The significance of interspecific interactions in microbial biotechnology

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Short Commentary

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SHORT COMMENTARY

Recently the interest in using microorganisms in various biotechnological applications increased significantly. Various bacteria and fungi have a great potential in applications like biodegradation of organic wastes, biocontrol of agriculturally important phytopathogens, or biofuel production. The prime research interest of our group is the assessment of the interspecific interactions in microbial biotechnology. Mechanisms and bioactive compounds involved in microbial interactions are studied using the following two main research models: fungal based bioreactors for biodegradation of contaminated wastewaters and the interactions of the pathogenic *Fusarium oxysporum* conglutinans with biocontrol agents.

Bioreactors based on fungal biodegradation power have become a widely studied technology for biodegradation of various recalcitrant organic pollutants. However, laboratory studies using model contaminations and standard media are remote from the conditions of true wastewater treatment processes, and thus, recent investigations into the use of fungal bioreactors in the wastewater treatment process focus on real industrial effluents [1]. The biodegradation performance of fungal bioreactors in wastewater treatment that act under non-sterile conditions may be affected by the interaction with invading microorganisms. However, it is difficult to predict whether the effect will be positive or negative. As documented in many studies the biodegradation efficiency of mixed microbial cultures may exceed the biodegradation by single fungal strains but it may also result in poorer biodegradation efficiency [2]. In this respect, *Pleurotus ostreatus* was shown to be promising organism in the degradation of synthetic dyes when exposed to wastewater bacteria in fixed-bed bioreactors [3] and thus could be used for the development of bioreactors for wastewater treatment. The future research in this area should focus on metabolites formed during biodegradation under non-sterile conditions. Practically, all the information on this subject that can be found in the literature was obtained with pure microbial strains and may not be true for mixed microbial consortia [4].

In the case of the interactions of *F. oxysporum* with host plants and biocontrol agents, recent publications demonstrated that OMICs techniques can be applied, separately or in combinations, to deepen our understanding of the virulence and biocontrol of the phytopathogen *F. oxysporum*. These modern profiling analyses enable us to better identify sets of metabolites, proteins and genes involved in host-microbe interactions and in interactions between antagonists, compared to classic approaches. However, the studies often included various ´formae speciales´ of *F. oxysporum* and the information obtained is not always easily applicable to *Fusarium oxysporum* conglutinans studied in our group. For example the use of comparative genomics for analyses of different *F. oxysporum* forms is complicated by karyotype variations and a high number of genetic transposable elements in *F. oxysporum* genomes. For this reason further research on *Fusarium oxysporum* conglutinans is required.

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