DETECTING FITNESS TRADE-OFFS USING A REVERSION EXPERIMENT

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INTRODUCTION

Herbivorous insects tend to have narrow diets. One explanation for such resource specialization is that there are trade-offs across hosts: adaptation to one plant will reduce fitness on another because optimal genotypes differ between hosts. Previous selection experiments caused a rapid increase in ***larval performance*** of a seed beetle (*Callosobruchus maculatus*) on a poor host (lentil); survival rose from about 1% to ≥90% in <30 generations (**Fig. 1**). In addition, the tendency of females to lay eggs on lentil seeds (***host acceptance***) increased two- to three-fold. We used a reversion experiment to test whether there are trade-offs associated with this adaptation. Three lines adapted to lentil were reverted back to their ancestral host (mung bean), and we periodically measured whether reversion to mung causes a loss of fitness on lentil.

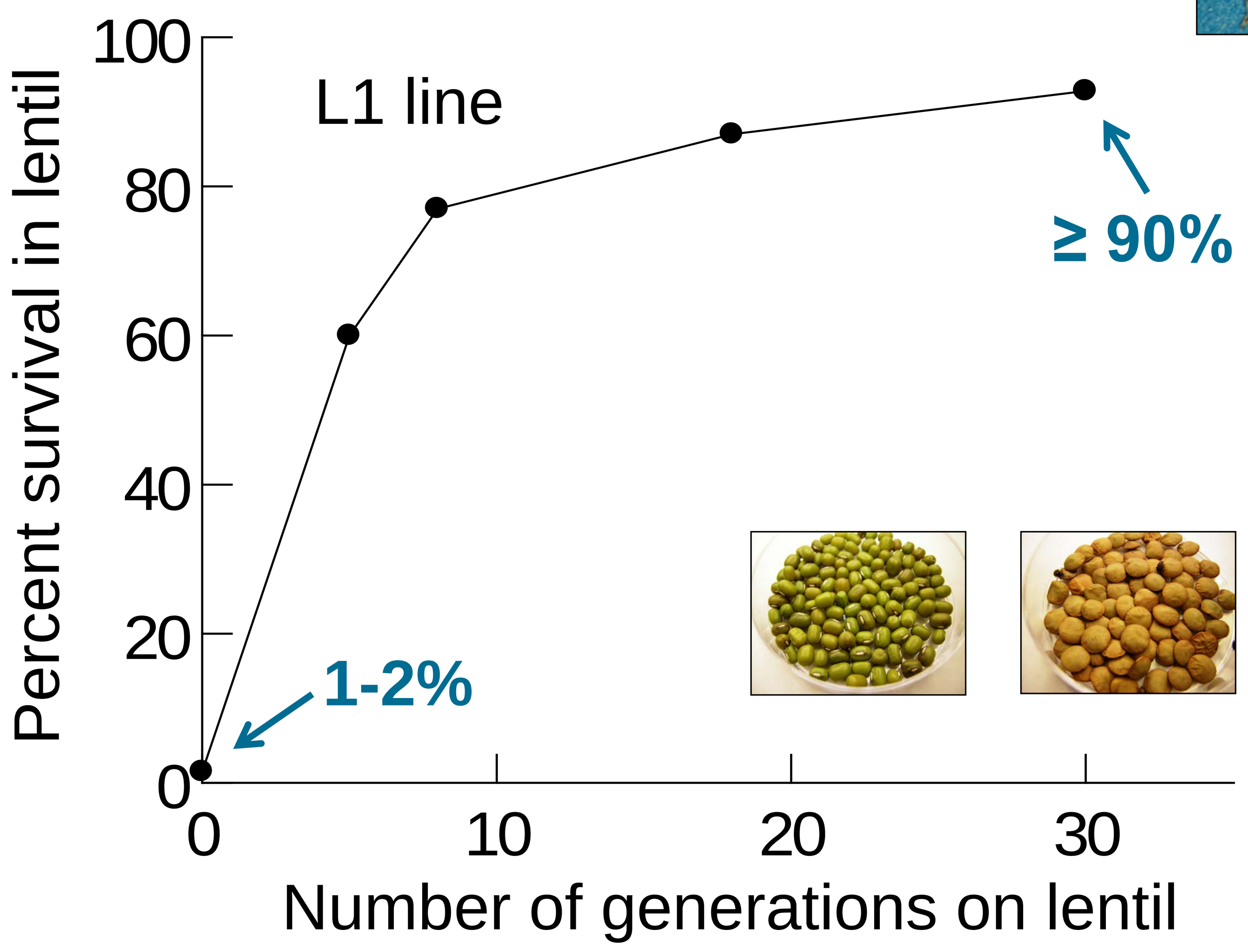

Fig. 1. Larval survival on lentil rose from 1-2% to >90% within 30 generations.

