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Insects Injurious to Sweet Potato Tubers in Tennessee

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INSECTS INJURIOUS TO SWEETPOTATO TUBERS IN TENNESSEE

By
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Sweetpotatoes injured by the larvae of the elongate flea beetle.

KNOXVILLE

SUMMARY

1. Several species of insects in Tennessee are capable of causing holes in sweetpotatoes. It appears that the elongate flea beetle, *Systena elongata,* and possibly the pale-striped flea beetle are the principal offenders. Injury may be caused occasionally by wireworms, the southern corn rootworm, and the sweetpotato leaf beetle.

2. The elongate flea beetles pass the winter in the larval stage on the roots of narrow-leaved plantain and possibly other weeds. They emerge early in June and enter the sweetpotato fields. They deposit eggs in the soil.

3. For control, clean culture through destruction of weeds such as plantain appears to be the only practical measure that can be recommended. The multiplication of this pest is favored by wet weather. Low, wet ground should not be used for sweetpotatoes.

INSECTS INJURIOUS TO SWEETPOTATO TUBERS IN TENNESSEE

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INTRODUCTION

For many years the Experiment Station has been getting reports of the presence of pinholes and pits in sweetpotatoes. At first the larvae of the sweetpotato flea beetle, *Chaetocnema confinis,* was suspected of being the culprit, but rearing tests failed to show any connection. Other investigators attributed the injury to nematodes or the wireworm, or to the sweetpotato weevil, which occurs farther south. In the summer of 1945 a search through the soil around sweetpotatoes revealed a few small white worms, which upon rearing were found to be *Systena elongata.* This species appears to be responsible for most of the damage. Since very little is known of the pest, an effort was made to learn as much as possible of its habits and life history in order that control measures might be recommended. This bulletin is a progress report, for much work remains to be done to complete the information required.

ELONGATE FLEA BEETLE

NATURE OF INJURY

The adult beetle is not injurious to sweetpotato foliage. Most of the injury observed on the leaves (Fig. 1), especially when the plants are first set out, is caused by the sweetpotato flea beetle.

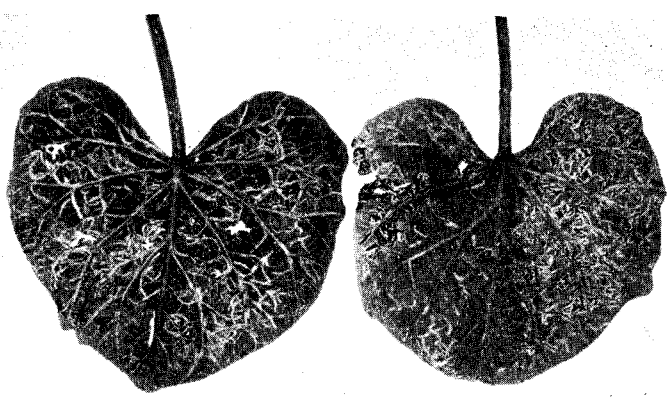

Fig. 1—Sweetpotato leaves, showing characteristic injury by the tiny adults of the sweetpotato flea beetle.

The larvae of the elongate flea beetle attack the tuber and cause small pinholes. As the tuber grows these holes expand, so that at digging time there is an assortment of pinholes and pits over the surface of the potato (Fig. 2).

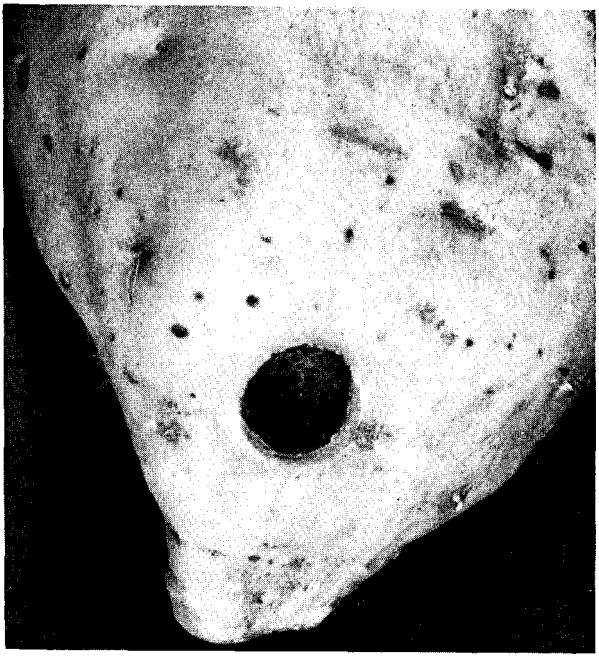

Fig. 2—Pinhole injury caused by the larvae of the elongate flea beetle.
The large hole was made by white grubs.

