

Temperature and Dietary Effects on UV Damage to Spider Mites and Phytoseiid Mites

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The two-spotted spider mite, *Tetranychus urticae* Koch, is an economically important agricultural pest worldwide because of significant acaricide resistance development. Recently, a novel spider mite control method by nighttime UV-B irradiation in strawberry greenhouses has been developed in Japan. However, the control effects by UV-B irradiation are reduced by increased overlap of crop leaves. Previous studies suggest that a phytoseiid mite, *Neoseiulus californicus* McGregor, well known biological control agent, hides from UV-B irradiation and entering the shade of leaves, leading to efficient predation of spider mites that survive in the shade. In this study, I aimed to evaluate concurrent use of UV-B technology and biological control with *N. californicus* toward establishment of integrated pest management (IPM).

Consequently, I obtained three important findings. First, although phytoseiids are vulnerable to a single UV-B irradiation, *N. californicus* eggs were resistant to UV-B radiation under the daily nighttime irradiation condition. I identified a range of doses that were lethal to *T. urticae* eggs but not to *N. californicus* eggs. Second, the ovicidal effect by nighttime UV-B irradiation was temperature dependent; more efficient in lower temperature against both *T. urticae* and *N. californicus* eggs. Third, strawberry pollen contained abundant spermidine derivatives with powerful antioxidant activity, and survival of *N. californicus* under UV irradiation increased via pollen diet. Other than these, I also investigated the effects of temperature and timing of UV-B irradiation on photoreactivation and embryogenesis in *T. urticae* eggs. These findings show the advantage of simultaneous use of UV-B and the phytoseiid mite for IPM systems.