

Research Report  
Sugarbeet Conference, Fort Collins Colorado  
February 5, 6, 1974  
Prepared by D. L. Mumford, January 10, 1974

- A. Location of Project: Western Region  
Idaho-Montana-Utah Area  
Crops Research Lab.  
Logan, Utah
- B. Work Reporting Unit Title: Sugar Beet Production Practices
- C. Work Reporting Unit: No. 10710
- D. SMY's for Past Year at Location: 1 SMY
- E. Names of Scientists in Project at Location: David L. Mumford
- F. Mission of Research:

To study sugarbeet diseases, particularly virus diseases, of importance in the Intermountain Region. To utilize the information obtained in developing sugarbeet varieties with improved disease resistance and in the adoption of practices that will reduce disease.

- G. Objectives of Research:

To purify and characterize curly top virus. To develop new techniques for investigating the relationship of curly top virus with its vector, its host and with other viruses. To develop improved methods of transmitting curly top virus and to use them along with other methods in evaluating for disease resistance. To develop knowledge on the mechanisms of resistance to curly top virus.

- H. Research Accomplishments:

Because of its past and potential threat to the sugarbeet industry in the Intermountain area, research has dealt primarily with curly top virus. Two significant achievements have been made recently concerning this virus. Curly top virus has been purified for the first time and examined by electron microscopy. It was found to be a very small isometric particle about 20 nanometers in diameter.

A new method was found for transmitting curly top virus. The virus was mechanically transmitted by an injector instrument normally used in human mass immunization. About 50% of susceptible sugarbeet seedlings given one injection became infected.

During the past 5 years approximately 6,000 sugarbeet breeding lines from throughout western United States have been evaluated for resistance to curly top virus in the field. Procedures have now been developed for artificially producing disease epidemics in field plots that make it possible to evaluate for resistance during years when natural epidemics do not occur.

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

The purification of curly top virus is of particular scientific interest because

of its highly specific relationship with its insect vector and because it appears to be one of the smallest plant viruses known. Its purification makes it possible to utilize several technical methods for studying strains of the virus and its relationship to other viruses, its vector, and its host. The mechanical transmission of curly top virus provides the first development of an inoculation method, other than using leafhoppers, with potential application to programs aimed at breeding for disease resistance. The method may also have application to several other viruses that are difficult to transmit mechanically.

J. Obstacles to Achieving Objectives:

Much of the research effort of this project involves laboratory work utilizing sophisticated techniques and equipment. Laboratory assistance has been in the form of temporary, inexperienced personnel with no continuity from one year to the next. The establishment of a permanent ARS laboratory technician position would greatly facilitate the research effort.

K. Future Plans and Needs:

Curly top virus will be characterized further and specialized techniques such as serology will be applied to studying strains of the virus, its relationship to its vector, its host, and other viruses.

Attempts will be made to improve mechanical inoculation with curly top virus to the point where it can be utilized in evaluation for resistance by industry and ARS plant breeders.

The reaction of resistant and susceptible sugarbeets to virus diseases will be studied to learn more about the mechanisms of resistance.

Sugarbeet breeding lines will be evaluated for resistance to curly top virus in a continuing effort to develop commercial varieties with improved disease resistance.