METHODS AND RESULTS

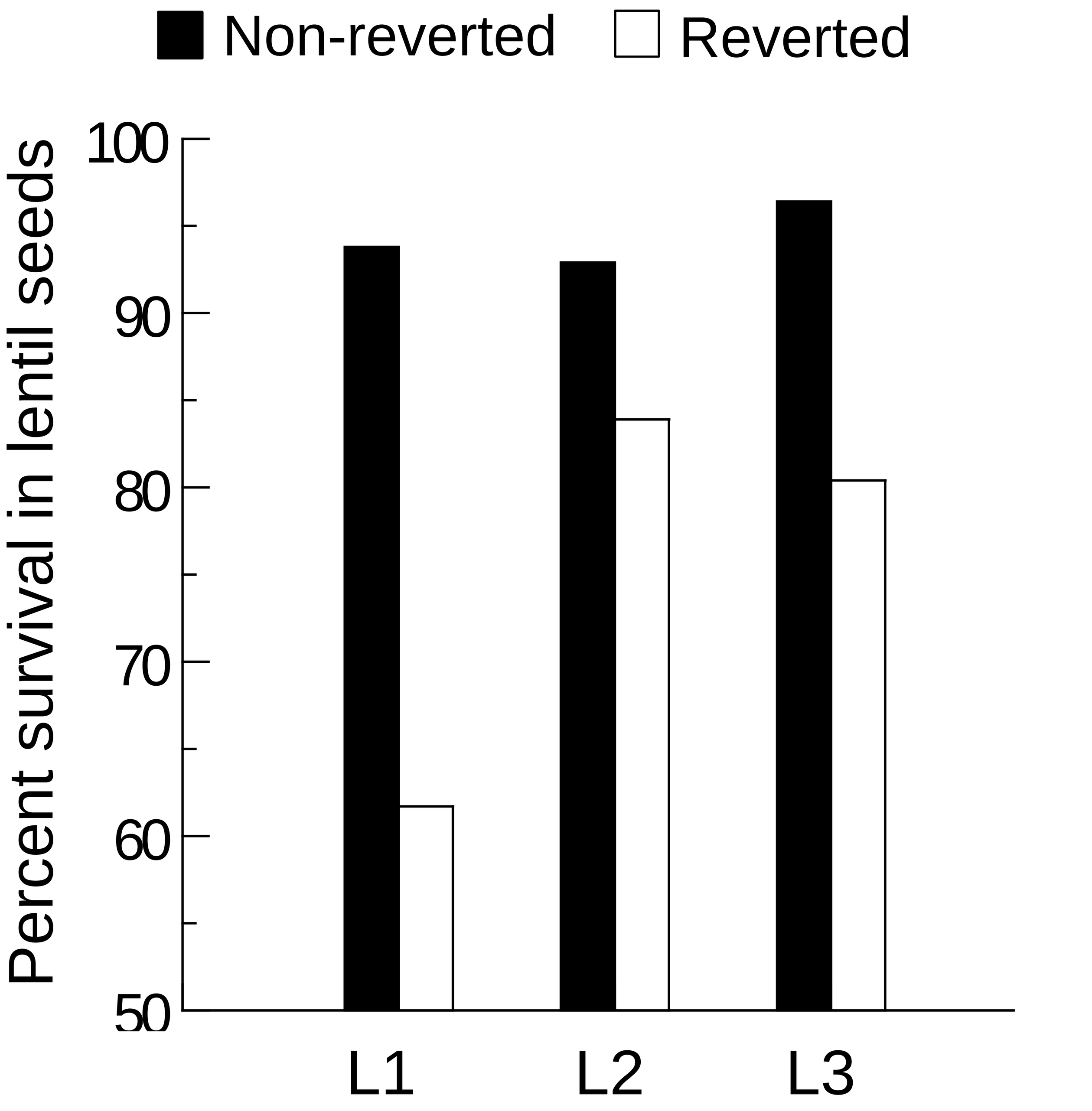

Fig. 2. Larval survival in lentil was reduced in the reversion lines after 25 generations back on the ancestral host.

We measured three components of larval fitness after 12 & 25 generations (**Table 1**). Host acceptance was estimated after 22 generations.

Although there was no detectable effect of reversion after 12 generations, reversion caused a significant drop in survival after 25 generations (**Fig. 2**), and development time tended to increase (**Table 1**). We found no evidence that egg-laying females in the reversion lines were less likely to accept lentil (**Fig. 3**).