Usually they are shallow, but sometimes are an inch or more deep (Fig 3). The injured areas often blacken, giving the potato an unsightly appearance. When the injury is severe the marketability of the potatoes is impaired.

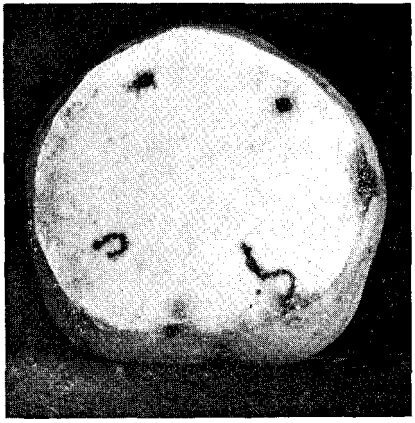

Fig. 3—Cross section of sweetpotato, showing injury caused by the larvae of the elongate flea beetle.

The larvae cause an amount of damage that seems altogether out of proportion to their numbers. They do not stay in the potato, but after feeding crawl back into the soil. They attack a new area each time, so that one worm can make a great many holes. They are effectively hidden in the soil; hence, it sometimes requires a great deal of digging to find them.

HISTORY

The elongate flea beetle, S. *elongata* (Fab.), belongs in the Chrysomelidae, a large family of leaf-eating beetles embracing such familiar pests as the potato bug and cucumber beetle. The flea beetles themselves are members of the tribe Halticini, characterized by thickened hind thighs, which fit them for jumping, whence the name "flea beetle." This tribe contains such well-known insects as the tobacco flea beetle and potato flea beetle.

Horn (1889) records S. *elongata* from Georgia and South Carolina.

Blatchley (1910) records it from Posey County, Indiana, where it was beaten out of wild grape on April 12.

Folsom (1936) found that this "beetle feeds on all of the cotton plant, but is fortunately not abundant and is not on record as an injurious species. It often eats into the squares, causing them to fall, and blasts small squares in clusters of buds. It makes pits on stems, and skeletonizes bracts and leaves, gnawing off the upper epidermis and the parenchyma beneath. Small plants may be killed by the beetle."

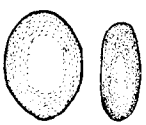

Fig. 4 — Left: Egg of the elongate flea beetle. Right: Egg of the pale-striped flea beetle.

DESCRIPTION OF STAGES

Egg.—The egg of S. *elongata* is pale yellow, the shape of a football, and measures 4/5 millimeter long by 2/5 millimeter wide (Fig. 4). About 10 days or longer is spent in the egg stage.

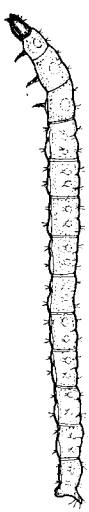

Fig. 5—Larva of the elongate flea beetle.

Larva.—The larva is long, slender, and cream-colored, with brownish head. It measures 10 mm. long when full-grown and nearly 1 mm. wide. As in most flea beetle larvae, the anal segment ends in a conspicuous pointed tubercle with four long spiny hairs (Fig. 5).

Pupa.—The pupa is whitish, becoming darker with age. It measures about 4 to 5 mm. long. Two heavy, prominent, curved spines on the end of the body are characteristic (Fig. 6). The pupal stage lasts about 9 days.

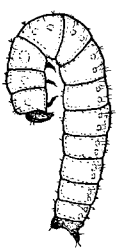

Fig. 6 — Prepupa of the elongate flea beetle.

