

Insects Associated with Firebush (*Myrica faya* Aiton)

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INTRODUCTION

Firebush, *Myrica faya* Aiton (family Myricaceae), is a small tree native to the Azores, Madeira, and Canary Islands. Introduced into Hawaii before 1900, it has become a serious pest on range lands, especially on the islands of Hawaii and Maui. This paper briefly records investigations on insects attacking *Myrica faya* and other species of *Myrica* during the past several years, and the introduction into Hawaii of several species.

Myrica faya is abundant in the mountains of the Azores, Madeira, and the Canary Islands. Many years ago it was taken to continental Portugal and many trees can be seen in areas planted to pine trees in the sandy country near the coast south of Figueira da Foz. In Madeira it is called *faia* and in Portugal, *samouco* or *faia das ilhas*.

In Madeira and the Canaries, male flowers were abundant in June 1962 but were beginning to dry up early in July. A few small fruits were noted in June, and in July there were many green fruits and some beginning to show a little purple. During September most of the fruits were still green but there were many ripening and ripe ones. In November 1960 at Ribeiro Frio I saw many ripe fruit on the trees but most had already fallen. All stages of fruits were seen on trees in the Azores in September 1962. *Myrica conifera*, a South African species, was seen growing with *M. faya* at Furnas, Sao Miguel, Azores.

F. A. Bianchi, Entomologist of the Hawaiian Sugar Planters' Association Experiment Station, worked on *Myrica faya* insects in Portugal, the Azores, Madeira, and Canary Islands in March–August 1955, in a cooperative project of the Hawaii Board of Agriculture and Forestry (now Department of Agriculture) and the HSPA Experiment Station. He sent five shipments of weevils and small caterpillars which attack the flowers and fruits to Hawaii from Madeira during the period June–August, but propagation of these was not successful.

Most of my investigations were carried on at Ribeiro Frio and other localities on Madeira, at Las Mercedes and Los Silos forests on Tenerife, Canary Islands and on Santa Maria and Sao Miguel Islands in the Azores. Insects on other species of *Myrica* were studied in the southeastern United States, Oregon, Mexico, Costa Rica and South, Central and East Africa. Selected insects were sent to Hawaii by air and the propagation, testing in a quarantine insectary, and release of approved species was carried on by members of the staff of the

Entomology Branch, State Department of Agriculture. Among the persons who aided me in this project I would like to mention especially Francisco Azevedo e Silva, Entomologist, Dirrecao-Geral dos Servicos Florestais e Aquicolas, Lisbon, Portugal; Rui Vieira, Entomologist, Estacao Agraria, Junta Geral, Funchal, Madeira; G. E. Maul, Director, Museu Minicipal, Funchal; Miguel Montes de Oca, Entomologist, Jefatura Agronomica, Santa Cruz, Tenerife, Canary Is.; Jose Ma. Fernandez and Manuel Morales Martin, amateur entomologists of Santa Cruz, Tenerife; Jaime O'Shanahan Bravo de Laguna, amateur botanist, Las Palmas, Gran Canaria, Canary Is.; Dale H. Habeck, Department of Entomology, Florida Agricultural Experiment Station; and Howard V. Weems, Jr., Division of Plant Industry, Florida Department of Agriculture. Insects were identified by the Entomology Research Division, U.S. Department of Agriculture and Commonwealth Institute of Entomology, London; fungi by the National Fungus Collections, U.S. Department of Agriculture and Commonwealth Mycological Institute, Kew; and plants by the National Herbarium, U.S. National Museum, and the Royal Botanic Gardens, Kew, England.

INSECTS SENT TO HAWAII

Of the several species of insects sent to Hawaii, only one moth, *Strepsicrates smithiana* (Walsingham), was released and has become established.

Strepsicrates smithiana (Olethreutidae). These small brownish caterpillars were found widespread and common, webbing and feeding on leaves and berries of wax myrtle or southern bayberry (*Myrica cerifera* L.) in Florida and coastal Georgia and South Carolina. The ichneumonid *Cremastus minor* Cushman was bred from larvae found at St. Simons Island, Georgia in October 1955. During September–November 1955 several lots of the larvae were sent to Honolulu from Orange Lake, Orlando and near Whitney, Florida and St. Simons Island, Georgia, and in June 1956, an additional lot from near Leesburg, Florida. The first release of this insect was made at Kukaiau Ranch, Hawaii in July 1956. It was found established on Hawaii in 1960 and, though now found in good numbers on *M. cerifera*, is not very effective. What was probably the same species was seen webbing leaves of *M. cerifera* at Grand Isle, Louisiana and Gulfport, Mississippi in June 1956; one lot was sent to Honolulu from Grand Isle.

