

1. The highly esteemed scientist, “Bro” Sophila is the president of ICSNMIF (the International Center for the Study of Nasty Maggots and Irritating Flies). In his collections, he has many different strains of *D. melanogaster*, including the following:

line X3: These flies contain a mutant P element and are homozygous for this mutation. The mutant P element is perfectly normal in its transcribed region, but the P element’s promoter is mutated so that it is transcribed at twice the normal rate. These flies do not have any wild type P elements.

line Z7: These flies are heterozygous for a mutation in the one P element present in their genome. The mutant allele of this P element has a change in the sequence of the third intron that results in this intron always being spliced out of the P element primary transcript during RNA processing.

Please answer the following questions about Bro’s flies.

a. If Bro crosses a male of line X3 with a normal P female, what sort of offspring would you expect him to obtain? Explain your answer.

All offspring will have the mutant P element in a cytoplasmic background that does NOT allow transposition of the P element. These offspring will be perfectly normal (and fertile) because their P elements will never be able to transpose.

b. If Bro crosses a male of line Z7 with a normal M female, what sort of offspring would you expect him to obtain? Explain your answer.

Half of the offspring will have a normal P element in a cytoplasmic background that allows transcription of the P element. This means that they will be perfectly healthy flies but they will be sterile as a result of P element transposition in their germ line cells.

The other half of the offspring will have the mutant P element in a cytoplasmic background that allows transcription of the P element. The mutant P element will cause the production of active transposase in all cells. As a result, the flies will not only be sterile but many somatic cells of their body will contain serious mutations. They would be in pretty bad shape if alive at all.

2. The world famous geneticist “Ma” Zorca, is preparing to make some crosses between different lines of maize. These lines have different alleles at the *A* locus, which encodes an enzyme necessary for anthocyanin production. At this locus, a functional *A* allele is always dominant to a nonfunctional *a* allele.

Here is a description of the genotype of some of the maize lines that Dr. Zorca has at her disposal:

#12 - one *A* allele

one *a(Ds)* allele

[the gene is interrupted by a *Ds* element, but there is nothing else wrong with it]

no Ac elements are present this line, but some Huck elements are present

#19 - *a/a*

Some Ac elements are present, but Huck elements are absent

If Dr. Zorca crossed line 12 with line 19 what would you expect the kernels to look like?

