

Welcome to this e module.

This program is designed for the

students of Bachelor of Science

Third Year and the subject of botany

and Semester 6 course code BOC 108.

Course title, cytogenetics and plant breeding.

The title of this unit is inbreeding

depression and heterosis. Module name,

inbreeding depression and its application.

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In this module we will see the

introduction of inbreeding depression.

Some of the work done by various

scientists on inbreeding depression,

degree of inbreeding depression and some

practical applications of inbreeding.

At the end of this module,

the student will define

inbreeding depression,

recognize the work done by various scientists on inbreeding depression, classify the degree of inbreeding depression and explain the applications of inbreeding.

The cross pollinator species are highly heterozygous and these plants lose their increased vigor and other superior qualities of selfing or inbreeding is allowed in them.

Now let us learn about the definition of two terms, inbreeding and outbreeding.

Inbreeding is the term given for the mating between genetically related individuals, that is, brother, sister, mating or sib mating.

On the other hand, we have outbreeding which is nothing but the mating between the individuals of different genetic constitution.

The reduction in growth, vigor, and fertility due to inbreeding is

referred to as inbreeding depression.

Inbreeding reduces heterozygosity and

leads to homozygosity in their progeny.

There is a distinct correlation between

the homozygosity and degree of inbreeding.

Selfing reduces the heterozygosity by

a factor of half in each generation,

and the degrees of inbreeding

increases in the same proportion.

Now let us see some of the work done by

various scientists on inbreeding depression.

Koelreuter, conducted his hybridization experiments

on *Nicotiana* that is tobacco.

He suggested that the vigor of

hybrid is related to the degree of

genetic dissimilarity of parents

and hybrid vigor is of particular

significance in evolution.

It was Darwin who published the

account of his experiment on self

and cross pollination in maize.

He concluded that the progeny
obtained from self-fertilization
is weaker than those derived from
outcrossing or cross fertilization.

Other scientists,
like East in 1996 and GH Shull in 1999,
studied the effects of inbreeding in
maize for 30 generations independently.

They found that the healing ability
in these lines finally reduced to
1/3 of the open pollinated variety,
from which these samples were derived.

They drew the following conclusions.

A number of lethal and subtitle types
appear in early generations of selfing.

The material rapidly separates
into distinct lines,
which become increasingly uniform for
differences in various morphological
and functional characteristics.

Many of the lines decrease in vigor

and fecundity until they cannot
be maintained even under the most
favorable cultural conditions.

Lastly, the lines that survive show
a general decline in size and vigor.

Now let us see the degree
of inbreeding depression.

The degree of inbreeding response differs
in different species and also by range
from very high to very low or zero.

Accordingly, we can categorize the degree
of inbreeding depression into four types.

High inbreeding depression moderate
inbreeding depression very low inbreeding
depression and no inbreeding depression.

Now let us discuss each of
these categories in detail.

High inbreeding depression in some plants.

The loss in vigor and fertility
due to inbreeding is so great that
very few lines survive after three

to four generations of inbreeding

they show greatly reduced yield,

generally less than 25% of

open pollinated varieties open.

Pollination is pollination which

occurs by wind, insect, birds, and

humans.

Plants which show high inbreeding

depression, alfalfa and carrot.

Moderate inbreeding depression-

In this setting of progeny results in

many big little or sub leader types in

population which are eliminated but

a good proportion of population can

be maintained under self pollination.

Examples of plants showing

moderate inbreeding depression.

Jawad and budget up.

Very low inbreeding depression.

Some plans will show very little

loss in vigor and fertility due

to inbreeding and some of the
inbred lines as much as their
open pollinated parent varieties.

Example dry and sunflower.

No inbreeding depression.

The self pollinated species do
not show inbreeding depression,
although they show some degree
of hybrid vigor or heterosis.

Now let us learn about some
practical applications of inbreeding.

In a heterozygous individual that
is an individual having different
forms of alleles or genes,
the harmful recessive alleles remain
masked by their normal dominant alleles.

If a heterozygote individual undergoes
inbreeding for various generations,
there will be equal chances for dominant
as well as recessive alleles to express.

But in homozygous condition

recessive alleles will be able
to express their deleterious
phenotypic effects on an individual.

On the other hand,
we have the homozygosity for dominant
alleles which has equal opportunity
to express their beneficial
phenotypic effects on inbred races,
and therefore we sometimes say
that inbreeding is boon or Bane.

Inbreeding cause homozygosity of
deleterious recessive genes which
may result in defective phenotype.

Under this we had the example in
human society the religious ethics
unknowingly and moral social norms
consciously have condemned and bend
the marriage of brothers and sisters.

Further, the plant breeders and animal
breeders to avoid inbreeding in the
individuals due to this particular reason.

Secondly, the inbreeding results in

homozygosity of dominant alleles.

It is the best means of mating

among hermafrodites.

Meaning a bisexual individual

and self pollinating plant

species of several families.

The animal breeder employed the inbreeding

to produce best races of horses,

dogs, bulls, cattle, etc.

Examples the modern race horses are all

descendants of three Arabian stallions.

Also, we know Merino sheep,

which is widely known for its

fine wool production.

These are my references,

thank you.