The relationship between the pollen–ovule ratio and seed size: a comparative test of a sex allocation hypothesis

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ABSTRACT

Hypothesis: Sex allocation theory predicts that the pollen–ovule ratio should increase linearly with increasing seed size among seed plants (Charnov, 1982).

Data examined: We retrieved data for the pollen–ovule ratio, seed size, and possible confounding variables (ovule number, plant height, mating system) from a database and additional literature for 299 gymnosperm plant species of the German flora.

Methods: We analysed uncorrected cross-species data as well as phylogenetically independent contrasts with Model II regressions and (partial) correlations.

Results: A linear positive correlation between pollen–ovule ratio and seed size was found to exist across all plant species analysed and within different mating systems for phylogenetically corrected and uncorrected data. This positive correlation remained valid when we controlled for the effect of possible confounding variables.

Conclusions: The interspecific variation of the pollen–ovule ratio depends, at least partly, on the allocation of resources to female sexual function.

Keywords: comparative analysis, mating system, pollen–ovule ratio, seed size, sex allocation.

INTRODUCTION

The pollen–ovule ratio is an important floral trait that reflects the mating system of a plant (e.g. Cruden, 1977; Preston, 1986; Bennett, 2001; Bosch et al., 2001; Jürgens et al., 2002) (following Neal and Anderson (2005), we will use the term 'mating system' instead of 'breeding system' throughout this article). Cruden (1977) was the first to observe that outbreeding plants tend to have higher pollen–ovule ratios. He explained this finding by the 'efficiency of pollination': self-pollinating plants (i.e. autogamous mating system) need less pollen grains for efficient pollination than plants dependent on agents such as wind or animals for pollination (i.e. xenogamous mating system). Charnov (1982) criticized this view for its bias towards seeds as the means to gain fitness (i.e. that the pollen only serves as a means to
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