

Drosophila Types and Crosses

Wild type (+)

Ebony body (e) (3-70.7)

Vestigial wing (vg) (2-67.0)

White eye (w) (1-1.5)

Note:

Designated wild type because it is the characteristic phenotype found in flies in nature.

Recessive trait: body colour is shining black. Viability compared to wild type is about 80%

Recessive trait: wings reduced to vestiges and usually held at right angles to the body. Viability somewhat reduced.

Recessive trait carried on the sex chromosome (chromosome 1): eyes are pure white.

(a) All phenotypes are due to single mutations.

(b) (2-67.0) = Located on Chromosome 2, 67 map units along its length.

The following crosses demonstrate appropriate mode of inheritance:

CROSS # 1: Homozygous Wild type X Homozygous Vestigial wing

Parental generation (P)	Phenotype:	Wild type	X	Vestigial wing
	Genotype:	\pm	X	\underline{vg}
		+		\underline{vg}

First filial generation (F1)	Phenotype:	All Wild type
	Genotype:	\pm
		\underline{vg}

Selfing the F1 provides an F2 generation	\pm	X	\pm
	\underline{vg}		\underline{vg}

Second Filial generation (F2)	Phenotype:	0.75 Wild type	:	0.25 Vestigial wing
	Genotype:	0.25 \pm	:	0.5 \pm : 0.25 \underline{vg}
		+		\underline{vg}
	Ratio:	1	:	2 : 1

The same principles apply to crosses between Ebony and Wild type as to crosses between Vestigial wing and Wild type.

See Cross #1 and Cross #2

CROSS # 2: Homozygous Ebony body X Homozygous Wild type

Parental generation (P)	Phenotype:	Ebony body	X	Wild type
	Genotype:	\underline{e}	X	\pm
		e		+

First filial generation (F1)	Phenotype:	All Wild type
	Genotype:	\underline{e}
		+

Backcross provides F2 generation:	\underline{e}	X	\underline{e}
	+		e

Second filial generation (F2)	Phenotype:	0.5 Ebony body	:	0.5 Wild type
	Genotype:	0.5 \underline{e}	:	0.5 \underline{e}
		e		+
	Ratio:	1	:	1

Backcrossing the F1 generation with the homozygote recessive mutant is another cross that can be set up to demonstrate the mode of inheritance. In this case the back cross progeny would be expected to segregate into two classes (mutant and wild type) of equal size.

CROSS # 3: White eyed mutant X Wild type

(a) Parental generation (P)	White eyed females (X^wX^w)	X	Wild type males (X^+Y)
First filial generation (F1)	White eyed males (X^wY)	:	Wild type females (X^+X^w)
(b) Parental generation (P)	White eyed males (X^wY)	X	Wild type females (X^+X^+)
First filial generation (F1)	Wild type males (X^+Y)	:	Wild type females (X^+X^w)

Monoybrid cross for a character determined by a single sex linked genetic locus. The White eyed mutant is used in these crosses. In this case the sex of the fly carrying the mutant locus will influence your results in the F1. Therefore one needs to set up reciprocal matings.

CROSS # 4: Homozygous Ebony body X Homozygous Vestigial wing

Parental generation (P)	Phenotype:	Ebony body	X	Vestigial wing
	Genotype:	\underline{e}	X	\underline{vg}
		e		\underline{vg}

First filial generation (F1)	Phenotype:	All Wild type
	Genotype:	$\pm \dots \pm$
		$\underline{vg} \text{ eb}$

Selfing the F1 provides an F2 generation	$\pm \dots \pm$	X	$\pm \dots \pm$
	$\underline{vg} \text{ eb}$		$\underline{vg} \text{ eb}$

Second Filial generation (F2)	Phenotype:	$\frac{9}{16}$ Wild type	:	$\frac{3}{16}$ Vestigial wing	:	$\frac{3}{16}$ Ebony body	:	$\frac{1}{16}$ Ebony body and vestigial wing
	Ratio:	9	:	3	:	3	:	1

This is a dihybrid cross. A 9:3:3:1 F2 ratio will be achieved when 2 flies heterozygous for 2 different, unlinked autosomal recessive genes are crossed.

To determine the genotypes of the F2, draw up a punnet square, using the possible gametes of the F1. eg. $+$; $+$, $+$; \underline{vg} , $+$; e and \underline{vg} ; e