Zoosymposia 22: 086–088 (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.22.1.50

Population density of eriophyid mites (Acari: Eriophyidae) on raspberry (*Rubus idaeus*) and their association with leaf blotch symptoms*

JIUNN LUH TAN[1,2*], NINA TRANDEM[3], ROSTISLAV ZEMEK[2], ZHIBO HAMBORG[3], BIJAYA SAPKOTA[3], DAG-RAGNAR BLYSTAD[3] & JANA FRÁNOVÁ[4]
[1]*Department of Zoology, Faculty of Science, University of South Bohemia, 37005 České Budějovice, Czech Republic*
jiunnluh@gmail.com; https://orcid.org/0000-0002-5950-4364
[2]*Biology Centre CAS, Institute of Entomology, 37005 České Budějovice, Czech Republic*
rosta@entu.cas.cz; https://orcid.org/0000-0001-7640-1503
[3]*Division of Biotechnology and Plant Health, Norwegian Institute of Bioeconomy Research (NIBIO), 1431 Ås, Norway*
nina.trandem@nibio.no; https://orcid.org/0000-0002-4249-8092
zhibo.hamborg@nibio.no; https://orcid.org/0000-0001-7070-6621
inspirevj@gmail.com; https://orcid.org/0000-0003-2142-4171
dag-ragnar.blystad@nibio.no; https://orcid.org/0000-0001-5490-3334
[4]*Biology Centre CAS, Institute of Plant Molecular Biology, 37005 České Budějovice, Czech Republic*
jana@umbr.cas.cz; https://orcid.org/0000-0001-8451-1454
[*]*Corresponding author*

**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.

Red raspberry, *Rubus idaeus,* is known to be infested by at least six species of eriophyid mites. Among them, the raspberry leaf and bud mite, *Phyllocoptes gracilis*, (Figure 1, A–B) is the only known vector of a raspberry virus, namely the raspberry leaf blotch virus (RLBV) (Dong *et al.* 2016; McGavin *et al.* 2012; Tan *et al.* 2022). Raspberry leaf blotch (Figure 1, C), a leaf disorder displaying as leaf chlorosis, distortion and patchy necrosis, yellowing and thinning on lateral branches, has been attributed to the feeding of *P. gracilis* until RLBV was also found to be associated with these symptoms (McGavin *et al.* 2012). Previous sampling of eriophyid mites was often based on the presence of the leaf blotch symptom, and there is a reasonable doubt if the symptom was caused by RLBV infection or mite infestation. It could also be hypothesized that eriophyid mites are attracted to RLBV-infected plants as viruses could make host plants more attractive to vectors (Donnelly & Gilligan 2020; Shi *et al.* 2019). It is therefore important to improve the detection of both mites and RLBV to efficiently manage the virus. In addition, knowledge on the dominant infestation area of eriophyid mites on raspberry canes is essential to develop an effective pest management approach. Gordon and Taylor (1976) reported that *P. gracilis* on primocanes during late summer (mid-August) was dominantly found on the upper leaves, due to the presence of predatory mites on the lower and middle leaves. But mite behavior on floricanes is also important to study if the goal is to prevent mite migration and RLBV transmission to primocanes. This study aimed to investigate the population density of eriophyid mites on raspberry floricanes and the association of eriophyid mites, RLBV, and leaf blotch symptoms.

Five biweekly samplings were carried out in four sites in South-East Norway, from early June to early August 2022. Two of the sites were with non-cultivated raspberry, while the other two sites (one in open-field and one in polytunnels) were with cultivated 'Glen Ample'. Three non-cultivated raspberry plants at the boundary of each cultivated site were also sampled. In all sites, three leaves were sampled from each floricane (one from the upper, one from the middle and one from the lower part) using a systematic sampling method. Each leaf was selected at random regardless of the presence of symptoms. Individual leaves were washed with 70% ethanol to extract the mites and the mites were counted. Mite and leaf samples were processed for molecular analysis, namely, molecular identification of mites and detection of RLBV in both mites and plants.

Preliminary results show that eriophyid populations increased with each sampling from early June to early August. The leaf blotch symptoms were rarely observed on sampled leaves and were absent even on leaves with high densities of eriophyid mites. In the polytunnels, the highest density of eriophyid mites was found on the upper

 Submitted: 21 Oct. 2022; Accepted by Zhi-Qiang Zhang: 22 Oct. 2022; published: 30 Nov. 2022

leaves, whilst in the open field, both on cultivated and non-cultivated plants, the highest was on the middle and lower leaves. The detection of RLBV in plant and mite samples is still on-going.

Keywords: *Phyllocoptes gracilis*, plant virus vectors, population dynamics, spatial pattern, pest control

