



Variability for mixis initiation in *Brachionus plicatilis*

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Key words: rotifers, sexual reproduction, mixis initiation, intraspecific variability

Abstract

Deductions from both evolutionary models and inductive argumentation from empirical data support the notion of intraspecific variability for the initiation of sexual reproduction (mixis) within rotifer populations. In this study, we focus on the time and density at which mixis is initiated in a growing population. Cyclical parthenogenetic clones of *Brachionus plicatilis* established by hatching of resting eggs, isolated from a natural habitat, have been tested at the start of their sexual phase. Clones exhibited great variation for this trait, their time of switching to sexual reproduction being correlated with population density. Most of the variation for mixis initiation has either low or no heritability and is caused by individual environmental factors.

Introduction

Mictic pattern is a critical component of the life cycle of the cyclically parthenogenetic rotifers, since the resting eggs which are a product of the sexual reproduction, are only a diapausing stage in most species – the rotifer populations being seasonal, sometimes ephemeral and inhabiting isolated habitats. The number of resting eggs, produced by a particular genotype in a growth season, which will hatch in future growth seasons, strongly determine the success of this genotype, and is a measure of its fitness.

As an important component of mictic patterns, mixis initiation should be under strong selection. A late initiation of sexual reproduction might result in low efficiency, as environmental conditions could already be so unfavourable that mictic phase would not be completed, or the period for resting egg production would be shortened. An early initiation of sexual reproduction implies a decrease of resources allocated in current parthenogenetic growth, which would result in lower resting egg production in the complete current growth season, because the genotypes with a too early mixis would not achieve the maximum possible density.

The above arguments provide a rationale for the expectation of a strong stabilizing selection for mixis initiation and a lack of variation within population for this trait. However, other arguments have been proposed to expect within-population diversity for the timing of mixis initiation. Firstly, Carmona et al. (1995) observed extended mictic patterns in field populations and proposed that this pattern would be adaptive in unpredictable habitats, as a bet-hedging strategy to face the uncertain length of the growth season. An extended mictic pattern can be achieved by intermediate mictic ratios (the amictic females producing both sexual and asexual daughters) and/or by variation among individuals for the timing of mixis. Secondly, Aparici et al. (1996) studied theoretical populations growing in predictable habitats, without competition, in which mixis is expected to occur at the very end of the growth season (Serra & Carmona, 1993). Aparici et al. (1996) found that a low level of variation in mixis initiation could be expected because it improves resting egg production through the overlap of male and immature mictic female occurrence. Their observation is quite puzzling that mating competition could affect evolution of mixis initiation, promoting variation in this trait and a decrease in resting egg production at the

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