



Figure 1. A) Travel group, L-R: M.C. Pretorius, Antonio Vicent, Megan Dewdney and Pete Timmer. B) Our host Collison Brentu

Citrus production and diseases in **GHANA**

By Megan Dewdney
and L.W. (Pete) Timmer

The Florida citrus industry is currently struggling with canker and HLB, but there are other diseases around the world that may cause further concern. With all the traffic and movement of people worldwide to Florida, the risk of introducing new diseases and pests is high. To avoid further problems, we need to protect the industry by developing methods and approaches to prevent introduction and allow for early detection of these diseases if introduced. One of the ways to do this is to learn about the diseases where they are endemic so that they can be rapidly recognized if introduced and effective strategies can be developed to eradicate the diseases.

We (authors Dewdney and Timmer) traveled to Ghana in late September. We were accompanied by Antonio Vicent from Polytechnic University in Valencia, Spain and M.C. Pretorius from Citrus Research International in Nelspruit, South Africa. Collison Brentu of the University of Ghana (Fig. 1) served as host. Collison is a Ph.D. student working on citrus black spot at the University of Ghana under the direction of Prof. K. Oduro and Timmer and he is a research officer at the Tropical Agriculture Experiment Station in Kade.

The purpose of the trip was to advise Collison on his project on black spot and for us to become familiar with the *Pseudocercospora* (sue-doe-sir-caw-spora) fruit and leaf spot

disease. We visited the experiment station in Kade, which has good basic facilities for research in plant pathology, entomology, horticulture and soils and fertilization.

We presented seminars at the University of Ghana in Accra. Dewdney explained the Florida situation on Huanglongbing (HLB) and Timmer discussed black spot and its biology.

We were surprised to find that Ghana has about 60,000 ha of commercial citrus primarily for domestic consumption, but they also export some organic juice to Europe. The other important crops in the area are oil palms for biofuel production, cacao, bananas and plantains, as well as other tropical fruits. Growers usually produce many crops on the same farm.

Most citrus plantings are small and the largest grower has about 400 acres of citrus. The citrus seemed to be well-maintained and fairly productive, although they provide few inputs besides fertilizer. The crops are not irrigated, but there is little need since rainfall is high in that area of Ghana. The weed control was primarily by goats, but sheep ran a close second (Fig. 2).

Fungal diseases cause serious losses to citrus in Ghana and black spot and *Pseudocercospora* leaf and fruit spot are the most important problems.

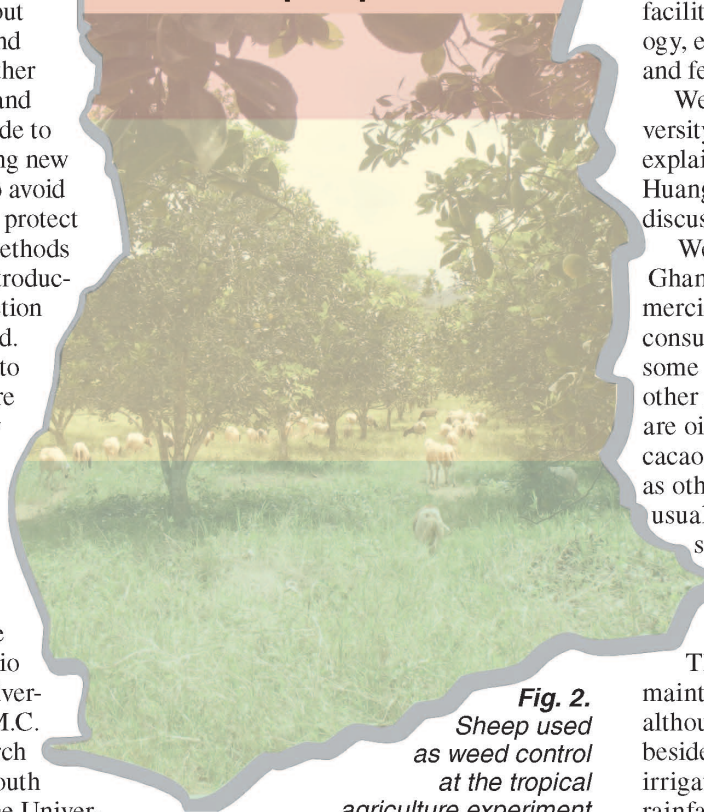


Fig. 2. Sheep used as weed control at the tropical agriculture experiment station in Kade, Ghana



