SRCAMB Collection Of Phosphate Solubilizing Microorganisms As A Long-Term Bioresource

Author(s) Igor A. Dunaytsev, Svetlana K. Zhigletsova, Marina V. Klykova, Tatiana N. Kondrashenko, Andrey M. Baranov, Ivan A. Dyatlov

Institution(s) 1. SRCAMB, SR Center for Applied Microbiology and Biotechnology, Obolensk, Moscow Region, 142279, Russia

Abstract:

The industry of phosphorus (P) compounds, especially soluble mineral fertilizers, is of very large scale. But, remaining P resources are prospected for 60-80 years and no more 10-15% of mined P achieves to plants. Other P disappears as environment contaminant [1, 2]. The “green” alternative for conventional P industry is to use direct microbial solubilization of insoluble P ore. **Purpose** of this work was to create and develop as wide as possible the collection of active phosphate-solubilizing microorganisms (PSM) basing on expedition work in Russian variability of climatic zones and unique ecological niches. This collection is used for development of regional phosphorus biofertilizer and other needs. **Methods.** 15 long- and short-term expeditions to various climate (from subarctic to subtropics) and ecological niches (mines, reserves, caves, volcanoes etc) were organized to collect most effective PSM. Semi quantitative and contradictory selection method of "clear zones" on tricalciumphosphate (TCP) agar [3,4] was strengthen by quantitative control of PS activity and efficacy in mineral liquid medium, use several carbon sources, checking of “non-halozoned” isolates. Selected PSM were stored in collection and screened for other prospective activities. **Results.** Wide expedition search (more 100 econiches) allowed creating large PSM collection of variable characterized cultures (more 700). Newly-selected isolates relate to different microbial groups: from Gram–negative bacilli, cocci to Gram-positive sporous bacilli and yeasts. Numerious isolates were selected not from soil or rhizosphere but from niches of very deficient on nutrients and phosphorus. One third of collection’s non-halozoned cultures revealed highest level of PSA. Many of isolates have very high PS activity with TCP and natural P ores comparing with best known PSM [7] and have preferable technological properties. As biofertilizer several strains were tested successfully in pot and field trials. Use of PS consortium shows flow continuous P mobilization from poor ores and wastes allowing recuperate P and protect the environment [5,6]. Useful property of many PSM was high level of fungicide activity. PSM collection is very prospective for screening metabolites, enzymes (organic acids, biopolymers, phytase etc). Work was supported by ISTC, Projects #2754.2, #3107.

Key words: phosphate solubilization, collection, phosphorus biofertilizer, biofungicide and organic acid producers, environmental protection