Zoosymposia 22: 133–134 (2022)
https://www.mapress.com/j/zs

Correspondence

ISSN 1178-9905 (print edition)
ZOOSYMPOSIA
ISSN 1178-9913 (online edition)

https://doi.org/10.11646/zoosymposia.22.1.84

Occurrence of parthenogenesis in a soil predatory mite *Lasioseius japonicus* Ehara (Acari: Blattisociidae)*

YANYING TAN[1#], NA ZHANG[1#], ZHITONG ZHU, YI YAN* & LIXIA XIE*

Department of Entomology, College of Plant Protection, Shandong Agricultural University; Shandong Provincial Key Laboratory for Biology of Vegetable Diseases and Insect Pests, Taian, 271018, China

Tan YY: 1694951744@qq.com; https://orcid.org/0000-0003-0363-4255

Zhang N: 764076392@qq.com; https://orcid.org/0000-0001-7871-6138

Zhu ZT: sdklczt1008@163.com; https://orcid.org/0000-0001-9164-8870

**Corresponding author: Xie LX: xielixia2006@163.com; https://orcid.org/0000-0003-1029-3575*

[#]These authors contributed equally to this work.

Yan Y: miteyy@163.com; https://orcid.org/0000-0002-4041-3366

**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.

Soil predatory mites are natural enemies of several important insect and acarine pests (Navarro-Campos *et al*., 2012; Saito and Brownbridge, 2016). Among them, members of the family Blattisociidae are considered great biological control agents against phytophagous pests (Zhang and Xie, 2021). *Lasioseius japonicus* belongs to the family Blattisociidae, with a high potential in controlling insect and mite pests. Yan *et al.* (2019) collected this mite from a laboratory colony of *Athetis lepigone* (Lepidoptera: Noctuidae) at Shandong Agricultural University. *L. japonicus* can prey on eggs of *Drosophila melanogaster*, *Sitotroga cerealella*, *Musca domestica*, *Bradysia cellarum*, *Tyrophagus putrescentiae*, and larvae of *B. cellarum* and *T. putrescentiae* (Li, 2019; Zhang *et al*., 2020).

Parthenogenesis is divided into three systems: 1) thelytoky, if unfertilised eggs develop into females only; 2) arrhenotoky, if unfertilised eggs develop into males only, and 3) deuterotoky if unfertilised eggs develop into both males and females (Oliver, 1971). This study investigated the reproductive system of the predatory mite *L. japonicus* to improve the understanding of their biology and usage as a biocontrol agent. We extracted 100 eggs from a population of *L. japonicus* and placed each egg in a single chamber. The development of the eggs was observed every 24 hours, and the eggs were fed with water and *T. putrescentiae*. After the eggs developed into adult mites, the female mites were retained in a single chamber and the male mites were discarded. After the female adult mite laid eggs by parthenogenesis, the eggs were collected and fed in a small chamber. When the eggs reached adulthood, they were killed with alcohol; the sex ratio was determined and the dorsal shield size of the dorsal plate was measured. We found that the unfertilized eggs of *L. japonicus* developed into both females and males, with a female-to-male ratio of 3:1, but the sex rato of the fertilized eggs was 17:3. Only about 15% of the individuals in the population of *L. japonicus* could reproduce through parthenogenesis. The length and width (μm) of the dorsal shield of daughters and sons of *L. japonicus* produced by parthenogenesis were not significantly different from those reproduced sexually (Table 1).

Table 1. Mean (±SE) length and width (μm) of the dorsal shield of daughters and sons of *Lasioseius japonicus* by parthenogenesis and amphigony.

Sex	Size (μm)	Parthenogenesis	Amphigony
Female	length	458.48±21.00a	460.59±21.18a
	width	261.54±12.26a	244.66±11.33a
Male	length	339.79±15.58a	358.89±16.66a
	width	219.19±10.09a	209.62±9.73a

Standard errors were estimated by using the bootstrap technique with 100,000 resampling; Means within a column followed by different letters are signiffcantly different (paired bootstrap test: $P<0.05$)

Submitted: 31 Oct. 2022; Accepted by Zhi-Qiang Zhang: 8 Nov. 2022; published: 30 Nov. 2022

The reproductive mechanism of *L. japonicus* is very interesting. Most mites produce only male offspring through parthenogenesis, such as *Stratiolaelaps scimitus* (Wright and Chambers, 1994). This study lays a foundation for further studies on mass rearing or faster establishments in new environments of biocontrol potential of this mite in the future.

Keywords: Parthenogenesis; predatory mites; *Lasioseius japonicus*; biological control

Acknowledgements

The authors would like to thank Prof. Zhi-Qiang Zhang (School of Biological Sciences, The University of Auckland) and an anonymous reviewer for helpful comments. This work was supported by the National Natural Science Foundation of China (Grant No. 31970401), the Natural Science Foundation of Shandong Province (Grant No. ZR2020MC046), and the Shandong Provincial Key Laboratory for Biology of Vegetable Diseases and Insect Pests.

References

Li, Y.Y. (2019) Evaluation effect on *Bradysia odoriphaga* and optimization of feeding prey of *Lasioseius japonicas*. Shandong Agricultural University, Taian, China, 20 pp.

Navarro-Campos, C., Pekas, A., Moraza, M.L., Aguilar, A. & Garcia-Marí, F. (2012) Soil-dwelling predatory mites in citrus: their potential as natural enemies of thrips with special reference to *Pezothrips kellyanus* (Thysanoptera: Thripidae). *Biological Control*, 63 (2), 201–209.
https://doi.org/10.1016/j.biocontrol.2012.07.007

Oliver, J.H. (1971) Parthenogenesis in mites and ticks (Arachnida-Acari). *American Zoologist*, 11 (2), 283.

Saito, T. & Brownbridge, M. (2016) Compatibility of soil-dwelling predators and microbial agents and their efficacy in controlling soil-dwelling stages of western flower thrips *Frankliniella occidentalis*. *Biological Control: Theory and Application in Pest Management*, 92, 92–100.
https://doi.org/10.1016/j.biocontrol.2015.10.003

Wright, E.M. & Chambers, R.J. (1994) The biology of the predatory mite *Hypoaspis miles* (Acari: Laelapidae), a potential biological control agent of *Bradysia paupera* (Dipt: Sciaridae). *Entomophaga*, 39 (2), 225–235.
https://doi.org/10.1007/BF02372360

Yan, Y., Zhang, Q., Zhou, C.Y. & Xie, L.X. (2019) Notes on soil predatory mites: the genus *Lasioseius* with a newly recorded species and key from China (Acari: Mesostigmata: Blattisociidae). *Entomotaxonomia*, 41 (1), 44–53.
https://doi.org/10.11680/entomotax.2019006

Zhang, N., Xie, L.X., Wu, X.R., Liu, K., Liu, C.L. & Yan, Y. (2020) Development, survival and reproduction of a potential biological control agent, *Lasioseius japonicus* Ehara (Acari: Blattisociidae), on eggs of *Drosophila melanogaster* (Diptera: Drosophilidae) and *Sitotroga cerealella* (Lepidoptera: Gelechiidae). *Systematic and Applied Acarology*, 25 (8), 1461–1471.
https://doi.org/10.11158/saa.25.8.8

Zhang, N. & Xie, L.X. (2021) The lifespans of the potential biological control agents in the family Blattisociidae (Acari: Mesostigmata). *Zoosymposia*, 20, 91–103.
https://doi.org/10.11646/zoosymposia.20.1.10