

info

Breeding Technology - What is Selection Pressure?

“Selection” is practiced in a breeding program to genetically improve a product or population. The population mean for a quantitative trait under selection (i.e. body weight, egg production) changes due to the fact that the best individuals are used to produce the next generation.

The success of a breeding program depends on:

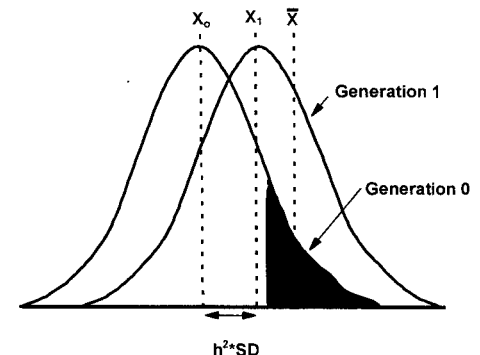
- The variation within the quantitative traits.
- The selection pressure (selection differential in units standard deviation).
- The accuracy of selection.

The more genetic variance there is in a population, the more superior the best birds will be compared to the population average (at a given selection pressure) and thus the higher the success of the breeding program.

The level of selection pressure tells a breeder something about how many birds we can select for certain traits. This of course is closely linked to the number of birds you want to keep for production. The accuracy of selection is expressed as a number between 0 and 1 and indicates how well you can identify the genetically best birds when using a certain selection strategy. This accuracy can vary from 0.1 (visual scoring for different traits) to 0.8 (BLUP-Best Linear Unbiased Prediction -statistical analysis).

In the following example, when the population mean in generation 0 is X_0 and the mean of the selected breeding animals is X the phenotype ‘superiority’ of the selected group is $(X-X_0)$. This

difference is called the selection differential, denoted by SD . The breeding value of the selected animals will be h^2*SD units above the population mean of the parental generation, with h^2 being the percentage of variation within a trait that can be explained by parent-offspring relations. This estimates the mean of the progeny or future population.



Of course the most successful breeding program will be one where a very small number of birds is selected out of an infinite population size. At the breeder parent (or pedigree) level, usually only 1 to 10 percent of the birds started is selected for breeding purposes. However, a less intensive selection at the grandparent (GP) or parent stock (PS) level is beneficial for the genetic improvement of the resulting parent stock and final product generations. The accuracy of selection in a GP stock flock and the amount of variation present within that population is pretty constant. Selection intensity, on the other hand, is something that you have to have an influence on. The relationship

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between selected percentage and selection intensity is given in table 1.

Table 1: Selection Intensity With Infinite Population Sizes.

Percentage selected	Selection intensity
30	1.159
35	1.058
40	0.966
45	0.880
50	0.798
55	0.720
60	0.644
65	0.570
70	0.497
75	0.424
80	0.350
85	0.274
90	0.195
95	0.109
100	0.000

The selection intensity indicates how much better your selected population will be compared to the unselected population, in terms of units and standard deviation.

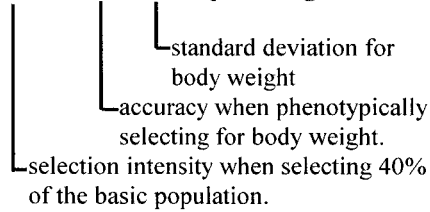
Example: At the Parent Stock (PS) Level-Male Line
Population average for body weight: 8300 grams

Standard deviation for body weight: 800 grams
Situation A: Selection of the best 40 percent of toms to produce the next generation, no selection in the hens.

Situation B: No selection of birds, all are going to produce the next generation.

In situation B, the average body weight of the next generation will again be 8300 grams (no selection is carried out), while in situation A, the average of the next generation will be more or less:

$$8300 + [(0.966 * 0.4 * 800)/2] = 8455 \text{ grams}$$



As you can see, there is a substantial benefit to carrying out selection even in the PS population, especially considering the number of final product poult that will be produced from every PS tom.

In the Hybrid breeding program we recommend the following selection percentages at the parent stock level to be carried out at the same mean flock weight as your commercial turkeys are marketed.

Line	
Female Line Hens	95%
Male Line Toms	25-40%

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