enhancement [15]. It has been traditionally being practiced as nutritious food for the enhancement of sexual performance and the restitution of impairment in sexual function amongst Chinese population [16]. Proved in the study using normal mouse Leydig cells, that *Cordyceps* treatment stimulated the steroidogenesis in a dose-dependent relationship and at a concentration of 3 mg/ml, significantly stimulated testosterone production determined by radioimmunoassay (RIA) ($p > 0.05$) [17–19]. Further results indicated that *Cordyceps* significantly elevated plasma testosterone levels both in immature and mature mice after 3 and/or 7 days of treatment ($p < 0.05$) [20]. Also, in MA-10 mouse Leydig tumor cells, *Cordyceps* stimulated steroidogenesis through both PKA and PKC signal transduction pathways, therefore could be utilized to modulate sexual efficacy [21,22]. Moreover, utilizing the

treatment of cordycepin, an active ingredient of *Cordyceps* extract, in an experiment upon Male Sprague-Dawley rats have shown dose-dependent elevation in epididymal weight, sperm motility, and movement, well-arranged spermatogonia, densely packed cellular material, along with increased number of mature spermatozoa in the seminiferous lumen [23]. The results further demonstrate that supplementation of *Cordyceps* mycelium improves sperm quality as well as quantity in subfertile boars which further supports the role of *Cordyceps* in the enhancement of aphrodisiac properties [24]. In another study, *Cordyceps* extract has been noticed to strengthen the accessory genital glands of mice along with modulation of androgen secretion [25]. This genus has also been suggested to positively influence the reproductive functions in yang vacuity of kidney mice model by improving adenine-induced testis morphology. The mice, when treated with *Cordyceps* which were receiving adenine at the same time, have shown improved testis morphology along with improvement in the rate and time of their matched female's pregnancy. In addition to this, numbers as well as the average body weight of their newborn mice were also found to be increased [26]. This mushroom also lightened the BPA-induced reproductive damage by activating the antioxidant defense system which involves testicular superoxide dismutase (SOD), glutathione peroxidase (GSH-PX), and glutathione (GSH), along with a reduction in serum malondialdehyde (MDA). This medicinal fungus was further found to elevate the levels of serum luteinizing hormone and testosterone in comparison to the BPA-treated group [27]. In conclusion, the genus of this sac fungus has the potential to modulate reproductive activity and restore the impaired reproductive function by directly affecting the release of sexual hormones such as testosterone from Leydig cells and estrogen and progesterone from granulosa or theca cells. As the cumulative observations from literature support the therapeutic role of *Cordyceps*, therefore, this fungus with medicinal importance could be introduced to improve sex or reproductive impairment.

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