

Horticulture 102: Section 1, Sexual Reproduction of a Flower

[Ongoing animation of the sexual reproduction process of a flower as describe in the following text] This figure explains a really important process in plant sexual reproduction. There are several different stages we are going to talk about; microsporogenesis, megasporogenesis, pollination, fertilization, triple fusion. The first part of the sexual reproductive process we are going to talk about involves the female gametophyte formation. That process is called megasporogenesis and it occurs within an ovule inside of the ovary. That is where the female gametes are formed to develop haploid megaspores that are used in the process of fertilization. So the way that it works is within an ovule inside the ovary the female gametes are formed during the process that we call megasporogenesis. The megaspore mother cell divides via meiosis and it produces four haploid megaspores. This is the only time in the formation of the female reproductive egg that meiosis occurs. One of the four megaspores continues to develop while the other three degenerate. The active megaspore undergoes three mitotic divisions to produce eight nuclei; one egg, two polar nuclei, and five other nuclei two of which become synergids and three of which become antipodal cells. The structure known as the megagametophyte is ready for fertilization at this point. In the male gamete formation it actually occurs inside anthers which are the male reproductive structures. The process of microsporogenesis occurs there. This is how male gametes, or pollen grains, are formed. In this case the microspore mother cell goes through meiosis to produce four haploid microspores. Again, this is the only time meiosis occurs during the formation of pollen grains. Each other these microspores continues to develop and eventually each one divides again and undergoes a structural change resulting in the formation of pollen grains that are released by the anthers. So unlike megasporogenesis where only one of the megaspores goes on to develop the egg, all of the microspores continue to develop to form pollen grains and so many more pollen grains are formed in plants compared to eggs. So somehow these two need to unite to create a fertilization event. That occurs through a process called pollination. During pollination, the pollen grain that was released by the anther lands on a stigma and it produces a pollen tube that grows down through the style to the ovary. That is where the nuclei are actually migrating actually deposited into the female gametophyte. One of the nuclei in that pollen grain goes through a mitotic division and produces what are called two sperm nuclei, or they are otherwise known as the male gametes. The other nucleus becomes the tube cell. These three nuclei migrate down the pollen tube to the ovary. The sperm nuclei are deposited in one synergid and it then bursts. After the synergid bursts, one of the sperm nuclei fuses with the egg to create the diploid embryo of the seed. This union of the male and female gamete is known as sexual fertilization. This is where the genetic information from the male and the female parent are combined. The sperm nucleus not involved in fertilization fuses with the other two polar nuclei to create the triple endosperm of the seed. The term triple fusion is used to describe the union of the other male gamete and those two polar nuclei to form that endosperm. The combination of the process of sexual fertilization and triple fusion is referred to as double fertilization.