

SYMBIO BANK – a collection of beneficial soil microorganisms

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Abstract

A Bank of Symbiotic Microorganisms, called SYMBIO BANK, has been established at the Research Institute of Horticulture in Skierniewice (Poland). The collected spores of mycorrhizal fungi and cultures of PGPR bacteria comes from organic orchards and plantations of strawberry, apple and sour cherry in Central Poland, the Bieszczady and Białowieża areas (less polluted regions in Poland). The bank currently contains about 55.000 spores of mycorrhizal fungi of different species and about 1.000 strains of bacteria that showed plant growth promoting characteristics. The strains are used to develop microbial based biopesticides and biofertilizers specific for fruit species and organic farming.

Keywords: arbuscular mycorrhizal fungi, plant growth promoting rhizobacteria, biopesticides, biofertilizers

Introduction

Plant-soil microorganisms can modulate the uptake of mineral nutrients through different processes. The intimate interrelation between the root and symbiotic arbuscular mycorrhizal fungi and the resulting enhancement in the uptake of N and P by the plant are further expanded by the interactions between the fungus and bacteria present in both the rhizosphere and mycorrhizosphere (Richardson *et al.* 2009). Numerous species of plant growth promoting bacteria form biofilm when colonizing roots, which can affect biogeochemical processes and can result in increased availability of poorly available mineral nutrients. An important part of the project EcoTechProduct, which is carried out at the Research Institute of Horticulture in Skierniewice, is to establish and maintain a repository of beneficial microorganisms called SYMBIO BANK that can be used in developing biofertilizers useful for organic fruit production.

Material and Methods

Roots of strawberry, apple, pear and cherry plants were collected from organic orchards and plantations in Central Poland, the Bieszczady and Białowieża areas (less polluted regions in Poland).

Bacterial strains were selected for being characterized by several characteristics related to plant nutrition. The bacteria isolates were distinguished by analysis of DNA polymorphism, using the technique of rep-PCR, phenotype (BIOLOG) and microscope characteristics.

Trap cultures were set up to isolate spores of arbuscular mycorrhizal fungi (AMF) using narrowleaf plantain in 0.5 L pots filled with a mixture of rhizosphere soil and autoclaved sand, at a ratio of 1:1 v/v. The isolated spores were divided into morphotypes according to size, shape, and colour of spores and were named according to Błaszowski (2003).

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Results and Discussion

The collection of AM fungi in the SYMBIO BANK is composed of the number of spores from the species listed in Table 1. The bank contains also 100 strains of *Actinomyces* and 50 isolates of microscopic fungi, including 30 *Trichoderma* sp.

Table 1: Amount of spores and list of AMF species maintained at the Symbio Bank.

Fruit species	Number of spores	AMF species
Strawberry	18.000	<i>Glomus aggregatum</i> , <i>G. caledonium</i> , <i>G. claroideum</i> , <i>G. constrictum</i> , <i>G. drummondii</i> , <i>G. fasciculatum</i> , <i>G. macrocarpum</i> , <i>G. microaggregatum</i> , <i>G. mosseae</i> , <i>G. pallidum</i> , <i>G. rubiforme</i>
Wild strawberry	9.000	
Apple	10.500	
Pear	14.000	
Sour cherry	1.500	
		<i>Ambispora fennica</i> , <i>A. gerdemannii</i>
		<i>Gigaspora margarita</i> , <i>Scutellospora dipurpurescens</i>

The repository contains about 1250 strains of bacteria with the characteristics listed in Table 2.

From the evaluation of several strains, it emerges that three strains (Ps49A - *Pseudomonas fluorescens*, Pi3A and Pi5A - *Rahnella aquatilis*) enhance growth of strawberry plants.

Table 2: Amount of spores and list of AMF species maintained at the Symbio Bank.

Bacteria features	Number of strains
Potential PGPR (<i>Pseudomonads</i> and <i>Bacillus</i>)	410
producing siderophores	500
dissolving phosphorus compounds	200
fixing atmospheric nitrogen	100
digesting cellulose	40

A website of SYMBIO BANK will be launched, which will contain a list of the isolates held in the collection and their descriptions, which will serve as a source of key information for the identification of the species of AM fungi and PGPR bacteria. The establishment of the SYMBIO BANK is expected to contribute to the understanding and maintenance of the biodiversity of these symbionts, to improve the knowledge of their biology and ecology, as well as to the development of formulation of microbiologically-enriched bioproducts for use in organic fruit-growing practices and to be registered in Poland.

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The citation of the full publication will be found on Ecofruit website as soon as available.