SUGAR BEET IMPROVEMENT BY EUROPEAN BREEDERS

Bergen-op Zoom

Heink Rietberg

Dr. Heink Rietberg gave an interesting report concerning European breeders who were engaged in sugar beet improvement. A list of these breeders is attached to Rietberg's report.

Summary of Breeding Methods Used in Europe

1. Practically all have used open pollinated breeding lines.

2. Breeding for disease resistance has been neglected.

3. Some breeders are now working on the assembling of genetic materials to work on disease resistance.

   a. Some L.S.R. breeding work is being done.

   b. Work has been started in Holland on virus yellows resistance.

   c. Considerable work is being done on breeding for nematode resistance. The source of nematode resistance is generally wild species. Webbiana, Procumbens, and Patelaris are all resistant or immune to nematode. They are also finding some resistance in cultivated strains.

Procedures Used

Flats are filled with heavily infected soil and incubated to develop still higher populations. Flats are watered with water in which young seedlings of crucifers have been grown. Rietberg stated definitely that growing crucifers or beets, either tame or wild, in water, and then placing the water on nematode cysts caused the cysts to enlarge and develop larvae. The plants can be grown on a mesh screen in water for a period of 16 to 18 days. The water is then used to activate nematode cysts.

Inbred lines should be tested for nematode resistance.

Nematode work should be carried on in the greenhouse where conditions can be controlled.

Beets are planted in the incubated flats and consequently are infected very early. Readings can be made very rapidly.

Soil from rootlets of each resistant plant is examined for presence of eggs and larvae. Rietberg stated that some strains of Beta Vulgaris showed striking differences in their reaction to the exposure.

He feels that all inbreds should be tested under such a procedure.

d. Rietberg stated that European breeders are generally afraid to work with wild species. In answer to a question from Rietberg it was stated that American breeders would like to do much more with species hybrids than they have been able to do.

Outline of Colchicin Treatment to Induce Tetraploidy in Young Sugar Beet Seedlings

Dr. Rietberg gave a detailed report of the methods used to induce tetraploidy by treating young seedlings with colchicin. The procedure as given by him is attached.

He also gave the detailed procedure for testing young seedlings to determine whether tetraploidy had been introduced. This procedure as outlined by him is also attached.

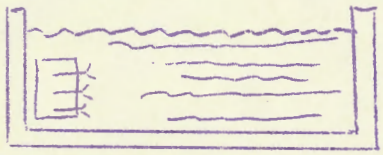
(Not for publication)

INDUCING TETRAPLOIDY IN YOUNG SUGAR BEET PLANTS

Statement of a method used at Bergen-op-Zoom

1. Take young plants in cotyledon stage as first true leaf tips begin to appear, put them in a glass container and partly fill with melted 1% agar (cool to 100° F.). The agar layer prevents damage to rootlets.

2. Put in incubator at 76° F. for 4-6 hours.
3. After this, submerge for 1 hour in 0.4% colchicin solution at 60° F.



4. Rinse for a few minutes with distilled water.
5. Put again in incubator at 76° F. for 4-6 hours, or overnight.
6. Repeat the colchicin treatment.
7. After a few days in a room at 60° F., replant surviving plants in small pots and place in cool greenhouse or cold frame.

About 20-30% of the young plants treated this way may die, whereas 25-30% will develop as tetraploids.

Tetraploidy of each plant has to be checked.

(Not for publication)

TESTING SUGAR BEET PLANTS FOR TETRAPLOIDY

Statement of a method used at Bergen-op-Zoom

1. Take basal portion of young leaves and put into a mixture of 50 cc. alcohol 95% and 50 cc. glacial acetic acid for 24 hours.
2. Put leaf parts now in HCl (1N) which is heated in advance to 140° F., and leave them in the dilute acid for 5 minutes.
3. Cool to room temperature in this HCl solution.
4. Wash with distilled water and then bring leaf parts in fuchsin solution (fuchsin - sulfuric acid as used normally for staining). This treatment takes 1 hour.
5. Wash in distilled water to which a few drops of sulfuric acid have been added.
6. Next, place leaves for 3 minutes in a mixture made of equal parts of $NaHSO_3$, 1%, and HCl, 1%.
7. Place leaf parts in acetic acid 45%, where they can be kept for a long time.
8. For microscopic readings, smear on slide. The dark, bluish-red clumps of chromosomes can be judged by their size to be 2n, 4n, etc.

N.B. Pollen can be stained with acetic acid, 45%, saturated with carmine.