Effects of Pine (*Pinus densiflora*) Sawdust on Cordycepin Yield from Medicinal Fungus *Cordyceps militaris* in Submerged Culture

Si Young Ha,[a] Ji Young Jung,[a] Jai Hyun Park,[a] Chan Yeol Yu,[b] Jae-Hyeon Park,[c] and Jae-Kyung Yang [a,*]

Cordycepin (3′-deoxyadenosine) is a nucleoside analog that exhibits a broad spectrum of biological activity. The effects of different tree sawdust on cordycepin as bioactive substances for mycelium growth were investigated. Pine sawdust was essential for increasing cordycepin content. Furthermore, a 1% NaOH-pretreated pine sawdust produced the highest cordycepin yield. The cordycepin yield of mycelium in submerged culture was significantly increased when the particle size was 100-mesh and the weight was 20 g/L of 1% NaOH-pretreated pine sawdust, with an increase of up to 38% compared to the control (only sabouraud dextrose broth (SDB)). The results demonstrated the effects of different tree sawdust on the biosynthesis of cordycepin as bioactive substances and that replacing traditional medium (SDB medium) with 1% NaOH-pretreated pine sawdust can increase the yield of cordycepin. After optimization of cordycepin production from *Cordyceps militaris* cultivated in medium containing 1% NaOH-pretreated pine sawdust using RSM (response surface methodology) BBD (Box-Behnken design) in its canonical form, the optimum combination was: particle size, 113.7-mesh; input weight, 11.9 g/L; and incubation time, 67.8 h. The model predicted a maximum yield of 922.6 µg/mL for cordycepin.

Keywords: Cordyceps militaris; Cordycepin; Wood sawdust; Pine; Response surface methodology

Contact information: a: Division of Environmental Forest Science/Institute of Agriculture and Life Science, Gyeongsang National University, Jinju, 52828, Republic of Korea; b: Gyeongsangnam-do Forest Environment Research Institute, Jinju, 52615, Republic of Korea; c: Department of Forest Resources, College of Life Science, Gyeongsang National University, Jinju, 52828, Republic of Korea;
** Corresponding author: jkyang68@gmail.com*

INTRODUCTION

Cordycepin (3-deoxyadenosine), a nucleoside analog, is the main bioactive ingredient of *Cordyceps* and is known to mediate a variety of pharmacological effects (Tuli *et al.* 2014). Many chemically modified cordycepin derivatives exhibit various potential therapeutic effects, including anticancer (Nakamura *et al.* 2015; Shao *et al.* 2016; Yoon *et al.* 2018), anti-inflammatory (Kim *et al.* 2006), and neuroprotective (Olatunji *et al.* 2016). Some *Cordyceps* species have been used for a long time for medicinal purposes in China, Japan, Korea, and other oriental countries due to their biological and pharmacological activities, which are generally attributed to the presence of important bioactive ingredients such as adenosine, cordycepin, and exopolysaccharides (Ling *et al.* 2002; Kim *et al.* 2003; Ng and Wang 2005). Artificially produced fruiting bodies were investigated by conducting a sequence analysis of the internal transcribed tracer (ITS) region. The results showed that specimens of the fungus *Cordyceps militaris* (*C. militaris*)