

Consumption and utilization of experimentally altered corn by southern armyworm: Iron, nitrogen, and cyclic hydroxamates

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Abstract

The effects of differential leaf water, leaf nitrogen and cyclic hydroxamate (DIMBOA) concentrations in corn seedlings were analyzed for a polyphagous insect, the southern armyworm (*Spodoptera eridania* Cram.). Six different combinations of nutrients and allelochemicals [DIMBOA = 2,4-dihydroxy-7-methoxy(2H)-benzoxazin-3(4H)-one] were generated using two corn genotypes (WF9 and CI3IA) and three fertility regimes (complete nutrient, Fe-deficient, and N-deficient solutions) in the University Biotron. Poorest larval growth was observed in the low-nitrogen treatments (1.2% and 1.7% leaf N) and was the result of both low consumption rates and high metabolic costs (low efficiency of conversion of digested food, ECD). Fastest growth rates were observed for the larvae fed leaves from the high-nitrogen treatments (4.6% and 4.4% leaf N). It is noteworthy that these treatments also contained the highest concentration of cyclic hydroxamates, which are generally believed to be the primary defensive chemicals mediating resistance against the European corn borer, *Ostrinia nubilalis* (Hubner). If these hydroxamates do have any deleterious or costly effects (perhaps accounting for a large portion of metabolic expenditures), the high digestibility of the leaf tissue and the increased consumption rates more than compensate, resulting in rapid growth (growth rate = consumption rate \times approximate digestibility \times efficiency of conversion of the digested food). These studies illustrate that variation in key nutrients and allelochemicals within a single plant species (*Zea mays* L.) may have significantly different effects upon various potential leaf-chewing caterpillars, such as these armyworms versus corn borers (which cannot handle the cyclic hydroxamates, even if provided with young nutritious leaf tissues).

Keywords: Fertilization - *Zea mays* - iron deficiency - nitrogen deficiency - armyworm feeding - *Spodoptera eridania* - Lepidoptera - Noctuidae - DIMBOA - cyclic hydroxamates