ABSTRACT

Biocontrol potentials of Microbial Surfactants on certain Plant Pathogens

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ABSTRACT

Microbial surfactants are valuable microbial amphiphilic molecules with effective surface active and biological properties applicable in several industries and processes; environmentally it's more compatible than chemically synthesized surfactants. They are a structurally diverse group and unlike chemically synthesized surfactants, which are classified according to the nature of their polar group, they are categorized mainly by their chemical composition and their microbial origin commonly referred as bio surfactants or Microbial surfactants. In general, their structure includes a hydrophilic moiety consisting of amino acids, peptides anions or cations, mono-, di-, or polysaccharides, and a hydrophobic moiety consisting of unsaturated or saturated fatty acids. Biosurfactants can have a positive, negative or a neutral charge and this is determined by their hydrophilic moieties. Several biosurfactants from microbes have antimicrobial activity against plant pathogens and therefore they are considered to a promising biocontrol molecule for achieving sustainable agriculture.

Key Words: *Biosurfactants; Pseudomonas sp; Bacillus sp; Rhamnolipid ;Lipopeptides*

INTRODUCTION

Microbial surfactants are valuable microbial amphiphilic molecules with effective surface active and biological properties applicable in several industries and processes; environmentally it's more compatible than chemically synthesized surfactants. They are a structurally diverse group and unlike chemically synthesized surfactants, which are classified according to the nature of their polar group, they are categorized mainly by their chemical composition and their microbial origin commonly referred as bio surfactants or Microbial surfactants. In general, their structure includes a hydrophilic moiety consisting of amino acids, peptides anions or cations, mono-, di-, or polysaccharides, and a hydrophobic moiety consisting of unsaturated or saturated fatty acids. Biosurfactants can have a positive, negative or a neutral charge and this is determined by their hydrophilic moieties. Several biosurfactants from microbes have antimicrobial activity against plant pathogens and therefore they are considered to a promising biocontrol molecule for achieving sustainable agriculture. producing ability can inhibit the growth of fungal pathogens such as Pythium ultimum (Causative agent of damping off and root rot of plants), Fusarium oxysporum (Causes Wilting in crop plants), Phytophthora cryptogea (Causes rotting of fruits and flowers),reduce the Viability of Verticillium sp ,terminate the growth of pathogenic fungus Rhizoctonia solani (causes several plant diseases) and Phythium ultimum (Causes damping offand root rot of plants). Biosurfactant extracted from Pseudomonas guariconensis LE3 with antagonistic activity against Macrophomina phaseolina, causal agent of charcoal rot in diverse crops. Bacillus sp., such as B. subtilis, B. cereus, B. licheniformis, and B. amyloliquefaciens, have been reported as the major producers of lipopeptide. Best studied Lipopeptide from the strains of Bacillus subtilis, Bacillus subtilis SPB1, Bacillus subtilis NCD-2 and Bacillus sp. CS30 effectively control Rhizoctonia solani AG-4, Fusarium solani, Magnaporthe grisea and Botrytis cinerea respectively. Moreover, an increasing number of phytopathogens have developed resistance to antimicrobial agents. Rhamnolipids biosurfactant produced by Pseudomonas sp. functionally targeted to Oomycetes fungi including

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Botrytis sp., Rhizoctonia sp., Fusarium sp., Alternaria sp., Pythium sp., and Phytophthora. All these studies have demonstrated an antimicrobial effect such as zoospore lysis, spore germination abortion and mycelial growth inhibition. Because of their amphiphilic nature, they interact directly with plasma membranes. Further, Members of the Bacillus genus are considered as the major biosurfactants producers such as lipopeptide that are potential inhibitors of growth of phytopathogens. Bacillus cyclic lipopeptides trigger plant systemic resistance shown on legumes. These molecules have similar dual effects by protecting plants through antimicrobial properties and stimulation of local and/or systemic plant immunity. These extraordinary properties are essential for the bio pesticides. Although numerous elicitors are perceived by plasma membrane receptors, recent studies on amphiphilic biosurfactants such as rhamnolipids or lipopeptides suggest that they are sensed by an uncommon way involving lipids in the bilayer of the plant plasma membrane that could explain their particular elicitor activity. To better understand the mechanisms of action of biosurfactants, experiments or trials need to be realized not only on mixture but also on highly purified molecules in the future. Nevertheless, several obstacles to the development of rhamnolipid and lipopeptide applications still remain.