Similar leaf-webbing caterpillars were observed on *M. californica* at Charleston and Brookings, Oregon in June 1963, and one lot was sent to Honolulu. Two lots of similar larvae, seen on *Myrica* sp. near Cartago, Costa Rica in November 1959 were sent to Honolulu; others were seen near Stanley Field Airport, British Honduras in August–September 1959; the British Honduras ones were parasitized by the braconid *Orgilus* sp.

Other small leaf-webbing caterpillars were observed on *M. microbracteata* near Chapungu Falls, Southern Rhodesia in March 1957 (two lots sent to Honolulu); on *Myrica* sp. in Imbeza Valley, near Penhalonga, S.R., March–April 1957 (one lot sent to Honolulu); on *Myrica* sp. probably *salicifolia*, on the Zomba Plateau, Nyasaland, April 1957 (one lot to Honolulu); on *M. conifera* near Salisbury, S.R., March 1957 (adults were blackish moths about 9 mm. long); and on *Myrica* sp., probably *pilulifera*, in the Vumba Mountains, near Leopard

Rock, S.R., March 1959. They were rather scarce in these places. Propagation of these in Honolulu was not successful.

Carposina sp. possibly *atlanticella* Rebel (Carposinidae). These small caterpillars were found boring into the green fruits and eating the seeds of *M. faya* at Ribeiro Frio, Madeira, July–September 1962. Extruded frass could be seen in the fruit clusters. The caterpillars were scarce. Twenty-one lots of infested fruits were sent to Honolulu but the stock died out. Ichneumonid parasites, *Diadegma* sp., were bred from infested fruits in July and August.

Gymnoscelis pumilata insulariata Stainton (Geometridae). Small caterpillars feeding on male flowers of *M. faya* on Madeira and Tenerife, May–July 1952; very scarce. Several lots of the caterpillars were sent to Honolulu but they could not be propagated. Larvae were also found feeding on flowers of the Mexican composite *Eupatorium adenophorum* at Monte, Madeira in June 1962.

Loopers (Geometridae). Three species of loopers were found feeding in small numbers on leaves of *M. faya* on Madeira and the Canaries, May–September 1962: *Cleora fortunata* Blachier on Madeira and Tenerife, *Cosymbia maderensis trilineata* Pronl on Tenerife and *Episauris killiani* Rebel on Tenerife. On Tenerife the following parasites were bred from loopers collected on this plant: *Elpe inepta* (Meigen) (Tachinidae), *Apanteles* sp. and *Zelee* sp. (Braconidae) and ?*Campoplex* sp. (Ichneumonidae). Several lots of the loopers were sent to Hawaii but propagation proved difficult. Loopers from Santa Maria and Sao Miguel in the Azores were also forwarded.

In June 1956 undetermined loopers feeding on *M. cerifera* leaves at Gulfport, Mississippi, and in August–November 1963 several lots collected in Florida localities were sent to Honolulu. The Florida ones are currently under study in our quarantine facilities on the island of Maui. A few loopers were found feeding on leaves of *Myrica* sp. at Jalapa, Ver., Mexico in November–December 1963.

Lepidopterous leaf miners. Two species of graciariid moth leaf miners, *Gracilaria* sp., possibly *laurifoliella* Hering and *Lithocolletis* sp., were found in small numbers in leaves of *M. faya* at Ribeiro Frio, Madeira in July 1962. Adults of the braconid *Apanteles* sp. and the eulophid *Epilampsis gemma* (Walker) were bred from the mines. Several lots of mined leaves were sent to Honolulu but the moths could not be propagated.

Undetermined caterpillars. These were observed forming galls on branches of *Myrica* sp. probably *pilulifera* in the Imbeza Valley and near Leopard Rock, Southern Rhodesia in March 1957, on *M. conifera* near Salisbury, Southern Rhodesia, also in March, and on *M.* sp. probably *salicifolia* on the Zomba Plateau, Nyasaland in April 1957. The branches beyond the galls were stunted and sometimes dead. Several lots were sent to Honolulu but the insect was not propagated. The perilampid parasite *Perilampus* sp. was reared from a gall on *Myrica* sp., probably *pilulifera* at Imbeza Valley, Southern Rhodesia in March 1957.

OTHER INSECTS ON MYRICA SPP.

THYSANOPTERA

Thripidae

Heliothrips haemorrhoidalis (Bouché). Funchal, Madeira, Nov. 1960, on leaves of *M. faya*.

