



HCGA Coffee Leaf Rust Update & Action Report

Topics:

1. Regional Disease Report
2. Control Method Update
3. CLR Resistant Varieties Update & Actions



Coffee Leaf Rust Regional Report

- **Big Island**

Kona/West Hawaii: All over Kona side, Honau'nau hot spot. Some Priaxor applications starting, non-systemics most common.

- **Other Big Island**

No confirmed positives in Ka'u and Hilo. A site in Pa'auilo confirmed positive in unmanaged area.



Coffee Leaf Rust Regional Report

Maui County

East Maui: Prevalent in most growing areas except central plain (Mahi Pono), less above 3,000'. Extreme defoliation in feral areas.

Success with nutrition, pruning and rotating CU and bacillus sprays

West Maui: Found October 2020 at Ka'anapali, has receded in dry weather, but moved quickly in wet months.

Using rotation of CU and Bacillus sprays and working well. Catuai and Mokka not very affected. Typica and Caturra showed sign early.

No Priaxor use to-date.



Coffee Leaf Rust Regional Report

- **Lana'i**
- Found on feral coffee trees above Lanai'I Hale in December 2020. No commercial production on Lana'i. Also found on Bourbon trees in Lana'I City.
- No Control activity
- **Molokai**
- Recently found in 2 different feral populations, none in managed areas. Estimated to have been present 2+ months.



Coffee Leaf Rust Regional Report

- **Oahu**

Found early in Maunawili (east) and recently in Waimea (west), none identified at Waialua farm.

No report on spray controls, pruning done in Maunawili

- **Kaua'i**

Still a clean island with no reported findings.



CLR Control Method Update

(Based on actual farm experiences since outbreak)

- **Non-systemic Fungicidal Sprays**

Copper and similar combinations of this family of fungicide generally are masking agents or do their best to stop new spores from becoming virulent. Not very effective in stopping already infected trees.

- **Kocide 3000**

This is one of many Copper materials to use in the copper fungicide rotation. Best to always rotate the different materials as each one adds a broader spectrum on the entire program. Is also compatible with Botanigard.
\$15.00/acre/entry

- **OxiDate 2.0**

Oxidate is a Hydrogen Dioxide/Peroxyacetic Acid compound and is exempt from pesticide residue restrictions. This material has been successful in stopping the spread after initial infection and works well with the other CU compounds. It is the exception in this family of controls as it does help kill active infections. \$2.55/acre/entry



CLR Control Method Update (cont.)

Non-systemic Fungicidal Sprays

- **Badge SC**

Badge is a dry flowable of Copper Oxycloride and Copper Hydroxide.

Has worked very well on the leeward drier climates. Another of the copper fungicides to rotate. \$8.00 acre/entry

- **Champ WG**

Another Copper hydroxide material that is compatible with Botanigard.



CLR Control Method Update

Bacillus Fungicides

Bacillus fungicides

This family of fungicides has live bacterium and not an elemental makeup. Generally these are compatible with Botanigard mixes.

- **Serenade ASO**

Serenades active ingredient is a strain of *Bacillus subtilis*. The organism seeks out and kills the rust mycelium. Is not used as a repellent like the copper compounds. \$30.00 acre/entry

- **DoubleNickel 55**

The active organism is *Bacillus amyloliquefaciens*. Similar mode of activity as Serenade. Works very well in the copper rotation. \$25/acre/entry



CLR Control Method Update

Systemic Fungicides

Trans-laminar fungicides

Also referred as systemic control, but more specific as instead of systemically working through the plants vascular system, the trans-laminars are sprayed on the leaf surface and work through the width of the leaf itself. This family is a true pesticide and needs the entire EPA registration process to be used on coffee.

- **Priaxor Xemium**
- In late 2020, the HCA coordinated an effort to allow the use of Priaxor through the Section 18 process. This refers to Section 18 of the Federal Insecticides, Fungicides and Rodenticides Act (FIFRA) that fast tracks the allowable use of a material that is not registered on a particular crop. On May 20, 2021 the EPA Granted the Hawaii Department of Ag the section 18 use.
- Field results are pending as of this writing, and we are hopeful of positive controls. This material will not kill spores and proper timing important to have sprayed prior to severe sporulation. Many restrictions though, we will only be able to use twice/year and during or 45 days before harvest. Initial cost estimates \$26.00/acre/entry.



