

Homework IV

Due Wednesday 12-11-2019 at 8:00AM. Show your work!

Problem A. Assume a herd of 1,000 beef cattle whereby both birth weight and calving difficulty scores (numerical score where 1 means no assistance was needed at birth and 5 means extensive assistance was needed due to dystocia) are recorded on all offspring. The genetic correlation between these two traits is 0.6. The additive genetic variance for birth weight and calving difficulty is 7.0 and 0.15, respectively. The narrow sense heritability for birth weight and calving difficulty is 0.34 and 0.29, respectively. The environmental covariance is 0.40.

1. What is the phenotypic correlation between these two traits? (10 pts.)
2. What is the selection response for calving difficulty if the selection intensity equals 2.40? (6 pts.)
3. Assuming the same selection intensity, what is the correlated response (CR) for calving difficulty if direct selection is applied to birth weight? (10 pts.)

4. How much more efficient (or inefficient) is direct selection on calving difficulty as compared to indirect selection via birth weight if the goal is to decrease calving difficulty in this population? (10 pts.)
5. Is the difference between the phenotypic correlation (r_P) and the genetic correlation (r_A) expected? Why or why not? (4 pts.)

Problem B. Suppose that a random-mating sorghum population had a mean biomass (dry matter) yield of 1400g per plot, and that four loci with known effects on biomass yield were segregating. The effects were given as below:

Locus	Aa	aa	frequency (a)
L1	-100	-200	0.5
L2	50	-300	0.4
L3	-200	-300	0.1
L4	0	-600	0.2

What would be the inbreeding depression caused by these loci after one generation of selfing? (10 pts.)