

NATURAL SELECTION CONTROLS

Fundamentally, natural selection is the product of the survival of young to adulthood times the reproductive success of the survivors. Most evolution simulations allow students to enter *relative fitness* values that are several steps removed from the basic processes of survival and reproduction. EVOLVE allows you to use either approach. It's often a good idea to start entering reproduction and survival to get a feel for their interaction. Once you understand them, you can simplify experiment setup by entering absolute fitnesses.

REPRODUCTION AND SURVIVAL (ON/off)

By default this option is checked and requires entry of two parameters for each genotype. We recommend that students start with this so they get a feel for the relationship of survival, reproduction, and fitness. Later they can change to the shortcut of the *Absolute Fitness* radio button (see below).

Survival Rates Parameters (decimal, 0.0–1.0)

Survival rates may range from 0.0 for a lethal genotype to 1.0 (or 100%) for one that cannot die before reproducing — obviously unrealistic.

Reproductive Rates (decimal, 0.0–1.0)

Reproductive rates may range from 0.0 for a sterile genotype to 10.0 for a high reproductive rate.

The *Absolute Fitness* values are grayed because they are calculated as *Survival Rate* * *Reproductive Rate* after you enter survival and reproductive rates.

Values above 1.0 indicate that reproduction exceeds mortality and the genotype's offspring will more than compensate for mortality. E.g., consider 100 young of a particular genotype. If survival is 0.5, then roughly 50 will survive to adulthood. If reproduction is 2.1, then $0.5 * 2.1 = 1.05$ and the 50 adults will produce around 105 young. If one or more *Absolute Fitness* is less than 1.0, the population may decline to extinction.

Relative Fitness Parameters (no entry)

Relative fitness values are always calculated by dividing each genotype's absolute fitness by the highest absolute fitness. The relative fitness of the genotype with the highest absolute fitness will always be 1.0. Genotypes with lower values will be at a relative disadvantage and will tend to decrease in frequency. E.g., a genotype with a relative fitness of 0.75 will be only 75% as successful (will have a 25% deficit) relative to the most successful.

ABSOLUTE FITNESS (OFF/on)

Entering survival and reproductive rates is tedious, especially with three alleles where there are 6 genotypes for a total of 12 parameters. Consequently, more advanced students can use this option to cut their parameter entry in half by entering only *Absolute Fitness* values. Again, the *Relative Fitnesses* will be computed automatically