Host Specificity Tests of *Coccipolipus epilachnae*,[1] a Mite Parasitic on the Mexican Bean Beetle[2,3]

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ABSTRACT

Environ. Entomol. 8: 46–47 (1979)

Tests of the host specificity of *Coccipolipus epilachnae* Smiley, a mite parasitic on the Mexican bean beetle, *Epilachna varivestis* Mulsant, suggested that hosts are limited to the members of the subfamily Epilachninae. Coccinellid species tested that were not suitable hosts included: *Chilocorus stigma* Say, *Coccinella septempunctata* L., *Cycloneda munda* (Say), *Hippodamia parenthesis* (Say), *Hippodamia convergens* Guérin-Ménèville, *Coccinella undecimpunctata* L. and *Coccinella novemnotata* Herbst. *C. epilachnae* did complete its life cycle on *Subcoccinella vigintiquatuorpunctata* (L.), another epilachnine.

A colony of the Mexican bean beetle, *Epilachna varivestis* Mulsant, was brought from El Salvador in 1972 by Dr. F. F. Smith, Collaborator, the ARS Ornamentals Laboratory, USDA, Beltsville, MD (Smiley 1974) for use by Dr. W. W. Cantelo in genetic studies. However, when the colony was established in the laboratory, the adults were observed to feed little, generally act lethargic, and lay few eggs on the bean plants. It was this decline in egg production that prompted examination of the beetles, and the examination of the adults revealed slightly raised elytra on some beetles and protruding bodies of small mites. Since numerous mites were found on the ventral surfaces of the elytra, it was felt that they could be associated with the decline in vigor and reproduction of the colonies. A mite-free colony was then established that exhibited normal reproduction. Meanwhile, the parasitic mites were made available for taxonomic studies to R. L. Smiley of the ARS, USDA, Systematic Entomology Laboratory at Beltsville, who described the mite as a new species, *Coccipolipus epilachnae* (Smiley 1974).

Since available evidence indicated that *C. epilachnae* might be associated with the decline in reproduction of the Mexican bean beetle, which is an important pest of soybeans in some areas of the United States, a trip was made to El Salvador in July 1974 to search for mite-infested Mexican bean beetles. This time the mites were found on beetles collected near San Vincente, El Salvador. Also, a 2nd ectoparasitic mite, *Coccipolipus macfarlanaei* Husband, was recovered from an entomophagous coccinellid, *Cycloneda sanguinea* (L.) collected from bean plants in El Salvador. Husband (1972) reported on the association of this mite with *C. sanguinea*. The mite-infested *Epilachna* beetles were returned, under APHIS-PPQ permits, to Newark, DE, for study by scientists of the USDA, ARS Beneficial Insect Introduction Laboratory and by the Beneficial Insects Research Laboratory. Because *C. epilachnae* attack *E. varivestis*, which is a plant-feeding coccinellid, it was necessary to determine whether they would attack beneficial predaceous coccinellid species present in the United States before they could be considered for release. A similar study was made before the larval parasite *Pediobius foveolatus* (Crawford) of the Mexican bean beetle was released (Angalet et al. 1968).

Methods

Before the tests the mites were transferred from the El Salvador beetles to a laboratory colony of *E. varivestis* that had originated from beetles collected in Maryland. The procedure was as follows: The El Salvador adult beetles were marked by clipping out a piece of the posterior part of one elytron and were then placed with Maryland beetles in a rearing cage. Potted snap beans were placed in the cage and changed weekly. Both the Maryland and El Salvador beetles were examined once a week to determine whether the mites were still present and whether transfer to Maryland beetles had occurred. Two wk after the colonies were mixed, a sample of 10 beetles selected randomly from the cage showed 100% infestation of the caged beetles by the mite. Since the mites were well established on the Maryland culture, the El Salvador beetles were removed from the cage 7 days later and killed by placing them in a 70% alcohol solution.