CLR Control Method Update

Cultural Practice Control

- **Pruning**

This is proven to be the quickest and safest method to stop the spread of CLR. You lose your crop, but the trees respond favorably. CLR establishes very poorly on young leaves.

- **Tillage of the soil around the trees**

The point here is to rid the ground area around the tree of weeds that hold dewy moisture and raise the humidity near the lower parts of the tree. Drier conditions make it difficult for the spore to germinate and spread.

- **CLR Resistant varieties**

This is the long-term future to ensure CLR control year without having to rely on spraying and cultural practices.



CLR Resistant (CLRr) Varieties Update & Actions

- What is a Coffee Leaf Rust Resistant variety?
- Does Hawaii have any CLRr varieties currently available?
- What is the process to bring in or breed new CLRr varieties in Hawaii?
- Why can't we just take the seed from known CLRr varieties and plant them since we know they are proven elsewhere?
- Why what Happened in Colombia is affecting the Hawaii CLR issue.
- What is being done regarding CLRr varieties?



1. What is a Coffee Leaf Rust Resistant (CLRr) Variety?

A leaf rust resistant coffee variety is a coffee cultivar that is descended from a natural cross between *C. arabica* and *C. canephora*. This was discovered in East Timor decades ago. It was this one-time event that has created this resistance.

These individual progenies were then crossed with known varieties the result being Catimor (Timor 1 x Caturra), Sarchimore (Timor 2 x Villa Sarchi) both crossed in Portugal and Columbia (Timor 3 x Caturra A) crossed in Columbia. This last one is the parentage of the Castillo line.

C. arabica is the coffee species of all Hawaiian Varieties: Typica, Bourbon, Caturra, Catuai, Blue Mountain, Mokka, Mondo Novo, Paca Mara, etc.

None of these are CLR resistant.

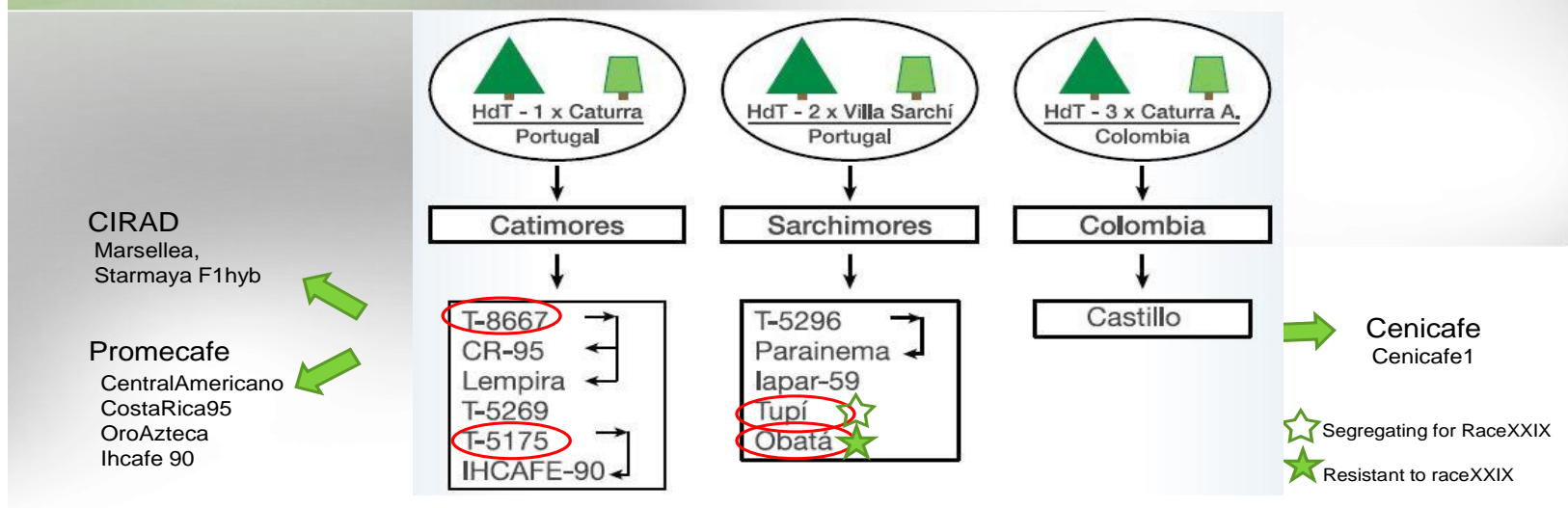
C. canephora is the robusta species. Grown commercially in other countries but normally associated with low cup quality.

