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Effect of Juvenile Hormone on Respiratory Metabolism during Non-Diapausing Sesamia cretica Wandering Larvae (Lepidoptera: Noctuidae)

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Abstract : The corn stemborer Sesamia cretica (Lederer), has been viewed in many parts of the world as a major pest of cultivated maize, graminaceous crops and sugarcane. Its life cycle is comprised of two different phases, one is the growth and developmental phase (non-diapause) and the other is diapause phase which takes place at the last larval instar. Several problems associated with the use of conventional insecticides, have strongly demonstrated the need for applying alternative safe compounds. Prominent among the prototypes of such prospective chemicals are the juvenoids; i.e. the insect (JH) mimics. In fact, the hormonal effect on metabolism has long been viewed as a secondary consequence of its direct action on specific energy-requiring biosynthetic mechanisms. Therefore, the present study was undertaken essentially in a rather systematic fashion as a contribution towards clarifying metabolic and energetic changes taking place during non-diapause wandering larvae as regulated by (JH) mimic. For this purpose, we applied two different doses of JH mimic (Ro 11-0111) in a single (standard) dose of 100µg or in a single dose of 20 µg/g bw in1µl acetone topically at the onset of nondiapause wandering larvae (WL). Energetic data were obtained by indirect calorimetry methods by conversion of respiratory gas exchange volumetric data, as measured manometrically using a Warburg constant respirometer, to caloric units (g-cal/g fw/h). The findings obtained can be given in brief; these treated larvae underwent supernumerary larval moults. However, this potential the wandering larvae proved to possess whereby restoration of larval programming for S. cretica to overcome stresses even at this critical developmental period. The results obtained, particularly with the high dose used, show that 98% wandering larvae were rescued to survive up to one month (vs. 5 days for normal controls), finally the formation of larval-adult intermediates. Also, the solvent controls had resulted in about 22% additional, but stationary moultings. The basal respiratory metabolism (O2 uptake and CO2 output) of the (WL), whether un-treated or larvae not had followed reciprocal U-shaped curves all along of their developmental duration. The lowest points stood nearly to the day of prepupal formation (571±187 µl O2/gfw/h and 553±181 µl CO2/gfw/h) during un-treated in contrast to the larvae treated with JH (210±48 µl O2/gfw/h and 335±81 µl CO2/gfw/h). Un-treated (normal) larvae proved to utilize carbohydrates as the principal source for energy supply; being fully oxidised without sparing any appreciable amount for endergonic conversion to fats. While, the juvenoid-treated larvae and compared with the acetone-treated control equivalents, there existed no distinguishable differences between them; both had been observed utilising carbohydrates as the sole source of energy demand and converting endergonically almost similar percentages to fats. The overall profile, treated and un-treated (WL) utilized carbohydrates as the principal source for energy demand during this stage.

Keywords : juvenile hormone, respiratory metabolism, Sesamia cretica, wandering phase
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