Welcome to 3rd year BSc Botany.

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Today we will be seeing the course

cytogenetics and plant breeding.

The unit is quantitative inheritance.

The module name is monogenic

versus polygenic inheritance.

Outline, we will be seeing monogenic,

inheritance and polygenic inheritance

learning outcomes of this module

will be understands the concepts of

monogenic and polygenic inheritance

differentiates between monogenic

and polygenic inheritance.

Introduction let us first see what

are monogenic and polygenic traits

monogenic trait is a characteristic

that is produced by a single gene.

Or a single allele.

An example of monogenic trait is the

ability to roll your tongue or implants.

An example would be the round or

the wrinkled seeds of pea plant,

whereas a polygenic trait is a

characteristic that is controlled by

two or more genes that are located at

different areas on different chromosomes.

Examples of polygenic inheritance would be.

Human skin color, human eye color.

The height, weight,

intelligence of people and amongst plants.

One example would be the kernel

color of wheat.

So the key difference between monogenic

and polygenic inheritance lies in

the number of genes involved in the

determination of a particular character.

So if we have to define polygenes,

it would be two or more different

pairs of alleles.

With a presumed cumulative effect that

governs such quantitative traits like size,

pigmentation,

intelligence, etc.

These contributing to the traits,

the alleles which contribute to the

trait are termed as contributing alleles.

They may also be referred to as effectively.

And those appearing not to do so I

refer to as the non contributing

alleles may also be referred to

as a non effective traits.

So in monogenic inheritance,

one trait is it ermined by a single gene

and in polygenic inheritance one trait

is determined by two or more genes.

So thus we can say that in monogenic

inheritance it refers to a kind

of inheritance whereby a trade is

determined by the expression of

a single gene or a single allele

and not by several genes as seen

in polygenic inheritance.

Having understood monogenic

and polygenic traits.

Let us try to understand what

is qualitative and quantitative

genetics in order to understand.

Qualitative and quantitative genetics.

Let's see what are qualitative traits.

The classical Mendelian traits are the

ones which are qualitative in nature.

Now these traits which are

qualitative in nature,

are easily classified into

distinct phenotypic classes.

So there are these distinct

phenotypic classes which are under

the control of only one or very few

genes and they have no environmental

modifications to the gene effects.

The example here would be the height

of the P plants, either tall or dwarf,

or the seed type of pea plants,

either round or wrinkled.

So these qualitative traits are

usually determined by a single gene.

That is,

they are set to be under the

control of a major gene,

and therefore these qualitative

traits are the moon oh genic traits.

As against that, let us see quantitative

traits now these quantitative traits.

Are the ones which have

a spectrum of phenotypes.

These straight exhibit continuous

variation that can usually be quantified,

and it can be quantified by measuring

by weighing by counting and so on.

Trade such as the grain yield per acre or

the human skin color or the kernel color

in read are all quantitative traits.

These quantitative traits were earlier

referred to as the metric traits and

these have continuous variability,

so these quantitative traits.

Autometric traits,

they tend to be more complex and they are

usually controlled by multiple genes.

These traits,

like I said from a spectrum of phenotypes

which blend from one type to another,

and thus they cost continuous variation.

So these quantitative traits

are the polygenic traits,

so we can now finally say that

in polygenic traits there is each

contributing non allelic gene and it

has a small and relatively equal effect.

The effect of every allele is additive in

polygenic traits there is no dominance,

no recessive characters.

There is no epistaxis or no interactions

which are observed and the value

of the trait is influenced by

the environmental factors.

Now, in summary,

if we have to differentiate between

the monogenic and the polygenic traits.

The monogenic traits,

like we saw,

are the classical Mendelian traits.

The height of the peak plant,

the seed type of the people,

and so these are the classical

Mendelian traits,

whereas the polygenic traits are

the nonclassical Mendelian traits.

In monogenic traits the phenotypic

classes are under the genetic

control or the genetic influence

of only one or very few genes,

whereas in polygenic traits they are

the quantitative traits or the metric

traits and they tend to be more complex.

These are usually controlled

by multiple genes.

In monogenic traits the phenotypic

classes are very distinct

whereas in polygenic traits the

phenotypic classes have a spectrum.

The spectrum of phenotypes which

blend from one type to another

to cause continuous variations.

In monogenic traits,

the traits may be dominant recessive,

no such dominance or recessive

knus is observed.

In the polygenic traits in monogenic

traits they may express epistaxis.

They may express allelic interactions,

however, in polygenic trait,

no such epistaxis or interactions

amongst the different loci contributing

to the value of that rate is seen.

Also in monogenic traits the traits are

not influenced by environmental factors,

whereas in polygenic traits the

value of the trade is influenced

by the environmental factors.

Here students are my references.

Thank you.