

## Composition of the Oviposition Plug of *Cylas formicarius* (Coleoptera: Curculionidae) in Host Sweetpotatoes<sup>1</sup>

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The sweetpotato weevil, *Cylas formicarius* (F.) (Coleoptera: Curculionidae), feeds and breeds on several species of Convolvulaceae (Austin 1991, Pp. 45–57 in Sweet Potato Pest Management: A Global Perspective, Westview). These include the sweetpotato, *Ipomoea batatas* (L.), of which it is the foremost pest worldwide (Chalfant et al. 1990, Annu. Rev. Entomol. 35: 157–180). Because of its economic importance, *C. formicarius* has been the subject of considerable research (Sugimoto and Sakuratani 1991, Mem. Fac. Agric. Kinki Univ. 24: 53–69), including several basic bionomic studies and reviews. Several studies note that oviposition holes created by female weevils in sweetpotatoes typically each have a distinctive brown-gray plug that occludes the hole and may directly cover the egg (Sherman and Tamashiro 1954, Hawaii Agric. Exp. Stn. Tech. Bull. 23). Authors agree on the supposed function of the plug in shielding the egg from enemies and preventing desiccation. However, reports on its origin and composition vary and are largely postulated as one of two main types.

Some have characterized the plug as a mucilaginous covering secreted by the female, noting that it hardens and darkens on exposure (Christian 1938, M.S. Thesis, Louisiana State Univ., Baton Rouge; Cockerham et al. 1954, Louisiana Agric. Exp. Stn. Bull. 483: 1–30; Reinhard 1923, Texas Agric. Exp. Stn. Bull. 308: 1–99). Floyd (1942, Louisiana Agric. Exp. Stn. Bull. 350: 12–16) characterized the plug as “waxy” with the implication that the substance was from the reproductive accessory glands. In contrast, others indicated that the plug was mainly or entirely fecal in origin (Chalfant et al. 1990; Jayaramaiah 1975, Mysore J. Agric. Sci. 9: 99–109; Rajamma 1983, pp. 87–92 in Insect Ecology and Resource Management,

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Sanatan Dharm College, Muzaffarnagar, India; Sherman and Tamashiro 1954; Subramanian 1959, Madras Agric. J. 46: 293–297; Sutherland 1986, Trop. Pest Manag. 32: 304–315). Heretofore, it has been commonly accepted that the substance comprising the oviposition plug of *C. formicarius* is secreted or excreted from the abdomen of the female. Yet, our observations in laboratory cultures of the weevil demonstrate that these assumptions are not entirely accurate.

In maintaining a laboratory culture of many thousands of sweetpotato weevils on some hundreds of sweetpotato storage roots, we found that the root surface becomes more or less densely stippled with oviposition and feeding holes, as well as fecal spots. While oviposition plugs and fecal spots have a superficial similarity, they differ in color and texture. Initial light microscopy of some tens of each of these showed that plugs are significantly coarser than fecal deposits. Furthermore, they do not resemble a glandular exudate.

Based on these observations, we hypothesized that the plug consists of masticated root material excavated from the oviposition hole. To test this, we simulated that condition by finely grinding fragments of root tissue with a scalpel. After allowing the chopped material to darken for several minutes, we compared authentic and simulated plugs. No difference was apparent.

Our hypothesis is further corroborated by direct behavioral observations of some tens of females in the course of ovipositing. After laying an egg, a female typically turns around to antennate the oviposition hole and places the tip of her snout into it. This behavior pattern may last no more than a second, but it must be at this point that the female regurgitates into the hole at least some of the tissue that she removed from it.

Kemner (1924, Z. Angew. Entomol. 10: 398–435) also referred to it as a “plug of masticated plant fibers” (Propfen zernagter Pflanzenfaser). He concluded, however, that it was of fecal origin. Our observations, furthermore, call into question statements that the oviposition plug of the small sweetpotato weevil, *Euscepes postfasciatus* (Fairmaire), is fecal in origin (Aramaki et al. 1987, Res. Bull. Plant Prot. Serv. Jpn. 23: 67–69; Sherman and Tamashiro 1954).

The apparent misinterpretations of the composition of the oviposition plug have likely resulted from the earlier observations of the ovipositional behavior of *C. formicarius* not including or ignoring the often very brief phase in which female places her mouthparts to the hole over the newly laid egg. Reinhard (1923) even stated that the female “leaves [the oviposition hole] without turning to inspect her work.” In our own observations, however, we were sometimes surprised to find an oviposition plug in place even after missing this behavior.

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