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REVIEW

Siberian plants: untapped repertoire of bioactive endosymbionts

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BACKGROUND: Endosymbionts are microorganisms present in all plant species, and constitute the subject of interest among the scientific community. These symbionts have gained considerable attention in recent years, owing to their emerging biological roles. Global challenges, such as antimicrobial resistance, treatment of infectious diseases such as HIV and tuberculosis, cancer, and many genetic disorders, exist. Endosymbionts can help address these challenges by secreting value-added bioactive compounds with various activities.
OBJECTIVE: Herein, we describe the importance of plants inhabiting Siberian niches. These plants are considered to be among the least studied organisms in the plant kingdom worldwide. Barcoding these plants can be of interest for exploring bioactive endosymbionts possessing myriad biological properties.
METHODS: A systematic survey of relevant scientific reports was conducted using the Pub Med search engine. The reports were analyzed, and compiled to draft this review.
RESULTS: The literature survey on Siberian plants regarding endosymbionts included a few reports, since extremely few exploratory studies have been conducted on the plants in these regions. Studies on the endosymbionts of these plants are highly valuable, as they report potent endosymbionts possessing numerous biological properties. Based on these considerations, this review aims to create awareness among the global scientific community working on related areas.
CONCLUSION: This review could provide the basis for barcoding novel endosymbionts of Siberian plants and their ecological importance, which can be exploited in various sectors. The main purpose of this review is to create awareness of Siberian plants, which are among the least studied organisms in the plant kingdom, with respect to endosymbionts, among the scientific community.

Keywords endosymbiont, endophyte, siberian plant, bioactive metabolite, novel compound

Introduction

Medicinal plants constitutesome of the important sources of medicines, with their constituents used in the preparation of most modern drugs (Newman and Cragg, 2015). The use of plant-derived products can be traced back to several millennia ago (Satish et al., 1999). Even currently, many plant extracts are used to prevent myriad human ailments, owing to their healing properties (Rather et al., 2016). Increase in scientific knowledge and development of modern pharmaceuticals in the past decades have caused considerable progress in the commercialization of plant-based therapeutics (Baker et al., 2015). Interestingly, plants are some of the most abundant living organisms occupying different ecological habitats worldwide (Baker et al., 2015). One such ecological habitat includes the geographical area covering Siberia, which is a vast region covering almost all of Northern Asia, sharing its border with different countries, such as, China, Kazakhstan, Mongolia, and other arctic regions (Raiklin, 2008). Apart from its vast territory, its varied climatic conditions, soil, and topography make Siberia an interesting habitat (Tchebakova et al., 2016). It can be considered that to date, Siberia is an "underexplored" area, with extremely few explorations carried out (Franke et al., 2004). The unique habitat constituted by the Siberian region supports abundant natural

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