Hello students myself,

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going to learn Types of embryo sac,

Monosporic- *Polygonum* type, Bisporic,

-*Allium* type and Tetrasporic- *Peperomia* type.

This module is from Unit 5 Structural

organization of flower from course code BOC103.

And course title, Plant Anatomy and Embryology.

Outline of the module is three types of

embryo sac found in angiosperms Monosporic- *Polygonum* type, Bisporic

-*Allium* type and Tetrasporic- *Peperomia* type.

At the end of the module, you will

learn to explain three types of embryo

sac found in angiosperms Monosporic- *Polygonum* type, Bisporic

-*Allium* type and Tetrasporic- *Peperomia* type.

Let's learn the types of embryo sac.

In the previous module,

You studied the development of female gametophyte

During The development of female gametophyte or

during the development of embryos sac, a

single hypodermal cell in the nucellus of the ovule functions archesporial cell

or archesporium. The archesporial cell

directly functions as Megaspore mother cell or undergoes

few mitotic divisions and one of

the cell functions as megaspore mother cell.

Megaspore mother cell enlarges in

size and divides by meiosis to

form 4 haploid megaspores.

The process is called Megasporogenesis. Out of four megaspores,

3 degenerate and one functional

megaspore by Megagametogenesis forms

female gametophyte or embryo sac.

In majority of the Angiosperms,

the embryo sac is derived from

the megaspore containing a single

haploid nucleus.

In some angiosperms,

the embryo sac is formed from

the megaspore having two or all

four haploid nuclei.

The megaspore with more than one

nucleus is formed by meiotic division,

in which karyokinesis is not

followed by cytokinesis.

Depending on the number of megaspore

nuclei involved in embryo sac development,

there are three types of embryo sac

monosporic embryo sac, bisporic

embryo sac and Tetrasporic embryo sac.

Each group has more than one type of

embryo sac named after the genus

in which it was first described.

In this module, we are going to

learn *Polygonum* type in monosporic embryo sac,

Allium type in bisporic embryo

sac and *Peperomia* type in.

tetrasoporic embryo sac.

The first one is monosporic embryo

sac- *Polygonum* type of monosporic

embryo sac is derived from only one

of the four megaspores formed during

meiosis of Megaspore mother cell.

Diagrammatic representation shows

the development of *Polygonum* type of

monosporic embryo sac. During megasporogenesis, megaspore mother cell

undergoes a meiotic division to give

rise to four haploid megaspores in a

linear tetrad. Out of four megaspores,

3 megaspores which are towards

the micropylar end degenerate,

whereas which is towards the

chalazal end remains functional.

This functional megaspore undergoes

mitotic division three times to give

rise to 8 nucleate structure.

This eight nucleate structure

undergoes cellular organization.

So in *Polygonum* type,

The final structure has the egg

apparatus which is towards the

micropylar end with two synergids

and one egg.

At the Chalazal end, there are three nuclei which get organized into three antipodal cells and in the center there are two polar nuclei in the central cell.

All the nuclei in monosporic embryo sac are genetically identical because they are derived through mitosis of a single nucleus.

Since the embryo sac is derived from a single meiotic product, it is called as monosporic embryo sac.

Polygonum type of monosporic embryo sac is the most common mode of embryo sac development found in almost 80% of the angiosperms.

The second type is bisporic embryo sac- *Allium* type of bisporic embryo sac is derived from the two megaspore nuclei formed during meiosis of Megaspore mother cell.

Diagrammatic representation shows

the development of *Allium* type of bisporic embryo sac. During megasporogenesis, megaspore mother cell undergoes meiotic division. During the first meiotic division, there is a formation of a dyad, the dyad cell which is towards the micropylar end undergoes degeneration. The chalazal end dyad cell undergoes a second meiotic division to give rise to megaspore with two haploid nuclei. There is no wall formation after the end of meiosis II. This two haploid nuclei undergoes mitotic division twice to give rise to 8 nucleate structure. This eight nucleate structure undergoes cellular organization to give rise to *Allium* type of embryo sac. The final organization of the *Allium* type is similar to the *Polygonum*

type. out of four nuclei which are

present at the micropylar end, three

organize to form egg apparatus,

with two synergids and one egg.

One is left free in the central

cell as polar nucleus.

Out of four nuclei at the chalazal end,

three organize to form 3 antipodal

cells and the 4th one is left free as

a polar nucleus in the central cell.

Segregation during meiosis normally

results in four genetically

different nuclear products.

The nuclei of bisporic type belongs

to two different genetic constitution.

4 nuclei are of one type and

another four nuclei are of different type.

Since the embryo sac is derived

from two meiotic products,

it is called as bisporic embryo sac.

Allium type of bisporic embryo sac

is found in many monocotyledonous

families such as Liliaceae,

Amaryllidaceae, Orchidaceae,

Alismaceae, and Butomaceae.

Among dicotyledons,

it is found in the genera of certain

families such as Podostemaceae, Balanophoraceae and Loranthaceae.

Let us learn the third type of

embryo sac, that is Tetrasporic type of .

embryos sac. *Peperomia* type of

tetrasporic embryo sac is derived from Coeno-Megaspore formed

during meiosis of Megaspore mother cell.

Diagrammatic representation shows the

development of *Peperomia* type of tetrasporic embryo sac during Megasporogenesis

Megaspore mother cell undergoes

meiotic division to give rise to coeno-megaspore. During meiotic division,

there is no wall formation so all the

four haploid nuclei remain in common

cytoplasm to give rise to coeno-megaspore.

These four nuclei in the megaspore

undergoes two mitotic divisions to

give rise to 16 nucleate structure.

The 16 nucleate structure undergoes

a cellular organization to give rise

to *Peperomia* type of embryo sac,

in which two nuclei get organized

to form the egg apparatus with a single synergid and an egg.

Eight nuclei are fused together to form a

polyploid nucleus of the central cell,

and six nuclei get organized

to form six peripheral cells.

Tetrasporic embryo sac is more

heterogeneous than a bisporic embryo

sac because all the four products

of meiosis which are genetically

different are involved in its formation.

Since the embryo sac is derived

from 4 meiotic products,

it is called as Tetrasporic.

Embryo sac. *Peperomia*

type of embryo sac is found in

Peperomia and *Gunnera* species.

These are the references which are being

used for the preparation of the module.

Thank you.