

Difference Between Gene Frequency and Genotypic Frequency

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Key Difference – Gene Frequency vs Genotypic Frequency

At present, [population](#) genetics has become a widely studied field by geneticists due to the popular trend of emerging [species](#). Thus, population genetics can be measured through [microevolution](#) where the [evolution](#) of a small population is analyzed in terms of its [allele](#) frequency or gene frequency, genotypic frequency and phenotypic frequency. These calculations are done in order to determine the similarity of a population and to develop evolutionary relationships amongst different species in a population over a period of time. The frequency determines the number of times a particular gene, [genotype or phenotype](#) is repeated in a particular population. The key difference between gene frequency and genotype frequency lies in the particular factor in which the frequency is determined. **In gene frequency, it is a gene or an allele that determines the frequency while, in genotypic frequency, it is a genotype that determines the frequency.**

What is Gene Frequency?

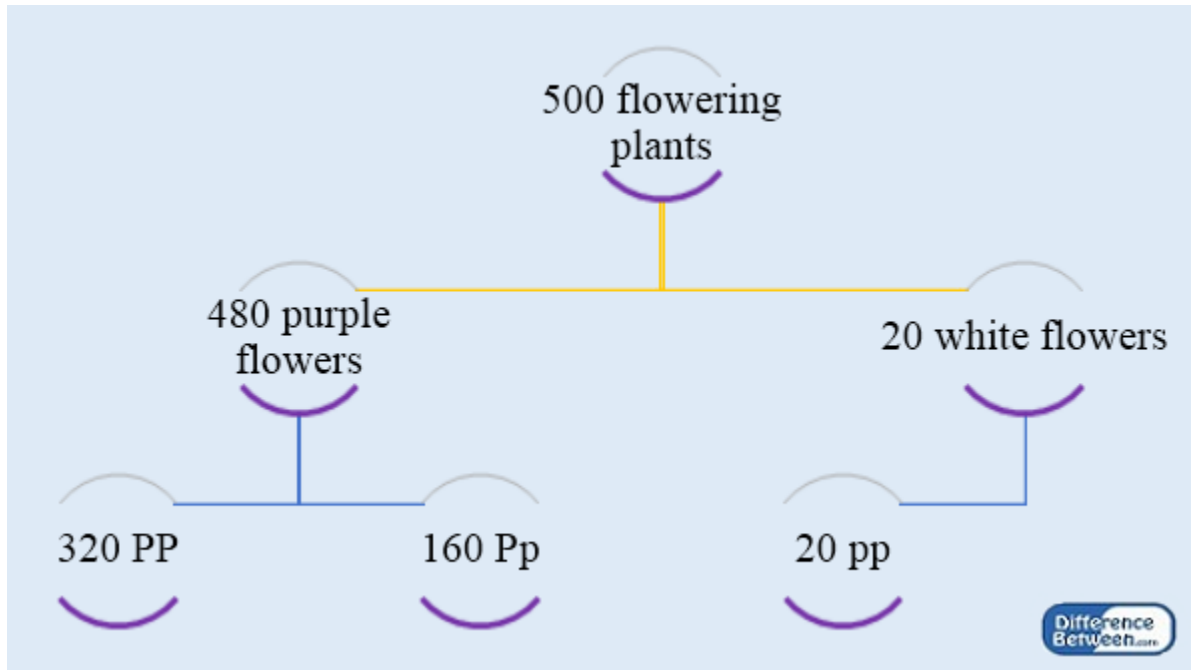
The gene is the unit of heredity which is transferred from parent to the offspring generation. The information which governs the characteristics of the offspring is stored in these genes. Every gene exists in alternative pairs, and an allele is one alternative form of the gene. Gene frequency, which more or less refers to the allele frequency, is the measurement where the number of repeats of the same allele is measured over a certain period of time. Thus, gene frequency (allele frequency) refers to how frequently an allele of a gene appears in a population.

