

New Non-Bolting and Mildew-Resistant Seed Releases

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The sugar beet breeder who is developing hybrid varieties for use in California has need for breeding stocks which combine bolting resistance with curly top resistance. For use in the coastal districts it is desirable that they be resistant to downy mildew and rust. It is also advantageous to incorporate the type O character, which insures that all the offspring from crosses to cytoplasmic male steriles will be completely male sterile. Three breeding stocks which possess certain of these characters have been made available to the breeders through the Beet Sugar Development Foundation. The pedigrees and brief descriptions of these stocks are given in this paper.

NB 1 and Its Male Sterile Equivalent

NB 1 = S₅ (CI 179 x CI 1-707)

CI 179 = Type O clone with high sucrose percentage from

U. S. 1 CI 1-707 = Self fertile inbred high in curly top resistance and dark green in color

The cross, CI 179 x CI 1-707, and the early inbred selections from it were made at Salt Lake City, Utah, by Dr. F. V. Owen. A composite of S₄ lines which had arisen from a selected S₂ line was planted at Salinas, California, in the fall of 1948. Non-bolting plants were selected the following summer based on vigor, root characteristics, and freedom from yellowing. S₅ seed was obtained from these selected beets in 1950 and tests made with the selfed progenies in 1951. NB 1 is an increase of the S₅ line which showed the greatest promise.

The inbred, NB 1, has been thoroughly tested in California, in Oregon seed plots, in Idaho curly top tests, and in the 1952 sugar beet breeders' cooperative inbred tests. Results of these tests show that it is resistant to bolting, is superior to U. S. 22/3 in curly top resistance, possesses average downy mildew and rust resistance, has average root size, is a little below average in percent sucrose, is low in sodium content, and is a good seed producer.

Difficulty with bolting in the seed plots has been experienced both at Medford and Salem, Oregon, unless the plantings are made by August 1. The inbred has been found to germinate poorly at temperatures below 45° F. In a test conducted in 1952 at Shelley, Idaho, by the Utah-Idaho Sugar Company the NB 1 inbred was found to be highly resistant to the black bean aphid, *Aphis fabae* (Scop.). Tests at both Salinas, California, and Salem, Oregon, showed NB 1 to be relatively free from the yellowing associated with virus yellows when most other surrounding inbreds were severely yellowed. The inbred has proved to be highly self fertile and an excellent type O.

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Hybrids produced for the purpose of measuring the combining ability of NB 1 have failed to yield significantly higher than the male parent, but most of these hybrids have shown a higher sucrose percentage than has the male parent.

The male sterile equivalent of NB 1 has also been released through the Beet Sugar Development Foundation. This MS equivalent represents the fourth backcross to NB 1 or to earlier generations of this inbred. It has shown a little less bolting resistance than NB 1. The source of male sterile cytoplasm used in producing this MS equivalent was a male sterile U. S. 56 clone discovered by Dr. F. V. Owen.

C361 and Its Male Sterile Equivalent

C361 = Type O, non-bolting selection from U. S. 22/3

In 1950, a group of 110 plants of a non-bolting selection from U. S. 22/3 were indexed for male sterility of which six were classed as approaching type O in their genetic constitution. Seed was produced from these six clones in an isolated plot. A group of 100 plants from this selection was again indexed of which 15 were classed as type O. A seed increase from these 15 plants was planted at Salinas in August, 1952. A bolting selection was made during 1953 by eliminating three-fourths of the plants which were the fastest bolters. Seed from the slower bolting plants has been designated C361.

During the development of C361, a male sterile equivalent has also been produced. The source of the cytoplasmic male sterility is the same U. S. 56 clone as for the MS of NB 1. Four backcrosses to C361-type plants have been made. Tests with the male sterile equivalent have shown that it is free of pollen producers. However, under some growing conditions a portion of the plants may produce yellow colored anthers.

C3504—Mildew Resistant Inbred

C3504 = Composite of three S_5 lines from the hybrid SL 51-1 x 4200-14

SL 51-1 = Clone from U. S. 22/3

4200-14 = Non-bolting inbred similar to NB 1

In 1948 a greenhouse mildew selection was made from an F_2 population of the hybrid SL 51-1 x 4200-14. The inbred progenies of the selected plants were tested for mildew resistance in the field and an increase was made of the most resistant S_3 line. Another greenhouse mildew selection was made from this increase in 1951, and 30 selected S_4 lines were tested in the field in 1953. S_5 seed from three of the most promising lines was composited and designated C3504.

Tests made in 1953 with C3504 show that it possesses high field resistance to downy mildew. Localized leaf infections were observed on a small percentage of the young plants but they recovered without permanent damage. The inbred showed moderate resistance to bolting and to rust. Tests with the S_5 line from which C3504 was selected showed good resistance to curly top. Combining ability tests have not been made.