Miscellaneous pests of cassava

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Abstract

A description is given of several pests that may on occasion cause serious damage to cassava. Aspects dealt with include their biology and ecology, type of damage and control methods. Insects attacking planting material on young plants during the establishment phase include white grubs *(Phyllophaga* sp., *Leucopholis rosida),* cutworms *(Prodenia litura, P. cridania, Agrotis ipsilon)* and termites *(Coptotermes* spp.). Pests attacking foliage include leaf-cutter ants *(Atta* spp., *Acromyrmex* spp.), gall midges *(Jatrophobia brasiliensis)* and lace bugs *(Vatiga manihotae).* Among insects attacking stems and branches are the stemborers *(Coelosternus* spp., *Lagochirus* sp.).

The term "miscellaneous" for pests of cassava is perhaps misleading. In this paper it has been used to refer to pests that cause little or no economic damage to cassava, to those about which there is little scientific information; or to others that appear to be of secondary importance at present but that may become more important in the future as traditional cassava cultivation practices change.

High populations of general feeders (i.e., leaf-cutter ants, white grubs, cutworms and termites) can causs serious damage to cassava. During a recent armyworm attack in Malaysia, plants were defoliated and girdled, causing an estimated 25 percent yield reduction in a 3000-acre plantation.

Pests attacking foliage include gall midges and lace bugs; stemborers attack stems and branches. Other pests considered to be of minor importance and not discussed herein include leafhoppers, several leaf beetles, armyworms, certain species of mites and crickets. These pests were reviewed by Bellotti and Schoonhoven (2).

Insects attacking planting material or seedlings

Grubs, cutworms and termites attack planting material or damage plants during the important establishment phase (26). All can cause serious losses in germination.

Grubs

Grubs are pests in nearly all cassava-growing regions and are reported as a serious problem in

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Indonesia (22) Several species are mentioned in the literature (15, 34) but *Leucopholis rorida* (Indonesia) and *Phyllophaga* sp (Colombia) appear to be the most important. The adult stage of the grub is a beetle, usually of the family Scarabaeidae or Cerambycidae.

Damage

Grubs feed on the roots of young plants, causing considerable damage. Damage to planting material is characterized by the destruction of the bark and buds of recently planted cuttings and the presence of tunnels in the woody part. Affected cuttings may rot and die, and severely attacked fields have to be replanted. Larvae will also feed on the bark of the lower stem just below the soil, roots and swollen roots (1). When young plants (1-2 months old) are attacked, they suddenly wilt and die. In studies with *Phyllophaga* sp at CIAT, germination was reduced by 95% in experimental plots. Losses of 70% have been reported from Madagascar (17)

Biology and ecology

The biology of *L. rorida* has been described by Dulong (17). Adults become active after initiation of the rains and begin oviposition about 9 days after mating, laying up to 37 white eggs singly, 50-70 cm deep in the soil. Larvae hatch in about 3 weeks. The larval stage lasts about 10 months, with the 4- to 6-month-old larvae being the most destructive. Pupation takes place at a depth of about 50 cm, the prepupal stage is about 10 days and the pupal stage, 22 days.

Observations of *Phyllophaga* sp. in Colombia indicate a one-year cycle, with heaviest damage occurring at the onset of the rainy season. Attacks are often more severe if cassava is planted in lands previously used for pasture or in weedy abandoned fields. High populations can often be detected at the time of land preparation.

Control

Experiments at CIAT for control of grubs has centered around chemical soil applications and biological control. A muscardine fungus *Metarhizium anisopiae* is pathogenic to the grub, and experiments indicate that this may be an effective control method. Nevertheless, field experiments have not proven successful; the major drawback appears to be the method of application.

Successful control of the grubs was obtained with aldrin and carbofuran as a dust or in granular form, applied in the soil below the cutting. Germination with an application of aldrin was 80% and with carbofuran, 73% whereas only 4.4% germination of cuttings was obtained in the control.

Cutworms

Cutworms are a universal pest, attacking many crops. Attacks on cassava have been reported from the Americas (14,16) and Madagascar (18). The three species reported are *Prodenia litura, P. eridania* and *Agrotis ipsilon.*

Damage

Cutworm damage to cassava can be grouped into three categories: (a) Surface cutworms, such as *A. ipsilon* and *P. litura,* chew off plants just above, at, or a short distance below the soil surface, leaving the plant lying on the ground. (b) The climbing cutworms ascend the stem, feeding on buds and foliage. They may also girdle the stem, causing the upper part of the plant to wilt and die. Larvae of the southern armyworm *P. eridania* have been observed causing this type of damage to cassava. (c) The subterranean cutworms remain in the soil where they feed on the roots and underground parts of the stem, resulting in the loss of planting material. The bark and buds of recently planted cuttings may be completely stripped causing a loss in germination. We have observed *A. ipsilon* causing this type of damage at CIAT and nearby farms, where there have been losses as high as 50%, making it necessary to replant.

