

Research Report

Sugarbeet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by R. T. Lewellen, January 14, 1974

- A. Location of Project: Western Region  
Northern California-Nevada Area  
U. S. Agricultural Research Station  
Salinas, California
- B. Work Reporting Unit Title: Improved Sugarbeet Varieties and  
Production Practices
- C. Work Reporting Unit: 10710
- D. SMY's for Past Year at Location: 1 SMY
- E. Names of Scientists in Project at Location: R. T. Lewellen
- F. Mission of Research:

To develop sugarbeet varieties and breeding lines adapted to California and Arizona; to select and incorporate resistance to virus yellows (beet yellows and beet western yellows viruses) in combination with resistance to bolting, curly top, beet mosaic, Erwinia, Cercospora, etc.; to determine the inheritance and nature of disease resistance; to improve the productivity and processing quality of disease resistant breeding lines; and to develop selection and breeding techniques to incorporate disease resistance and combining ability for productivity.

- G. Objectives of Research:

To develop sugarbeet breeding lines that possess resistance to virus yellows, Erwinia, Cercospora, curly top, beet mosaic, etc., in combination with regional adaptation and combining ability for productivity; to select and evaluate breeding lines for disease resistance and productivity; to conduct studies to determine the inheritance and nature of disease resistance; to develop and evaluate the relative merits of various selection and breeding schemes; and to study other fundamental and applied aspects of genetical, pathological, and physiological phases of sugarbeet improvement.

- H. Research Accomplishments:

Breeding lines with resistance to virus yellows in combination with regional needs and good combining ability have been developed. For example, the monogerm, 0-type, self-fertile line C3718 and its cytoplasmic-male-sterile equivalent, C3718H0, show promise as potential

components of commercial hybrids. The effects of infection by beet yellows and beet western yellows viruses on sugarbeet lines have been investigated in controlled inoculated field experiments. The inheritance of resistance to beet mosaic virus was determined and this resistance has nearly been backcrossed into virus yellows resistant breeding lines. Techniques for obtaining sufficient quantities of seed for various types of progeny tests have been developed. In cooperation with Dr. Whitney, it was determined that breeding lines are variable in their reaction to Erwinia vascular necrosis and rot and that selection for resistance should be possible. Also with Dr. Whitney, it was determined that physiologic races of Cercospora beticola exist and that the differences in plant reaction to different races are simply inherited.

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

When used in commercial hybrids, breeding lines resistant to virus yellows and other diseases will potentially increase the net return to growers and processors, stabilize production, and decrease the risk of growing sugarbeets. Breeding lines not commercially usable may provide parental germplasm for use in other breeding programs. Information on the source, inheritance, and nature of disease resistance will aid breeders in their choice of the appropriate breeding methods.

J. Obstacles to Achieving Objectives:

The greatest obstacle has been the nature of the virus yellows disease: (1) Immunity or a high level of resistance is unknown; (2) The present level of moderate resistance is difficult to transfer; (3) There is not a good criterion to distinguish relative levels of disease reaction; (4) At least two distinct viruses, each with many strains, are involved; (5) At Salinas, natural infection by strains of one or both viruses is difficult or impossible to prevent in field tests; (6) Virus yellows infected plants do not store well during photo-thermal induction, are more difficult to induce than noninfected plants, and produce low amounts of seed. Greenhouse space is often a limiting factor as is adequate facilities for raising insect vectors. Additional technical help is needed.

K. Future Plans and Needs:

Work to develop virus yellows resistant breeding lines and germplasm sources and to combine yellows resistance with other factors will be continued. The inheritance of yellows resistance and the importance of the specific virus components will be studied. Cooperative research will be continued on the nature and inheritance of other sugarbeet diseases important in California.

There is a need for highly skilled technical help, e.g., GS 7-11, to help expedite this program.