

AGR1709: Potential Seeds in Heat – Improving pea ovule heat tolerance

Pea crops are highly sensitive to stress like heat and drought, and readily abort flowers and even young pods. Yield loss is caused by aborted or blasted flowers, which were potential pods and seeds that did not make it to crop maturity. An ovule is a potential pea seed within a pod after it is fertilized by pollen, and fertilized ovules develop into seeds. A potential cause of flower and seed loss is ovule susceptibility to heat. While pollen formation and pollination is heat susceptible, less is known about ovules and young embryo heat susceptibility. This project looks at six varieties of peas to develop methods to measure heat stress on ovules in young tiny pods, usually hidden in flowers. We have developed two methods so far. The first method is on tiny pods and the ovules inside, collected from plants about four days after a flower is open. Here we can view ovule health with a fluorescent stain under the microscope that highlights wound tissue on the ovule surface. The second method uses a purple stain that when partly removed, allows us to see inside an ovule to the developing embryo in an embryo sac. So far we have discovered that four days of heat stress (midday temperatures above 30°C) can affect ovules in some varieties more than in other varieties. For heat-susceptible varieties, heat damages the ovules making them smaller, with smaller embryo-sacs and damaged embryos compared to ovules from heat-resistant varieties. In this coming year (2018) we will use our methods to measure 18 pea varieties for heat-resistant ovules in the field (if we get a heat wave), and in the growth chamber where we can control temperatures. We will identify the best varieties with the most ovule heat-resistance so they can be used to develop future pea varieties.