Partial Paternal Inheritance of Realized Fecundity in a Bruchid Beetle, *Callosobruchus maculatus*

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Reciprocal hybrid female *Callosobruchus maculatus* Fabricius from two strains with distinct oviposition rates display realized fecundities skewed toward the paternal strain. This pattern must be due to a factor, influencing oviposition, inherited exclusively from their fathers. The most likely explanation is that cytoplasmic genes carried in sperm or ejaculate influence the phenotype of resulting female offspring.

**KEY WORDS:** Bruchidae; *Callosobruchus*; oviposition behavior; paternal inheritance.

**INTRODUCTION**

It is generally agreed that genetic material can be transmitted from parents to offspring from nuclear chromosomes and from extranuclear (i.e., cytoplasmic) genetic material located in the egg, a phenomenon known as maternal inheritance. In contrast, the insignificant amount of cytoplasm included in most sperm is believed to preclude paternal cytoplasmic inheritance.

Mark (1981) reported a peculiar pattern of inheritance for oviposition rate in the seed beetle *Callosobruchus maculatus* Fabricius. Hybrids from reciprocal crosses between strains with distinct oviposition rates showed significantly different 2-day realized fecundity: oviposition rates of hybrid females resembled the paternal more than the maternal strain. However, Mark could not establish whether these patterns reflect genetic differences among males or females, as hybrid females were paired with males from

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the same reciprocal cross. In fact, genetic differences among males derived from alternate strains, although not from reciprocal crosses between strains, can influence the realized fecundity of their mates via behavioral or physiological means (Wasserman, 1987). The pattern of inheritance reported by Mark does not conform either to sex linkage or to the inheritance of cytoplasmic genetic material from a single parent.

In the present study, I examine the inheritance of oviposition rate and realized fecundity in females alone. By pairing hybrid females with males of a single strain, I interpret differences in realized fecundity of reciprocal hybrid females in terms of their distinct genetic complements.

**MATERIALS AND METHODS**

Female *C. maculatus* oviposit on the surface of commercially grown beans; feeding and growth of the immatures occur within the cotyledons. The life cycle takes approximately 3 weeks at 30°C and 70% RH, the rearing conditions for this study. An adult female deposits 80 to 100 eggs over her week-long life. If provided with a sufficient number of attractive beans as oviposition substrates, females deposit almost all of their potential eggs. Mated females almost exclusively deposit fertilized eggs (Brauer, 1943-1944; Wasserman and Asami, 1985).

The strains of *C. maculatus* used in this study showed different realized fecundities in preliminary studies: strain A, collected in Japan in 1946 and reared on blackeye cowpeas since 1981; and strain F, collected in Suwannee Co., Florida, in 1980 from, and reared on, crowder cowpeas (both hosts are *Vigna unguiculata* L.).

Two experimental blocks were run. In the first, the host material was blackeye cowpeas; in the second, the host was crowder cowpeas (*V. unguiculata* vars. Mississippi Silver and Queen Anne, respectively). For both blocks, newly emerged (aged 0 to 24 h) virgin adults from the two strains were paired in all nine possible intra- and interstrain crosses. Eggs derived from pairs within crosses were combined before the emergence of the F1 generation. Newly emerged female hybrid offspring were paired with newly emerged males of strain A and allowed to oviposit until death. Beans were replaced daily with fresh ones, and egg deposition was recorded for each female. Sample sizes for the crosses in both experimental blocks are given in Table I.

Differences between overall fecundities of the reciprocal hybrids were analyzed by Bayesian methods (Novick and Jackson, 1974). Like a classical meta-analysis, Bayesian analysis allows the combination of information from sequential sources in order to strengthen estimates of population parameters. The Bayesian comparison of two means, like a *t*