The host specificity tests were conducted in quarantine to determine whether the mite could attack or attack and complete a life cycle (egg → larviform → adult → egg) on insects other than *E. varivestis*. If it did it could not be released in the United States. The native coccinellids tested included 7 predaceous species (all members of the subfamily Coccinellinae): the convergent lady beetle, *Hippodamia convergens* Guérin-Ménèville; twicestabbed lady beetle, *Chilocorus stigma* Say; *Coccinella septempunctata* L.; *Cycloneda munda* (Say); *Hippodamia parenthesis* (Say); *Coccinella novemnotata* Herbst; and *Coccinella undecimpunctata* L. Also 2 phytophagous coccinellids (subfamily Epilachninae) were tested: the Mexican bean beetle and *Subcoccinella vigintiquatuorpunctata* (L.). The *Epilachna* served as a check to determine whether mites transferred successfully from infested to uninfested beetles.

The test was conducted as follows: Nine 22×10×7-cm plastic rearing cages were each stocked with 3 Mexican bean beetles infested with mites. Then each cage

[1] Acarina: Podapolipidae.
[2] Coleoptera: Coccinellidae.
[3] Received for publication Aug. 16, 1977.
[4] Acknowledgments are made to the following Systematic Entomology Laboratory taxonomists for their identification of insects and mites: R. L. Smiley, *Coccipolipus epilachnae* and *Coccipolipus macfarlanaei*; R. D. Gordon, *Epilachna varivestis* and *Cycloneda sanguinea*. Acknowledgements are made to the personnel of the USDA Beneficial Insects Research Laboratory, Newark, DE, for their technical support.

was stocked with 20 uninfested beetles of one of the 9 species under test. Cages were provided with a 4% sugar-water solution in a vial plugged with cotton, and pea aphids, *Acyrthosiphon pisum* (Harris), as needed, were introduced. Also, snap bean plants were placed in the cages for *E. varivestis*, and cuttings of bouncing-bet were placed in cages for *S. vigintiquatuorpunctata*. The cages were examined once a week for positive transfers of the mites from the original Mexican bean beetle to the other species of coccinellids. A positive transfer meant that either eggs, newly emerged larviform mites, or adult mites were observed on the host during the 6–8 wk of the test. All dead test insects were examined for mites and then replaced in the cage with live insects of the same species. When mites were found on a new host, the original 3 infested Mexican bean beetles were removed from the cage, but they were reintroduced the next week if the mites were not found a 2nd time. Test beetles that became infested with the mite were marked with white paint and examined each week to check on the development of the mite.

Results

During the test, mites were found only on *S. vigintiquatuorpunctata*, *C. stigma*, and *E. varivestis*, but those found on *C. stigma* (during the 2nd week of the test) were dead by the 3rd wk. The recovery of eggs, larvae, and adults from *S. vigintiquatuorpunctata* in the 3rd and 4th wk indicates that *C. epilachnae* can complete its life cycle on this host. Thus, the mite may be limited to members of the subfamily Epilachninae, all of which are phytophagous. The *E. varivestis* serving as a check were infested with the mites throughout the test.

Coccipolipus epilachnae may therefore be suitable for release in the United States. However, specificity will be further studied, and research will be conducted on the biology, population dynamics of the mite and how much it reduces the vigor and reproductive potential of the Mexican bean beetle.

REFERENCES CITED

Angalet, G. W., L. W. Coles, and J. A. Stewart. 1968. Two potential parasites of the Mexican bean beetle from India. J. Econ. Entomol. 61: 1073–5.

Husband, R. W. 1972. A new genus and species of mite (Acarina: Podapolipidae) associated with the coccinellid *Cycloneda sanguinea*. Ann. Entomol. Soc. Am. 65: 1099–104.

Smiley, R. L. 1974. A new species of *Coccipolipus* parasitic on the Mexican bean beetle. Wash. Acad. Sci. 64: 298–302.