THE Af-I-Aero-"Ch" GENE SYSTEM AND ITS USE AS A TEACHING AID

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Previously I drew attention to the utility of a gene system involving the loci Af-I St R-Tl as an aid to teaching several fundamental principles of genetics (1). Recently two more tightly linked loci have been found to reside in the Af-I region of chromosome 1, viz. Aero (2) and an as yet unnamed chlorophyll mutant (3) which is merely designated here as ch for convenience. The Af-Aero-Ch gene set offers another possible opportunity as a teaching aid. Because Af and Aero are so tightly linked, repulsion phase crosses yield F2 populations consisting of approximately 1/4 af segregants, 1/4 aero segregants and 1/2 normal, non-mutant plants. Since crossovers are extremely rare, the normal segregants are almost always heterozygous for both loci and seeds from such plants will, upon progeny testing, again segregate for af and aero.

Because the chlorophyll mutant, ch, is also tightly linked with af and because its effect is manifest in the seeds as well as in the plant, it serves in the coupling phase to mark seeds that will give rise to af seedlings. Thus in the cross Af aero Ch x af Aero ch, the F1 plants are normal in phenotype but the F2 seeds borne on the F-| plants show segregation for the chlorophyll mutant, expressed as pale yellowish-green seeds. These pale seeds should comprise, on average, 1/4 of the F2 and give rise to seedlings which express the afila phenotype. Correspondingly, the normal F2 plants will be heterozygous at all three loci, Af/af Aero/aero and Ch/ch, and pale seeds borne on these plants will again identify F3 seedlings that will express the afila phenotype. procedure can be repeated in each succeeding generation with the same expectations unless or until a crossover occurs among one or another of the three loci.

For the above scheme to be most effective, the af parent should be recessive at the I locus (i/i)» because the seed expression phase of the chlorophyll mutant is best seen against a background of green cotyledon rather than of yellow (I/-).

If this scheme were to be used in laboratory exercises it might be used in conjunction with, and as a supplement to, the Af-I St R-Tl scheme. In the former scheme, the i/i (green cotyledon) segregants mark the af segregants (unless a crossover occurs) whereas in the present scheme it is the "yellow" seeds that identify the afila segregants.

The present scheme has the advantage to the extent that if the instructor has glasshouse or growth chamber facilities, he/she can generate a continuing supply of material simply by growing the normal, non-mutant seedlings to maturity and collecting the seed therefrom for use in a later classroom exercise.

1. Marx, G.A. 1974. J. Hered. 65:252-254.
2. Marx, G.A. 1987. PNL 19:35-36.
3. Marx, G.A. 1988. PNL 20:24.

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