

Cold-Loving Microbes for a Warming Planet: Using Psychrophiles to Intensify Agriculture in Cold Regions

Luis Andrés Yarzabal R.

Carrera de Bioquímica y Farmacia. Grupo de Microbiología Molecular y Biotecnología (GI-M2YB). Unidad de Salud y Bienestar, Universidad Católica de Cuenca, Cuenca, Ecuador

ABSTRACT

Contrary to common belief, Earth is a cold planet. The average temperature across many terrestrial and aquatic ecosystems is well below 10°C, and in some environments—such as glaciers and permafrost—sub-zero temperatures persist year-round. Yet, microbial life thrives in these extreme conditions. Many microorganisms have adapted to grow optimally at low temperatures and are known as psychrophiles. Their survival is made possible by a range of molecular and physiological adaptations, some of which have been leveraged by the biotechnology industry to develop valuable products and processes. Among the most promising microbial resources in this field are cold-adapted plant growth-promoting microorganisms (PGPM). These valuable microbes, mainly bacteria and fungi, have significant potential as biofertilizers and biocontrol agents, particularly in cold climates. Their application has been proposed as a means to enhance agricultural productivity in mountainous regions such as the Andes and the Himalayas. Beyond promoting plant growth through direct and indirect mechanisms, psychrophilic PGPM offer a sustainable alternative to chemical fertilizers and pesticides. This manuscript provides an overview of current knowledge on the identity and characteristics of these PGPM and examines their potential to support plant growth at low temperatures in a warming world.

Keywords: Psychrophiles, PGPM, Biocontrol agents

How to Cite

Luis Andrés Yarzabal R., “Cold-Loving Microbes for a Warming Planet: Using Psychrophiles to Intensify Agriculture in Cold Regions”, *AIJR Abstracts*, p. 51, Mar. 2025.

