A PREVIOUSLY UNKNOWN SEXUAL CHARACTER FOR THE PEPPER WEEVIL (COLEOPTERA: CURCULIONIDAE)

FRED J. ELLER
Bioactive Constituents Research
National Center for Agricultural Utilization Research
USDA/ARS/MWA 1815 N. University Street
Peoria, IL 61604

The pepper weevil, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae), is an important pest of both sweet and hot peppers (*Capsicum* spp.) in the southern United States, Mexico and Central America (Elmore et al., 1934). Eller et al., (1994) describe the isolation, identification, and field activity of a male-produced pepper weevil aggregation pheromone. During investigations of the aggregation pheromone of the pepper weevil, it was necessary to sex individuals to identify male-specific chemicals. In addition, weevils captured during field trials of synthetic pheromones were sexed to determine whether the pheromone attracted both sexes. Pepper weevils can be sexed by examination of the eighth tergum using characters described for sexing the boll weevil (Coudriet & Kishaba, 1988) (males have a notch in the eighth tergum, see Figure 1). However, the tergum is often not exposed, especially in weevils captured in pheromone traps. Dietz (1891) reported that female pepper weevils have a more slender and less densely punctured rostrum than males and their antennae are inserted further from the mouthparts. Although these sexual dimorphisms generally hold, these characters are somewhat subjective and are not completely reliable (Patrock, 1986). Some anthonomines can be sexed by examination of the tarsal claws (Kovarik & Burke, 1983), however, Patrock (1986) reported there is no sexual dimorphism of the tarsal claws of pepper weevils. The objective of this study was to find an obvious and reliable sexual dimorphism for sexing pepper weevils.

A laboratory culture of pepper weevils was established from insects collected in Florida and reared according to methods described by Patrock (1986). Pepper weevils were examined using a Nikon SMX-2B stereomicroscope and it was found that males (sexed by examination of genitalia) possess metatibial mucrones (Figures 1 and 2A). These metatibial mucrones are visible at magnifications of about 80×. In males, the mucrones of the protibia and mesotibia are not curved and are much shorter and thinner than the metatibial mucrones. Scanning electron micrographs were taken using a JEOL JSM-6400V scanning microscope. The electron micrographs revealed the inner surface of the mucrones of males to be coarse and scale-like. Although females also possess metatibial mucrones, they are not curved and they are much shorter and more slender than those of males (Figure 2B). The metatibial mucrones of females are about the same size as the mucrones of the protibia and mesotibia. The surface of female mucrones were not obviously scale-like. The metatibia of males tends to be more strongly curved than those of females, however, this character is not as reliable as the metatibial mucrones.

I found this method of sexing pepper weevils to be very useful for determining the sex of pepper weevils used in laboratory experiments and those captured in field trials. Although the function of the metatibial mucrones is unknown, I hypothesize that they are used by the male to grasp the female during mating. Sexual dimorphism of tarsal claws in other anthonomines is thought to be another adaptation for grasping the female during copulation (Kovarik & Burke, 1983).

Several other species of *Anthonomus* were examined to determine if this character could be used to sex them as well. The species examined included: the boll weevil, *A.*

