Biological disinfestation of tare soils contaminated with quarantine plant pathogens

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Abstract

Tare soils are soils attached to harvested products like potato tubers, flower bulbs and carrots. There is a high chance on incidences of contamination of these soils with (quarantine) plant pathogens, because of the close contact with plant surfaces. Tare soils are considerable waste streams derived from industrial processing of harvested products. Reuse of tare soils for agricultural purposes are greatly hampered by possible contamination with plant pathogens. To make tare soils applicable for primary agricultural production, it is required to disinfest these soils from contaminating agents. Biological soil disinfestation (BSD) is a suitable approach to decontaminate tare soils in a sustainable fashion. For this purpose, we applied four treatments (BSD with freshly cut grass, commercial product called 'Herbie', inundation and the combination of BSD with inundation) on two tare soils (clay and sand) inoculated with *Ralstonia solanacearum* bv 2 (causative agent of potato brownrot) and *Globodera pallida* (potato cyst nematode). We compared decline rates of both quarantine pathogens under experimental conditions with control (non-treated) soils during a two-month period. After this period, soils were analysed for the presence of *R. solanacearum* bv 2 colony forming units and nematodes. In addition, biotests with tomato (*R. solanacearum* bv 2) and potato (*G. pallida*) plants were applied. These analyses revealed strong declines of both pathogens in all treated soils in comparison with controls. Decline rates down to undetectable levels were recorded for *R. solanacearum* bv 2 colony forming units in the BSD treatment with Herbie in sand. Incidence of disease were not recorded in tomato and potato plants, with the exception of a single occurrence of tomato wilting in BSD-treated sand with freshly cut grass. We therefore concluded that BSD and inundation are promising methods to remediate tare soils from contaminating quarantine pathogens.