Targeted Project / AY 2023 -2024

Cool maize

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Department/Institute: Plant Sciences

Research area: maize photosynthesis in suboptimal temperature

Project outline:

The C4 crop Zea mays (maize) is currently the most dominant global food crop with a world-wide production volume of 1.09 billion metric tons. Crop species with the C4 photosynthetic pathway circumvent some of the inefficiencies of the Calvin-Benson-Bassham cycle by concentrating carbon dioxide around its central enzyme Rubisco. The physiological advantages of C4 species, such as high efficiency of photosynthetic light, water and nitrogen use, have allowed several of these species to become agriculturally relevant crops or weeds, as well as dominate many of the open landscape biomes across warmer regions of the earth. They also form the rationale for attempts to improve C3 crops such as rice, by installing C4 biochemistry and anatomy.

However, crops originating from the tropics and sub-tropics often are particularly sensitive to chilling temperatures. Maize was domesticated by ancient farmers in Mexico approximately 9000 years ago and is one of the most susceptible crops to chilling-induced photoinhibition amongst those grown in temperate regions. As a result, maize yields at higher latitudes are limited by a relatively short growing season, and are sensitive to yield losses due to early and late season cold snaps, poor establishment of sufficient leaf area to efficiently capture light and early season competition with weeds. Despite these well-known issues with temperate-grown maize, the underlying reasons for its chilling-sensitivity are not fully understood. This project will study physiological and genetic determinants of chilling-tolerance in maize.

BBSRC DTP main strategic theme: Bioscience for sustainable agriculture and food