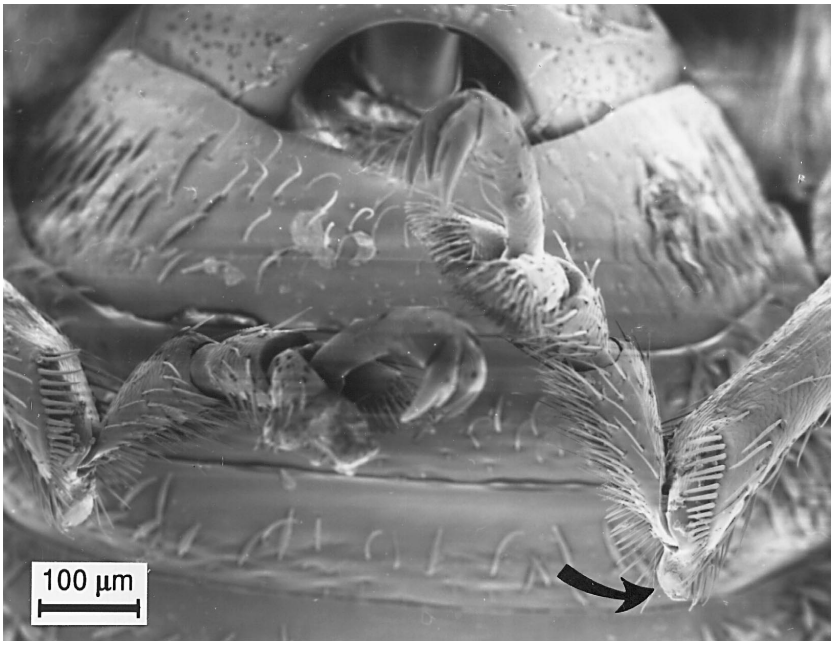

Fig. 1. Ventral view of male pepper weevil. Arrow indicates location of metatibial mucro.

grandis Boheman; the cranberry weevil, *A. musculus* Say; the potato bud weevil, *A. nigrinis* Boheman; the apple curculio, *A. quadrigibbus* (Say); the strawberry bud weevil, *A. signatus* Say; *A. texanus* Dietz; *A. albopilosus* Dietz; and *A. aeneolus* Dietz. Of these species, only *A. texanus* is clearly dimorphic in the metatibial mucro character. Male *A. texanus* have larger mucrones than females.

I wish to thank David G. Riley for providing a start-up culture of pepper weevils. Scanning electron micrographs were prepared by Lee Baker. Technical assistance was provided by Betty Thomas, Bruce Zilkowski and JoAnne Toohill. Horace R. Burke and Wendy Mechaber supplied other species of *Anthonomus* for examination. The author wishes to thank Drs. Horace R. Burke, Patrick F. Dowd, and David R. Schuster for reviewing an earlier draft of this manuscript.

Summary

Male pepper weevils possess metatibial mucrones which are larger and more strongly curved than those of females. This secondary sexual character is an easy and reliable method for sexing pepper weevils.

References Cited

Coudriet, D. L., and Kishaba, A. N. 1988. Bioassay procedure for an attractant of the pepper weevil (Coleoptera: Curculionidae). J. Econ. Entomol. 81:1499-1502.

Dietz, W. G. 1891. Revision of the genera and species of Anthonomini inhabiting North America. Trans. America. Entomol. Soc. 18:177-276.

