How trees guard their seeds: Unlocking the secrets of mast seeding

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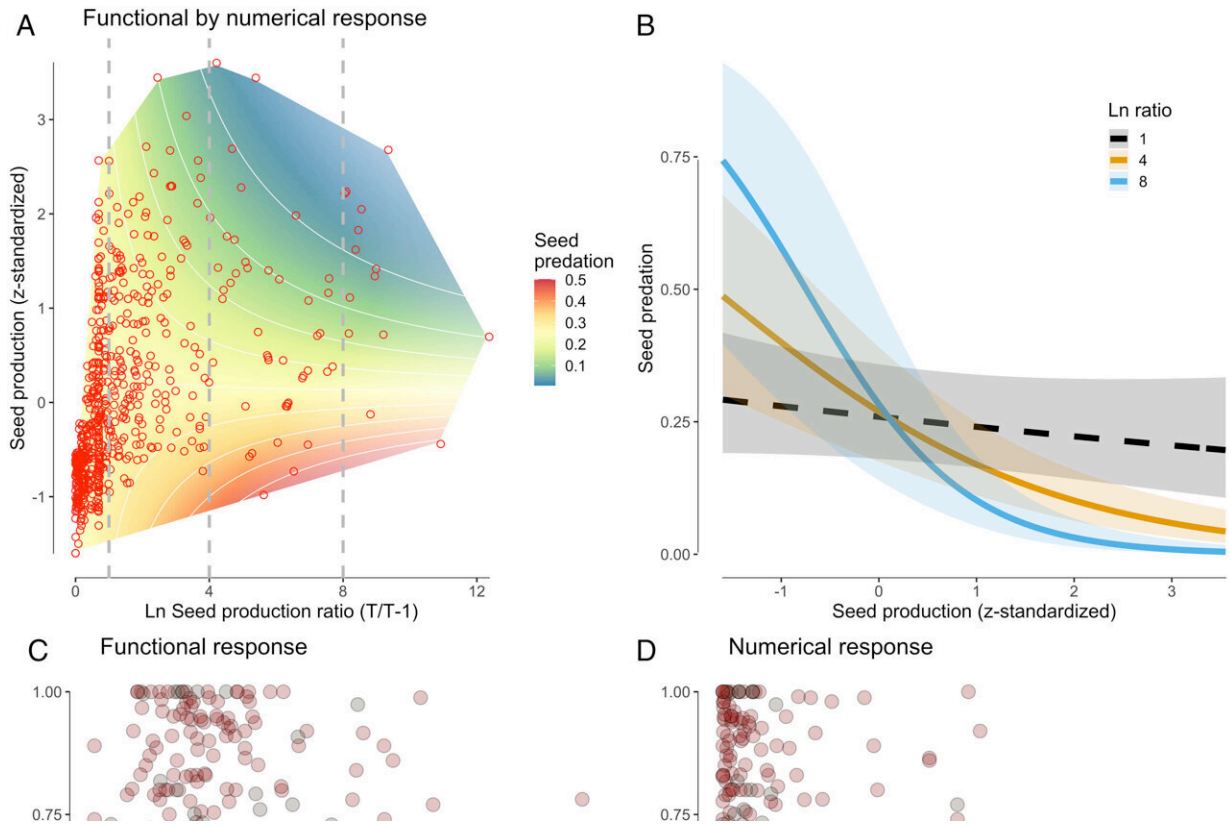

Starvation enhances satiation. The strategy is effective against invertebrates but not vertebrate predators. (A and B) The functional response was stronger when the seed production ratio (T/T − 1) was high. Convex hull in A is defined by observations (red points). Dashed lines indicate the transects plotted in B, i.e., the conditional relationship between seed predation and production for a selected levels of seed production ratio. Surface transparency increases as the inverse of the predictive SE; faded edges reflect increased uncertainty at data extremes. (B) Curves are sections through surfaces highlighted by transects at A, while the

dashed line indicates not significant slope. (C) Functional response and (D) numerical response were significant for invertebrate (red line and dots) but not vertebrate (gray dots) seed predators. Credit: *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2105655119

Mast seeding is a periodic phenomenon where plants, notably trees, synchronize their production to yield a large volume of seeds. For years, scientists have been intrigued by the reasons behind this synchronous reproductive strategy.

A prevailing theory, known as the consumer satiation hypothesis, proposes a rationale. It suggests that by inundating the environment with seeds, plants decrease the likelihood of individual seeds being consumed by animals. Here's how this defense strategy is thought to work: in the intervals between these mast seeding events, the population of seed-eating animals dwindles because of food scarcity. Then, during a mast year, plants produce such an abundance of seeds that these diminished animal populations can't possibly eat them all.

But is this hypothesis accurate? A team from the Faculty of Biology at Adam Mickiewicz University, Poznań delved into this question. By statistically examining numerous studies conducted over the past four decades, they determined that this strategy does, in fact, enhance the protection of seeds. They noted that when periods of low seed production alternate with periods of high seed production, seeds have the best chance of survival.

However, the research also unveiled an emerging issue: mast seeding events appear to be losing their efficacy in satiating seed consumers. This decline is suspected to be a consequence of global warming altering seed production dynamics. Such a shift is concerning, as it could

undermine trees' natural defense mechanism, making their seeds more vulnerable to consumption.

The research is published in the journal *Proceedings of the National Academy of Sciences*.

More information: Rafał Zwolak et al, Global patterns in the predator satiation effect of masting: A meta-analysis, *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2105655119

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