HEMIPTERA

Lygaeidae

Ischnorhynchus ericae var. *truncatulus* Walker. Riberio Frio, Madeira, Nov. 1960, on leaves of *M. faya*.

Nysius contiguus Walker. Chao das Faias, Madeira, Nov. 1960, on leaf of *M. faya*.

Scolopostethus sp.? Las Mercedes Forest, Tenerife, Canary Is., May 1962, on trunk of *M. faya*.

Miridae

Lygus insularis Reuter. Las Mercedes Forest, Tenerife, May 1962, on *M. faya*.

Lygus sp.? Near Moya, Gran Canaria, Canary Is., May 1962, on *M. faya*.

Orthotylus viburni Lindberg. Las Mercedes Forest, Tenerife, May 1962, on *M. faya*.

Pentatomidae

Brochymena arborea (Say). Clearwater, Florida, Oct. 1963, on *M. cerifera*.

Diolcus chrysoorrhoeus (Fabricius). Sullivans Island, South Carolina, Sept. 1963, on *M. cerifera*.

HOMOPTERA

Acanaloniidae

Acanalonia latifrons (Walker). Gulfport, Mississippi, June 1956, on branches of *M. cerifera*.

Aleyrodidae

Aleurotrachelus sp. Salisbury, Southern Rhodesia, March 1957, on leaves of *M. cerifera*.

Aphididae

Rhopalosiphum sp. 1 km. southwest of Apostica, Portugal, April 1962, on *M. gale*.

Toxoptera aurantii (Boyer de Fonscolombe). Salisbury, Southern Rhodesia, March 1957, on leaves *M. conifra*.

Cercopidae.

Philaenus angustipennis Horvath. Las Mercedes Forest, Tenerife, May 1962, on *M. faya*.

Cicadellidae

Homalodisca triquetra (Fabr.). Gulfport, Miss., June 1956, on branches *M. cerifera*.

Penthimia irrorata Horvath. Las Mercedes Forest, Tenerife, May 1962, on *M. faya*.

Coccidae

Larval stage male coccids only, possibly *Pulvinaria jacksoni* Newstead or something close to this. Imbeza Valley, Southern Rhodesia, March 1957, on leaves of *M. sp.*, probably *pilulifera*.

Saissetia nigra (Nietner). Salisbury, Southern Rhodesia, March 1957, on leaves of *M. conifra*.

Saissetia oleae (Bernard). Ursa National Forest, Portugal, July 1960, on leaves and branches of *M. faya*.

Diaspididae

Chrysomphalus diversicolor Green. Funchal, Madeira, Nov. 1960, on *M. faya* leaves.

Margarodidae

Icerya purchasi Maskell. Mata Sao Jacinto, Portugal, July 1960, on *M. faya* branches.

Pseudococcidae

Pseudococcus cimensis Green. Ribeiro Frio, Madeira, June and July 1962, on *M. faya* twigs.

Pseudococcus obscurus Essig. Kokee, Kauai, Hawaii, March 9, 1963, on *M. faya* flowers (Det. J. W. Beardsley).

Flatidae

Metcalfa pruinosa (Say). Gulfport, Miss., June 1956, on *M. cerifera* branch.

Issidae

Issus canariensis Melichar. Ribeiro Frio, Madeira, Nov. 1960, on *M. faya*.

Membracidae

Bolbonota inaequalis Fairmaire? Near Cartago, Costa Rica, Nov. 1959, nymphs and adults on *Myrica* sp. branches.

Platycotis tuberculatus (Fairmaire). Near Catago, Costa Rica, Nov. 1959, on *Myrica* sp. branches.

Psyllidae

? Genus and species. Salisbury, S. Rhodesia, March 1957, on *M. conifera* leaves.

Undetermined yellowish species. Summerstrand, Port Elizabeth, South Africa, Feb. 1957, forming galls on *M. quercifolia* leaves. Near Salisbury, S. Rhodesia, March 1957, forming galls on *M. conifera* leaves.

LEPIDOPTERA

Arctiidae

? *Hyphantria cunea* (Drury). Hampton, Florida, Sept. 1963, caterpillars forming tent web over leaves of *M. conifera* on which they fed.

Cosmopterygidae

Pyroderces sp. Ribeiro Frio, Madeira, Sept. 1962, ex *M. faya* fruits.

Geometridae

Anacamptodes defectaria (Guenée). Orange Lake, Fla., Sept. 1955, brown looper feeding on *M. cerifera* leaves.

Limacodidae

Species of Limacodidae. Sumter County, near Whitney, Fla., Nov. 1955, larvae feeding on *M. cerifera* leaves.

