ALTERNATE IRON SOURCES FOR USE IN GYPSY MOTH ARTIFICIAL DIET

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Abstract

The consistent and predictable development of laboratory strains of gypsy moth is critical for production of insects for research and applied programs. In the past there have been periods of poor hatch, reduced survival, and slow asynchronous development resulting from lack of available iron in the artificial diet. Production of gypsy moth has been stabilized by using Wesson salt mix without FePO4 and adding the required amount of amorphous FePO4, however, since this form of iron is no longer available from any known vendor, this study was designed to find alternatives before the usable stock was exhausted.

All insects used in this study were the New Jersey Standard Strain (NJSS) of gypsy moth. Nine different gypsy moth high wheat germ diets were prepared by incorporating the following iron compounds: no iron, $FePO_4$, $Fe(NH_4)(SO_4)_2$, $FeC_6H_5O_7$, $C_4H_2FeO_4$, $Fe_4(P_2O_7)_3$, $Fe_2(SO_4)_3$, $Fe_2(C_4H_4O_6)_3$, and $C_{10}H_{12}N_2O_8FeNa$. Gypsy moth development and survival were assessed at 10 and 34 days for two successive generations reared at 25° C, 60% RH, and a 16:8 (L:D) h photoperiod. Egg masses produced in the first generation were chilled at 7-8° C for 168-175 days; hatch and embryonation were determined and larvae were fed the same diet as the first generation.

Gypsy moths reared on the no iron (insufficient iron) diet had significantly reduced pupation, lower fecundity, lower percent embryonation of eggs and reduced hatch of embryonated eggs compared to those reared on the other diets. In the first generation, the only differences between gypsy moths reared on alternate iron compounds and the amorphous $FePO_4$ were significantly lower fecundity for individuals reared on the $Fe_2(SO_4)_3$ diet and slightly more variation in percent embryonation of eggs produced by individuals reared on diets containing ferrous compounds ($C_4H_2FeO_4$ and $Fe_2(SO_4)_3$). In the progeny generation, gypsy moths reared on the no iron diet developed significantly slower and less synchronously, and had higher larval mortality than those on other diets. In the progeny generation, there were no significant differences in larval survival or development between the amorphous $FePO_4$ and alternative iron compounds but larvae on the $Fe_2(SO_4)_3$ diet did develop less synchronously. Based on these results, diet that contains the proper amount of available iron (85-115 mg/liter) is suitable for NJSS development and survival, regardless of the source of the iron. The results for the ferrous compounds were slightly more variable and the $C_{10}H_{12}N_2O_8FeNa$ diet darkened rapidly, suggesting that $Fe(NH_4)(SO_4)_2$, $FeC_6H_5O_7$, $Fe_4(P_2O_7)_3$, and $Fe_2(C_4H_4O_6)_3$ are the best choices among the compounds tested as replacements for amorphous $FePO_4$.