**Flowers and seeds**

**Study guide and reading assignments**

# Reading assignment: Yuan et al. 2013. The genetic control of flower–pollinator specificity. Current Opinion in Plant Biology. 16: 422-428.

# A pdf of the paper can be downloaded from the “Files” section of the class Canvas site.

# You are responsible for reading the abstract, introduction, and conclusions. If you have the opportunity, enjoy reading the full article.

# Study questions based on the paper are provided at the end of this guide.

1. What features are in common between angiosperms, gymnosperms, and ferns in terms of reproductive organs and reproduction?
2. What features are different between angiosperms, gymnosperms, and ferns in terms of reproductive organs and reproduction?
3. Which of the following numbers is closest to the number of flowering plant species?
   1. 2,000
   2. 20,000
   3. 200,000
   4. 2,000,000
4. In the alternation of generations, what is meant by “n” and “2n”?
5. What is the difference between the “n” and the “x” in defining ploidy level?
6. Compare and contrast the alternation of generations in angiosperms and gymnosperms vs. ferns.
7. What are homologous chromosomes?
8. What is a locus?
9. What are alleles?
10. If you had to guess the number of genes in a diploid plant, which of the following numbers would be most correct?
    1. 3,000
    2. 30,000
    3. 3,000,000
11. Give two advantages and two disadvantages for sexual reproduction in angiosperms.
12. Polyploidy is quite prevalent in plants. Which of the following is a more likely explanation for the prevalence of polyploidy in plants?   
    1. Polyploids have more alleles and are therefore bigger, stronger, and more fit.
    2. Polyploids have more alleles and the alternative alleles may confer advantages at different times and/or tissues during plant growth and development.
13. Be able to name, and identify on a diagram, three critical female reproductive structures in a perfect angiosperm flower.
14. According to Heil (2011), what is the most important mediator of interactions between plants and pollinators?
15. Give two examples of flower color where the attraction is to human disseminators rather than animal pollinators.
16. Explain the role of transgenics and viruses in blue roses and tulips.
17. Be able to diagram and explain the steps between a megaspore mother cell and the 8 nuclei in an embryo sac.
18. Briefly describe the function and fate of the antipodals, the synergids, and the egg.
19. Be able to draw a general diagram of the 8-nucleate embryo sac and label the nuclei.
20. Considering the male reproductive structures in a perfect angiosperm flower, one stamen is connected to one anther, which can contain approximately how many pollen grains?
    1. 1
    2. 10
    3. 100
    4. 1,000
    5. 10,000
21. What is different, in terms of the fate of the four products of meiosis, between the developing megaspores and microspores, and what implications does this have for genetic analysis?
22. If a plant is heterozygous at many loci, would it be possible for it to produce a tetrad of microspores, each with a different combination of alleles?
23. If a plant is heterozygous at many loci, would it be possible for the two sperm in a pollen grain to be genetically different?
24. What tissue is the site of pollen recognition?
25. Is there a genetic component to pollen recognition?
26. Explain how the egg can be 2n and the endosperm 3n.
27. What implications are there, in terms of the genetics of the embryo and endosperm, as to which parent is the female and which is the male?
28. Know the genetic consequences of which megaspore in the linear tetrad is the one to survive and give rise to the 8 nuclei in the embryo sac.
29. Explain how a seed can be a genetic mosaic, in terms of which alleles are represented (e.g. maternal, paternal, or maternal + paternal).
30. Be able to identify male and female reproductive structures in maize and explain how they relate to the symptoms of water stress observed on a young ear of corn.
31. In “Double fertilization in angiosperms: The movie” the narrator states that the endosperm is triploid and that the egg is diploid. That is true for a diploid plant, but what if the plant in the film was a polyploid?
32. Are the advantages and disadvantages of sexual reproduction the same for angiosperms and gymnosperms?
33. Compare the frequency of polyploidy in angiosperms and gymnosperms.
34. What is key difference is there, in terms of sexual reproduction, between the angiosperm flower shown in side 16 and the gymnosperm flowers shown in slide 24?
35. Identify commonalities and differences between angiosperms and gymnosperms in terms of megasporogenesis and microsporogenesis, pollination biology, and seed structure.
36. Are the advantages and disadvantages of sexual reproduction the same for angiosperms, gymnosperms, and ferns?
37. What key difference is there between the alternation of generations in ferns vs. the alternation of generations in angiosperms and gymnosperms?
38. Comment briefly on polyploidy in ferns.
39. Allele dosage in the endosperm more a matter of genetic interest and importance for breeding during segregating generations than a commercial concern in released varieties. Why is that?
40. Two growers of corn have adjacent properties. One planted yellow feed corn and the other grows white sweet corn. The sweet corn producer complains that her crop has been ruined by the feed corn producer – the normally 100% white ears now have several yellow, starchy kernels in each year. The feed corn producer argues that the sweet corn producer bought contaminated F1 seed. What is your opinion?
41. If gymnosperms lack endosperm, what is the source of nutrition for the germinating seed?
42. How does the maternal haploid nature of the gametophyte facilitate the genetic analysis of gymnosperms?
43. Briefly tell the story of the world’s oldest viable seed. What implications does this story have for managing weeds in agricultural soils?

The following questions are based on the assigned reading by Yuan et al.

1. What is a transcription factor?
2. Briefly describe the role of transcription factors in the class of example of three *Petunia* species and their different pollinators.
3. What is the phenotypic consequence of a nonsense mutation in the AN2 gene?
4. On page 10 of the pdf, there are four bullet points. Explain, in your own words, why these are considered the highlights of the article.