

Seedborne *Cercospora beticola* Can Initiate *Cercospora* Leaf Spot from Sugar Beet (*Beta vulgaris*) Fruit Tissue

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ABSTRACT

Cercospora leaf spot (CLS) is a globally important disease of sugar beet (*Beta vulgaris*) caused by the fungus *Cercospora beticola*. Long-distance movement of *C. beticola* has been indirectly evidenced in recent population genetic studies, suggesting potential dispersal via seed. Commercial sugar beet “seed” consists of the reproductive fruit (true seed surrounded by maternal pericarp tissue) coated in artificial pellet material. In this study, we confirmed the presence of viable *C. beticola* in sugar beet fruit for 10 of 37 tested seed lots. All isolates harbored the G143A mutation associated with quinone outside inhibitor resistance, and 32 of 38 isolates had reduced demethylation inhibitor sensitivity ($EC_{50} > 1 \mu\text{g/ml}$). Planting of commercial sugar beet seed demonstrated the ability of seedborne inoculum to initiate CLS in sugar beet. *C. beticola* DNA was detected in DNA isolated from xylem sap, suggesting the vascular system is used to systemically colonize the host. We established nuclear ribosomal internal transcribed spacer region amplicon sequencing using the MinION platform to detect fungi in sugar beet fruit. Fungal sequences from 19 different genera were identified from 11 different sugar beet seed lots, but *Fusarium*, *Alternaria*, and *Cercospora* were consistently the three most dominant taxa, comprising an average of 93% relative read abundance over 11 seed lots. We also present evidence that *C. beticola* resides in the pericarp of sugar beet fruit rather than the true seed. The presence of seedborne inoculum should be considered when implementing integrated disease management strategies for CLS of sugar beet in the future.

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