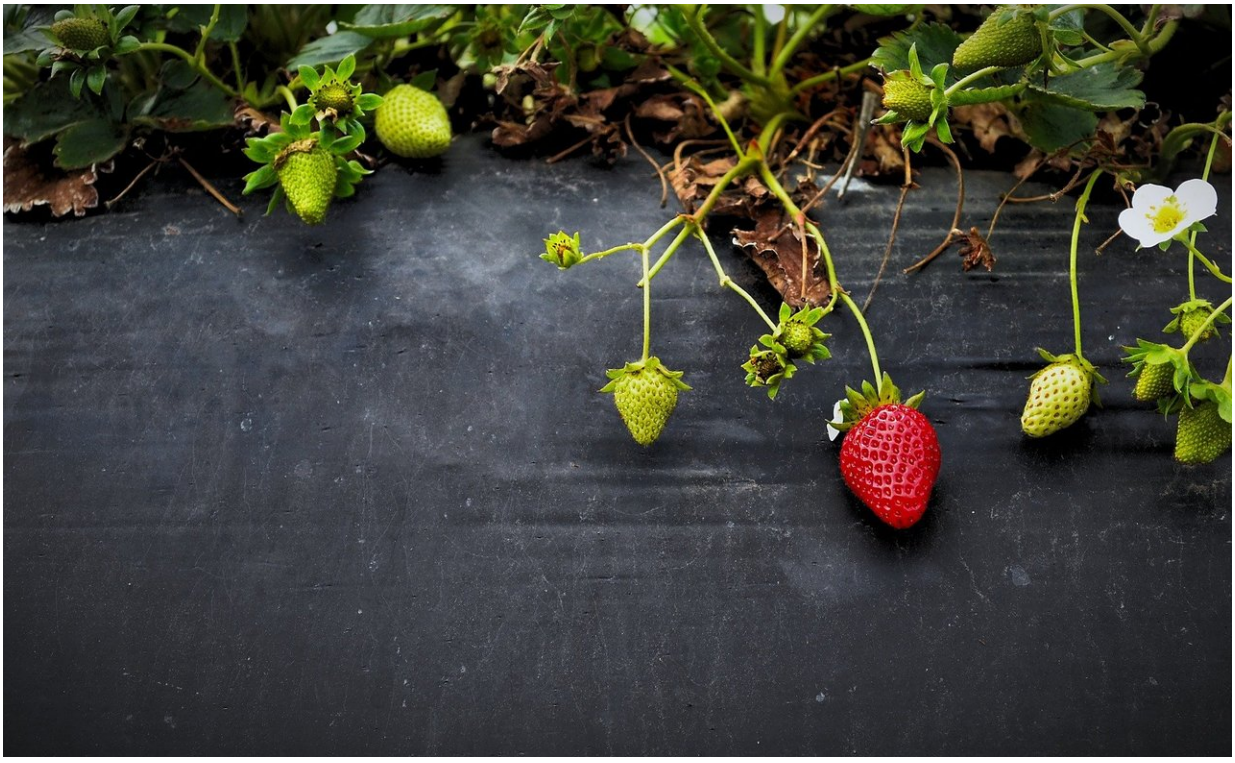
Jumping genes drive sex chromosome changes in strawberries

September 10 2018



Credit: CC0 Public Domain

The transfer of gene cassettes across generations of strawberry plants has been shown to drive changes in sex chromosomes, according to a team led by a researcher from the University of Pittsburgh Department of Biological Sciences.

Distinguished Professor of Evolutionary Ecology Tia-Lynn Ashman, along with researchers from Oregon State University's Department of Integrative Biology and Department of Botany and Plant Pathology, published the paper, "Repeated translocation of a gene cassette drives sex chromosome turnover in strawberries," in the September edition of *PLOS Biology*.

The study is supported through a National Science Foundation award granted to Pitt's Kenneth P. Dietrich School of Arts and Sciences.

Researchers determined that Wild North American octoploid strawberries feature separate sexes with homomorphic, female heterogametic (ZW) inheritance, whose origins trace back to three different chromosomes from three different taxonomic groups. The researchers were able to identify sex-determining region sequences that formed an SDR cassette in female plants that were never found in males. Further study of the SDR cassette showed "a history of repeated translocation."

The discovery is the first known to show that "plant sex regions can 'jump'" and indicates that "the phenomenon may be adaptive by gathering and locking new genes into linkage with sex," according to the paper.

"Although we know something about what determines whether an individual will be female or male—or the more varied mating types found in plants—their evolution is still poorly understood," said Samuel Scheiner, program director at the National Science Foundation. "This study shows that process to be much more complex than we might have guessed. These results can help create new varieties of crop plants and perhaps tell us something about how the great diversity of plants came to be."

Ashman said the work adds a novel phenotype to the broad set of evidence—including antibiotic resistance and human traits—supporting the theory of scientist Barbara McClintock, who received the Nobel Prize in physiology or medicine in 1983 for the discovery of mobile genetic elements.

"We're trying to understand more broadly the mechanisms that determine why sex chromosomes are different across species. Here we have the first clear evidence that gene movements underlie the turnover leading to different chromosomes determining sex," said Ashman.

More information: Jacob A. Tennessen et al, Repeated translocation of a gene cassette drives sex-chromosome turnover in strawberries, *PLOS Biology* (2018). DOI: 10.1371/journal.pbio.2006062

Provided by University of Pittsburgh