

An easy relationship between a beetle and its yeast symbiont

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Lizard beetles plant a fungal garden inside dead bamboo stems to feed developing larvae. Credit: Wataru Toki

Japanese lizard beetle larvae feed on yeast injected from their mothers' abdomens into the bamboo stems they are growing in. Now, scientists at Nagoya University have made a surprising discovery: the yeast can digest some complex sugars in the bamboo woody tissue, but it doesn't. Instead, it consumes much simpler and more available sugar sources.

"This was a real surprise," says Nagoya University bioagricultural researcher Wataru Toki. "While yeast can indeed decompose those indigestible components, our analysis shows the yeast actually grows on small molecule monosaccharides." The results are published in the journal *Scientific Reports*.

Female Japanese lizard beetles carry the yeast *Wickerhamomyces anomalus* in a specialized pocket-like organ. In spring, they dig holes in [bamboo](#) and insert their eggs and the yeast. *W. anomalus* grows into a sort of fungal garden that the very hungry beetle [larvae](#) munch on as soon as they hatch.

In other symbiotic relationships, fungi typically break down [complex sugars](#) into more digestible chunks that their host insects can feed on. Toki and his colleague, Dan Aoki, wanted to know whether this was also the case in the relationship between the Japanese lizard beetle and *W. anomalus*.

Their research suggests not. The scientists used a technique called ion exchange chromatography to analyze and compare the sugar content of fresh bamboo pith, and pith colonized by yeast alone or by yeast and beetle larvae. The comparison revealed that the yeast mostly ate the simple free sugars glucose and fructose.

This surprised the scientists because further tests showed that the yeast can actually digest some complex, indigestible sugars if necessary.

"Bamboo is not only a farm for the [yeast](#) but also a house for the larvae. So the larvae can live in a strong house safely because the house is not decomposed by the food," explains Toki.

The researchers now want to further investigate the relationship. Perhaps, they suggest, the beetle larvae grow larger inside unusually sweet bamboo, giving them a competitive advantage. The scientists also want to know how [adult females](#) distinguish free-[sugar](#)-rich bamboo to lay their eggs.

More information: Wataru Toki et al, Nutritional resources of the yeast symbiont cultivated by the lizard beetle *Doubledaya bucculenta* in bamboos, *Scientific Reports* (2021). [DOI: 10.1038/s41598-021-98733-y](https://doi.org/10.1038/s41598-021-98733-y)

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