In experiments at CIAT, cutworm damage was simulated by removing shoots of recently planted cuttings. It was found that plants could recover from this type of damage so there was little or no yield loss. The most severe damage due to cutworms appears to be stem girdling, which can cause plant mortality and damage to cuttings, resulting in a loss in germination.

Control

Cutworm attacks are sporadic but often occur when cassava follows maize or sorghum or is planted adjacent to these crops. Longer cuttings (30 cm) will allow plants to recover from surface cutworm attack. Underground cutworms can be controlled with aldrin or carbofuran around the cuttings; it is, however, difficult to anticipate cutworm attacks and damage is not noted until cuttings fail to germinate. Aboveground attacks can be controlled effectively with poison baits (10 kg of bran or sawdust, 8-10 liters of water, 500 g of sugar or 1 liter of molasses, and 100 g of triclorfon for 0.25-0.5 ha).

Termites

Termites attack cassava mainly in the tropical lowlands, primarily in Africa. We have also observed them causing damage in the Americas and Asia. *Coptotermes voltkowi* and *C. paradoxis* have been identified from Madagascar (18) and *Odontofermes obesus* in India.

Damage

Termites will feed on propagating material, swollen roots or growing plants. Principal damage appears to be loss of propagating material. They attack cassava stems in storage, as well as cuttings after they have been planted, severely affecting plant establishment. Experiments on the North Coast of Colombia resulted in a 46% loss of stored cassava stems due to termite attack. Stems are stored during dry periods for planting at the initiation of the rainy season. Termite attacks will occur to stored material during the dry period and into the rainy season after planting. We have also observed swollen root damage and subsequent root rot caused by termite attack, primarily during dry periods.

Control

Treatment of stems with aldrin, chlordane or carbaryl prior to storage was effective in preventing termite attack.

Pests attacking foliage

Leaf-cutter ants

Several species of leaf-cutter ants (*Atta* spp. and *Acromyrmex* spp.) have been reported feeding on cassava in the Americas, especially in Brazil (9,11,29) and Guyana (4). There have been reports of *Atta* spp. attacking cassava in Africa; however, there is some doubt as to the presence of these ants there (Brown, personal communication).

Damage

Ant outbreaks frequently occur during the dry season in Colombia when normal food sources are limited since cassava is one of the few crops with considerable foliage. Plants can be totally defoliated when large numbers of worker ants move into a crop. A semicircular cut is made in the leaf, and during severe attacks the buds may also be removed. These parts are carried off to the underground nest and chewed into a paste, on which the fungus *Rhozites gongylophora* is grown (3-4). The ant nest is often readily visible by the piles of sand around the entrance hole. Attacks frequently occur during the early months of the crop, but yield losses are not known.

Control

Chlorinated hydrocarbons around the nest (11) or granular Mirex baits applied along the ant trails give effective control (33). Varietal differences to ant attack have also been mentioned (29).

Gall midges

Several species of gall midges (Cecidomyiidae) have been reported on cassava in the Americas (21, 32); *Jatrophobia brasiliensis* appears to be the most widespread (5-7).

Damage

Although gall midges are one of the most frequent pests found in cassava plantations, they are considered of little economic importance and control is usually not required. Reports from Peru and Mexico indicate that 6- to 7-month-old plants were totally deformed, measuring only 20-30 cm high as a result of gall midge attack. A severe attack causes yellowing of leaves, retarding plant growth; roots may become thin and fibrous.

Biology and ecology

Leaf galls on the upper surface are yellowish green to red, narrower at the base and often curved.

Galls are easily noticeable as they contrast against the green leaf surface. Eggs are laid individually by the fragile adults, 4 to 5 per leaf on the leaf undersurface. The emerging larvae cause abnormal cell growth and a gall is formed during the first larval instar. The second and third instars are also passed there. The larval duration is from 15 to 21 days and there is only one larva per gall. (21). Pupation, which occurs in the gall, is from 10-15 days. Prior to pupation, the larva enlarges the exit hole, through which the adult emerges.

Control

Varietal resistance to gall midges has been reported (36). Several larval parasites have been observed (6,30). The collection and destruction of affected leaves at regular intervals has been recommended to reduce pest populations.

