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Nuclear male-sterility system of hybrid seed corn production — The extreme susceptibility of plants with T (Texas) cytoplasm to Southern Corn Leaf Blight race T has precluded the use of the T cytoplasmic male-sterility system in hybrid seed production. A return to stocks with normal cytoplasm that require hand or mechanical detasseling is the temporary solution, but alternate methods are needed to alleviate the problems and expense associated with detasseling. In order to use a nuclear (genic) form of male sterility, the system has to be modified in order that lines consisting of only male-sterile plants can be produced. This may be accomplished by preventing the pollen transmission of the normal allele as in the following cross: ms ms ♀ x ~~Ms~~ ms ♂. Incorporation of the stocks listed below into elite parental material with normal cytoplasm would provide a workable nuclear male-sterility system to replace hand or mechanical detasseling.

Stocks:

1) 5-6b translocation (5S.1, 6 sat); 2) nuclear male-sterile polymitotic (po); 3) 5-6b duplication-deficiency.

Utilization of the stocks:

1) Backcross both the translocation and the male-sterile gene into the appropriate female parental lines. Experience may allow the option of backcrossing the duplication-deficiency into the parental lines; this may be done in addition to or in lieu of backcrossing the translocation, a procedure which subsequently requires the additional step of extracting the duplication-deficiency.

2) Extract the genotype carrying both the duplication-deficiency and the male-sterile gene (po) in heterozygous condition (in repulsion).

3) Generate large supplies of the desired male-sterile female parent by crossing homozygous male-sterile plants with the corresponding duplication-deficiency genotype (step 2 above).

4) The production of hybrid seed would be accomplished by using the male steriles produced in step 3 as the female parent in combination with an appropriate fertile male parent. Any elite parental material can serve as male and accomplish fertility restoration.

Supporting data:

In the table below, the proportion of male-sterile (po) plants to total plants observed is given for eight independent extractions (ear cultures) of the 5-6b duplication-deficiency. Lines with only male-sterile plants (i.e., 100% male steriles) are the ultimate objective in any nuclear or cytoplasmic-genetic male-

sterility system. The 5-6b translocation is superior in this regard to other stocks tested against the male-sterile gene polymitotic (see lower part of table).

| Translocation | Number times Dp-Df extracted | Progeny of po po x Po* po (ms plants/total)** | % male steriles |
|---|---|---|---|
| 5-6b | | 145/145 | 100 |
| " | | 119/119 | 100 |
| " | | 104/104 | 100 |
| " | | 96/97 | 99 |
| " | | 26/26 | 100 |
| " | | 17/17 | 100 |
| " | | 10/10 | 100 |
| " | | 8/8 | 100 |
| | 8 | 525/526 | 99.8 |
| Others | | | |
| 3-6b | 31 | 3213/3311 | 97.0 |
| 4-6(5227) | 12 | 950/987 | 96.3 |
| 5-6(8219) | 1 | 132/139 | 95.0 |
| 5-6d | 1 | 35/38 | 92.1 |
| 4-6c | 17 | 679/763 | 88.6 |

*Po linked to duplication-deficiency and not usually pollen-transmitted.

**Only small samples of seed from several extractions have been grown thus far.

In extensive observations stocks carrying the polymitotic male-sterile gene have exhibited complete male sterility; such reliability is highly important in hybrid seed production.

Related issues:

1) The use of these stocks for commercial hybrid seed production would be subject to the patent recently granted to the University of Illinois Foundation, Urbana, Illinois.

2) The nuclear male-sterile stock available for release has a reduced seed set; a selection program is underway to develop an improved version of this stock.

Seed supplies and distribution:

Total available seed supply of the 5-6b translocation stock and the 5-6b duplication-deficiency stock is 1000 kernels each. Three thousand kernels of the male-sterile stock are available. Additional supplies are expected from current winter nurseries. Seed may be obtained at no charge from the Cytogenetics Project, Department of Agronomy and Plant Genetics, University of Minnesota.

R. L. Phillips

Progress report on three possible methods of producing an all male-sterile progeny —

Method 1: Tertiary trisomic. Two interchanges, T2-6a(2L.5-6S.$0^{+}$) and T4-6(055-8) (4L.26-6L.25), were crossed on plants trisomic for chromosome 6.