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Research Article

Polar Fungi *Pseudogymnoascus*: Secondary Metabolites and Ecological Significance

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Abstract

Fungi are widely distributed organisms known to produce secondary metabolites and other biochemical compounds. However, fungi from the polar regions with extreme environmental conditions such as low temperatures, high ultra-violet exposure, nutrient scarcity, and dryness are understudied. They produced many secondary metabolites that are yet to be identified, to adapt and survive the extreme conditions. These polar fungi with potential in secondary metabolites are promising in biotechnological applications such as pharmaceutical, textile, and food manufacturing. *Pseudogymnoascus* is a genus within the *Pseudeurotiaceae* family that has been reported in the Antarctic regions. This genus plays an important role in the decomposition process in the polar regions. To date, there are 24 species identified within the genus *Pseudogymnoascus* in the world. The true potential of *Pseudogymnoascus*, especially those from the polar region, is yet to be explored. This review gives an overview of the polar *Pseudogymnoascus* spp. Based on their secondary metabolites production and understanding their ecological perspective in the extreme environment.

Keywords: secondary metabolites, fungi, extreme environment, adaptation, extremophiles

1. Introduction

Antarctica is a continent on its own which experience extreme environmental condition, including strong wind, ice-free areas, poor nutrient content, high salinity, poor solar radiation, and minimal biochemical activity [1,2]. The continent is divided into three regions: Sub-Antarctica, maritime Antarctica, and continental Antarctica. Sub-Antarctica has a milder climate than the other two, whereby, even the coldest sub-Antarctic region would permit year-round biological activity [3]. This region often gets research attention, too [4,5]. Maritime Antarctica and continental Antarctica's biological processes are often limited by the low winter temperatures [6].

Despite the harsh conditions, both polar regions are habitable to various organisms, including microbes such as bacteria, archaea, protists, and fungi [7,8]. Among those microbes, fungi are the most diverse group in the Antarctic's soil ecosystems [9]. Over a thousand non-lichenized fungi and 500 lichenized fungi were reported from the Antarctic in 2012 and 2013,