Cooperative Extension Service
College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Edition Update
Jan. 2004

Growing Coffee in Hawaii
Modifications in the Revised Edition

Growing Coffee in Hawaii (1999), by H. C. Bittenbender and V. E. Smith, was reprinted in January, 2004, with some corrections and updates. The following sections were modified for the revised edition.

Sources *(p. 2)*

Sudax (variety Dekalb-Pfizer Genetics SX-17+): Hikiloa Co-op, PO Box 231, Hoolehua, HI 96729; 808-567-6774; fax 808-567-6660.

ZipSets (paper planting containers for raising seedlings): Monarch Manufacturing, Inc., 13154 County Road 140, Salida, CO 81201; <www.monarchmfginc.com>.

Spin Out® (root growth regulator for plastic or paper planting containers for raising seedlings): United Horticultural Supply/UAP Pacific, Hilo, HI; 808-935-7191; <www.nurserysupplies.com>.

Vegetable grafting clips: Fukuda Seed Store, 528 Kaaahi St., Honolulu, HI 96817; 808-841-6719.

Tractor-mounted rotary saw for stumping trees in mechanical pruning systems: TOL® pruner (TOL Inc., Tulare, CA).

Coffee harvester currently in most frequent use in mechanically harvested coffee in Hawaii: Korvan Inc., 270 Birch Bay Lynden Road, Lynden, WA 98264; 360-354-1500; <www.korvan.com>.

Hand-held air-powered harvest aid: The Spidy®. The New Farmer, 17655 Panama Ave. S, Prior Lake, MN 55372; fax 612-440-6624; <kumamn@aol.com>.

Hawaii's coffee industry today *(p. 3, 1st paragraph)*

Hawaii's coffee industry is one of the most diverse and dynamic in the world. The current technologies and production practices span a range of producers from 1-acre, certified organic, rainfed farms to 4000-acre, totally mechanized, irrigated plantations. Even the forests, and long-abandoned coffee farms on most of the inhabited Hawaiian islands, yield harvests of feral coffee sown in the droppings of birds and pigs. Hawaii's coffee production grew in recent years from under 2 million pounds of green coffee bean in 1992 to 7 million pounds in 2003, with a farm-gate value of $23.5 million. Hawaii's coffee roasting industry also ranges widely, from home roasters to "boutique" labels to full-scale industrial roast-and-grind marketers. The retail value of the blended portion of our roasting industry (roasted beans plus beverage sales) was valued at $117 million in 2002. The coffees grown include a hybrid of 'Mokka', one of the most primitive landraces from Africa; 'Guatemalan' (also called "Kona typica"), an early 19th century Central American land race of *Coffea arabica* "typica"; and some of the most modern semidwarf cultivars from Brazil, including both 'Red Catuai' and 'Yellow Catuai'.

Coffee nematode decline caused by the Kona coffee root-knot nematode *(pp. 23–24)*

A serious disease of coffee has occurred in the Kona region in recent years, characterized by the occurrence of individual or clustered, poorly growing or stunted coffee trees. Initially, it was referred to as "transplanting decline," "replant problem," "nutritional stress," and "Kona wilt." CTAHR plant pathologists have determined that it is caused by a new species of root-knot nematode, named *Meloidogyne konaensis*. Nematode entry and feeding within roots disrupts plant growth processes and causes growth decline, so infection by them is considered a plant disease (see Schmitt 1996, Serracin et al. 1999). Root-knot nematodes are the most harmful of the extremely small, parasitic roundworms known as nema-

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todes, although the burrowing nematode, which is also found in Kona, is also a pest of coffee.

Root-knot nematodes have been a misunderstood problem on coffee in Kona for many years. Coffee trees have died at CTAHR's Kona Research Station and on some farms. At the station, in the infested area, CTAHR researchers assessed four rootstocks and two cultivars of coffee for performance in the presence of root-knot nematodes. It was determined in 1991 that the nematode on the station was a new species. Subsequent surveys revealed that at least four farms in the Kona area were infested with this new species. The nematode was described and named in 1994.

Experimental evidence proved that the Kona coffee root-knot nematode is damaging to the 'Guatemalan' variety. It was calculated that the damage threshold is about 1.5 nematode eggs per 250 cm^3 (approximately 1 cup) soil. At the level of 150 eggs, 20–40 percent of the roots were galled and up to 44 percent of the roots were rotted.

Tolerant rootstocks are a promising means of nematode control. In a field infested with the Kona coffee root-knot nematode at the Kona Research Station, most rootstocks tested (including *C. arabica* var. *purpurascens*, *C. congensis*, *C. liberica* var. *dewevrei*, and *C. kaffe*) suppressed populations of the nematode better than the susceptible 'Guatemalan' cultivar. The *dewevrei* selection was especially effective in reducing the nematode population and has been named Fukunaga and released by UH-CTAHR (see Bittenbender et al. 2001). The grafted trees grew vigorously, and the rootstock had no detectable effect on cupping quality. In a subsequent experiment in which yields were collected, the grafted treatment yielded about 10 times more than seedling 'Guatemalan' in the nematode-infested orchard.

