**Purpose:**

* To reinforce students understanding of stages of meiosis and allele segregation, and make a connection between the two
* To emphasize the differences in genetic makeup (genotype) of nuclei of the embryo sac and pollen grain
* To reinforce understanding of the type of fertilization that occurs

**Keywords**:

* Meiosis, metaphase, megaspore mother cell, embryo sac, pollen, nuclei, chromosome, heterozygous, genotype, allele, endosperm, fertilization

**References:** CG Reproduction in Crop Plants Module 1

**CG ALA-1\_Reproduction in Crop Plants Module 1**

1. An F1 crop plant is heterozygous (Aa) for a gene on chromosome pair 1 and heterozygous (Bb) for another gene on chromosome pair 5.

a. Diagram chromosome 1 and 5 as they would appear at the first metaphase (Metaphase I) of a megaspore mother cell undergoing meiosis. Indicate the appropriate alleles on each of the chromosomes in the diagrams. How does your diagram differ from the one you would draw from metaphase of mitosis?

Alternatively,

b. Diagram chromosome 1 and 5 as they would appear at the second metaphase (Metaphase II) of each of the two nuclei produced by the first phase of meiosis. Indicate the appropriate alleles on each of the chromosomes in the diagrams.

c. Diagram and label the nuclei in the embryo sac. The egg cell can have one of four different genotypes for the A, a and B, b alleles on chromosomes 1 and 5, respectively. Diagram the four possible egg cells each with a different genotype for the A, a and B, b alleles in chromosomes 1 and 5, respectively.

d. Diagram and label the nuclei in a pollen grain. The sperm nucleus can have one of four different genotypes for the A, a and B, b alleles on chromosomes 1 and 5. Diagram the four possible sperm nuclei each with a different genotype for the A, a and B, b alleles in chromosomes 1 and 5, respectively.

e. Which nuclei in the pollen and embryo sac unite during sexual fertilization to form the endosperm of the seed and what would be the number of chromosomes in the nucleus of the endosperm?

2. If the plant is homozygous (AA) for a gene on chromosome pair 1 and homozygous (BB) for another gene on chromosome pair 5, then answer the following:

a. How many different genotypes of sperm nucleus or egg cells for gene A and B could be produced?

b. If this crop is a self-pollinated species and has the genetic makeup described in 2a, you save seed for the next crop, will the next crop have the same agronomic performance as the seed parents for the traits controlled by genes *A* and *B* assuming the growing environment are identical? Explain your answer.