A Newly Isolated Anamorph of the Medicinal Fungus *Cordyceps sinensis* (Berk.) Sacc. (Ascomycetes): A Review of Its Identification, Cultivation Parameters, Chemical Composition, and Antioxidant and Antitumor Activities

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Cordyceps sinensis (Cs) (DongChongXiaCao in Chinese), is a rare and precious Chinese herb facing a stringent shortage of natural supply (i.e., overharvesting and continued destruction of habitat) due to increasing world demand. This increasing shortage in supply has driven the price of wild collected Cordyceps up to previously unimaginable levels, making wild collected *C. sinensis* the most costly medicinal raw material available today. The cultivated mycelium of the *C. sinensis* fungi has been shown to significantly lower the cost and has proven to be a feasible alternative to the natural species for herbal medicine, pharmaceutical, and functional food use. Since the mid-1980s there have been a number of different anamorphs of *C. sinensis* isolated and brought into cultivation. While these modern biotechnologically cultivated anamorphs appear to hold great potential for relieving the worldwide shortage of this valuable medicine, the sheer number of different anamorphs and their widely differing chemical and cultivation parameters pose many questions about the effectiveness and equivalence to the wild collected *C. sinensis.*

In this work, we investigated and elucidated a fungus species, which was isolated from the wild Cs herb, which we have identified as a new anamorph of Cs. Its UV, IR, and HPLC spectra all exhibit high similarity in chemical composition to those of natural Cs herbs. As in the case of the wild fungus, this fungus (extracted by water or ethanol) exhibits strong antioxidant properties, scavenging free radicals (as shown by DPPH assay), and inhibits lipid peroxidation (shown by TBA assay). It also shows strong antitumor activity in a number of different tumor cell lines, both *in vitro* and *in vivo*, and shows potent inhibition of tumor growth in the Murine model.

These results suggest that this newly isolated Cs anamorph more closely mirrors the chemical composition and pharmacological activity of the natural Cs than has any previously identified anamorph, indicating the potential for an improvement upon the existing fungal lines in Cordyceps cultivation. The morphological characteristics, genetic identification, biotechnological potential, and detailed growth parameters in both liquid cultivation and solid state fermentation for this fungal mycelium are fully evaluated and indicate this new anamorph as having great potential as an effective and low-cost substitute for the natural Cs herb.