

SEMINAR-III

IMPROVING MANAGEMENT AND UNDERSTANDING OF MAJOR DISEASES OF SUGAR BEET

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Executive Summary

Sugar beet is a sugar-yielding crop that contributes 25% of the global sucrose production. Economic production of sugar beet is hampered by *Cercospora* leaf spot (CLS) (*Cercospora beticola*), *Rhizoctonia* crown and root rot (RCRR) (*Rhizoctonia solani*), *Sclerotinia* root rot (SRR) (*Sclerotinia sclerotiorum*), and *Rhizopus* root rot (*Rhizopus arrhizus*) diseases. These diseases can reduce yield by 15 to 40%. On CLS, buildup of fungicide-resistance strains is a major issue due to poor implementation of fungicides and understanding of disease development at early stages. The identification of germplasm resistant to RCRR disease is hindered by the lack of effective inoculation methods. Identification of SRR and RRR pathogens is crucial for their proper management. The objectives of this research were 1. To evaluate the role of adjuvants in improving the efficacy of fungicides on CLS, 2. To characterize the infection process during early stages of infection by *C. beticola*, 3. to identify an effective inoculation method for RCRR, and 4. to identify and characterize the causal organisms of SRR and RRR. The value of adjuvants was evaluated in greenhouse and field conditions. Application of fungicides with or without adjuvants before disease onset reduced disease severity of CLS in greenhouse condition. In field conditions, additions of adjuvants did not improve the effectiveness of fungicides and few of them negatively impacted root yield. The initial stage of infection on CLS susceptible and resistant sugar beet variety were compared using confocal microscopy. *C. beticola* biomass accumulation, percent leaf cell death and disease severity were all significantly greater in the susceptible variety compared to the resistant variety ($P < 0.05$). *R. solani* inoculated on the crown and roots were compared in a replicated trial in greenhouse conditions. The root inoculation method provided a more consistent disease rating of the sugar beet variety in the greenhouse for screening of RCRR cultivars in a resistance breeding program. Based on morphological and molecular techniques, causal organisms of SRR and RRR were characterized and were found to be pathogenic to sugar beet varieties tested in-vitro and in the greenhouse conditions.

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