Adult.—The adult is black. It is one of the larger flea beetles, measuring from 3 to 5 mm. in length. The elytra is marked with two narrow, cream-colored stripes, as shown in figure 8. In *blanda* the color is more variable and the stripe considerably wider (Fig. 10). The head of S. *elongata* is coarsely punctate. The hind femora are dark. The antennae and legs are reddish, the first and second joints being darker than the third.

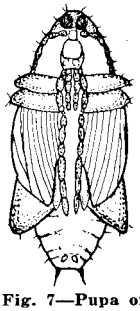

Fig. 7—Pupa of the elongate flea beetle.

SEASONAL HISTORY

1945

In the summer of 1945 a search for the larvae was not made until August 28. On that date the soil was carefully examined around several hills of sweetpotatoes at the Blount County experimental farm, and three larvae and one prepupa (Fig. 6) were found. Many of the potatoes already showed the characteristic holes. Three more larvae were found in the experimental plots of the Horticulture Department on September 3. From one of these an adult beetle emerged on September 14, identified by the Bureau of Entomology and Plant Quarantine as *S. elongata.*

Examinations of the soil about the sweetpotatoes October 10 and 17 revealed larvae on both of these dates. One larva was very small, probably in the 1st or 2nd instar. Adults were obtained in these patches by sweeping with an insect net. Alfalfa, buckwheat, and weedy fields swept at this time failed to disclose any beetles. On November 1, beetles were found on a leaf of one of the docks, possibly *Rumex obtusifolia,* and on narrow-leaved and broad-leaved plantain.

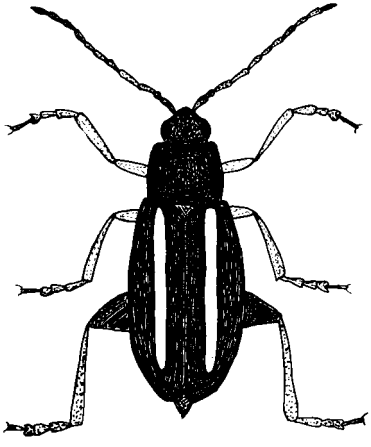

Fig. 8—Adult stage of the elongate flea beetle.

It is of interest that the sweetpotatoes in the victory gardens and in plots of the Entomology Department were comparatively clean. The plots of the Horticulture Department, in which larvae were found, were surrounded by weedy fields.

1946

Systena elongata probably passes the winter in Tennessee mainly in the larval stage. On May 23, 1946, some narrow-leaved plantain, *Plantago lanceolata* (Fig. 9), was dug up and several larvae were found in the soil. These were brought into the laboratory and placed on sweetpotato. They began to feed at once. On May 27 and June 3 pupae were found under plantain, from which adults of *S. elongata* emerged June 5 and June 13. An adult beetle also emerged August 24 from pupa found August 20.

On June 13 two adult beetles were caught in the sweetpotato patch by the use of a sweeping net. The beetles are inconspicuous and are difficult to catch, as they are extremely wary and jump away at the slightest disturbance. Adult beetles were also found by sweeping the sweetpotato field at the Blount County Farm June 28 and July 1. They were brought into the laboratory, and eggs were obtained for rearing purposes. Eggs laid June 30 hatched July 10. When placed on sweetpotato the larvae fed readily and grew. They also ate small sweetpotato rootlets. They were kept alive and growing until August 4, when they died. Their physical requirements, such as temperature and moisture, are definite and limited, and for this reason they are difficult to rear.

Potatoes began to show the presence of holes on August 6, indicating that the larvae were already at work. One larva was found on August 8, and on September 16 a few larvae and two pupae were found. From one

of the latter a misshapen adult emerged September 22. In the horticultural plots the potatoes dug October 7 showed many holes, especially near the edges of the field, where plantain was growing.

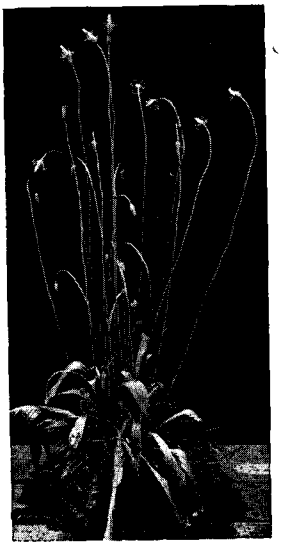

Fig. 9—Narrow-leaved plantain, the roots of which serve as a host for the larvae of the elongate flea beetle.

