



## Kinship mediates the expression of alternative reproductive tactics in competing spider mite males\*

PETER SCHAUSBERGER<sup>1</sup>, THI HANH NGUYEN<sup>1</sup> & MUSTAFA ALTINTAS<sup>1</sup>

<sup>1</sup>Department of Behavioral and Cognitive Biology, University of Vienna, Djerassiplatz 1, 1030 Vienna, Austria

✉ [peter.schausberger@univie.ac.at](mailto:peter.schausberger@univie.ac.at); <https://orcid.org/0000-0002-1529-3198>

\*In: Zhang, Z.-Q., Fan, Q.-H., Heath, A.C.G. & Minor, M.A. (Eds) (2022) *Acarological Frontiers: Proceedings of the XVI International Congress of Acarology (1–5 Dec. 2022, Auckland, New Zealand)*. Magnolia Press, Auckland, 328 pp.

Owing to its fitness implications, the degree of genetic relatedness within and between the sexes is a highly significant determinant in mate competition, mate choice and mating success. The role of kinship in the expression of alternative reproductive tactics (ARTs) has been rarely investigated. Here we scrutinized kinship effects on male ARTs in two-spotted spider mites *Tetranychus urticae*. ARTs of spider mites are conditional and reversible and apparent as fighters and sneakers. Both fighters and sneakers guard premature females in the teleiochrysalis stage to secure being the first mate after adult female emergence. Precopulatory mate guarding evolved because of first male sperm precedence. Fighters battle with other males to get access to guardable females and defend guarded females against rival males. Fighting can be lethal by stabbing with the needle-like chelicerae. Sneakers do not fight and are not fought by rival males. They try to secure the guarding position and obtain mating partners by arriving first at guardable teleiochrysalis females and by being cryptic to other males allowing to sneak copulations. Demes or local groups of spider mites typically have a higher than population average degree of inter-individual relatedness (Schausberger *et al.* 2021). Under such circumstances, the fighter-to-sneaker ratio ranges at around 3:1 (Sato *et al.* 2014, Schausberger & Sato 2019). Based on inclusive fitness theory, we hypothesized that the fighter-to-sneaker ratio scales with the intensity of mate competition, which in turn depends on the level of kinship among males. Close kinship should alleviate competition and favor the sneaking tactic, low degrees of kinship should intensify competition and increase the males' propensity to adopt the fighting tactic. Schausberger and Sato (2020) did indeed observe a higher fighter proportion among unrelated than related males competing for females. We extend these findings and report the mating behavior of males competing with brothers, males from their own population or males from two other populations. Males were members of demes of three populations differing in genetic distance (two red forms, one green form) and guarding occurrence. Among other sophisticated adjustments of guarding behavior to the level of competition, our study provides striking evidence that the ART ratio scales with kinship of rival males, with a higher fighter proportion when competing with males from other populations. This was true for males of all three populations and additionally driven by the genetic distance between populations. Sibling and within-population competition resulted in similar ART ratios supporting the assumption of kin recognition ability by spider mites at the group level, but lack of fine-scale kin discrimination (Schausberger *et al.* 2021).

**Keywords:** Alternative reproductive tactics, spider mites, Tetranychidae, kin recognition, precopulatory mate guarding

### References

- Sato, Y., Sabelis, M.W. & Egas, M. (2014) Alternative male mating behavior in the two-spotted spider mite: dependence on age and density. *Animal Behaviour*, 92, 125–131.  
<https://doi.org/10.1016/j.anbehav.2014.03.032>
- Schausberger, P. & Sato, Y. (2019) Parental effects of male alternative reproductive tactics (ARTs) on ARTs of haploid sons. *Functional Ecology*, 33, 1684–1694.  
<https://doi.org/10.1111/1365-2435.13385>
- Schausberger, P. & Sato, Y. (2020) Kin-mediated male choice and alternative reproductive tactics in spider mites. *Biology*, 9, 360.  
<https://doi.org/10.3390/biology9110360>
- Schausberger, P., Yano, S. & Sato, Y. (2021) Cooperative behaviors in group-living spider mites. *Frontiers in Ecology and Evolution*, 9, 745036.  
<https://doi.org/10.3389/fevo.2021.745036>