
Plants versus herbivores : synchronization matters

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Abstract

Plants can escape herbivores either by building up defenses such as plant secondary compounds, or by shortening their life-cycle so that they become mature before herbivores attack them. In France, a first generation of herbivores such as European corn borers occurs in spring. A second generation occurs in summer. Sowing of early maize varieties is recommended because maize stems are stronger when the second-generation larvae arise and better resist invasion, but it is still not known if this is simply due to their age.

To analyse how plant phenology shifts interfere with *Lepidoptera* stem borers, we used the maize lines selected for early or late flowering, coming from two independent Divergent Selection Experiments (DSEs). The two initial populations arose from two inbred lines, F252 and MBS. At each generation, we selected and selfed early and late flowering genotypes. The resulting Early and Late evolved populations exhibited pronounced phenotypic divergence for flowering, while preserving original characteristics of the initial inbreds. We expect thus that these lines differ mostly by the timing of their growth rather than by the quality of their secondary compounds.

DSEs experimental designs were used to measure the prevalence of corn borers in Early and Late populations. Altogether flowering time varied between 1300 (Early F252) and 1900 (Late MBS) degree-days. Pyralids prevalence was more important in Early than in Late MBS populations. For F252, there was no difference between populations, but the average prevalence depended on the date of arrival of the second generation (year effect). In our plant material, synchronization between insect and plant life cycles appeared more important than the trade-off between growth and defense. We further discuss the setting-up of an experimental design to measure differences of leaf consumption rates between plant genotypes attacked by pyralids.

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