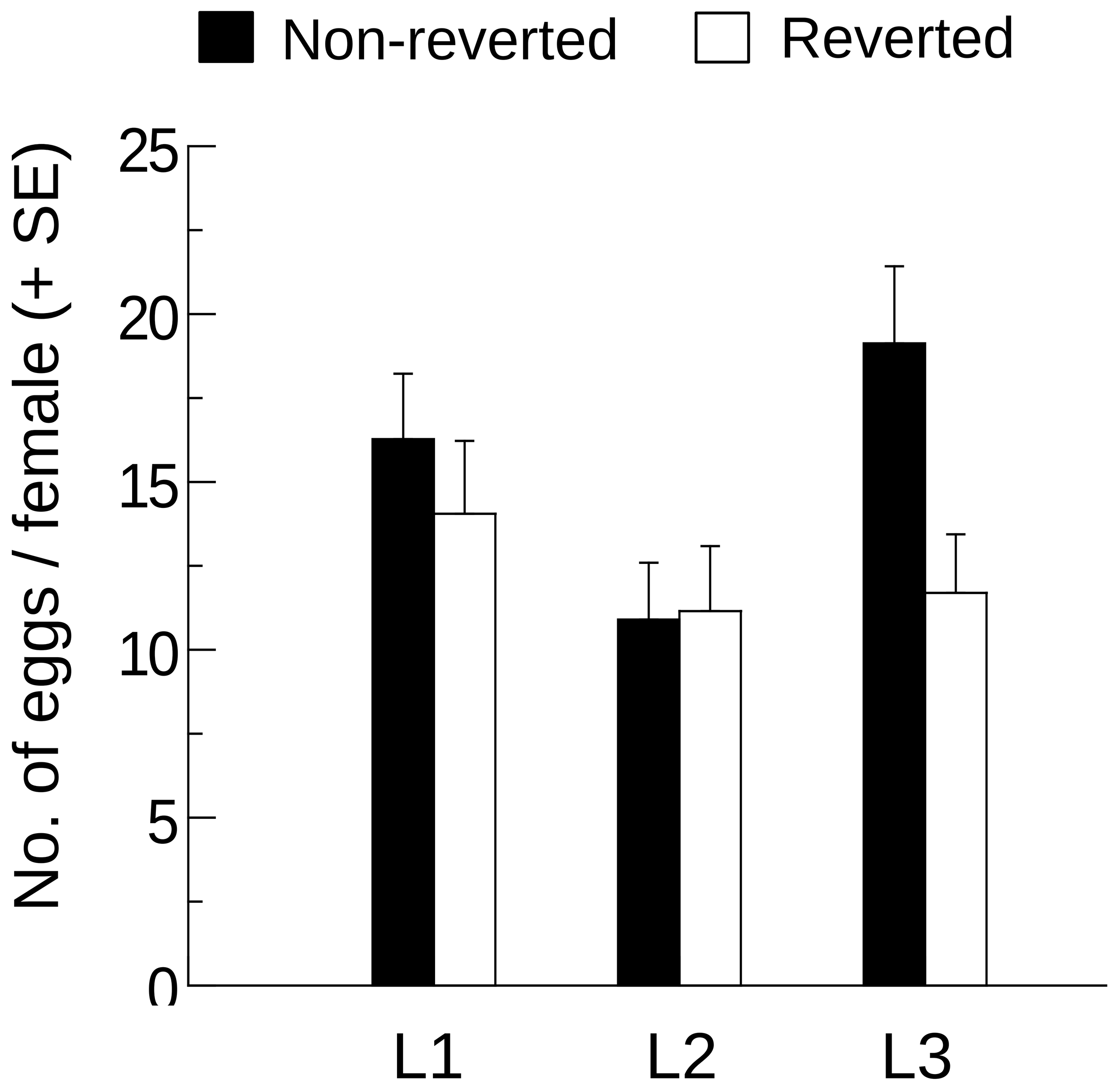

Fig. 3. Acceptance of lentil (eggs per female) did not decrease after 22 generations back on the ancestral host.

Table 1. Effect of Reversion? (*P* values)

Generation	Larval survival	Development time	Adult mass
12	**0.14**	**0.84**	**0.77**
25	**0.02**	**0.07**	**0.19**
35	**?**	**?**	**?**

CONCLUSIONS AND FUTURE WORK

Available results suggest there may be a gradual decline in larval performance associated with reversion back to the ancestral host, mung bean. Because our lines are maintained at large populations sizes, such a decline is unlikely to be due to genetic drift, and instead implies a genetic trade-off between hosts. To confirm this, we are currently measuring survival, development time, and adult mass after 35 generations on mung. Our single assay of host acceptance suggests that reversion to mung bean does not reduce egg laying on lentil. However, there was high variation among lines (**Fig. 3**). This oviposition assay will therefore be repeated after 40 generations. We eventually hope to use genome scans to identify genes involved in both rapid adaptation to lentil and the loss of adaptation following reversion.

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