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Using nanoparticles to enhance fungicide efficacy for management of Cercospora leaf spot of sugar beet.

Cercospora leaf spot (CLS) of sugar beet is a devastating disease caused by the fungal pathogen *Cercospora beticola*. Management of CLS mainly relies on the timely application of fungicides. However, many populations of *C. beticola* around the world have become resistant to most fungicide classes. Therefore, the objective of this study was to use cellulose nano fibers (CNFs) to enhance efficacy of fungicide for disease management. Five treatments were used; inoculum only, CNF-Cu at 2 mg/ml, CNF-CU at 1mg/ml, CNFs and buffer only. These treatments were applied to 5-week-old sugar beet plants. Three days later, *C. beticola* was inoculated at 10^5 spores per ml and disease severity was evaluated two weeks later to evaluate efficacy of CNF-Cu treatments. Disease inoculation of all CNF-Cu treated plants showed significantly less CLS than non-treated plants or plants treated with CNF or buffer alone, which suggests CNF-Cu can inhibit disease development on sugar beet leaves. An additional potential benefit of using CNF-Cu is the nano scaled cellulose fibers can tightly adhere to plant leaves and therefore may avoid rainfall wash off to provide longer defense against fungus. Future greenhouse experiments will cover multiple high and low concentrations of CNF-Cu as well as rainfall simulated events to provide great insight for future field applications. This study shows that CNFs based nano technology has the potential to be a useful management strategy for Cercospora leaf spot.