The gene frequency can be measured in a micropopulation by using a simple formula as follows, and the value is usually given as a percentage.

Frequency of an allele ‘A’ = Number of copies of allele ‘A’ in a population ÷ Total number of copies of allele A/a in the population

Example 01:

Calculation of gene frequency of a flowering plant population with a dominant allele P for purple color plants and a recessive allele p for white color plants is worked below.



Total number of genes in the population = 1000

Gene frequency for gene P = $[\{(320 \times 2) + 160\} / 1000] \times 100$
= 80%

Gene frequency for gene p = $[\{(20 \times 2) + 160\} / 1000] \times 100$
= 20%

What is Genotypic Frequency?

Genotype is the genetic expression of a particular trait or a characteristic and involves two or more alleles together to give rise to the particular expression. The genotype can be homozygous (alleles are of the same form – PP) or heterozygous (alleles are of different forms – Pp). The genotypic frequency measurement refers to how many times a particular genotype is expressed in a population at a given period of time. Thereby the genetic relationship within a population can be determined.

As per the example 01, the genotypic frequency can be calculated in the following manner and is expressed as a percentage.

Total number of Genotypes = 500

Genotypic frequency of PP = $[\frac{320}{500}] \times 100 = 64\%$

Genotypic frequency of Pp = $[\frac{160}{500}] \times 100 = 32\%$

Genotypic frequency of pp = $[\frac{20}{500}] \times 100 = 4\%$

What are the similarities between Gene Frequency and Genotypic Frequency?

- Gene frequency and genotypic frequency are measured within a particular population, preferably in a micropopulation.
- Both percentages are measured within a particular time period.
- Both values are expressed as a percentage.
- Both measurements are used to determine the genetic relationships within a selected population.

What is the difference between Gene Frequency and Genotypic Frequency?

Frequency vs Genotypic Frequency

Gene frequency is the percentage of a particular gene/allele being repeated in a given population at chosen period of time.

Genotypic frequency is the percentage of a genotype being repeated in a given population at chosen period of time.

Evolutionary Rate

Gene frequency evolves fast within a gene pool.

Genotypic frequency evolves at a slower rate within the gene pool.

Structure

Gene frequency can be either dominant or recessive.

Genotypic frequency can be homozygous dominant, homozygous recessive or heterozygous.

Complexity in Measurement

Gene frequency is more complex as it is measured at the allelic level.

Genotypic frequency is less complex.

Summary – Gene Frequency vs Genotypic Frequency

The gene pool which consists of the total number of genes in a particular population constantly evolves as species undergo adaptations for environmental and other physical factors surrounding them. Hence, geneticists use changes in genes and genotypes study the evolutionary patterns over a period of time. The gene frequency and genotypic frequency are measurements conventionally determined through Mendel's theories but advanced with the theories put forward by Darwin on evolution. Allele or gene frequency is a measure of the relative frequency of an allele on a genetic locus in a population. Genotypic frequency is the proportion of a particular genotype amongst all the individuals in a population. This is the difference between gene frequency and genotypic frequency.

References:

1. "Allele frequency & the gene pool." Khan Academy. N.p., n.d. Web. [Available here](#). 08 Aug. 2017.
2. "Genotypic Frequency: Definition & Explanation". Study.com, n.d. Web. [Available here](#). 08 Aug. 2017.

How to Cite this Article?

APA: Difference Between Gene Frequency and Genotypic Frequency. (2017, August 10). Retrieved (date), from <http://differencebetween.com/difference-between-gene-frequency-and-vs-genotypic-frequency/>

MLA: "Difference Between Gene Frequency and Genotypic Frequency" *Difference Between.Com*. 10 August 2017. Web.

Chicago: "Difference Between Gene Frequency and Genotypic Frequency." *Difference Between.Com*. <http://differencebetween.com/difference-between-gene-frequency-and-vs-genotypic-frequency/> accessed (accessed [date]).



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