Reducing the microbiomes of beetroot and spinach seeds can increase infection by Pythium ultimum

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Seed health is an indispensable prerequisite of food security. While the toolkit of plant protection products is currently limited, evidence suggests that the seed microbiome could protect seeds from pathogens. Thus, given its possible disease suppressive potential, we tested eleven different pathosystems to achieve the following proof-of-concept: seed microbiomes are beneficial for seed health through conferring disease suppression. This study focused on beetroot, onion, spinach, pepper, coriander, red fescue and perennial ryegrass seeds, with each crop being challenged with one or two from a total of six pathogens, namely *Pythium ultimum* (or *Pythium* sp.), *Setophoma terrestris*, *Fusarium oxysporum*, *Phytophthora capsici*, *Laetisaria fuciformis* and *Puccinia* sp.. We found disease suppression in two pathosystems. Part of the beetroot and spinach seed lots were able to suppress disease by *Pythium ultimum* when their microbiomes were intact, but this protection was reduced after seed disinfection. We speculate that this relates to the microorganisms selectively residing on and in the seed. A holistic understanding of the types of seeds that harbour suppressive microbiomes as well as the pathogens that are sensitive to suppression, could lead to more targeted and informed seed processing and treatment and consequently to the sustainable management of seedling diseases.

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