

Research Report

Sugarbeet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by E. G. Ruppel, January 7, 1974

- A. Location of Project: Western Region  
Colorado-Wyoming Area  
Crops Research Laboratory, CSU  
Fort Collins, Colorado
- B. Work Reporting Unit Title: Improved Sugarbeet Varieties and Sugarbeet  
Production Practices
- C. Work Reporting Unit: No. 401-5602-10710
- D. SMY's for Past Year at Location: 1 SMY
- E. Names of Scientists in Project at Location: E. G. Ruppel, also  
cooperating with R. J. Hecker, G. W. Maag, and G. A. Smith
- F. Mission of Research:

To develop knowledge on the epidemiology of sugarbeet diseases, especially *Cercospora* leaf spot and *Rhizoctonia* root rot; to study physiologic specialization of the causal organisms; to develop methods for creating epiphytotics for evaluating breeding lines for resistance in the field and greenhouse; to conduct cooperative research with others on the biochemical nature and inheritance of resistance to *Cercospora* and *Rhizoctonia*.

- G. Objectives of Research:

To determine the effects of various environmental factors on the development, spread, and severity of disease under natural conditions, and for creating moderately severe artificial epiphytotics in experimental plots; to ascertain strain or race relationships of causal organisms and how they might affect breeding programs for disease resistance; and to utilize information from biochemical and/or inheritance programs for developing methods of resistance evaluation in the field and greenhouse.

- H. Research Accomplishments:

Results indicate that, although different cultural types of *Cercospora beticola* and *Rhizoctonia solani* were found, sugarbeet lines X isolate interactions were nonsignificant. Histological evidence indicated that resistance to *Rhizoctonia* was not due to mechanical barriers, but, probably, due to physiological or biochemical phenomena. Resistance to *Cercospora* was not found to be associated with stomatal aperture size, activity, or stomate density.

I. Impact of Research Accomplishments on Science and General Public:

The lack of complexity in race relationships of *Cercospora* and *Rhizoctonia* isolates indicates that resistant lines developed at Fort Collins can be grown safely in all areas where leaf spot and root rot are endemic. The lines also can serve as germ plasm in the transfer of resistance to locally adapted varieties. Histological evidence against mechanical barriers serves as a prelude to physiological and biochemical studies on the nature of resistance to *Rhizoctonia*.

J. Obstacles to Achieving Objectives:

Methods are needed to evaluate breeding lines for disease resistance in the greenhouse, and to study epidemiological factors in leaf spot and root rot of sugarbeet. To these goals, environmental growth chambers are needed to standardize as many variables as possible.

K. Future Plans and Needs:

Epidemiological studies on leaf spot and root rot will be continued as best as possible without growth chambers. We also will attempt to devise a practical method to quantitatively detect antifungal compounds (phytoalexins) in sugarbeet cultivars having varied resistance to *Cercospora beticola*. Such a technique has potential as a laboratory tool for evaluating lines for disease resistance, with the resultant reduction of costly field trials. Progress on the *Cercospora* phytoalexin investigations and on the nature of resistance to *Rhizoctonia* will be somewhat dependent on the replacement of our Research Chemist who plans to retire during the last half of FY-74.