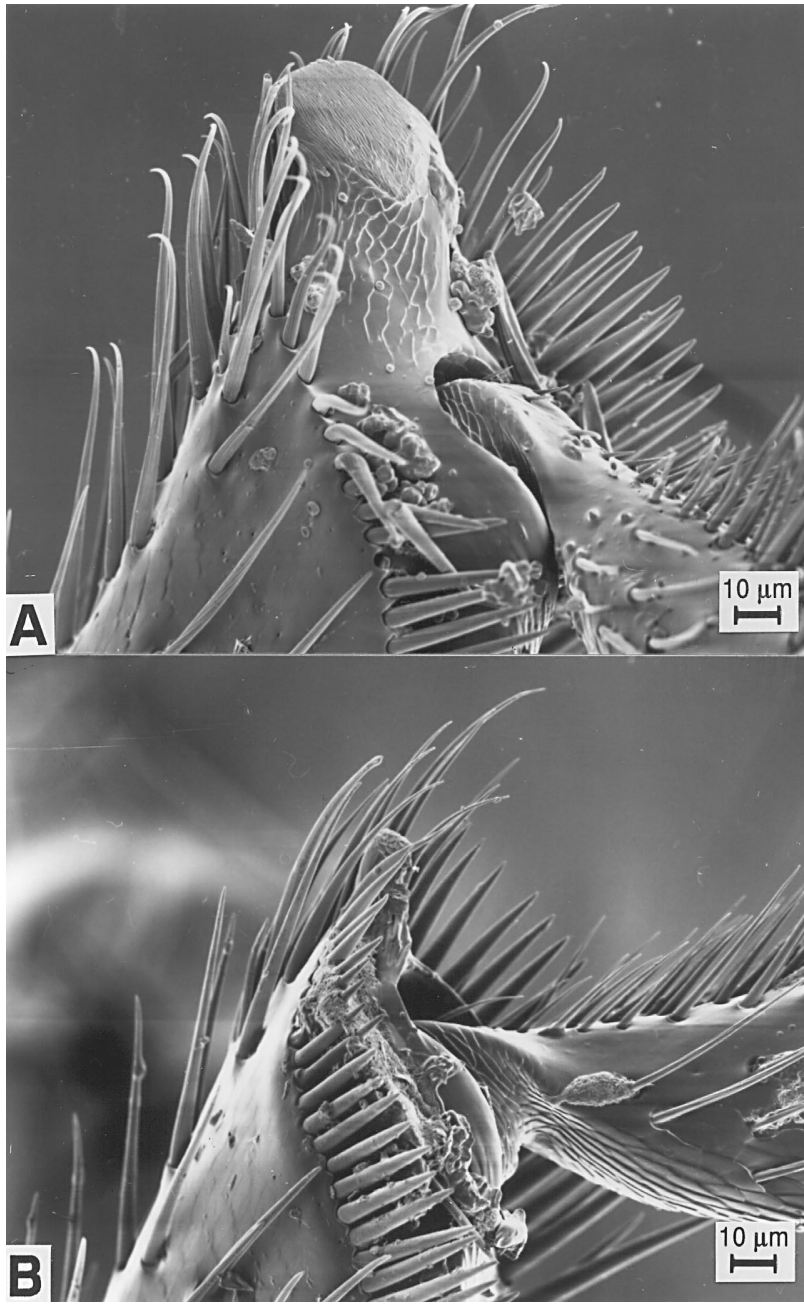

Fig. 2. Lateral view of apex of metatibia showing mucrones of male (A) and female (B) pepper weevils.

ELLER, F. J., R. J. BARTELT, B. S. SHASHA, D. J. SCHUSTER, D. G. RILEY, P. A. STANSLY, T. F. MUELLER, K. D. SHULER, B. JOHNSON, AND J. H. DAVIS, C. A. SUTHERLAND. 1994. Aggregation pheromone for the pepper weevil, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae): Identification and field activity. J. Chem. Ecol. 20:1537-1555.

ELMORE, J. C., A. C. DAVIS, AND R. E. CAMPBELL. 1934. The pepper weevil. U.S. Dept. Agric. Tech. Bull. 447.

KOVARIK, P., AND H. R. BURKE. 1983. Sexual dimorphism of tarsal claws in anthonomine weevils (Coleoptera: Curculionidae). Entomol. News 94:37-40.

PATROCK, R. J. 1986. Observations on the behavior and host relations of the pepper weevil *Anthonomus eugenii* Cano (Coleoptera: Curculionidae) in Florida. MSc thesis, Univ. Fla., Gainesville, Fla.

♦♦

BUSCHMAN, L. L., H. N. PITRE, C. H. HOVERMALE, AND N. C. EDWARDS, JR. 1981. Occurrence of the velvetbean caterpillar in Mississippi: Winter survival or immigration. Environ. Entomol. 10: 45-52.

BUSCHMAN, L. L., W. H. WHITCOMB, T. M. NEAL, AND D. L. MAYS. 1977. Winter survival and hosts of the velvetbean caterpillar in Florida. Florida Entomol. 60: 267-73.

ELLISOR, L. O. 1938. Control of the velvet bean caterpillar, *Anticarsia gemmatilis* Hbn. in seed production. Louisiana Agricultural Experiment Station. (#90 Louisiana) pp.8-9.

GREGORY, B. M. JR., S. J. JOHNSON, A. W. LIEVENS, A. M. HAMMOND, JR., AND A. DELGADO-SALINAS. 1990. A midlatitude survival model of *Anticarsia gemmatalis* (Lepidoptera: Noctuidae). Environ. Entomol. 19: 1017-1023.

JOHNSON S. J., B. M. GREGORY, JR., S. A. HSU, AND A. M. HAMMOND. 1991. Migration paradigm for the velvetbean caterpillar, pp. 88-92 *in* Preprints, Tenth Conferences on Biometeorology and Aerobiology and Special Session on Hydrometeorology, September 10-13, 1991. Salt Lake City, Utah. American Meteorology Society, Boston, Mass.

WATSON, J. R. 1916. Life-history of the velvet-bean caterpillar (*Anticarsia gemmatilis* Hübner). J. Econ. Entomol. 9:521-528.

WATSON, J. R. 1932. Further notes on the velvetbean caterpillar. Florida Entomol. 16: 24.

WEI, X., AND S. J. JOHNSON. 1994. An efficient method to harvest velvetbean caterpillar pupae from field cages. Southwestern Entomol. 19: 411.