Leibniz Institute of Plant Genetics and Crop Plant Research (IPK)
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A targeted ‘off switch’ in the egg cell speeds up the breeding process

Press Release

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Gatersleben, 07.05.2026 **An international research team led by the IPK Leibniz Institute has succeeded in generating haploids in the model plant *Arabidopsis thaliana* very efficiently. This process involves degrading a specific protein in the centromere. The study’s findings, published in the journal ‘Plant Communications’, could in principle also be applied to crop plants, significantly speeding up breeding processes.**

Faster breeding brings climate-adapted, high-yielding, robust varieties to the fields more quickly. These varieties have greater tolerance to drought or heat, for example. This increases yield reliability and reduces resource use. Haploids, which are plants with only a single set of chromosomes, are an important tool in breeding. By doubling their chromosomes (‘double haploids’), haploids can be used to quickly produce fully homozygous lines within one generation. This accelerate the development of new varieties.

When the centromere protein CENH3 is degraded in a plant’s egg cell, paternal haploid offspring are frequently produced. Using the model plant *Arabidopsis thaliana*, the research team generated up to 57 per cent of these haploids in the corresponding offspring. The first author of the study, Dr. Saravanakumar Somasundaram, explains that „removing CENH3 from the egg cell efficiently produces paternal haploids, essentially disabling maternal chromosomes. The method is modular, uses the plant’s natural processes, and could be applied to crops.“

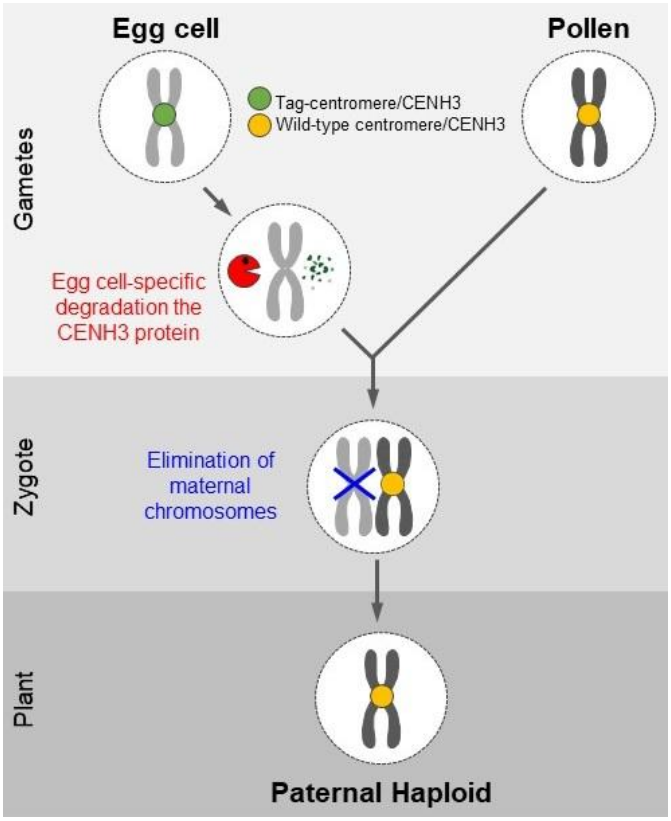
Initially, the scientists added a small tag to CENH3 to enable enzymatic degradation. The cellular ‘rubbish collection’ system then removes the CENH3 protein before fertilisation. Consequently, CENH3 is absent from the egg cell, yet remains present in the pollen. "A specific egg cell promoter ensures that the elimination affects only the embryo, not the nutritive tissue. And this increases the germination capacity of haploid seeds,” explains Dr. Saravanakumar Somasundaram.

“The aim is essentially to ‘switch off’ CENH3 in the egg cell, pollinate the plant with normal pollen, and produce haploid seeds,” says Prof. Dr. Andreas Houben, head of the ‘Chromosome Structure and Function’ research group. “Our method produces non-transgenic haploids following cross-pollination, thereby accelerating the development of inbred lines. This significantly reduces breeding time, cutting the process down from several years to a single season.”

Original publication:

Somasundaram *et al.* (2026): Targeted CENH3 protein depletion in egg cells enables highly efficient haploid induction. Plant Communications. DOI: 10.1016/j.xplc.2026.101837

Graphic:



During gamete development, the CENH3 protein is cleaved and degraded in the egg cell. After fertilisation of the egg cell with pollen from a wild-type plant, the embryo contains exclusively the paternal chromosomes of the pollen. The resulting plant is haploid and, following chromosome doubling, immediately completely homozygous.