

Research Report

Sugarbeet Conference, Fort Collins, Colorado

February 5, 6, 1974

Prepared by J. S. McFarlane, January 8, 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: 2 SMY's
- E. Names of Scientists in Project at Location: J. S. McFarlane and
I. O. Skoyen
- F. Mission of Research:

To develop sugarbeet varieties and breeding lines adapted to California and Arizona; to incorporate resistance to bolting, curly top, downy mildew, and Fusarium stalk rot; to improve the sucrose concentration and processing quality of breeding lines; to determine relationship of environment and bolting resistance; to determine inheritance of bolting resistance and seed germinability.

- G. Objectives of Research:

To develop inbred lines and cytoplasmic male sterile lines that are resistant to bolting, curly top, downy mildew, Fusarium stalk rot, and possessing the monogerm seed characteristic; to measure the combining ability of inbred lines and produce hybrid combinations suitable for commercial use; to test high-performing inbred and male sterile lines for seed producing ability in Oregon; to test the seed germinability of inbred lines; to select breeding lines for high sucrose concentration and quality with emphasis on low sodium, potassium, and amino nitrogen.

- H. Research Accomplishments:

Breeding lines with high resistance to bolting, curly top, virus yellows and downy mildew resistance have been developed. Cytoplasmic male sterility has been introduced into a portion of these inbreds. These CMS lines have been utilized in the production of hybrid combinations. The monogerm character has been incorporated into a wide range of inbred lines which possess resistance to bolting and disease.

Ten sugarbeet varieties have been developed and released for commercial use. Nine of these varieties are hybrids and four possess the monogerm seed characteristic. US H9 and US H10, the most recently released varieties, possess moderate resistance to bolting, curly top, downy mildew, and virus yellows. These two varieties are grown on approximately 90% of the sugarbeet acreage in California and Arizona.

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

Research with cytoplasmic male steriles and inbred lines demonstrated that highly productive varieties with combined resistance to bolting and disease could be produced. Male sterile lines developed in this program have been used exclusively in hybrid varieties developed for use in California and Arizona. The development of varieties combining bolting and disease resistance enabled California growers to plant earlier and thereby increase yields. The US H9 and US H10 varieties produce approximately two tons more beets per acre than did previously developed varieties. The use of these varieties has materially increased financial returns to sugarbeet growers and has made the sugarbeet a more attractive crop in many parts of the state.

J. Obstacles to Achieving Objectives:

For many years progress was impeded by the lack of equipment for field and laboratory studies. Most of these needs have now been met. A need exists for additional support help. The station chemist retired two years ago and insufficient funds were available to replace him. A plant physiologist or chemist who could participate in the chemical studies and in the nature of resistance studies would be a most worthwhile addition to the professional staff.

K. Future Plans and Needs:

Work will be continued to find higher resistance to curly top, bolting, Fusarium stalk rot, and to combine these resistances with other desirable characters. In cooperation with the cytogeneticist, segregating backcross populations of hybrids between Beta corolliflora and the sugarbeet will be evaluated for curly top resistance. When the genes for resistance have been transferred to a sugarbeet chromosome, parental lines suitable for use in commercial hybrid varieties will be developed. Similarly, nematode resistance from Beta procumbens will eventually be transferred to the cultivated beet. Inheritance studies on seed germination and other characters will be pursued.

A need exists for additional studies on polyploidy as a breeding method. The work to improve sucrose concentration and processing quality needs to be accelerated but additional professional and support help is needed.