New study provides insights into plant evolution

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New research has uncovered a mechanism that regulates the reproduction of plants, providing a possible tool for engineering higher yielding crops.

In a study published today in *Science*, researchers from Monash University and collaborators in Japan and the US, identified for the first time a particular gene that regulates the transition between stages of the life cycle in land plants.

Professor John Bowman, of the Monash School of Biological Sciences said plants, in contrast to animals, take different forms in alternating generations - one with one set of genes and one with two sets.

"In animals, the bodies we think of are our diploid bodies - where each cell has two sets of DNA. The haploid phase of our life cycle consists of only eggs if we are female and sperm if we are male. In contrast, plants have large complex bodies in both haploid and diploid generations," Professor Bowman said.

These two plant bodies often have such different characteristics that until the mid-1800s, when better microscopes allowed further research, they were sometimes thought to be separate species.

Professor Bowman and Dr Keiko Sakakibara, formerly of the Monash School of Biological Sciences and now at Hiroshima University, removed a gene, known as KNOX2 from moss. They found that this

caused the diploid generation to develop as if it was a haploid, a phenomenon termed apospory. The equivalent mutations in humans would be if our entire bodies were transformed into either eggs or sperm.

"Our study provides insights into how land plants evolved two complex generations, strongly supporting one theory put forward at the beginning of last century proposing that the complex diploid body was a novel evolutionary invention", Professor Bowman said.

While Professor Bowman's laboratory in the School of Biological Sciences is focused on basic research exploring the evolution and development of land plants, he said there were possible applications for the results as mutations in the gene cause the plant to skip a generation.

One goal in agriculture is apomixis, where a plant produces seeds clonally by skipping the haploid generation and thereby maintaining the characteristics, such as a high yielding hybrid, of the mother plant. Apomixis would mean crops with desirable qualities could be produced more easily and cheaply.

"Gaining a better understanding of the molecular basis of plant reproduction and the regulations of the alternation of generations could provide tools to engineer apomixis - a breakthrough that would be highly beneficial, especially in developing countries," Professor Bowman said.

Provided by Monash University