DSY2 Protein Functions as a Key Factor for Meiotic Gene Recombination and Synapsis

A research team led by Dr. Chung-Ju Rachel Wang, Assistant Research Fellow at the Institute of Plant and Microbial Biology (IPMB), recently reported the discovery of a protein DSY2 in the major crop maize (corn) and revealed its important functions during sexual reproduction. The study was published in *The Plant Cell* on August 21, 2015.

Sexual reproduction in flowering plants involves the production of male and female reproductive cells (pollen in male and ovules in female) via meiosis, a specialized cell division to halve the number of chromosomes. Together with fertilization, meiosis maintains a constant number of chromosomes in a species. The meiotic recombination, which exchanges parts of DNA from paternal and maternal chromosomes (so-called homologs), creates new combination of genetic material naturally, and thus provides genetic diversity among individuals and is the molecular basis of crop breeding.

During meiosis, homologous chromosomes pair and recombine with each other via repair of programmed DNA double-strand breaks (DSBs). Meanwhile, assembly of the synaptonemal complex (SC), a process called synapsis, provides a tight connection between paired homologous chromosomes. Production of viable reproductive cells relies on these processes.

In this study, Dr. Wang‘s group identified a maize protein, DSY2, and revealed its important roles during meiosis. In mutant plants with nonfunctional DSY2, paternal and maternal chromosomes fail to recognize each other, leading to sterile plants. The team’s research revealed that DSY2 protein, which is located on chromosome axes, is required for DSB formation and synapsis. Super-resolution fluorescence microscopy showed that DSY2 forms a distinct alternating pattern with the other axial protein ASY1. The results further demonstrated that DSY2 serves as a key factor for SC assembly by interacting with the central element protein ZYP1 as well as the axial element protein ASY1. This study provides novel insight into the role of chromosome axis-associated proteins and reveals the molecular mechanism of SC assembly at the molecular level in plants.

Maize is an important staple food for more than 1.2 billion people, and is also widely used for livestock feed and industrial products. This study enhances the understanding of meiotic recombination during sexual reproduction, and was nominated as “noteworthy maize primary literature” by the US federally-funded informatics service on maize, the MaizeGDB Editorial Board.

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The complete article entitled “The Axial Element Protein DESYNAPTIC2 Mediates Meiotic Double-Strand Break Formation and Synaptonemal Complex Assembly in Maize” can be found at the *Plant Cell* journal website at:
http://www.plantcell.org/content/early/2015/08/21/tpc.15.00434.abstract