This species is CLR resistant.

Origin of Coffee Leaf Rust Resistance

(slide courtesy of HARC)

Rust-resistant varieties derived from Hybrido de Timor (HDT)



= at HARC

http://www.anacafe.org/glifos/index.php/Variiedades_resistentes_a_roya



2. Does Hawaii have any CLRr varieties currently available?

- There are some known CLRr varieties within the State, none in current production. Most of these are located at PBARC, HARC or in some cases on farms that brought in the varieties without complying with the Hawaii Department of Agriculture quarantine rules.
- Within the past few months PBARC received known germplasm from World Coffee Research to conduct bioassays on. Much of this material has CLR resistance. At HARC there are two known genetically pure varieties (Tupi and Obata) and many hybrids that crossed Catimor lines with Hawaii's known arabica varieties. This was done around 2000. After CLR was found in Hawaii, HARC began selfing these crosses to begin the selection process that hopefully will give Hawaii farmers more choices of potential varieties to grow.
- The selection process can be long however, with so many qualities and characters that each variety possesses. These being environmental adaptability, tree stature (for mechanized harvesting), yield and most importantly cup quality.



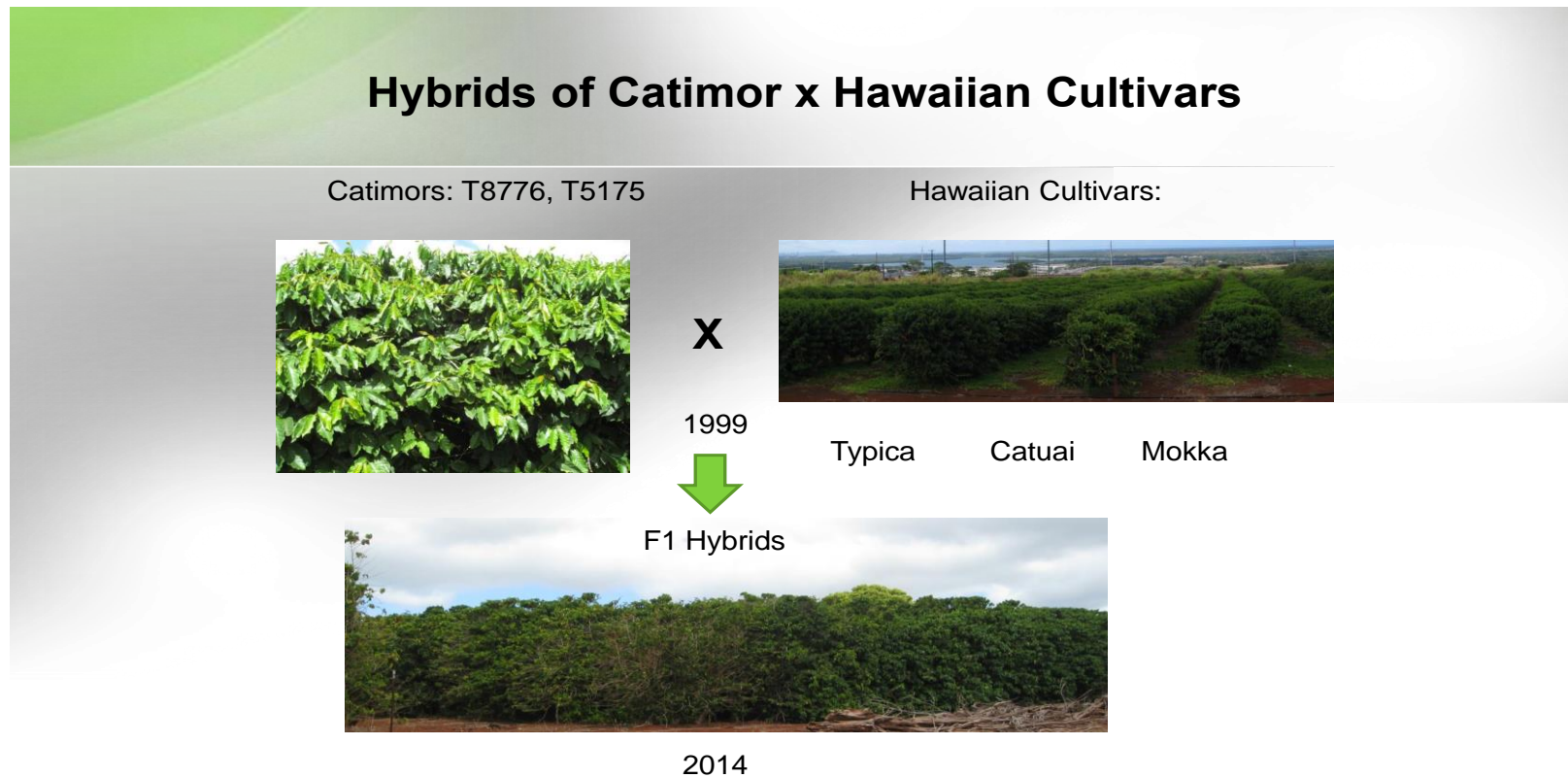
Hawaiian Varieties Crossed with Catimor in 1999

