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Formulation of microbial bioeffectors - a materials perspective

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Microbial biofertilizers and biocontrol agents are promising alternatives to agrochemicals in sustainable agriculture; however the lack of effective formulations is a major limitation for their successful application in the field. The scientific challenge is therefore to elucidate microbial responses to multiple factors including the properties of the used materials, the formulation process itself and the environmental conditions during processing and storage, and to estimate the driving factors that impact stability (viability, shelf life, metabolic activity), performance (germination, plant penetration) and function (release efficiency). Examples will be given for different types of bacteria and application (seed coatings, granules, capsules, foliar spray) highlighting the necessity of taking into account the interplay between materials and microbes to better understand the impact of materials and eventually optimize the formulation process.