Tight insect-host phenological synchrony constrains the life-history strategy of European pine sawfly

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Abstract

The synchronization of insect and plant phenologies may impose ecological constraints on host specialization and the evolution of life histories. • European pine sawfly Neodiprion sertifer (Geoffroy) feeds on mature foliage of Scots pine Pinus sylvestris L. during a limited temporal period in early spring and is univoltine despite the continual presence of this resource throughout the growing season. Reciprocal manipulation of host and insect phenologies demonstrated that larval performance was highest in mid-April, with the window of host susceptibility closing rapidly thereafter. • As the host phenology advanced, the foliar concentration of nitrogen, amino acids and soluble carbohydrates decreased, whereas that of terpenoids increased. As the foliar quality declined, larvae ate more in an attempt to compensate, although they were less efficient at converting consumed foliage to body mass. • The phenological window for larval development began to reopen late in the growing season as the quality of mature foliage started to improve until it once again supported larval development during the next spring. • Neodiprion sertifer must synchronize its life cycle with an ephemeral phenological window of host suitability that closes too early and reopens too late to permit a second generation.