Preference-performance in polyphagous *Copitarsia decolora* and *Peridroma saucia:* do larvae know better?

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Introduction

The preference-performance hypothesis predicts that herbivores oviposit where the larval performance is optimal. However, a recent review has shown that host selection by adults in terms of larval performance is only related in specialist herbivores while polyphagous species are unable to make the right choice[1].

In this work, we choose two lepidopteran polyphagous species, *Copitarsia decolora* and *Peridroma saucia* (Noctuidae), to test if larvae have an active role in host selection and choose a better host than their mothers in terms of larval performance.

Methods

In laboratory and greenhouse assays with eight species of cultivated plants, we tested adults preference and larval preference and performance. The plants tested were cabbage (*B. oleracea* var. viridis), broccoli (*B. oleracea* var. italica), alstroemeria (*Alstroemeria* sp.), potato (*S. tuberosum*), red clover (*T. repens*), hot pepper (*Capsicum annuum*), onion (*A. cepa*) and cape goose berry (*Physalis peruviana*). All insects were reared on artificial diet and maintained at 18ºC ±2 and 70% ± 2 of relative humidity.

Adults preference: Oviposition (in greenhouse)

Fig. 1. Random disposition of four plants from each plant species. Fifteen one day old adults couples were released into the gauze tent and the eggs on each plant counted 7 days later.

Larval preference (in lab)

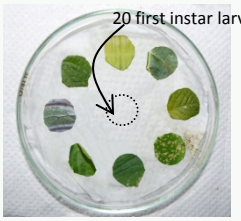

Fig. 2. Arrangement of freshly excised leaf circle (5 mm diameter) from each plant species in a circular pattern. The number of larvae found on or below each leaf circle was counted one hour after release in the middle of the petri dish. Petri dishes were maintained in complete darkness until counting.

Larval performance

Fig. 3. Plastic cup (30 ml) with a freshly excised leaf piece of the plant species tested and a sopping cotton. In each, 10 or 20 neonates were individually placed. All pupae were weighted one day after pupation and waited for adult emergence to calculate the survival rate until this developmental stage. Length of the larval period was measured as the number of days each individual took to develop from neonate to prepupae.

Results

Our data show that adults as well as larvae of the polyphagous species *C. decolora* and *P. saucia* have clear host preferences (Fig. 4). However, a multiple generalized linear model analysis combining the data of oviposition preference, herbivore identity and its interaction show that females' preferences of both herbivores do not match larval performance, ($F_{3,10}$= 0.54, P= 0.66; $F_{3,10}$= 3.46, P= 0.06; $F_{3,10}$= 2.97, P= 0.08 respectively).

Larval performance and preference were related ($F_{3,10}$= 4.24, P=0.03); however, the Univariate Analysis of Covariance tests that followed the result of the multivariate test for larval preference, did not show any relation of larval preference with survival rate, length of larval stage, and pupal weight (P>0.5). This suggests that larval orientation is not driven by the response of a single variable but by an integrative measure of larval performance.

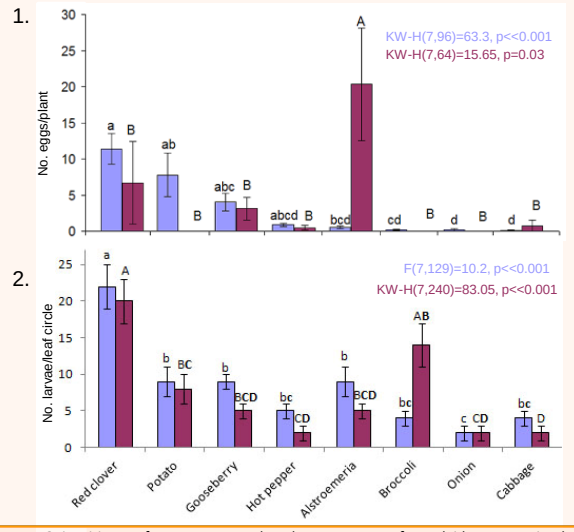

Fig. 4. 1. Oviposition preference measured as the percentage of eggs laid on a certain plant species in relation to the total amount of eggs laid per set-up, and **2.** larval preference, measured as the percentage of larvae found in a certain plant species leaf circle. Blue and purple rectangles represent the response of *C. decolora* and *P. saucia* respectively. Bars correspond to Standard Error, different lowercase and capital letters indicate statistical differences in separate tests.

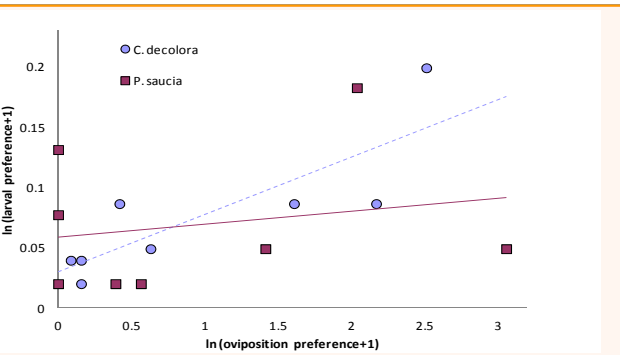

Fig. 5. Relation between oviposition and larval preference. Discontinous line corresponds to *C. decolora* and solid line to *P. saucia*.

These results show that neither females nor larvae "know better" and suggest that the preference are not determined solely by future larval performance, other selective pressures appear to be influencing the choice of host as avoidance of predators[2] or the variability space-temporal in the agroecosystems[3].

In this work, we found that although neither females and larvae were able of choosing the best host, larval preference was positively related to oviposition preference ($F_{1,12}$=5.14, P=0.042) and was not affected by herbivore identity ($F_{1,12}$=0.65, P=0.43) or the interaction between herbivore identity and oviposition ($F_{1,12}$=2.02, P=0.18) (Fig. 5). However, this relationship was stronger for *C. decolora* than for *P. saucia.* This correspondence between larval and adult preferences suggests that stimuli act in similar ways in both life stages.

References
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