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.

Low-sterile plants (25 to 35% pollen abortion) from those crosses were selected and crossed as females with ms heterozygotes. This was repeated for another generation, this time selecting for the 10-20% sterile class, which should have been tertiary trisomics. Some of the low-sterile plants among their progeny had a chance of having the desired constitution: two normal chromosomes, each carrying ms, and the extra interchange chromosome carrying the Ms allele. Crosses of such a plant on ms plants should produce all male-sterile progeny except for the transmission of n+1 through the pollen or the occurrence of crossovers between the interchange breakpoint and the ms locus.

In 1973 tests of the low-sterile plants crossed on ms were grown; the results of small scale tests in Hawaii were used to eliminate all but those crosses which appeared promising. From a few of the low-sterile plants descended from T2-6a, about 90% of the plants in the test cross were male sterile. In those from T4-6(055-8) about 80% of the plants were male sterile. Since all non-male sterile plants had about 15% pollen abortion, they were presumed to result from the functioning of n+1 pollen and, if so, should have been tertiaries similar to the parents. Eighteen of those Ms plants were selfed and test-crossed on ms, and all but three gave 1:1 ratios from the crosses on ms and 3:1 ratios from the selfs; the other three yielded an excess of ms plants, but nothing even approaching 90%. Based on ear sterility, the progeny in these tests also segregated for low sterile, 50% sterile and normal. Remnant seed is available and will be grown for cytological analysis.

In conclusion, those two interchanges are not satisfactory for the tertiary trisomic method. A clue for selecting an interchange more likely to be satisfactory is furnished by Dr. R. L. Phillips' results with T5-6b in which the transmission of a duplication for nearly all the short arm of 5 occurred only rarely, if at all. The T5-6(5765), with breaks at 5S.19-6L.32, and T5-6(5906), with breaks at 5S.15-6L.13, should be good sources of an interchange chromosome with a duplication for 5S for the desired tertiary trisomic.

Method 2: Internal deficiency linked with male-sterility but not pollen-transmissible. X-rayed pollen was applied to recessives or heterozygotes whose loci are linked with that of a genetic male sterile in that chromosome. The recessives that appeared among the progeny grown in 1972 were too weak to produce ears. In material from a similar test grown in 1974 a few recessives did produce an ear that was crossed with an inbred. Their progeny will be grown and tested for the presence of a deficiency, how it is transmitted, and its position with respect to the linked male sterility locus. A usable deficiency should be linked with the locus but should not include it.

Method 3: A male- and female-transmissible deficiency for a male sterility locus (proposed in M.N.L. 15:133, 1971). X-rayed pollen from an inbred was used on plants that were homozygous or heterozygous male sterile. The male-sterile plants among the progeny were increased by crossing them as females with an inbred. These male steriles should have carried a deficiency for the normal allele in the chromosome from the x-rayed inbred. If that deficiency were transmitted, at least through the female, part of the progeny from the F_1 male sterile x inbred should be heterozygous for the deficiency and should not segregate sterile plants when selfed. If the deficiency is not transmitted, all the progeny should segregate male steriles when selfed.

For six ms lines progeny of selfs from four to 14 different plants per line were grown in 1974. In four lines all the progenies tested by selfing segregated for ms, but three of 14 plants tested in one line and three of eight plants tested in another did not segregate. In a seventh ms line the only plant tested did not segregate. These three lines, plus one from earlier tests, may carry the desired type of deficiency. If the deficiency is transmissible through both the female and the male, progeny from the selfs should include the deficiency homozygote, recognizable by test crosses with ms. All that is known thus far is that the deficiency is transmissible; the original deficiency produced in x-rayed pollen was most likely transmitted in a sperm carried down by a normal pollen tube. Plants in those lines that did not segregate ms were selfed and also crossed on ms; unfortunately, many of the crosses on ms were unsuccessful for no known reason. The tests obtained will be grown this summer, and more plants will be test-crossed.

There were three lines from ms2, but seven or eight selfs from each all segregated ms2, indicating that those deficiencies were not even female-transmissible.

In 1974 the progeny from heterozygotes for other male steriles crossed with x-rayed pollen were grown. For ms10 (3859 seeds) there were 4 sterile plants, and for ms8 (4094 seeds) there were 2 sterile plants; these 6 ms plants were crossed with a normal inbred.

These tests were done on a small scale, but tests on a much larger scale may be needed to establish a usable line homozygous deficient for a male-sterile locus.

I wish to thank Dr. E. H. Rinke and Northrup, King and Co., Minneapolis, for their cooperation in growing and pollinating some of this material.

Note: Another reprinting of my book "Discussions in Cytogenetics" was made in September 1974. Paper costs were considerably higher, but printing a larger number lessened the needed increase in price (now $10.40 including postage).

Chas. R. Burnham, Emeritus Professor