CONTROL

Clean Culture.—Considering the long period over which the adult beetles enter a sweetpotato field, control by insecticides is not practicable. It appears that the main reliance must be placed on clean culture and destruction of the weed hosts, such as the narrow-leaved plantain. On the Station plots most of the plantain is found around the borders and edges of the fields rather than in the fields themselves. It is possible that other weed hosts will be discovered. In 1945 the sweetpotato plots of the Horticulture Department showed severe damage. This ground, therefore, was replanted in 1946 in order that the pest might be studied to better advantage. But the injury did not show up as bad as in 1945. It is evident that not all the factors favoring the multiplication of this flea beetle are understood, and much work remains to be done to fill up the gap in our knowledge.

Climatic Conditions.—The larvae are very sensitive to unfavorable conditions. A moist soil is essential for their complete development, and during summers of heavy precipitation potato injury is pronounced. For this reason, bottom lands or low, wet places are more likely to show severe damage.

In 1942, a wet year, the sweetpotato crop on the University Farm and in other parts of the State was seriously injured. The year 1944 had several drouths during the growing season, with correspondingly little damage. In 1946, the rainfall was ample at the main farm, while the Blount County Farm, only seven miles away, missed many needed local showers. As a consequence, the potatoes on the latter farm suffered less than in 1945, when rainfall was ample.

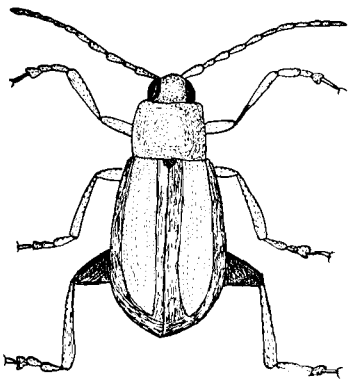

Fig. 10—Adult stage of the pale-striped flea beetle.

PALE-STRIPED FLEA BEETLE

In 1926, Thomas found S. *taeniata* var. *blanda* injuring sweetpotatoes in North and South Carolina. Dr. Muesebeck states that the Division of Insect Identification at Washington now applies the name *blanda* to the form that originally went by the name of *taeniata* (Fig. 10). The color in this species is variable, ranging from dark to brownish-yellow. This variability has caused confusion in the literature. In some forms the contrast between the stripe and the remainder of the wing cover is almost lacking.

S. *blanda* has not been reared from sweetpotatoes at Knoxville, although it is

common here and may be responsible for some of the damage.

Blanda is an important pest of corn, beans, sugar beets, and various vegetables, according to Chittenden (3) and Hawley (8). It breeds on many weeds, such as lambs-quarters, shepherds-purse, ragweed, cocklebur, and pigweed. Forbes (6) found larvae attacking early-planted corn seed, and reared adult beetles from them. In New York State, beans sometimes are severely damaged by the feeding of adults on the leaves (Hawley, 8). Sweetpotato tubers are recorded as being injured by the larvae of this species (Fackler, 5). Drake and Harris (4) give an account of the pale-striped flea beetle as a pest of seedling onions. In that case the injury was caused by the feeding of the larvae.

SEASONAL HISTORY

This species appears to pass the winter as an adult beetle in Tennessee. On May 7, 1946, the adults were found injuring newly-germinated beans. On

Fig. 11—Cotyledons of cotton showing injury by the adults of the pale-striped flea beetle.

May 15, they were abundant on young cotton eight miles from Knoxville. As many as 8 or 10 beetles could be found on a single cotyledon. They would have caused considerable damage (Fig. 11), but were controlled with cryolite dust. The cotton fields were well cultivated and had almost no weeds.

At Knoxville, the beetles were observed feeding on ragweed, lambs-quarters, cocklebur, Jimson weed, beans, and radishes, on May 19.

Beetles brought into the laboratory deposited eggs May 8, and the eggs hatched May 19. When placed on sweetpotato, the newly-hatched larvae failed to grow.

On June 12, no larvae could be located under lambs-quarters, pigweed, or cocklebur where the adults previously were abundant. At the Cotton Farm, near Knoxville, a few larvae and pupae were found under Jimson weed on June 25. One pupa was found in corn.

