

2. A cytogenetic method for utilizing nuclear male-sterility in hybrid corn production.

Until recently, use of the "T" male-sterile cytoplasm has aided the efficient and economical production of hybrid corn. High susceptibility to Southern Corn Leaf Blight of varieties produced by means of "T" type cytoplasmic male-sterility has led to a return to costly detasseling procedures. An attempt is currently in progress to develop and test a method of using nuclear (rather than cytoplasmic) male-sterility for the production of lines with all male-sterile plants; current methods only allow for the production of lines with 50% male-sterile plants. Utilization of such a method (which we term the "double duplication method") would eliminate the need for detasseling and avoid potential problems associated with planting large acreages to varieties with a single source of cytoplasm. The double duplication method also should be immediately applicable to various other agriculturally important species.

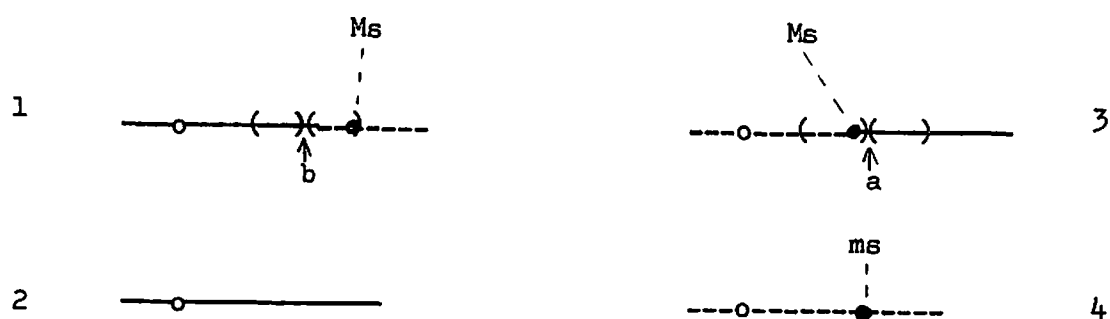
The method consists of selecting pairs of chromosomal interchanges (designated by "a" and "b" below) from currently available stocks according to the following criteria. First, the breakpoints of each of the interchanges must occur in the same arm in each of the chromosomes. Next, the order of the breakpoints must be reversed in the two chromosomes with respect to their centromeres. Also, a male-sterile (ms) locus must be located in the arm containing the breakpoints in one of the chromosomes. The male-sterile locus ideally should be near one of the breakpoints. A simple representation is diagrammed below.



Stocks homozygous for each of the two chromosomal interchanges and for the normal male-sterile allele are crossed. The chromosome constitution of progeny resulting from such a cross is represented below.



The progeny (each heterozygous for the two interchanges) are crossed, as the female parent, with a stock possessing a chromosome complement that is normal but carrying the desired male-sterile gene in the heterozygous condition. One-sixth of the total progeny from the previous cross should be of the desired genotype. The desired progeny contain a duplication for the "between breakpoints" region of each of the two chromosomes involved (a double duplication) and a normal set of chromosomes carrying the recessive male-sterile allele. This can be represented as below.



The only chromosome combination to successfully be transmitted through the pollen is 2 & 4. Chromosome combinations 1 & 3, 1 & 4, and 2 & 3 all result in aborted pollen grains or ones that are unable to compete with normal pollen. The line diagrammed above is crossed, as the male parent, to plants homozygous for the recessive male-sterile allele and with a normal chromosome complement. All the progeny from such a cross should be male-sterile and the type to be used in commercial seed production.

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R. L. Phillips
W. D. Springer

3. Position of bm_1 in chromosome 5.

The T1-5 (8041) interchange was shown by diakinesis observations on intercrosses with the other T1-5 interchange stocks to have the