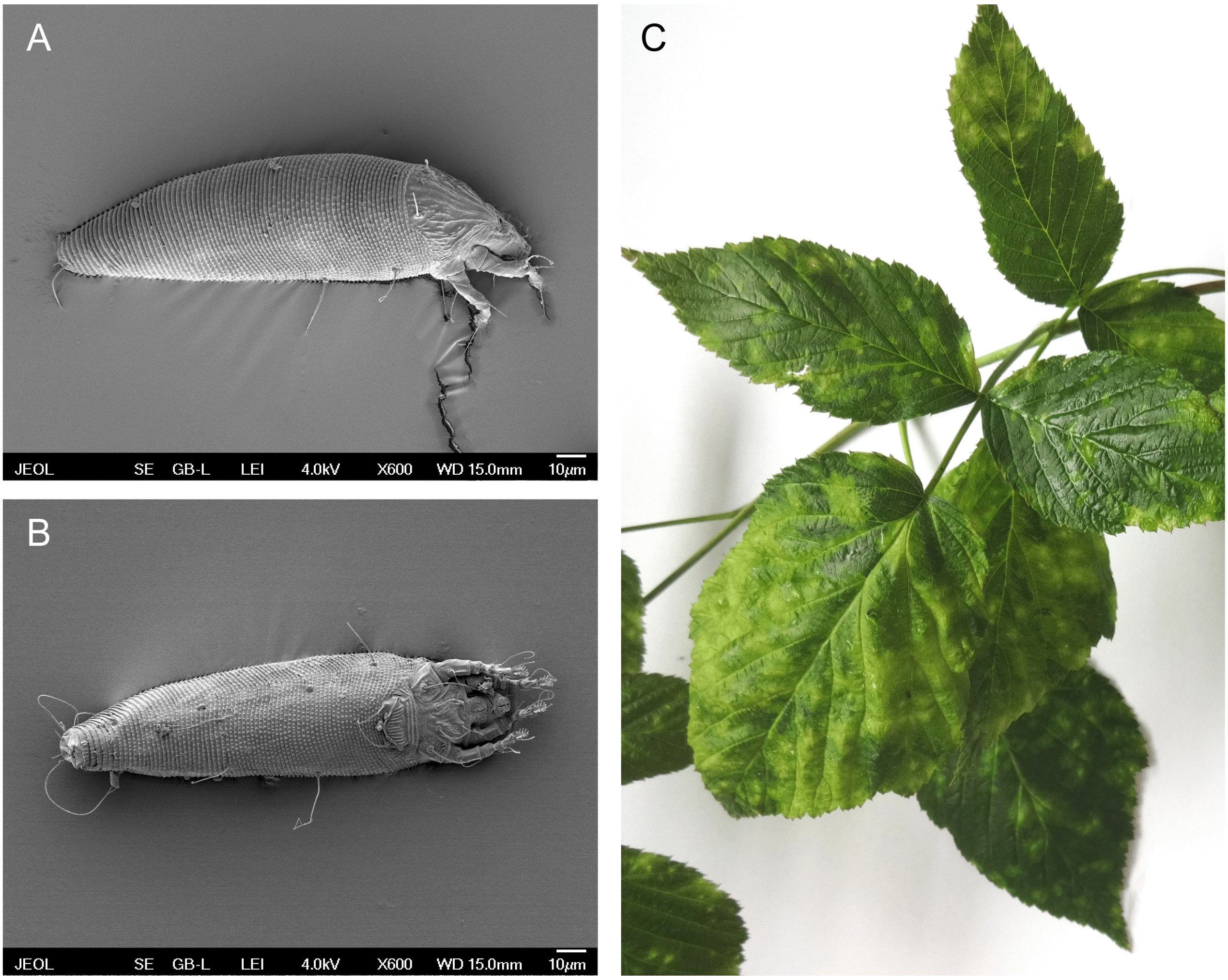

FIGURE 1. (A–B) Scanning electron microscope (SEM) images of *Phyllocoptes gracilis*; A: lateral profile, B: ventral profile. (C) Leaf blotch symptoms associated with raspberry leaf blotch virus (RLBV) on raspberry plants.

Acknowledgements

The project NOBERRYVIRUSCZ is funded by a grant from Iceland, Liechtenstein and Norway through the EEA Grants and the Technology Agency of the Czech Republic (TO01000295). Jiunn Luh Tan's stay in Norway was co-funded by the IBERA grants of Biology Centre CAS and Erasmus+ programme of University of South Bohemia. We acknowledge the BC CAS core facility LEM supported by MEYS CR (LM2018129 Czech-BioImaging and OP VVV CZ.02.1.01/0.0/0.0/18_046/0016045).

References

Dong, L., Lemmetty, A., Latvala, S., Samuilova, O. & Valkonen, J.P.T. (2016) Occurrence and genetic diversity of *Raspberry leaf blotch virus* (RLBV) infecting cultivated and wild *Rubus* species in Finland. *Annals of Applied Biology*, 168(1), 122–132.
https://doi.org/10.1111/aab.12247

Donnelly, R. & Gilligan, C.A. (2020) What is pathogen-mediated insect superabundance? *Journal of the Royal Society Interface*, 17(170).

https://doi.org/10.1098/rsif.2020.0229
Gordon, S.C. & Taylor, C.E. (1976) Some aspects of the biology of the raspberry leaf and bud mite (*Phyllocoptes* (*Eriophyes*) *gracilis* Nal.) Eriophyidae in Scotland. *Journal of Horticultural Science*, 51, 501–508. https://doi.org/10.1080/00221589.1976.11514719
McGavin, W.J., Mitchell, C., Cock, P.J.A., Wright, K.M. & MacFarlane, S.A. (2012) Raspberry leaf blotch virus, a putative new member of the genus *Emaravirus*, encodes a novel genomic RNA. *Journal of General Virology*, 93, 430–437. https://doi.org/10.1099/vir.0.037937-0
Shi, X., Preisser, E.L., Liu, B., Pan, H., Xiang, M., Xie, W., Wang, S., Wu, Q., Li, C., Liu, Y., Zhou, X. & Zhang, Y. (2019) Variation in both host defense and prior herbivory can alter plant-vector-virus interactions. *BMC Plant Biology*, 19. https://doi.org/10.1186/s12870-019-2178-z
Tan, J.L., Trandem, N., Fránová, J., Hamborg, Z., Blystad, D.-R. & Zemek, R. (2022) Known and potential invertebrate vectors of raspberry viruses. *Viruses*, 14 (3), 571. https://doi.org/10.3390/v14030571