Lace bugs

Lace bugs *(Vatiga manihotae)* damage is reported from Brazil (35), Colombia (9) and several other countries in the Americas (37). There are no reports of lace bugs from Africa nor Asia.

Damage

Yield losses due to lace bugs are not known but high populations can cause considerable damage to foliage. Leaves develop yellow spots that eventually turn reddish brown, resembling mite damage. Populations and damage have been increasing on the CIAT farm in recent years. There has been defoliation of lower leaves, but seldom has the whole plant been affected. Lace bugs are often observed as part of an insect complex involving mites, thrips and other pests attacking the plant. Alternate hosts have not been identified.

Biology and ecology

Lace bugs occur in high populations during the dry season and may attack the plant during any part of its growth cycle; however, populations at CIAT were highest during the first three months of plant growth (14). The gray adults, about 3 mm long, are generally found on the undersurface of the upper leaves. The whitish nymphs are smaller and prefer feeding on the central part of the plant (12). Laboratory studies at CIAT show five nymphal instars of 2.9, 2.6, 2.9, 3.3 and 4.8 days, respectively (totaling 16.5 days). Females deposit an average of 61 eggs; the egg stage is about 8 days. Adult longevity averages about 50 days.

Control

No control methods have been developed. but a germplasm screening program for varietal resistance has been initiated. It is suspected that this pest may become more important economically as new, efficent, high-yielding varieties are grown.

Stemborers

Numerous insect species have been reported feeding on and damaging stems and branches of cassava plants (2). They are mainly found in the Americas, especially Brazil (28) but have also been reported from Africa (23) and Asia (34). The most important stemborers belong to the orders Coleoptera and Lepidoptera. They appear to be highly host specific and few are reported to feed on alternate hosts. Approximately 17 species have been identified as successfully feeding on cassava; others reported attacking cassava appear to be only occasional feeders. Two species, *Megasoma elephas* and *Syllepta gordialis* have been observed feeding on swollen roots in Venezuela (20; Bellotti, personal observation). Seven species of *Coelosternus* are reported attacking cassava in the Americas (8-11, 19, 25, 27) and *Coelosternus manihoti* is reported as a pest in Africa (8). Only *Lagochirus* sp. is reported from Indonesia (34), and several lepidopteran and coleopteran stemborers are reported from Africa (24). Dissemination of stemborers was probably through infested planting material.

Damage

Larvae of the *Coelosternus* weevils and the *Lagochirus* long-horned beetles cause similar damage by penetrating the cassava stem and tunneling into the center or pith region. This weakens the plant, and stems and branches may eventually dry and break. Larvae of *C. sulcolutus* have been observed feeding on underground parts of the stem, but they have never been found attacking roots. Stemborers are suspected of reducing root production, but there is no sound data confirming this. We have observed stemborer-

infested planting material that had rotted and failed to germinate. Frass and exudate from stem wood, ejected from burrows by feeding larvae, can be found on infested branches or on the ground below the plants. Adults may feed on the tips of young shoots or stems, which may retard growth (28).

Biology and ecology

Female *Coelosternus* may oviposit on various parts of the cassava plant, but they prefer the tender parts (15) Oviposition is made by the proboscis near broken or cut ends of branches or beneath the bark in cavities. Adults of *Lagochirus* beetles also oviposit in stems and branches, and eggs hatch in 5 to 6 days. The full-grown larvae of *Coelosternus* vary in size, depending upon the species, but can range from 9 mm *(C. tarpides)* to 16 mm *(C. alterans)* in length. Most larvae are curved, with a yellowish white to pale brown body, a reddish brown head capsule, and black mandibles. There may be one to several larvae in each stem depending upon the species. The larval period ranges from 30 to 60 days. The larval development period for *Lagochirus* is about 2 months and larvae measure up to 29 mm. They feed mainly at the base of the plant and many can be found in one plant. Pupation for both genera takes place in pupal chambers usually within the pith region of the stem and lasts about one month.

Adult *Coelosternus* range in length from 6 to 12 mm, depending upon species and are light to dark brown in color and may be almost completely covered with yellowish scales. Adult *Lagochirus* are rapid nocturnal fliers, brown in color, about 17 mm long, and feed on leaves and bark. Both genera are active throughout the year.

Control

Since adult stemborers are difficult to kill and larvae feed within the stems, pesticidal control is impractical. Resistance to *Coelosternus* spp. has been reported (31) Cultural practices that will reduce borer populations include removal and burning of infested plant parts (28) Only uninfested and undamaged cutting should be used for propagation.

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