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Understanding Colorado Potato Beetle behavior and the potential effectiveness of biological control measures using optimal control theory. Preliminary report.

The Colorado Potato Beetle is a voracious pest that does significant damage to crops and has evolved resistance to the pesticides typically used to control it. Research to assess the potential effectiveness of utilizing predators to control the potato beetle population has shown that Colorado Potato Beetle larvae often cannibalize their egg-bound siblings and that cannibals exhibit stronger predator avoidance behaviors than non-cannibals. We use optimal control theory to understand whether the improved nutritional condition, due to cannibalism, is enough to explain the difference in behavior when a predator is present. We use the results to create a population model to explain the overall effectiveness of biological control measures on the population size and the implications of predator density for the population dynamics. (Received July 18, 2016)