HCGA/HARC Breeding Trials (slide courtesy of HARC)

Hawaii Commercial varieties used as parents for F1 with Catimor

- Typica : Blue Mountain (MW collection 1980), KO34 (originally Kona Mountain 1997), KO32 (originally Greenwell Farms 1997).
 - Red Catuai : KA19 (originally Kauai Coffee 1997), MA10 (originally Kaunawili Coffee, Maui 1997) and MO24 (originally Coffee of Hawaii, Molokai 1997)
 - Mokka : MA1 (originally Kaanapali 1997), mokka Maui (unidentified tree at Kaanapali Coffee 1997) and mocha (MW collection 1980)
 - Others : “ 6666” (originally UH Kainaliu Collection), OA11, OA12 (originally Waialua Coffee 1997), Yel Bourbon (MW collection 1980) and MO21 (originally Coffee of Hawaii, Molokai, 1997)
- Each hybrid family has 5-20 trees and total about 500.

CLRr F-1's of Hawaiian Commercial varieties in Kunia (slide courtesy of HARC)





3. What is the process to bring on or Breed new CLRr varieties into Hawaii?

- The State of Hawaii enforces a one-year quarantine on plants and plant material shipped in, with special attention on material from other countries. A few companies have done this with some promising CLRr varieties, but the process for them began before CLR was actually discovered on Maui last fall. The Board of Agriculture has granted some leniency to allow small quantity to be moved out of quarantine after a moderately reduced time period less than the mandated one year.
- The process of breeding new coffee varieties takes many years. In a natural breeding, after the cross is made the parent plant needs to grow to flowering maturity before another cross can be made. This is where selection for plant characteristics like plant vigor and CLR resistance begins. This is also where undesirable crosses are discarded. This continues for generations. The first cross is called an F-1 (filial 1), it's progeny F-2 and onward through many generations until parental segregation stops and the variety is considered genetically pure.



4. Why can't we use First Generation CLRr seed (F-1) to plant on our farms?

- A general understanding of Genetics is that the F-1 will possess the traits of both parents, the F-2 and beyond if planted from seed, segregation occurs. If you planted seed from those generations, a large percentage of plants would not have CLR resistance. This is why the Columbians stopped at the F-1 generation and started micropropagation, because through this method you are cloning the original plant and you know the desired traits, including CLRr, are there.
- In Hawaii, we are looking at the same dilemma. We have CLRr varieties but now it's the question of finding a facility to micropropagate so that we do not have to cross and select for years to come. This would further support importing and crossing new CLRr varieties that are performing well outside our border.



