TRADE-OFFS ASSOCIATED WITH THE DROSOPHILA LONGEVITY MUTANT, METHUSELAH

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A variety of single gene mutations have been shown to extend the life span of *Drosophila melanogaster* under laboratory conditions, but it remains unknown whether the mutant flies would be sufficiently hardy to thrive in the wild. The hypothesis tested in this study was that a hypomorphic mutation at the *methuselah (mth)* locus, which has been reported to extend the life span by approximately 35% (Lin *et al.*, Science 282: 943-946, 1998), may have pleiotropic effects on other components of fitness. Life span studies were conducted under various conditions, and metabolic rates, locomotor activity and reproductive output were compared between homozygous *mth* mutant flies and w^{1118} parental controls. The life spans of male *mth* flies were extended at 29°C and 25°C, and females exhibited increased longevity at 29°C, but the magnitude of these effects was only about half of the previously reported value. The effect of *mth* on the life span of male flies diminished with decreasing temperature, becoming neutral at 18°C and deleterious at 4°C, but *mth* had no significant effect on the life span of female flies at any temperature other than 29°C. Thus, the effects of *mth* on survivorship were temperature-dependent and sex-specific. There were no differences in rates of oxygen consumption between the two genotypes at 25°C, but both male and female *mth* mutants exhibited significantly greater locomotor activity than w^{1118} controls. In contrast, the life-time reproductive output of *mth* mutants was decreased by 23-35% at 29°C. This effect diminished or was reversed at lower temperatures. Thus, the reproductive output was diminished under warm conditions associated with increased survival times, and the resistance of *mth* mutants to cold stress was decreased. Collectively, the results suggest that the *mth* allele may not confer a competitive advantage under natural conditions.