

# Genetic variation for an aphid wing polyphenism is genetically linked to a naturally occurring wing polymorphism

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Many polyphenisms are examples of adaptive phenotypic plasticity where a single genotype produces distinct phenotypes in response to environmental cues. Such alternative phenotypes occur as winged and wingless parthenogenetic females in the pea aphid (*Acyrtosiphon pisum*). However, the proportion of winged females produced in response to a given environmental cue varies between clonal genotypes. Winged and wingless phenotypes also occur in males of the sexual generation. In contrast to parthenogenetic females, wing production in males is environmentally insensitive and controlled by the sex-linked, biallelic locus, *aphicarus* (*api*). Hence, environmental or genetic cues induce development of winged and wingless phenotypes at different stages of the pea aphid life cycle. We have tested whether allelic variation at the *api* locus explains genetic variation in the propensity to produce winged females. We assayed clones from an F<sub>2</sub> cross that were heterozygous or homozygous for alternative *api* alleles for their propensity to produce winged offspring. We found that clones with different *api* genotypes differed in their propensity to produce winged offspring. The results indicate genetic linkage of factors controlling the female wing polyphenism and male wing polymorphism. This finding is consistent with the hypothesis that genotype by environment interaction at the *api* locus explains genetic variation in the environmentally cued wing polyphenism.

**Keywords:** *Acyrtosiphon pisum*; alternative phenotypes; *aphicarus*; phenotypic plasticity; polyphenism; polymorphism