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Introduction: Monogenic and Polygenic Inheritance

- **Monogenic** trait is a characteristic that is produced by a single gene or a single allele.
- An example of a **monogenic** trait is eye color or the ability to roll your tongue or Round or wrinkled seeds of Pea.
- **Introduction: Monogenic and Polygenic Inheritance**
- A **polygenic** trait is a characteristic controlled by two or more genes that are located at different areas on different chromosomes.
- Some examples of polygenic inheritance are: **human** skin and eye color; height, weight and intelligence in people; and kernel color of wheat.
- **Monogenic and Polygenic Inheritance**
- The key difference monogenic and polygenic inheritance lies in the number of genes involved in the determination of a particular character.
- Polygenes: Two or more different pairs of alleles, with a presumed cumulative effect that governs such quantitative traits as size, pigmentation, intelligence, among others.
- Those contributing to the trait are termed contributing (effective) alleles; those appearing not to do so are referred to as non-contributing or non-effective alleles
- **Monogenic and Polygenic Inheritance**
- In monogenic inheritance, one trait is determined by a single gene whereas, in polygenic inheritance, one trait is determined by two or more genes.
- Thus, Monogenic inheritance refers to the kind of inheritance whereby a trait is determined by the expression of a single gene or allele, not by several genes as in polygenic inheritance.

- **Qualitative and Quantitative genetics**

Qualitative Traits:

- The classical Mendelian traits are qualitative in nature.
- These are traits that are easily classified into distinct phenotypic classes.
- These distinct phenotypic classes are under the genetic control of only ONE (or very few) genes with little or no environmental modifications to the gene effects.
- E.g. Height of the Pea plants- Tall or dwarf, Round or wrinkled seeds of Pea.
- **Qualitative and Quantitative genetics**
- Qualitative traits are characters that are usually determined by single genes, i.e. under the control of major genes.
- These are monogenic.
- **Qualitative and Quantitative genetics**

Quantitative Traits:

- In contrast to this, some traits form a spectrum of phenotypes.
- Traits that exhibit continuous variation can usually be quantified by measuring, weighing, counting and so on.
- Traits such as grain yield per acre, human skin colour, kernel colour in wheat etc. are Quantitative traits (earlier called as metric traits) with continuous variability.
- **Qualitative and Quantitative genetics**
- Quantitative or metric traits tend to be more complex and are usually controlled by multiple genes.
- These are traits forms a spectrum of phenotypes which blend from one type to another to cause continuous variations.
- These are polygenic.
- **In Polygenic traits**
- Each contributing non allelic gene has a small and relatively equal effects.
- The effects of each allele are additive.
- There is no dominance
- There is no epistasis or interaction among the different loci contributing to the value of the trait.
- The value of the trait is influenced by the environmental factors