Confirm diagnosis with laboratory assay
To confirm the presence of the Kona coffee root-knot nematode, collect a soil and root sample and send it for nematode assay and identification to CTAHR’s Agricultural Diagnostic Service Center (ADSC) via the CTAHR Cooperative Extension Service (CES) office in your area.

Taking a soil and root sample for assay
With a shovel, pick, ‘ō‘ō, or soil-coring device, sample the zone of soil where the coffee roots are found. To diagnose a suspected infection, sample two or three spots at the leaf canopy drip line of each of several trees that are showing symptoms, preferably early symptoms (yellow leaves, stunted trees). To assay infestation of nematodes in a field, take samples from about 20 spots. The samples should include roots.

Mix the subsamples together, and take about a pint of this mixture for the assay. Quickly put this sample in a plastic bag and keep it in an insulated cooler. Label the sample with your name, field identification number, date, and any other information that will be useful. Check with your local CES office to find out the best time to bring in a sample for prompt shipping to ADSC.

Sanitize. Remove all volunteer coffee seedlings (pulapula) and weed hosts of the nematode.

Nematicides. No nematicide is currently registered for use in coffee. Research indicates that nematicides are relatively ineffective in older coffee plantings. Because nematicides are expensive and highly toxic, other options for nematode management are preferable. Also, registration is an expensive process, and agrochemical companies are not likely to see much profit potential in pursuing approval of a product for use in coffee in Hawaii.

Seek expert advice. Contact your nearest CTAHR Cooperative Extension Service office.

Prevention and avoidance
- Don’t transplant volunteer coffee seedlings.
- Don’t plant coffee seeds in untreated soil; use only sterilized soil for potting.
- Remove pulapula from around coffee trees (they harbor many nematodes in their roots).
- Avoid moving farm machinery from infested to noninfested fields.
- Don’t irrigate indiscriminately. Excess soil moisture favors root rot in nematode-infected roots. Time irrigation according to the crop’s needs.
- Eliminate other host plants of the Kona coffee root-knot nematode, such as hilograss and amaranth (pulapula).
- Minimize soil erosion and runoff.

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Coffee Decline
Caused by the Kona Coffee Root-Knot Nematode

Coffee growers in Hawaii are able to grow their crop free from many of the world’s most serious coffee diseases because our islands are isolated from other coffee-growing areas and the diseases have yet to be introduced here. However, during the past several years a serious disease has been observed in the Kona region of the island of Hawaii. This disease has been referred to in Kona as “transplanting decline,” “replant problem,” “nutritional stress,” and “Kona wilt.” It is characterized in coffee plantations by the occurrence of individual or clustered poorly growing or stunted coffee trees.

Why would coffee trees grow poorly or be discolored? The reason in this case is attack by small, plant-parasitic roundworms known as nematodes, which enter the plant’s roots and cause serious plant damage and crop loss. Other factors that can worsen decline include nutritional deficiency or toxicity, moisture stress, herbicide damage, and attack by insect pests or plant diseases caused by bacteria, fungi, or viruses.

Nematode entry and feeding within roots disrupts plant growth processes and causes growth decline, so infection by them is considered a plant disease. Their damage also can allow secondary infection when other disease-causing organisms enter. Coffee trees with nematode-damaged roots grow weakly and slowly, suffer moisture stress more readily, often turn yellow, and eventually die.

The nematode causing the coffee plant decline in Kona has been named Meloidogyne konaensis, the Kona coffee root-knot nematode.

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Combined strategies are needed for nematode management. Following are recommendations from CTAHR researchers for managing coffee decline.

**Control and recovery**

**Fallow.** Fallowing means maintaining a field entirely free of any plants. A 6–9-month fallow period will reduce nematode numbers greatly; however, some will survive.

**Replanting.** Some farms may require extensive replanting, which should be done after a fallow or a rotation with a crop that is a confirmed non-host of the Kona coffee root-knot nematode. When replanting coffee, use only vigorous, nematode-free transplants at least one year old.

**Replant with trees grafted onto tolerant rootstock.** Graft coffee scions onto a nematode-tolerant rootstock known as *Coffea dewevrei*.

**Organic soil amendments.** Adding large quantities of organic amendments such as animal manure to the soil has been found to stimulate growth of soil organisms that may compete with and suppress nematodes. This technique has not yet been verified on coffee in Hawaii. Use of coffee cherry pulp as a soil amendment is being evaluated.

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**Coffee decline caused by the Kona coffee root-knot nematode**

**The Kona coffee root-knot nematode** is a microscopic round-worm that lives, feeds, and reproduces in plant roots. It infects coffee, many vegetables, and some weeds. It has been detected on coffee at 600–1800 ft elevation and to our knowledge is restricted to the Kona region at present.

**How to diagnose coffee decline**

The only sure method is lab assay of the soil, but you can look for these symptoms in the field:

**Above ground**

*Early symptoms*
- leaves drooping and yellowed
- trees small, stunted, with thin trunks

*Later symptoms*
- wilting despite adequate nutrition and irrigation
- leaf loss (defoliation)
- wobbly trees, easily uprooted

**Below ground**

- root system small
- roots rotting or dead
- feeder roots scarce
- taproot and root tips with slight to large swellings (galls)
- root texture corky

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*Infected roots*  
A healthy root system has many fine, white feeder roots.

*Dead tree*

Nematode-infected coffee trees with good crops can decline rapidly (2–3 months). A heavy crop makes demands on the tree, causing stress that may hasten the decline.

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*Swollen roots*

with corky texture, few feeder roots

*Swollen taproot*

oversized with corkiness

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Drooping leaves, thin foliage  
This stunted 3-year-old plant with a poor crop also shows leaf yellowing (chlorosis).

Yellow leaves  
Nematode-infected coffee trees with good crops can decline rapidly (2–3 months). A heavy crop makes demands on the tree, causing stress that may hasten the decline.

Dead tree  
Nematode-infected coffee trees with good crops can decline rapidly (2–3 months). A heavy crop makes demands on the tree, causing stress that may hasten the decline.

**Continued on back panel**