

Reproductive biology of pawpaw, the only species of the tropical and subtropical Annonaceae adapted to cold climates

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The pawpaw (*Asimina triloba* L.) belongs to the early-divergent angiosperm family Annonaceae, which includes tropical and subtropical species with edible fruits such as cherimoya, sugar apple, soursop, custard apple or atemoya. Interestingly, the pawpaw is the only representative of the family adapted to cold climates. Although commercial pawpaw production is small and mainly located in some local North American markets, it has a high potential to become a new high-value niche fruit crop in countries with temperate climates. However, information is scarce on its floral biology, and the prezygotic mechanisms that regulate fruit set. In order to fill this gap in this work, we studied the cycle and anatomy of the pawpaw flower, with special emphasis on the role of arabinogalactan-proteins (AGPs) during the initial stages of male-female interaction. The showy flowers of *A. triloba* display protogynous dichogamy, a common characteristic of Annonaceae that prevents self-pollination. The petals started to open 15 days before anther dehiscence whereas the unicellular epithelial papillae that coat the stigma showed stigmatic secretions concomitant with the presence of AGPs and pollen germination 6-11 days before anther dehiscence. Finally, in vitro studies of AGPs on pollen tube elongation demonstrated a critical role of AGPs on pollen tube growth in this species. These results are critical to understand pollen-pistil interactions in this underutilized fruit crop and establish the effective pollination period that is essential for an optimal fruit production.

Keywords: AGP, *Asimina triloba* L., pollen germination, protogynous dichogamy, stigmatic receptivity.