

# A Bolting Oddity in Sugar Beets

J. F. SWINK AND C. W. DOXTATOR<sup>1</sup>

Production of seed stalks in commercial sugar beet fields, commonly called "bolting," is a frequent occurrence in sugar beet-growing areas. Such plants commonly produce seed stalks only after the beet root has reached considerable size. If the season is long enough, normal flowering and seed production may follow.

An unusual type of bolter which produces a stalk directly after emergence of the seedling (Fig. 1) and which under field conditions produces no flowers, was first observed at Rocky Ford, Colorado, in 1944, in certain inbreds in the breeding nursery. This interesting oddity grows a very large stalk (see photograph) which at harvest date is approximately the diameter of the beet crown. Beets of 5 pound weight having a stalk diameter of 5 inches at the base and a height of 8 feet have been commonly found. Such beets cannot be topped by normal methods, and when topped as mother beets fail to produce any more growth. The upper portion of the beet as well as the crown is extremely fibrous. Obviously such beets are never selected for seed production.

Since 1944, selection in inbred and backcross progenies appears to have eliminated this character from the breeding nursery. Nevertheless, this nuisance character continues to reoccur in breeder's stock seed increases from groupings of inbreds and backcrosses originating from the hybrid seed lot in which this character was first observed.

## Origin and Breeding History

In 1942 a cross was made of American 1 (M 35) with 0-419, a selection of U. S. 216, in one of the phases of the *Cercospora* leaf spot resistance breeding program. In the 1943-44 winter season roots of the hybrid and the parents were planted in the greenhouses for self-pollination and backcrossing to each parent. Twelve backcross seed lots were obtained and planted in the field in 1944, along with 25 self-pollinated progenies. Odd type bolters occurred in 10 of these progenies, both inbreds and backcrosses. All these progenies were discarded, along with several other progenies of which one of the parent roots had, in other crosses, produced odd type bolters.

In 1945 breeders' stock of some of these lines was obtained under the breeders' stock number 5-406; and on other lines backcrossing and selling was continued. In 1946, 133 selfed and backcrossed progenies from these selections were planted in the nursery, none of which produced odd type

**Figure 1.** (See page 153) Here is shown an unusual type of bolter which produces a stalk directly after emergence of the seedling and which under field conditions produces no flowers. This interesting oddity grows a very large stalk (see bottom portion of Figure 1) which at harvest date is approximately the diameter of the beet crown. The upper portion of Figure 1 shows this unusual type of bolter directly after emergence of the seedling.

<sup>1</sup>Research Assistant and Plant Breeder, respectively, American Crystal Sugar Company, Rocky Ford, Colorado.



Figure 1.

bolters. The seed lot 5-406 was tested for yield in replicated plots, and was also free of bolters. In 1947 roots of 100 of the nursery progenies of 1946 were divided into three groups for seed increase in space isolation, as follows:

7-401 a : (35 x 0-419)35  
 7-401 b : (35 x 0-419)0-419  
 7-401 c : 35 x 0-419 selfs;

These three seed lots were tested in replicated plots in 1948 at Rocky Ford, Colorado, and were found to contain approximately .24% odd type bolting. No normal "quick" bolters were found in any of the 3 selections.

#### 1948 1949 Experiments

Greenhouse planting of seed of 7-401a, b, and c, were made in 1948, for a further study of this character. Forty-three "odd" bolters were obtained from approximately 18,000 seedlings, distributed as follows:

7-401 a — 4 odd bolters  
 7-401 b — 6 odd bolters  
 7-401 c — 33 odd bolters

All of these odd bolting plants were left in flats for one month and then transplanted to 8" pots. Twenty-three of the plants were subjected to incandescent illumination during nights. The other twenty were allowed to grow without supplemental light.

After 5 weeks in the greenhouse the effect of incandescent supplemental light in promoting increased growth was evident. Seed stalks grew over 6 feet high and flowers were produced on several plants. However, all flowers were found to be male sterile. No plants under non-supplemental light conditions produced any flowers.

Since there were available *in* the greenhouse normal flowering beets of the 7-401a variety, several crosses were made by pollen transfer to odd bolting plants. Six seeds were obtained from one of these crosses. Two odd type bolters produced a few seeds from open pollination.

Plantings of these three seed lots in the spring of 1949 produced a total of 14 beets, all of which were normal non-bolting plants. Attempts are now being made to obtain self-pollinated seed from these plants for further study of the inheritance of this character.

#### Discussion

This odd bolting type as described, although occurring rather infrequently in variety test fields, is nevertheless a very serious character and must be eliminated before any sizable seed increase of this variety can be made. The character apparently is found only in certain crosses involving M-line number 35, since it has not been observed *in* any other of the many selections of American 1, nor in their hybrids.

Further studies of the inheritance of this character are being conducted from selected seedlings under incandescent supplemental light in the greenhouses.