5. Why what happened in Columbia is affecting the Hawaii CLR issue

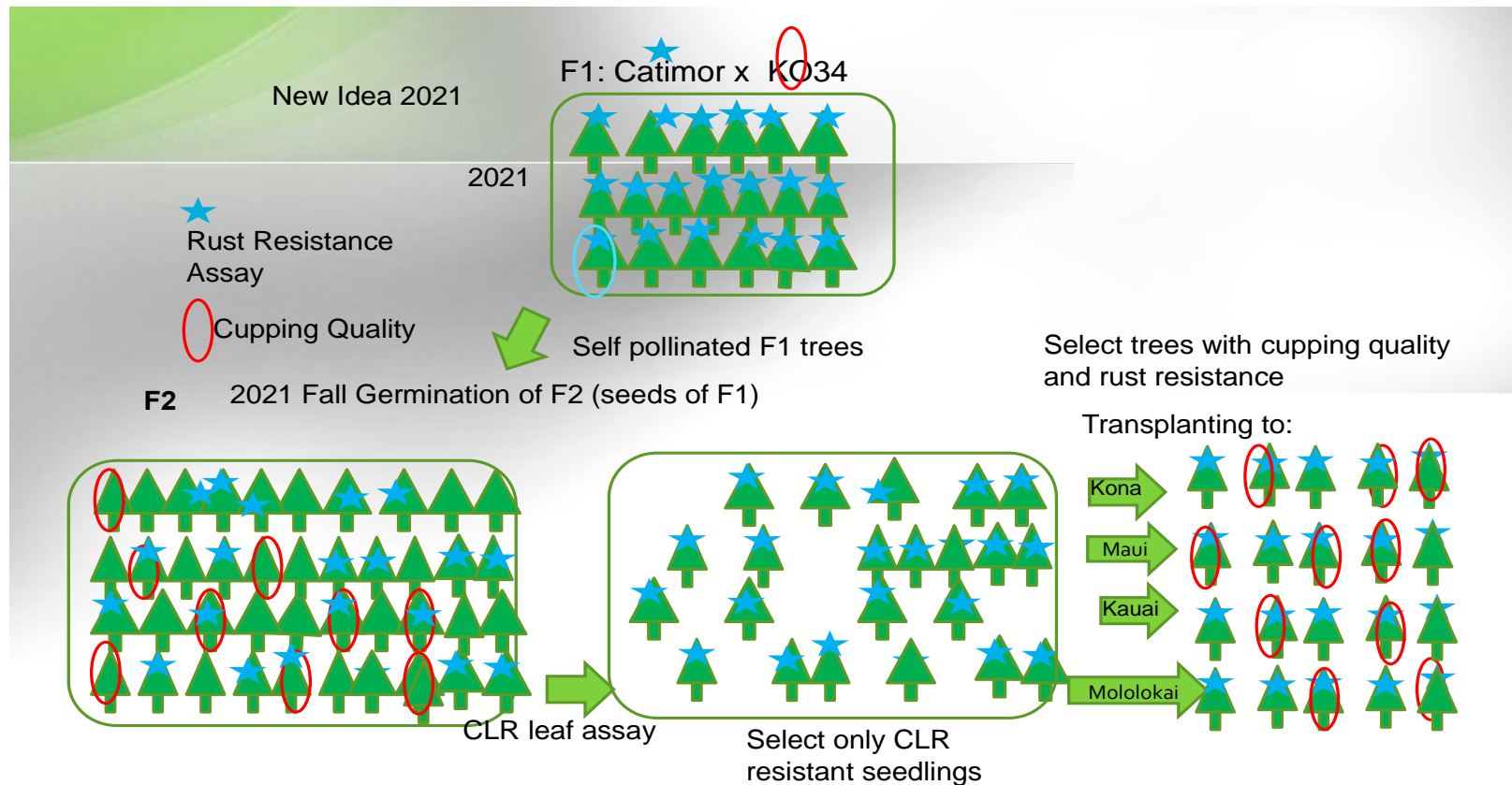
- When CLR became an epidemic in the coffee regions of Latin America around 2008, they were forced to rapidly ramp up breeding research since the varieties then had no resistance. At that time they were experiencing dramatic wet weather due to El Nino events and the spore load and infection could not be controlled.
- The Columbian method was to do the simple crosses of their varieties with Catimor lines to achieve resistance. After their first generation (F-1), they began selecting and discarding literally millions of crossed plant combinations through micropropagation. They began replanting their farms with F-1's that had promise but were not guaranteed. They have learned more as time passed, now having a better understanding of which candidates they planted and did further discarding. **This was only 13 years ago.** Had they taken the natural crossing route, they would be just past the F-2 stage which was not acceptable timewise.



6. What is being done now regarding CLRr varieties?

- The F-1 crosses of the Hawaii commercial varieties and the catimor line were bagged (selfed) this past spring. Seed will be available for selection.
- Hawaii Coffee Growers Association members will dedicate areas on their farms (and environments) for selection purposes.
- PBARC has developed a bioassay technique to positively identify CLRr on leaf tissue samples of any coffee variety or CLRr candidate therefore eliminating lengthy field selection.
- HCA is working with Gov't agencies and lawmakers trying to leverage potential funds to the research sector that can mass produce CLRr candidates.
- HCA, Hawaii Agencies and Outside are working with World Coffee research on collaborations to acquire more germplasm material to our trials.
- Working to ease current quarantine requirements through local legislation or by designating large greenhouse facilities in California work with HDOA to meet local quarantine requirements.

Quickest model to produce CLRr with Cupping in Hawaii (slide Courtesy of HARC)



Mahalo!