

**Additional Alternate Hosts of the Sweetpotato Weevils
Cylas formicarius elegantulus
and *Euscepes postfasciatus*
(Coleoptera: Curculionidae) in Hawaii¹**

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ABSTRACT

Laboratory and field studies of food preferences and alternate hosts were conducted with the sweetpotato weevils *Cylas formicarius elegantulus* (Summers) and *Euscepes postfasciatus* (Fairmaire). Results demonstrated that carrot roots could be an alternate host for *C. formicarius elegantulus* larvae and adults. Radish roots could serve as an alternate host for only adult survival, for both species of weevils. Among the convolvulaceous hosts recorded, *Ipomoea horsfalliae* Hook and *I. obscura* (L.) Ker. are new hosts for *C. formicarius elegantulus*.

Among the numerous insects infesting sweetpotato (*Ipomoea batatas* L.) Lam. around the world, the sweetpotato weevil, *Cylas formicarius* (Fabricius) and the West Indian sweetpotato weevil, *Euscepes postfasciatus* (Fairmaire), are known to be the most damaging. *C. formicarius* has a worldwide distribution and is reported to occur in a total of 64 countries (Anonymous 1970). *C. formicarius elegantulus* is a subspecies limited to the Western hemisphere, while *C. formicarius formicarius* is the subspecies found in Europe, Africa, Asia and the South Pacific (Sherman and Tamashiro 1954). *E. postfasciatus* has a narrower distribution and has been found in only 21 countries (Anonymous, 1973). Both *E. postfasciatus* and *C. formicarius elegantulus* occur in the Hawaiian Islands.

Other than sweetpotato, numerous wild hosts of *C. formicarius*, mainly other members of the family Convolvulaceae, have been reported (Chittenden 1919, Cockerham 1940, 1943, Subramaniam 1959, Jayaramaiah 1971, 1975, Pillay and Lal 1976). Reports of wild hosts of *E. postfasciatus* are very limited, probably due to its restricted distribution. Records from Hawaii indicate that *E. postfasciatus* has been found breeding in *Ipomoea pentaphylla* (Swezey 1925), *I. triloba* (Pemberton 1943), *I. horsfalliae* (Swezey 1946) and *I. reptans* (Shiroma and Kunishi 1977). We conducted the study reported here to update information on alternate hosts of the sweetpotato weevils in Hawaii.

MATERIALS AND METHODS

Investigations on the root preferences were conducted in the laboratory. Whole roots of carrot (*Dacus carota* L.), radish (*Raphanus sativus* L.) and rhubarb (*Rheum rhaponticum* L.) were placed in separate glass battery jars each 20.3 cm in diam. by 20.3 cm high. Jar tops were covered with a single layer of cheesecloth. To prevent weevils from moving to the tops of the jars Fluon AD1, (Northeast Chemical Co. Inc., Woonsocket, Rhode Island), a compound of unknown chemical composition was smeared in a 6.35 mm thin band around the mouth of the battery jar and allowed to

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dry before roots and weevils were placed within them. Ten pairs of weevils of both species were released in each battery jar. *E. postfasciatus* weevils were selected by collecting mating pairs with an aspirator because sexes cannot be identified visually. *C. formicarius elegantulus* adults were sexed using antennal characters. Temperature in the laboratory ranged from 22°C up to but did not exceed 25°C. Weevils used in these tests were reared on sweetpotato roots, cultivar 'Centennial.' The stock culture maintained in the laboratory was derived from field collected weevils. Flight behavior and presence of immature stages in test foods were used as criteria in evaluating feeding preferences. Observations were recorded daily and fresh roots were added whenever previously placed roots showed loss of turgidity or fungal growth. Such roots were dissected under a binocular microscope and examined for immature stages of the weevils.

In another part of this study, vines of *Ipomoea* spp. growing around fields of sweetpotato and elsewhere on Oahu were collected and examined for weevil injury. Vines were also confined with weevils in the laboratory to observe feeding and other behavioral activities. Field collected plants were identified by botanists of the University of Hawaii.

RESULTS AND DISCUSSION

Insects tend to remain close to their food sources and attempt to crawl or fly away if their food is not appetizing. This behavioral characteristic was utilized in evaluating food preferences of the weevils. In tests with all three kinds of roots *E. postfasciatus* weevils displayed thigmotactic behavior by gathering in compact groups at areas where the roots were in contact with glass surface at the bottom of the battery jars. *C. formicarius elegantulus* individuals, on the other hand, moved about freely on the upper surface of the roots and also along the sides of the battery jars. This behavior increased at dusk and continued all night.

