Weed gave up sex long ago

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The ability of plants to self-pollinate – a big factor in the spread of weeds – is much older than previously thought in one widely studied species, leading biologists say. The findings show that at least in plant evolution, sex with others may be more trouble than it's worth.

The mustard-like plant Arabidopsis thaliana lost interest in sex and started self-pollinating at least a million years ago, said plant geneticists led by Magnus Nordborg, associate professor of molecular and computational biology at the University of Southern California.

The results contradict a 2004 estimate from North Carolina State University that A. thaliana began self-pollinating in the last 400,000 years.

"We can rule out a very recent change to self-fertilization," said Chris Toomajian, USC research associate in molecular and computational biology and co-author of two new papers on A. thaliana in *Science Express* and *Nature Genetics*.

Self-pollination, or selfing, confers a major advantage to weedy species. A selfing plant can invade new territory by itself and colonize it alone.

The potential downside -- a nasty case of inbreeding depression -- is averted by rare sexual breeding. According to an older study, 1 percent of all A. thaliana have received pollen from other plants of the species.

"A little sex goes a long way," Nordborg said.

The researchers arrived at their findings by studying common combinations of genetic variants.

Certain variants at different points on the genome tend to go together, like blond hair and blue eyes in humans.

This phenomenon, called linkage disequilibrium, is important because it helps predict what an individual's genome looks like based on information from selected locations.

In their Science Express study, published online July 26, the researchers used the genome-wide pattern of LD to estimate the time at which selfing evolved.

Since cross pollination mixes two plants' genomes and disrupts some combinations of variants, a recent transition to selfing should have left a footprint in the LD pattern for A. thaliana.

Specifically, the researchers expected to find a relatively high level of LD, because after the transition to selfing the disruption of variant combinations would have slowed dramatically.

But the LD pattern instead suggested that selfing evolved "on the order of a million years ago or more," and perhaps soon after the evolution of the species itself.

In their Nature Genetics study, published online August 5, the researchers used the LD pattern to design a method for mapping the associations between genetic variants and corresponding physical traits in A. thaliana.

"This is of broad interest, as Arabidopsis is likely to become an important model for identifying the genetic basis of evolutionary

change," Nordborg said.

Source: University of Southern California