Megalopygidae

Megalopyge sp. Sumter Co., near Whitney, Fla., Nov. 1955, larva feeding on *M. cerifera* leaves.

Psychidae

Undetermined species. Savannah Beach, Georgia, Oct. 1955, Larvae feeding on *M. cerifera* leaves.

Tortricidae

Clepsis retiferana (Stainton). The lightly spotted greenish caterpillars, about 15 mm. long, were found webbing leaves of *M. faya* at Ribeiro Frio, Chao das Faias, Queimadas and Encumeada, Madeira in 1960 and 1962, more numerous in fall months. Caterpillars were also on three other plants at Ribeiro Frio—Pau Branco (*Notelea excelsa*), Folhado (*Clethra arborea*) and Uveira (*Vaccinium maderensis*), and parasitized by the ichneumonid *Campoplex* sp.; carabids *Diomus insularis* Wollaston, and dermapteron *Anechura schmitzi* (Borelli) were noted between the webbed leaves.

Tortrix sp. Las Mercedes Forest, Tenerife, May 1962, green caterpillars webbing *M. faya* leaves.

Undetermined family

? sp. Near Cartago, Costa Rica, Nov. 1959, gregarious brown larvae feeding on *Myrica* sp. leaves.

COLEOPTERA

Chrysomelidae

Colaspis favosa (Say). Gulfport, Miss., June 1956, green adults feeding on *M. cerifera* leaves.

Curculionidae

Apion spp. Adults making small pin-hole feeding punctures on *M. faya* leaves on Madeira and the Canary Is.

Atlantis laemellipes Wollaston. Chao das Faias, Madeira, Nov. 1960, on *M. faya* leaf.

Atlantis noctivagens Wollaston. Ribeiro Frio, Madeira, Nov. 1960, June 1962, feeding on *M. faya* leaves.

Auletes (*Parauletes* sp.). Ribeiro Frio, Madeira, Nov. 1962, ex *M. faya* seed material.

Auletobius maderensis Wollaston. Ribeiro Frio and Chao das Faias, Madeira, Nov. 1960, tiny reddish-brown weevils on *M. faya* leaves.

Brachyderes evidently *lusitanicus* (Fabr.). Ursa National Forest, Portugal, July 1960, on *M. faya* leaves (fed on the leaves in the laboratory).

Brachyrhinus sp. Ribeiro Frio, Madeira, Nov. 1960, on leaves *M. faya*. Los Silos Forest, Tenerife, Canary Is., May 1962, on leaves *M. faya* (fed on leaves in the laboratory).

Mordellidae

Anaspis sp. Ribeiro Frio, Madeira, July 1962, on *M. faya* flowers.

FUNGI AND OTHER ORGANISMS ON MYRICA SPP.

A wilting of the leaves and dieback of the twigs, very common on *Myrica faya* on Madeira and the Canary Islands, was caused by the fungus *Ramularia destructiva* Phillips and Plowright identified by X. Deighton of the Commonwealth Mycological Institute. This fungus was also identified in a grayish growth on occasional fruits in clusters of green fruit from Ribeiro Frio, Madeira, August 1962. The fungus *Pestalotia algeriensis* (Sacc. and Berl.) was identified by Mr. Deighton in wilted leaves and dieback material from Las Mercedes Forest, Tenerife, May 1962.

Fungus in dieback material on *Myrica conifera* at Furnas, Sao Miguel, Azores, September 1962 was identified at the National Fungus Collections, U.S. Department of Agriculture as *Cercospora* sp. "The conidia resemble *C. penicillum* but the conidiophores are much reduced and therefore this may be an undescribed species."

A *Cercospora* was found in leaf spots on *M. conifera* near Salisbury, Southern Rhodesia in March 1957. The fungus *Pseudothitis* sp., probably *P. pterocarpi* Syd., was identified by X. Booth of the C.M.I. in leafspot material on *Myrica* sp., probably *salicifolia* from the Zomba Plateau, Nyasaland, April 1957.

Large blackened knots or galls are common on branches of *Myrica faya* in Madeira, the Canary Islands and Azores. These may be caused by mites. Several

species of bacteria, including what is probably a species of *xanthomonas* (det. Pirozynski, C.M.I.), were found in gall specimens from Ribeiro Frio, Madeira, August 1962.

Witch's broom growths were found on branches of *Myrica* sp., probably *salicifolia*, on the Zomba Plateau, Nyasaland in April 1957, and on *M. salicifolia* at Lushoto and the nearby Mkusu Forest Reserve, Tanganyika in May 1957.

Chlorosis was noted on leaves of *M. faya* in Madeira, the Canaries, and Azores.