Apr 21st, 1:15 PM - 2:15 PM

A Threshold for Initiating the Canalized Phase of Reproduction in the Lubber Grasshopper

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Poster Presentation P20

A THRESHOLD FOR INITIATING THE CANALIZED PHASE OF REPRODUCTION IN THE LUBBER GRASSHOPPER

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The reproductive cycle of the lubber grasshopper, *Romalea microptera*, is believed to consist of two phases: a plastic (flexible) phase during which feeding rate affects reproductive timing and allotment, and a later, canalized (inflexible) phase, in which feeding rate has no effect on reproductive outcome. The duration and cues for initiation of this phase are currently unknown. We hypothesize that the initiation of this canalized phase of oogenesis begins when the level of hemolymph protein (derived from feeding) exceeds a threshold, and is therefore dependent on the amount of food eaten. Two mathematical descriptions of the timing of these phases of reproduction were considered: one in which the threshold is constant, and one in which the threshold decreases linearly with the amount of food consumed. Both models predict that the time to oviposition should be linearly related to the inverse of the daily food ration, with the slope of the regression estimating the threshold (in units of mass of food) and the intercept estimating duration of the canalized phase. We tested this hypothesis by assigning newly eclosed females to different daily rations of Romaine lettuce. We tested linear and quadratic regressions of age at oviposition versus the inverse daily food ration for both models to test the prediction of linearity. Linear regression was significant for the constant threshold model, with $r2 = 0.621$. Quadratic parameters were not significant ($P>0.05$). Our results yield estimates of the duration of the canalized phase of 23.5 days and a threshold of 4.0 g (dry mass) of lettuce. Our data are thus consistent with our hypothesis of a simple, fixed threshold for food eaten that is the determinant of the initiation of the canalized phase of reproduction. Supported by NSF grant DBA-9978810 to SAJ.