Limited amounts of Fukunaga seeds are available to growers or nurseries for growing mother trees to produce seeds for rootstocks, although buying grafted plants is recommended. The grafting procedure is fairly simple but tedious because the plants are grafted at a very young age. The rootstock seeds are planted 2–3 weeks before the scion seeds. The best time to graft is after the rootstock seedlings and scion seedlings have germinated and before or just after the cotyledon leaves emerge from the parchment coat. A Fukunaga seedling is cut in half with a razor blade, and the stem is split less than ¼ inch (5 mm) to make a cleft to receive the scion. A 'Guatemalan' seedling is the scion, which becomes the top of the new grafted plant. It is cut in half, and the razor blade is used to make two angled cuts to form a wedge at the bottom of the stem. This wedge is then gently pushed into the cleft in the top of the Fukunaga seedling, so they fit together. The two parts of the new plant are held in place with vegetable grafting clips (see Sources, p. 2) for a few weeks until the graft union has formed. After grafting, the seedling flat should be covered with clear plastic to prevent drying and kept out of direct sun. Once the grafted plants begin to grow, they can be planted in plastic or paper sleeves like any other seedling to grow until they are ready for transplanting into the field. More information on this topic is available from CTAHR as a video (Bittenbender 2002) and a document (Nelson et al. 2002).

Commercially available nematicides do not significantly help recovery of nematode-infected or declining coffee trees, they are expensive, and they are not registered for use on coffee in Hawaii. Nemacur®, a nematicide, was evaluated by CTAHR nematologists. It was applied bimonthly at 0.5 pounds a.i./acre for two years on trees damaged by the Kona coffee root-knot nematode. The nematicide treatments gave little or no improvement in yield. Other nematicides based on organic products such as fungi or plant products (e.g., sesame) are becoming available. These products have not been tested on coffee and probably require a lengthy period of use before good nematode control is realized, if at all.

CTAHR's Agricultural Diagnostic Service Center assays soil for nematodes and identifies them, for a fee. If nematodes are present, consider the full range of management options. These options include the use of grafted plants on Fukunaga rootstock, which is tolerant of nematodes; weed control; nutrition and water management; organic soil amendments; growing coffee under shade; etc. (see Serracin et al. 1999).

Fertilizer schedule for coffee farms in Kona *(p. 15)*

All amounts are in pounds / acre / year and assume adequate rainfall or irrigation. Do not apply in two consecutive months unless there has been rain or the field is irrigated.

Farms above 1500 ft
minimum amount per year = 270 N, 100 P_2O_5, 400 K_2O

January	0
February	500 CC* or 360 CS
March	0
April	500 CC or 360 CS
May	0
June	500 CC or 360 CS
July	0
August	200 AP or AS or 100 urea
(This is important to avoid overbearing dieback.)	
September	0
November or December	500 CC or 360 CS
(Apply once during this period to avoid overbearing dieback.)	

Farms below 1500 ft (sunny areas)
minimum amount per year = 300 N, 100 P_2O_5, 400 K_2O

January	0
February	500 CC or 360 CS
March	0
April	500 CC or 360 CS
May	500 CC or 360 CS
June	300 AP or AS, or 150 urea
(This is important to avoid overbearing dieback.)	
July	0
August	300 AP or AS, or 150 urea
(This is important to avoid overbearing dieback.)	
September	0
October	0
November	0
December	500 CC or 360 CS

*Key to fertilizer types: CC = 10–5–20 fertilizer, sometimes called Coffee Cherry®, a product formulated for coffee; CS = 14–7–28 fertilizer, sometimes called Coffee Super®, a product formulated for coffee; AP = ammonium phosphate; AS = ammonium sulfate

Grading
(p. 39, 3rd paragraph of section replaced)*

In Hawaii, green coffee is separated by state administrative rules into six grades and five geographic regions: Hawaii (state of Hawaii), Kauai (island), Kona (North and South Kona districts on the island of Hawaii), Maui (island), and Molokai (island). The grades are Extra Fancy (screen size 19), Fancy (screen size 18), No. 1 (screen size 16), Select (any screen size), Prime (any screen size), and Hawaii No. 3 (any screen size). The screen sizes are in 64ths of an inch and apply to "Type I" beans that do not pass through round holes of the specified sizes; "Type II" beans (peaberry) have different size requirements.

Hawaii's grading is based not only on size but on cleanliness, defects, moisture content, color, roasting quality, and aroma and flavor when brewed. Green coffee graded No. 3, regardless of origin, may only be labeled Hawaii No. 3 coffee. Off-grade green coffee may be exported but must labeled OFF-GRADE COFFEE. Grading and certification of green coffee is conducted for a fee by officers of the Hawaii Department of Agriculture, Commodities Branch, P.O. Box 22159, Honolulu, HI 96823, telephone (808) 973-9566, fax (808) 973-9565. For the most recent standards and rules, contact the Commodities Branch or see the Web site <http://www.hawaiiag.org/hdoa/qad_comm.htm> and refer to Chapter 4-143, Standards for Coffee.

Additions to Selected References *(p. 40)*

Bittenbender, H.C., and D. Hamasaki. 2002. The case of the nematode nemesis. Univ. of Hawaii, CTAHR, video series 157. 59 min.

Bittenbender, H.C., D.P. Schmidt, M. Serracin, and C.G. Cavaletto. 2001. Fukunaga, a coffee rootstock resistant to the Kona coffee root-knot nematode. Univ. of Hawaii, CTAHR, publication NPH-6.

Nelson, S., D. Schmitt, and V.E. Smith. 2002. Managing coffee nematode decline. University of Hawaii, CTAHR publication PD-23.

*The first two sentences as given here are as modified by an erratum to the revised edition.