

Chromosome	Complex
1	C1B (Bar eyes), very little crossing-over. (Muller)
"	dl-49, sc lz ^S (only recessive markers), crosses over right of garnet (Muller)
"	dl-49, y Hw (Hairy wing), crosses over right of garnet (Muller, Redfield)
2	Cy (Curly wings), with 2 inversions and very little crossing-over (Ward)
"	C2L C2R sp (only recessive marker, speck), 2 inversions, some crossing-over in middle. (Sturtevant)
"	Pm (Plum eye) inversions involving 2L and 2R. (Muller)
3	CC, D (Dichaete) little crossing-over except near ends (Oliver, Stone)
"	CC, Dfd (Deformed eye) 2 inversions, moderate crossing-over in middle (Payne, Bridges)
"	C3X, M3X (Minute bristles) 2 inversions, moderate crossing-over in middle (Muller)
"	Mc-2 (Moire eye) inversions and translocation with 2, crossing-over only near right end (Muller)
2 & 3	T(2-3) S Cy (Star eye, Curly wings) inversions and translocation 2-3, moderate crossing-over (Muller)
4	ci ^D (Cubitus-interruptus - Dominant - venation) (inversion not needed for 4) (Sturtevant)
"	cy ^D (eyeless - Dominant) (inversion not needed for 4) (Muller)

Many other usable complexes, some lacking dominant markers and many affecting a limited part of a chromosome, are available. (See list of symbols in DIS-3).

Muller, H. J. To Balance Sex-linked Genes

1. General method for genes to left of garnet.

Symbols:

- 1 = sex-linked gene or combination of genes with low or no viability or fertility in ♂, or else in homozygous ♀.
 - sc = scute
 - lz^S = lozenge-spectacled (sterile in homozygous ♀, not in ♂)
 - dl-49 = inversion (left break about 11, right about 44 on map)
- P₁ 1/sc ♀ X dl-49, sc lz^S ♂
 F₁ 1/dl-49, sc lz^S ♀ X dl-49, sc lz^S ♂
 F₂ 1/dl-49, sc lz^S ♀ - like mother, fertile and continues ♂
 dl-49, sc lz^S/dl-49, sc lz^S ♀ - sterile
1 ♂ = dies or is sterile or yields lethal or sterile 1/1 daughter
 dl-49, sc lz^S ♂ - like father, fertile and continues ♂

2. Genes to right of garnet may be balanced similarly, using CR ♀s B in place of dl-49, sc lz^S. CR is rearrangement preventing crossing-over to right of garnet, ♀s makes homozygous ♀ sterile (but not ♂) and B is Bar eye.

3. If "1" is itself associated with an arrangement preventing crossing-over, then "C" in chromosome balancing is unnecessary. Example:

$Cl/lz^S \text{♀} \times lz^S \text{♂}$ is balanced stock, though lz^S here is in normally arranged chromosome instead of with dl-49 inversion.

4. Other genes like lz^S which do not kill or sterilize ♂ but only homozygous ♀, may be balanced also with ClB . Example:

$P_1 \quad ClB \text{♀} \times sn \text{♂}$ ($sn =$ singed; $sn \text{♂}$ fertile; $sn/sn \text{♀}$ sterile)

$F_1 \quad ClB/sn \text{♀} \times sn \text{♂}$ (balanced stock)

$F_2 \quad ClB/sn \text{♀}$ (fertile) $sn/sn \text{♀}$ (sterile) $ClB \text{♂}$ dies
 $sn \text{♂}$ fertile

5. Genes in class 4 also may be balanced against attached X's

$y/sn \text{♀}$ (3X's - sterile) $X \quad sn \text{♂}$ $y \text{♀}$ $sn \text{♂}$ no-X(dies)

Method 5 is inferior to others whenever ♀♀ with "1" may be required.

Methods 4 and 5 are inferior to 1 and 2 where "1" ♂ is hard to obtain or to breed.

Austin, Tex. laboratory Balancers Chromosome 1: ClB -
Good, except for extreme ends.

$sc^8 \quad sn$ - good for chromosomes not crossing-over in the middle region (e.g. Translocations &c)

99b sn - Ditto.

dl-49 - Balances middle region.

In-Am - Balances right end (f-bb) (probably left as far as y)

Chromosome 2:

Cy - Balances all of chromosome; Crosses over but seldom.

Pm -

NS -

Chromosome 3:

CMe - Inversion in left arm

T2,3-C e - Translocation with inversions; balances all of chromosome except the ca region.

Dex - Double inversion including D ; balances middle of chromosome (all of chromosome except ru-h, & ca)

C3X - Balances most of chromosome, but crosses over too frequently.

C3c -

Payne -

Oliver, C. P. Balancers

X-chromosomes with genes which cause sterility

or poor viability in males and with which ClB cannot be used, can be balanced with the dl inversion (Muller's) that has connected with it the visible spectacle eye. The spectacle female is sterile. Only a small per cent of crossing-over occurs to the left of forked. If spectacle-forked males are used to balance, no or only occasional selection is required. Punch eye, dominant, is a useful balancer for inviable genes in the left arm of 3 except for a small amount near the left end. The viability of punch is good.