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Bioplastic formulations for the delivery of beneficial microbes to control agricultural pests

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Biocontrol agents are beneficial microbes used to control agricultural pests including fungi, insects, weeds, and bacteria. Their efficacy depends on effective formulations and delivery systems to facilitate production, maintain viability during storage, facilitate field application and enhance effectiveness on crops. Starch-based bioplastics possess a number of unique properties that make them advantageous for biocontrol formulations. They are available in various forms that facilitate delivery and efficacy. In each form used, the starch component of the bioplastic plays key roles. In granule formulations, the starch-based bioplastic component enables adsorption of spore suspensions with good viability retention and provides a nutrient source for the fungus after application. In sprayable liquid formulations, the starch component allows heat-induced gelatinization of finely-divided particles, which can then deform to pass through a sprayer head, and enhance adherence to leaf surfaces, as well as providing the spore suspension adsorption and nutrient provision advantages. In seed coating, spray-coated bioplastic formulations provide a stable, adherent nutrient source with excellent dust-generation resistance and viability retention. Bioplastic granules coated with spores of non-aflatoxigenic *Aspergillus flavus* spread on maize (corn) field soil reduces levels of aflatoxigenic *A. flavus* in soil and aflatoxin contamination in harvested kernels by 97%. Biocontrol *Trichoderma* species in bioplastic granules reduce fungal infection of emerging roots by 85% in tomatoes, impatiens and bluegrass. Coating seeds with bioplastic containing *Trichoderma* species helps prevent fungal infection of roots of germinating seedlings, preventing root rot. Sprayable liquid bioplastic dispersion formulations of *Beauveria bassiana* significantly reduced damage caused by European corn borer in maize and tarnished plant bug in cotton, and delivered *Bacillus thuringiensis*endotoxin crystals to European corn borer larvae, causing 72% mortality. Bioplastic formulations have proven effective delivery vehicles for several microbial biocontrol agents in treating or preventing agriculturally-important plant diseases, but improved methods are being sought to enhance cost-effectiveness.

Biography

Dr. Hamed Abbas has been the lead scientist in the aflatoxin control project since 1999. The focus of Dr. Abbas' research is reduction of corn contamination with mycotoxins (especially aflatoxins and fumonisins) by studying agricultural practices, varietal resistance, fungal ecology, and biological control. He developed a sensitive, inexpensive method to identify aflatoxigenicity in *Aspergillus* isolates. Currently Dr. Abbas is cooperating with an industrial partner (Syngenta) to further develop and refine application methods for two promising aflatoxin biocontrol strains. Dr. Abbas has 27 years of post graduate research experience and he has authored or co-authored 261 publications (212 refereed research journal articless, 50 review articles/book chapters) and over 200 abstracts. He has received 7 patents for his work on mycoherbicides and aflatoxin control. Dr. Abbas has been recognized worldwide as an authority on mycotoxin contamination in the field, and in food, and for his work on mycoherbicides.

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