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SHORT COMMUNICATION

Ferret out a Natural Bio-Pesticide: *Ophicordyceps nutans* in Central India and Its Interaction Analysis with Tree Stink Bug

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Abstract *Ophicordyceps* is a genus of fungi that grow on insects. In this paper we report for the first time the occurrence of *Ophicordyceps nutans* Pat. a species belonging to this entomopathogenic fungi group in Kanger Valley National Park in Bastar District of Chhattisgarh in Central India. The fruiting body or ascocarp of *O. nutans* was found in *Halyomorpha halys*, brown marmorated stink bug—an insect pest. The study highlighted the impact of *O. nutans* on the host insect and the damage it causes in trees and crops. The local people use this fungus in traditional medicine as an immune stimulator and also as a pest-control agent to protect crop and tree from stink bug. Therefore, it appears that *O. nutans* possesses great potential to be developed as natural medicine and bio-pesticide to save the agricultural crops and forest trees.

Keywords *Ophicordyceps nutans* · Entomoparasitic fungi · *Halyomorpha halys* · Bio-pesticide · Stink bug

Introduction

Ophicordyceps are well known parasitic fungi belonging to the ascomycetes group. *Ophicordyceps* sp. are the natural insecticides. They are entomoparasitic in nature. They grow up from different host insects and kill them (Hywel-Jones 1995; Sasaki et al. 2004; Friedrich et al. 2018; Luangsa-ard et al. 2018). *Ophicordyceps* sp. holds immense potential to be used as a biological pest control agent (Sasaki et al. 2008; Friedrich et al. 2018). There are several species of *Ophicordyceps* fungi (*Ophicordyceps sinensis*, *O. forquignonii, O. gracilis, O. militaris, O. coccinea*, etc.) having different medicinal properties (Sasaki et al. 2005). In China, *Ophicordyceps* sp. is traditionally used as medicine in a number of diseases (Hywel-Jones 1995). *Ophicordyceps nutans* Pat. is one of the fungal species, which is parasitic to stink bug insect, belongs to Order of Hemiptera (Karun and Sridhar, 2013). *O. nutans* are host-specific fungi that parasitize stink bug tree sap succulent insect *Halyomorpha halys* which damages several forest trees and agricultural crops. The fungi infect the insect and complete their life cycle in them. In the process, they extract precious nutrition from the insects that ultimately results in death of the insect. The fungal infection in *H. halys* is visible when the fruiting body is developed. In general, the infection spreads when the insects come in contact with each other. In addition, the fungal spores spread in the surrounding after death and degradation of the insect (Sasaki et al. 2008; Friedrich et al. 2018). *O. nutans* fungus has been reported from several Asian countries including Japan, China, New Guinea, Thailand, Taiwan, Nepal and Korea (Hywel-Jones 1995; Sasaki et al. 2004, 2012; Shrestha 2011; Luangsa-ard et al. 2018). In India, it is only found in the Western Ghat region (Karun and Sridhar 2013). However, there are very few studies on *O. nutans* with regards to its structure, behaviour, habitat mode of action, and interaction with host insect. Besides its entomopathogenic nature, the fungus is known to possess several medicinal and bio pesticide properties (Sridhar and Karun 2017; Wen et al. 2017) that warrants further investigation. Against this backdrop, we report for the first time the presence of *Ophicordyceps*

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