



Kin discrimination in cannibalism by a predatory mite, *Amblyseius herbicolus* (Chant) (Acari: Phytoseiidae)*

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Kin recognition has been widely observed across the animal kingdom. Individuals discriminate and treat conspecifics differently in relation to their genetic relatedness to increase their inclusive fitness (i.e. their own reproductive success and that of their relatives) and to avoid adverse influences from inbreeding. Although most studies on kin recognition have focused on group-living species, this behaviour can also be adaptive in solitary species. Cannibalism is frequently reported among predatory mites of the Phytoseiidae, and the avoidance of kin cannibalism may be a strong driver for the evolution of their kin recognition ability. By preferring non-kin and avoiding relatives, the cannibals can still acquire the benefits (e.g., nutrients and reduced competition) from cannibalism without reducing their inclusive fitness. *Amblyseius herbicolus* (Acari: Phytoseiidae), a thelytokous generalised predatory mite with the potential for the biocontrol of phytophagous mites and insects, was used in this study to examine kin discrimination through cannibalism. Choice tests were performed for cannibals (an adult or a nymph) using enclosed arenas with a pair of larval prey. Three experiments were conducted to investigate the influence of cannibal attributes (starvation, ontogenetic development, and social experience) and prey attributes (degree of relatedness to the cannibal) on kin discrimination in *A. herbicolus*. The first experiment found that the hunger level of the cannibals modulated kin discrimination during cannibalism (Zhang & Zhang 2022b). Non-starved adults reluctantly cannibalised daughters when non-kin were available (i.e., significantly more non-kin rather than daughters were cannibalised), while adults starved for either 24 or 48 h before the choice test showed no prey preference. The second experiment showed that the adults discriminated among relatives by preferring to cannibalise first and second cousins once removed rather than their daughters (Zhang & Zhang 2022a). However, *A. herbicolus* adults did not discriminate between daughters and nieces. The third experiment revealed that kin discrimination was only observed in ovipositional adults and was not influenced by early social experiences with siblings (Zhang & Zhang 2022c). Ovipositional adults of *A. herbicolus* avoided cannibalising siblings in the presence of non-siblings, while protonymphs, deutonymphs, and pre-ovipositional adults showed no preference. Kin recognition is observed in *A. herbicolus* and is probably used to avoid cannibalism of offspring through the direct learning of their physical and chemical characteristics. Familiarisation and phenotype matching seem prominent as recognition mechanisms used by *A. herbicolus* adults. Our study improves the understanding of kin recognition in phytoseiids. Further studies on competition and dispersal may provide meaningful insights into the adaptive function of kin recognition in *A. herbicolus*.

Keywords: kin recognition, kin discrimination, cannibalism, Phytoseiidae, predatory mite, *Amblyseius herbicolus*

References

- Zhang, K. & Zhang, Z.-Q. (2022a) A thelytokous predatory mite is more cannibalistic towards distant kin. *Current Zoology*, zoac074.
<https://doi.org/10.1093/cz/zoac074>
- Zhang, K. & Zhang, Z.-Q. (2022b) Kin recognition by cannibals is modulated by hunger level in a generalist predatory mite *Amblyseius herbicolus* (Chant) (Acari: Phytoseiidae). *Journal of Applied Entomology*, 146 (5), 579–585.
<https://doi.org/10.1111/jen.12973>
- Zhang, K. & Zhang, Z.-Q. (2022c) Social context during ontogeny affects cannibalism and kin recognition of the predatory mite *Amblyseius herbicolus* (Chant) at different life stages. *Experimental and Applied Acarology*, in publication.