

Genetics Notes Chapter 19: Measuring Quantitative Variation

19.1-Measuring Quantitative Variation

- Continuous traits take an infinite number of values and follow complex inheritance involving multiple genes and often environmental influence.
- Categorical traits can be sorted into discrete categories and often follow simple or Mendelian inheritance. Often controlled by one gene locus with little phenotypic influence from the environment.
- Threshold trait- must have a certain number of factors to develop the trait. Ex: Type 2 Diabetes.
- Meristic Trait- "Counting trait" Ex: children, you can have 1, 2, 3, or 4 children but you can't have 3.5 children.
- Complex trait-any trait that is influenced by both genetic and environmental factors.
- Quantitative geneticists study a sample of the total population.
- Use sample mean.
- Use variance and standard deviation.
- Most quantitative traits follow the normal curve.

19.2-A Simple Genetic Model for Quantitative Traits

- It has to be determined how much a trait is influenced by genetics and how much it is influenced by the environment.
- Covariance-A measure of association between two traits.
- Correlation is measured by the R value or the correlation coefficient.

19.3-Broad Sense Heritability: Nature versus Nurture

- Broad Sense Heritability (H^2)- Part of the phenotypic variance among individuals in a population that is due to genetic differences.
- H^2 is the ratio of genetic variation of a population over total population variation.

19.4-Narrow Sense Heritability

- Narrow Sense Heritability- A measure of the degree to which an individual's genetic make-up determines the phenotypes of their offspring. Ratio of the additive variance to the total variance.
- Gene action-Interaction of alleles at a gene locus.
- Alleles can be additive. Ex. B_1/B_1 - 1 flower, B_1/B_2 - 2 flowers, B_2/B_2 - three flowers.
- Alleles can follow dominant and recessive
- Alleles can also show partial dominance.
- When the phenotypic value of the heterozygous is midway between the two homozygous values then the gene action is additive.
- When the phenotypic value of the heterozygous deviates from the midpoint value then there is some degrees of a dominance gene action.

19.5-Mapping QTL in Populations with Known Pedigrees

- The genes that control variation in quantitative traits are called quantitative trait loci.
- Analysis of these loci mutations are studied through a process of QTL mapping.

- QTL mapping cannot specify a gene or number of genes that control the trait it can only specify a region.

19.6-Association Mapping in Random-Mating Populations

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