Figure 3. The hard spot symptom of black spot on mature fruit from a grove in Kade, Ghana

CITRUS BLACK SPOT

Citrus black spot, caused by the fungus *Guignardia citricarpa*, produces several types of symptoms on fruit, such as hard spot (Fig. 3), virulent spot, cracked spot and false melanose. Citrus black spot also affects leaves, but produces only occasional spots. The life cycle is similar to that of greasy spot in that it produces air-borne sexual spores in the leaf litter beneath the tree canopy. Asexual spores are produced on hard spot lesions on fruit and are spread by rain splash. The disease not only results in unsightly blemishes on the fruit, but yields are reduced due to premature fruit drop. The disease is widespread in Asia and in the southern hemisphere including Australia, Brazil and Argentina. The disease occurs in South Africa, but is not well-doc-

umented elsewhere in Africa. In recent years, black spot appeared in Ghana and, under the conditions there, causes severe problems. It is important as a fruit-spotting disease, but more importantly, causes fruit drop before oranges reach maturity. The disease can be controlled by timely applications of fungicides such as copper, mancozeb and strobilurin fungicides, but growers in Ghana are not set up to apply chemicals and do not have adequate sprayers to do those applications.

PSEUDOCERCOSPORA

Pseudocercospora (formerly known as *Phaeoramularia*) fruit and leaf spot is a fungal disease caused by *Pseudocercospora angolensis*. The disease produces large lesions on the fruit and leaves which cause significant fruit drop and defoliation prior to harvest (Fig. 4). The disease has been recorded mainly in sub-Saharan Africa, excluding South Africa, to date. Outside of sub-Saharan Africa, the disease has only been reported in the Comoros Islands and Yemen. Within sub-Saharan Africa, it has been documented in countries as far flung as Cameroon, Angola, Zimbabwe and Kenya in addition to Ghana. Furthermore, the region affected by the disease is increasing. For example, *Pseudocercospora* fruit and leaf spot was not reported in Ghana until the last decade.

Limited research, mainly in Kenya

and Cameroon, has been conducted on the disease. Additionally, M.C. Pretorius did his master of science thesis on the problem in Zimbabwe. He is one of the few active researchers knowledgeable about the disease.

The disease is favored by prolonged wet weather that stimulates the production of new susceptible flush. Lesions produced the previous season can begin to sporulate within two weeks of the beginning of the rainy season, at most temperatures in the tropics, and those spores infect the new tissue.

Within a grove, the majority of spread is caused by rain splash, but significant movement of inoculum from grove to grove can occur via windborne spores. In many countries, neglected or abandoned groves can be a large source of spores.

The best control for *Pseudocercospora* fruit and leaf spot is fungicide applications of mancozeb, mineral oil, copper or strobilurins every two weeks throughout the rainy season, but most producers in Africa are unable to afford such a regimen.

Pseudocercospora fruit and leaf spot would be a serious problem in Florida and any other humid citrus production area. There are possible avenues to work with the disease. Work cannot be conducted on these diseases in Florida, but Antonio Vicent has quarantine facilities in Spain where at least some laboratory and greenhouse work can be conducted in addition to field studies in Ghana and elsewhere.

