

Introduction to Botany. Lecture 14

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1 Questions and answers

- Quiz
- Syngamy (Y!)
- Meiosis (R!)



Questions and answers

Quiz



Final question (3 points)

Why do living things support diversity?



Final question (3 points)

Why do living things support diversity?

- Individual: diverse genes increase adaptation
- Population: diverse individuals make population survive



Questions and answers

Syngamy (Y!)



Exchange and renovation of DNA

- To sustain with the ever-changed environment, organisms must evolve (“Red Queen Law”)
- To evolve, they need a genetic diversity: different genotypes in different organisms
- To be genetically diverse, they need a process of genetic exchange
- One of ways of exchange is a sexual process in a form of **syngamy**
- However, constant syngamy will result in constant increase of DNA amount
- Meiosis is a counterbalance to syngamy



Definition of syngamy

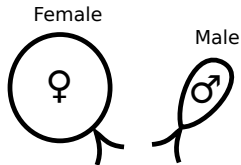
- *Fusion of two cells, where resulted cell will have two times more chromosomes*
- Initial cells are **gametes**, resulted cell is a **zygote**
- Chromosome formula: $X + X \longrightarrow XX$
- **The goal of syngamy** is the renovation of genetic material
- Syngamy changes genotype of cells



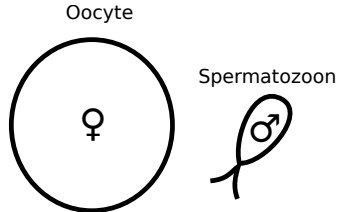
Types of syngamy



Isogamy:
different
genotypes



Heterogamy:
different
size



Oogamy:
different
motility



Questions and answers

Meiosis (R!)



Some useful terms

- Gene
- Protein
- Enzyme
- Genotype
- Phenotype
- Genome
- Population
- Mutation
- Syngamy



Ploidy, or chromosome set

- In diploid ($2n$) organisms, chromosomes form pairs
- Paired chromosomes (XX) are **homologous**
- In haploid (n) organisms, all chromosomes are single
- In mitosis, ploidy will be the same: $2n \rightarrow 2n + 2n$
- In syngamy, ploidy will increase: $n + n \rightarrow 2n$
- In meiosis, ploidy will reduce: $2n \rightarrow n + n$



Stages of meiosis

- First division: reductive part
 - Prophase I: homologous chromosomes form pairs (**synapses**) and start to exchange DNA (**crossing-over**)
 - Metaphase I
 - Anaphase I: homologous chromosomes will go *independently* to different poles
 - Telophase I becomes Prophase II, without interphase (and typically without cytokinesis)
- Second division: equal part (similar to mitosis)
 - Prophase II
 - Metaphase II
 - Anaphase II
 - Telophase II



Final question (2 points)



Final question (2 points)

Before syngamy, every cell has 3 picograms of DNA. How many DNA are in zygote immediately after syngamy?



Summary

- **Syngamy** is a sexual process of cell fusion, **ploidy doubles**, **genotype changes**
- **Meiosis** is a process of reduction of DNA amount, **ploidy halves**, **genotype changes**



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

2016.

Mode of access:

http://ashipunov.info/shipunov/school/biol_154

