Single parenthood doesn't pay off for plants

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Many plants can pollinate themselves and reproduce without the aid of a mate, thanks to having both male and female parts. But the short-term perks of being able to go it alone come with long-term costs, says a new study in the journal *Science*. The reason is because plants that can pollinate themselves are more prone to extinction, scientists say.

Flowering plants are incredibly creative when it comes to sex, said co-author Boris Igic, a biologist at the University of Illinois at Chicago. "Plants just can't walk over to potential mates like we do. Many species rely on wind or pollinators coming to them."

About half of all flowering plants have another option, said Igic — they can fertilize themselves.

Being able to have sex with yourself has some surprising short-term perks, scientists say. Plants that can pollinate themselves can still produce seeds, even when wind or insects don't deliver.

"You don't need a partner to reproduce," said co-author Emma Goldberg of the University of Illinois at Chicago.

"And because you're both the mother and the father of your own seeds, as well as the father of other plants' seeds, you also pass on more copies of your genes." Goldberg added.

Previous work by Igic and others found that many members of the nightshade family — a group that includes potatoes, peppers, tomatoes,

and tobacco — gain the ability to mate with themselves over evolutionary time.

"We see a one-way transition where self-incompatible species turn into self-compatible species, but aren't able to go back," said Goldberg.

But what are the long-term consequences of being able to mate with yourself, rather than relying on a partner?

"We wanted to know what happens when species stop relying on other individuals to reproduce," said co-author Stephen Smith, who conducted the study while at the National Evolutionary Synthesis Center in Durham, NC.

To find out, the researchers compared speciation and extinction rates for nightshade species that mate exclusively with other plants, versus species that can pollinate themselves.

The result? Despite the short-term benefits of solitary sex, the single parent option has serious pitfalls over time. "Species that can pollinate themselves have much higher extinction rates," said Igic.

One reason why self-compatible lineages are more likely to die off, the researchers say, may be a lack of genetic diversity. Plants that can pollinate themselves are less likely to inherit the genetic variants that enable them to adapt to changing environments, Smith explained.

"It's like playing the stock market," he added. "If you put all your eggs in one basket you might win big in the short term. But if you don't maintain a diverse portfolio, in the long run you're less able to endure the market's ups and downs."

More information: Goldberg, E., J. Kohn, et al. (2010). "Species

selection maintains self-incompatibility." Science 330(6003): 493 - 495. DOI:10.1126/science.1194513"
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Study data are available in the Dryad Digital Repository at www.datadryad.org/handle/10255/dryad.1888

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