

Microbial ecology to support integrative efficacy improvement of biocontrol agents for postharvest diseases management

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Abstract

Harvested fruits and vegetables are threatened by pathogens which can cause losses for up to 55 % depending on the fruit and country. A potentially sustainable control method is the biological control of these postharvest diseases using biocontrol agents (BCA). Nevertheless, the lack of reliability in practical conditions compared with synthetic chemical pesticides is a major hinderance. Strategies combining BCA application to nutrient additives, salts, edible coatings, or physical treatments have been evaluated to improve BCA antagonism activity, but with only relative success. The fruit surface is colonized by complex microbial communities that are often resilient. In a such environment, BCA establishment might be difficult. The integration of the role of microbial communities to assemble a BCA-friendly microbiota, is a promising solution to manage the reliability of BCA in real condition. Biocontrol phenotype of a microbiota is a complex metabolic phenotype that can be broken down in a multiple process supported by a network of beneficial microorganisms and molecules. Combining BCA application in a suitable complex biocontrol mix including for example beneficial helper strains, essential macro and micronutrients also acting as prebiotic of biocontrol could help the establishment of BCA in the epiphytic microbial network. At the same time, it could achieve a biocontrol efficacy and reliability comparable to synthetic chemical pesticides. In addition, the timing of beneficial microbial application has been reviewed based on the available literature. For example, we propose that shifting application at flowering stage (to induce a “path dependency”) could be considered for the future management of postharvest disease of fruits and vegetables. This application moment shift could be extended to other plant organ like seeds.