With carrots as food, both species of weevils probed and fed intensely on the roots. *C. formicarius elegantulus* made deep feeding holes with their relatively long snouts and remained feeding by burying their whole snout at one site for long periods, sometimes up to 30 min., as they do in sweetpotato roots. *E. postfasciatus*, on the other hand, made wider, irregular shallow feeding holes with their shorter snouts and fed at the same site for periods up to 20 min. Both weevil species laid eggs freely on the surface of carrots. These eggs were characteristically covered by a fecal plug. Some eggs were also observed to be laid devoid of protective plugs on the surface of the carrot roots and along the sides of the battery jar. This method of oviposition is not common when the weevils feed on sweetpotato roots. At night, the adults of *C. formicarius elegantulus* were observed spreading their wings and flying in very short bursts which usually ended when they hit the sides of the battery jars and dropped down. This type of flight activity was never observed in *E. postfasciatus*. Flight activity was observed on carrots although it was less frequent than with the other two types of roots evaluated.

Weevils confined on radish roots produced feeding damage similar to that observed on carrot roots. On radish, feeding by weevils was not restricted to roots but also was observed on leaves. The feeding damage by both species of weevils was only skin deep. Flight activity by *C. formicarius elegantulus* confined on radish was observed occasionally during the day, and increased after dusk. Flight activity was never observed in *E. postfasciatus*. Frequently individuals of both species crawled away from the radish roots up the sides of the battery jar before turning away upon encountering the Fluon barrier. No eggs of either species of weevil were found on the

surface of radish roots. However, eggs were found along the sides of the battery jar, and, in all observations, were devoid of fecal plugs.

No feeding was recorded by either weevil on roots of rhubarb. The adults of *E. postfasciatus* congregated at the point of contact between the roots and the floor of the glass jar, but did not cause appreciable damage to the roots, although tiny punctures were visible, obviously having been caused by their probing. They did not remain at the sites of probing to feed, but wandered away. This type of probing behavior was also noticed in *C. formicarius elegantulus*. No eggs were found on the surface of rhubarb roots. *E. postfasciatus* eggs found on the glass surfaces of the battery jars were devoid of protective fecal plugs. Flight activity by *C. f. elegantulus* was very frequent during the day, and increased after dusk. Weevils were observed wandering around the battery jar, and their movements usually ended in short flights. *E. postfasciatus*, although not observed to fly, displayed similar restless movements at night and wandered around the jar.

Several non-convolvulaceous plants have been recorded as alternate hosts of the sweetpotato weevils (Cockerham 1940). Dissections of different roots fed upon by the weevils revealed on two occasions the presence of fourth instar weevils in carrot roots. These were identified to be *C. f. elegantulus*. From India, carrot has been reported to serve as an alternate host for *C. formicarius formicarius* (Jayaramaiah 1975). Though the subspecies present in Hawaii is different, the observed presence of larval stages within carrot roots indicates that this root could be an alternate host for *C. formicarius elegantulus*. Radish roots, which showed feeding damage but which contained no larval stages within them, possibly could serve as an alternate host for the weevils for adult survival only, but not for reproduction. The flight activity and restless movements by the weevils may indicate that radish is an unsuitable host. Absence of both feeding damage and eggs on surface of rhubarb roots and the intense flight activity coupled with restless behavior noticed in both species of weevils when confined on that host suggests that the weevils are repelled by rhubarb roots. Rhubarb thus does not appear to be a potential alternate host for either species of sweetpotato weevil.

Numerous convolvulaceous hosts of the sweetpotato weevils have been recorded in North America (Cockerham 1940, 1943), India (Subramaniam 1959, Jayaramaiah 1975, Pillay and Lal 1976) and Hawaii (Swezey 1925, 1946, Pemberton 1943). *Ipomoea horsfalliae* Hook, commonly called Princess vine or Kuhio vine, is recorded as an alternate host in Hawaii of *E. postfasciatus* (Swezey 1946). *C. formicarius elegantulus* adults were observed feeding on the mainstem, leaves and flowers of *I. horsfalliae*, in the Honolulu area and this constitutes a new host record.

Wild convolvulaceous vines growing as weeds around sweetpotato fields were also found to be alternate hosts of the weevils. Vines of *Ipomoea obscura* (L.) Ker. collected from the Windward side of the island of Oahu were dissected and one larva of *C. formicarius elegantulus* was recovered. Rapid withering and death of these vines when removed from the soil prevented testing its acceptance by the weevils in the laboratory. This is a new host record.

I. triloba L., a vine often growing around sweetpotato fields, also has been recorded as an alternate host of *E. postfasciatus* (Pemberton 1943). Recovery during the present study of weevil larvae of *E. postfasciatus* and evidence of weevil tunnels in the roots of this vine, confirmed Pemberton's finding.

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