On July 10, adults were present among the sweetpotatoes and very numerous on lambs-quarters growing along the border. These appeared to be second-generation, newly-emerged beetles. They were numerous also in alfalfa.

Adults collected on alfalfa and brought into the laboratory deposited eggs July 27. These eggs hatched in 8 days, and when the newly-emerged larvae were placed on sweetpotato they fed and grew. The larvae were kept alive on sweetpotato until half-grown, when they died.

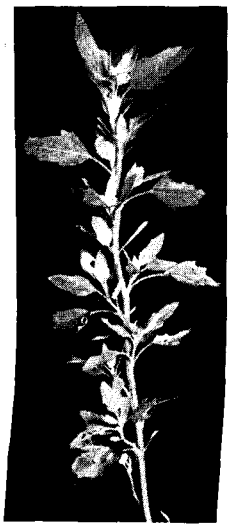

Fig. 12—Lambs-quarters —a host of the pale-striped flea beetle.

On August 11 and 20, full-grown larvae and pupae were found under lambs-quarters (Fig. 12). The larvae when placed on sweetpotato fed and made characteristic holes.

Bordering the sweetpotato plot was a patch of Irish potatoes. The latter was allowed to go to weeds, with lambs-quarters predominating. *S. blanda* was abundant on this weed during the summer months, and the adult beetles were observed in the sweetpotatoes as well. Yet at digging time the potatoes were found comparatively clean, with few holes in them.

CONTROL

Clean Culture—Destruction of weeds and clean cultivation no doubt will be helpful in the control of this pest. Lambs-quarters, Jimson weed, and cocklebur seem to be preferred by the larvae and serve as important hosts.

SOUTHERN CORN ROOTWORM

The 12-spotted cucumber beetle (Fig. 13), *Diabrotica duodecempunctata*, also known as the southern corn rootworm

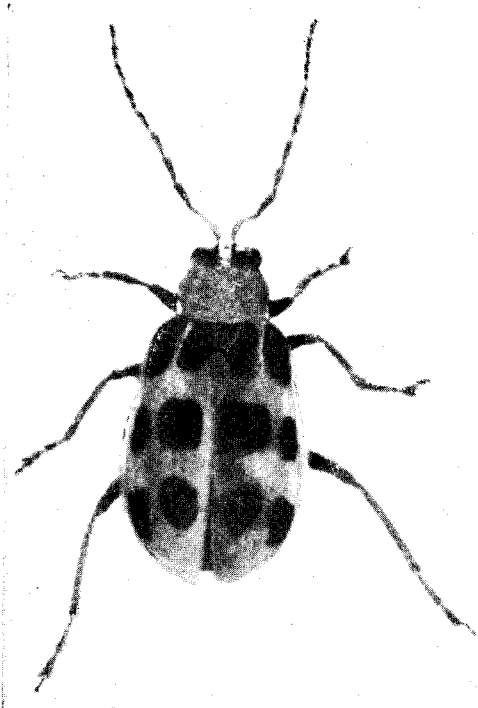

Fig. 13—12-spotted cucumber beetle (adult stage of the southern corn rootworm.)

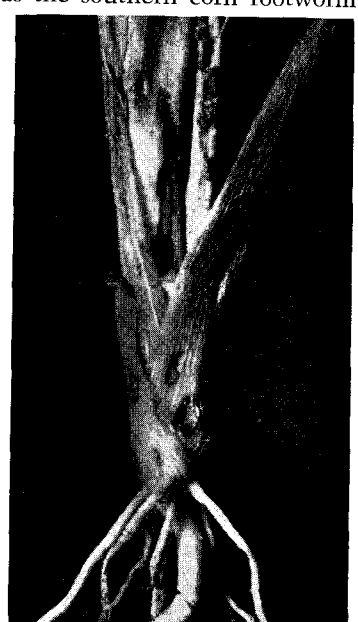

Fig. 14—Seedling corn, showing holes drilled by the larvae of the southern corn rootworm.