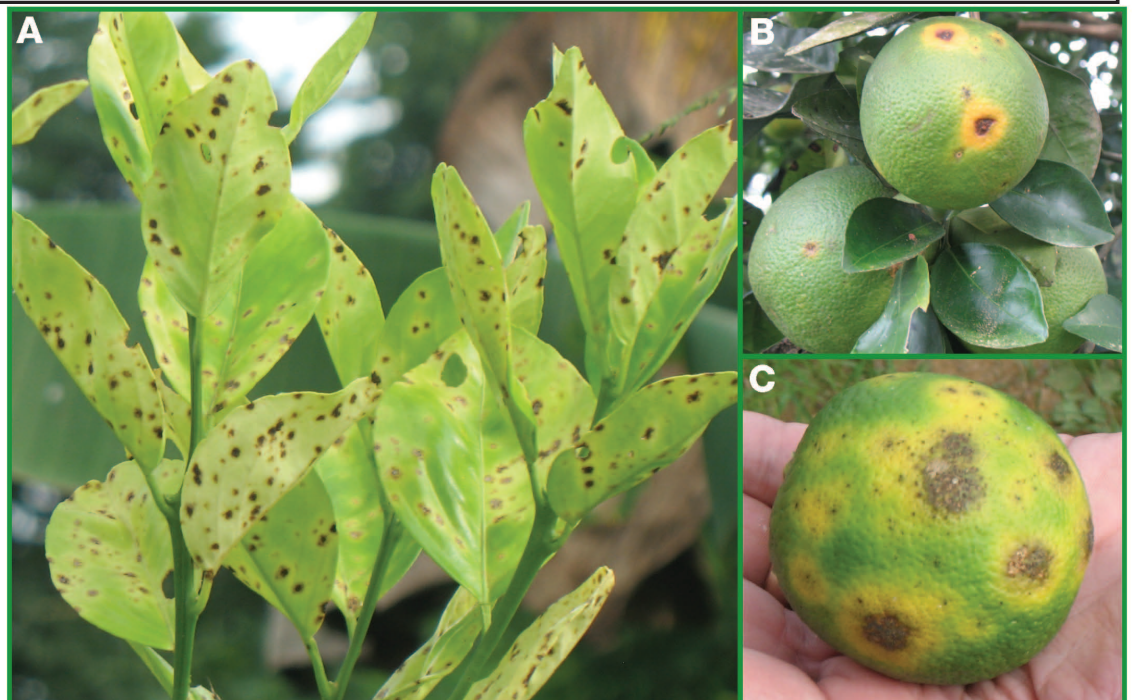


Fig.4. Leaf and fruit symptoms of *Pseudocercospora* fruit and leaf spot.
 A) Lesions on young flush that has become chlorotic because of the disease.
 B) Older lesions on mature fruit showing the large halo and dead tissue at the center of the lesion.
 C) Younger lesions on immature fruit with halo and light colored sporulation on the fruit surface.

FOUNDATION NURSERY

We also visited the foundation nursery of Ghana, where new cultivars are multiplied and distributed. The trees were produced in soil-filled bags on the ground.

The most commonly-grown rootstock in Ghana is rough lemon and the most common scion is Valencia sweet orange.

One thing that we noticed immediately during our visit to the nursery was that fungal diseases were a major problem. The most commonly seen diseases were *Alternaria* leaf spot on rough lemon, citrus scab and *Pseudocercospora* fruit and leaf spot (Fig. 5).

There were no structures to protect the plants in the nursery. We felt that adding a simple structure with a roof to protect the foliage from the rain — thereby reducing the leaf wetness — was essential to improving the success of the nursery. Leaf wetness is necessary for all of these diseases to complete the infection process. We made this recommendation to the researchers involved in managing the nursery. Unfortunately we have no reports as to whether our recommen-

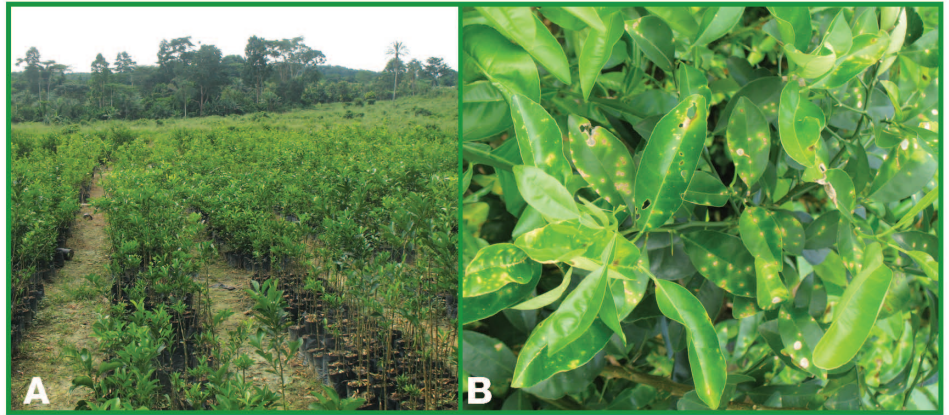


Fig.5. A) The foundation nursery in Kade, Ghana. B) The fungal diseases found in the nursery.

dations were followed.

We had a successful trip to learn about how citrus is grown in Ghana, which is similar to much of sub-Saharan Africa. We also learned about a disease, *Pseudocercospora* fruit and leaf spot, which is little known, but is potentially threatening in humid citrus production regions. In addition, we obtained a better perspective of the scope of the black spot epidemic in Ghana and the challenges faced by the producers there. Foreknowl-

edge of exotic diseases in areas where they are endemic is essential for Florida to implement effective practices to avoid further disease introductions and early enough detection to eradicate introduced diseases before they become established.

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