

Initiation of meiotic double strand breaks in plants depends on two different SPO11 proteins

Thorben Sprink and Frank Hartung

Julius Kühn-Institut, Institute for biosafety in Plant Biotechnology, Quedlinburg

Email of corresponding author: thorben.sprink@jki.bund.de

The pairing and balanced distribution of allelic chromosomes is one of the main factors leading to genetic diversity and a successful meiotic outcome in eukaryotes. This process depends in nearly all analyzed eukaryotic organisms on the initiation of double strand breaks (DSBs) by the protein SPO11, an evolutionary conserved meiotic transesterase. SPO11 is introducing these DSBs during early meiotic prophase. Whereas in animals and fungi only a single SPO11 is present, plants have at least two SPO11 proteins which are active and essential in meiosis (SPO11-1 and SPO11-2). Single knockout mutants of Arabidopsis SPO11-1 as well as SPO11-2 are nearly sterile and random chromosome segregation during meiosis occurs.

In all so far sequenced plants genes orthologous to Arabidopsis SPO11-1 and -2 exist. Our aims are to investigate whether the function of these two different SPO11 proteins is species specific or interchangeable between near and far distantly related plants. Furthermore, we want to define which regions of the proteins determine the specificity of the respective SPO11 protein 1 or 2. To analyze the functional conservation we used

orthologous genes from different land plants (*Brassica rapa*, *Carica papaya*, *Oryza sativa* and *Physcomitrella patens*) for heterologous complementation of well characterized SPO11 mutants from Arabidopsis.

To figure out which part of the protein sequence determines the specificity, we interchanged regions between the two SPO11 genes in Arabidopsis and transformed mutant plants with these swap constructs.

Here we will present first results on heterologous complementation with near related land plants as well as first results of interchanged regions between the two SPO11 proteins. We will show chromosome distribution as well as pollen vitality by different microscopic techniques. We will also evaluate if there is a differences in the number of seeds produced by the different complemented plants.

Analysing the results of these experiments, we should be able to answer the questions if there are sequence and/or species specific functions of each SPO11 and which region(s) of the proteins are essential for the initiation of meiotic double strand breaks.