Fig. 14), does not appear to be an important pest of sweetpotatoes in Tennessee. But a closely related form, the belted cucumber beetle, *D. balteata*, is known to be injurious to sweetpotatoes in Louisiana. On August 6, 1946, a *Diabrotica* larva one-third grown was encountered in the soil about sweetpotatoes. When taken to the laboratory and placed on sweetpotato it fed readily. Unlike the *Systena* larva, it bored its full length in the potato and remained there.

SEASONAL HISTORY

It is probable that the 12-spotted cucumber beetle passes the winter in Tennessee as an adult. The beetles are active on warm days in the winter. G. G. Ainslie found them feeding on wheat at Nashville in January.

In the spring of 1944, beetles were collected by sweeping alfalfa at the University Farm on April 13. These were placed in oviposition cages, and eggs were deposited April 14. These eggs hatched April 23 in the laboratory. Larvae were placed on slices of sweetpotato and on sprouted corn. They fed on both of these materials, but made the more rapid growth on the corn. Some of the larvae pupated May 15, and adults emerged May 19.

Nothing has been found in the literature to indicate that the larvae are capable of attacking sweetpotatoes, although some were reared in the laboratory upon cut pieces. It is of interest that the larvae reared on sweetpotato are yellowish-brown, somewhat resembling small wireworms. The color probably is due to the pigment found in sweetpotatoes, for those reared on corn are white.

The larvae also were capable of feeding on sweetpotato roots and young tubers. When they were placed on sweetpotato, the characteristic holes and pits soon appeared.

THE SWEETPOTATO LEAF BEETLE

There is some evidence that the sweetpotato leaf beetle, *Typophorus viridicyaneus*, at times may become injurious to sweetpotato tubers in Tennessee. Fackler (5) records the presence of this pest at Knoxville and in Middle Tennessee. According to Brannon (2), it is capable of causing damage periodically in certain localities in the Southern States.

The adult beetles feed on the foliage, while the larvae feed on the tubers. The larva measures about ¼ inch in length, is white with a brown head, and resembles a small white grub. The eggs are laid in the soil, and the larvae upon hatching enter the sweetpotatoes. The burrows are ⅛ inch in diameter and often are filled with fras. The winter is passed in the larval stage, and transformation to adults takes place in May.

If control measures are necessary the adults may be killed by cryolite or calcium arsenate when they emerge in May or early June.

WIREWORMS

Sweetpotatoes are injured also by such general feeders as wireworms. Wireworm injury is somewhat distinctive, and may be recognized by the presence of rather large holes, ⅛ inch or more in diameter. While digging sweetpotatoes in a garden on October 6, 1944, the author found several potatoes with the characteristic holes (Fig. 15). Upon turning over the dirt he

located the worms. These were brought into the laboratory and placed on a sweetpotato. The next morning, several holes were found, and one worm was completely embedded.

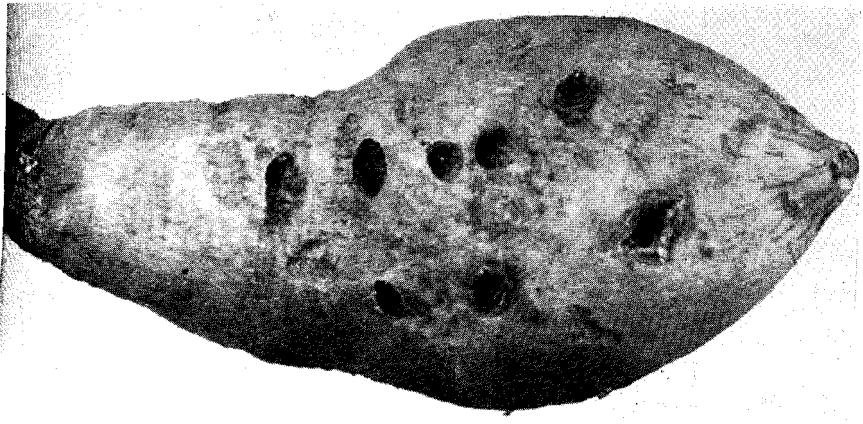

Fig. 15—Large characteristic holes on sweetpotato caused by wireworms.

Sweetpotatoes on Station plots were dug October 24, and a few wire-orms were located. One of these appeared to be a species of *Melanotus*.

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