

Update on the Coffee Leaf Rust Research Centre CIFC

Centro de Investigação das Ferrugens do Cafeeiro



Coffee Leaf Rust - CLR



Coffee Berry Disease - CBD

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CIFC

The importance of coffee leaf rust as a threat to world production led, in 1955, the Governments of the USA and Portugal (Agreement FO-PO-5, Project D. O. A. 72-11-004) to provide for the foundation of CIFC in Portugal



Labs

Greenhouses

More than 3.000m² of heated greenhouses

CIFC

Subsequent to IICT's recent liquidation, the CIFC was integrated in the Institute of Agronomy of the University of Lisbon, in August 2015.



More than 3.000m² of heated greenhouses

CIFC's main objectives

To provide a centre for international cooperation on CLR research and pre-breeding outside the coffee growing regions and so avoid inadvertently spreading of new virulent races to coffee countries



The discovery of Timor Hybrid (HDT)

A decisive step forward in the research programme of the CIFC was the discovery of the Timor Hybrid , a population in which most of the plants showed resistance to all the known rust races



Some of these coffee plants were used as sources of resistance to coffee leaf rust (CLR)

CATIMOR and **SARCHIMOR** were used to replace the traditional susceptible Arabica coffee cultivars in many coffee growing countries

Variety Caturra x Timor Hybrid = Population “**CATIMOR**”

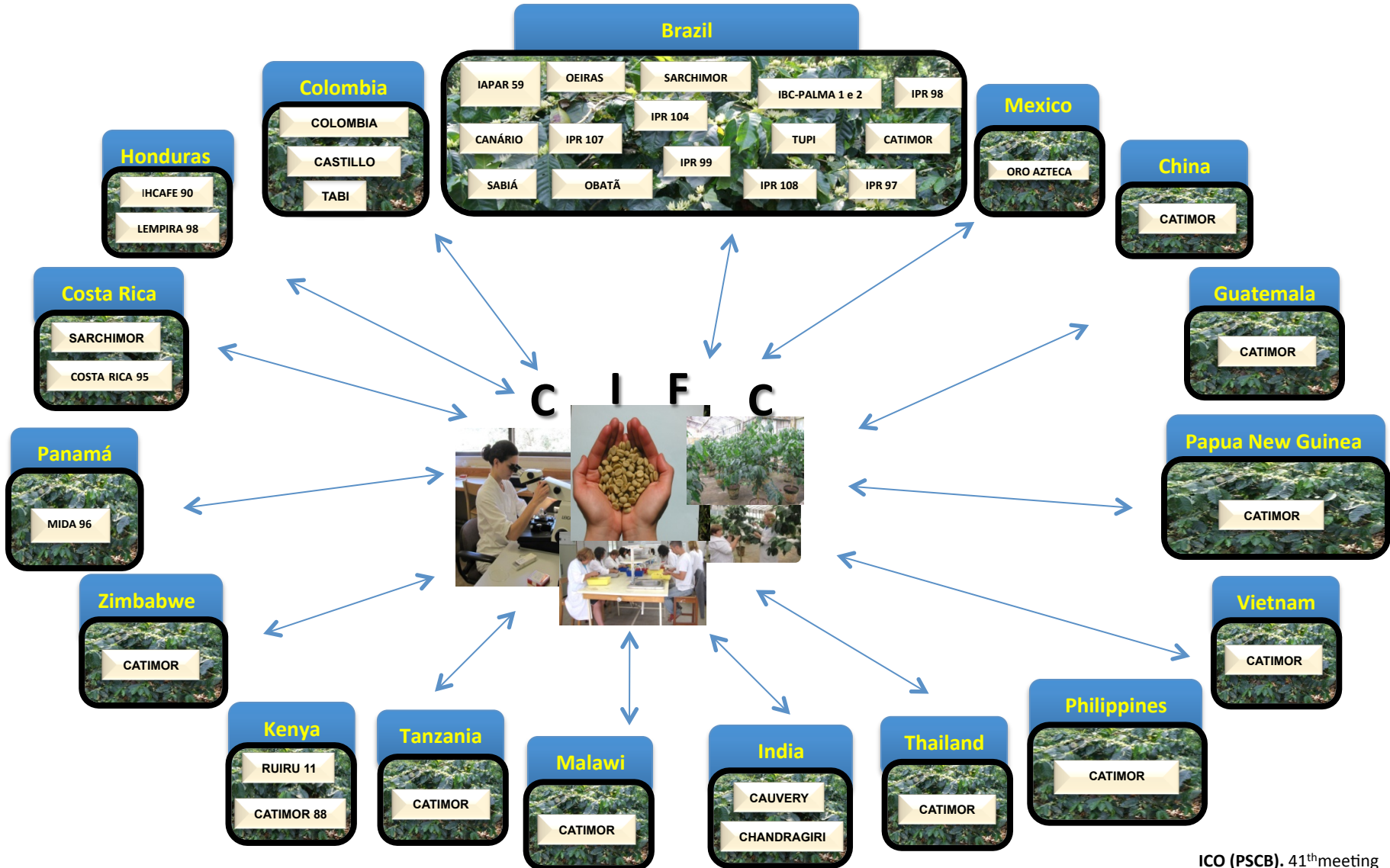
Variety Villa Sarchi x Timor Hybrid = Population “**SARCHIMOR**”



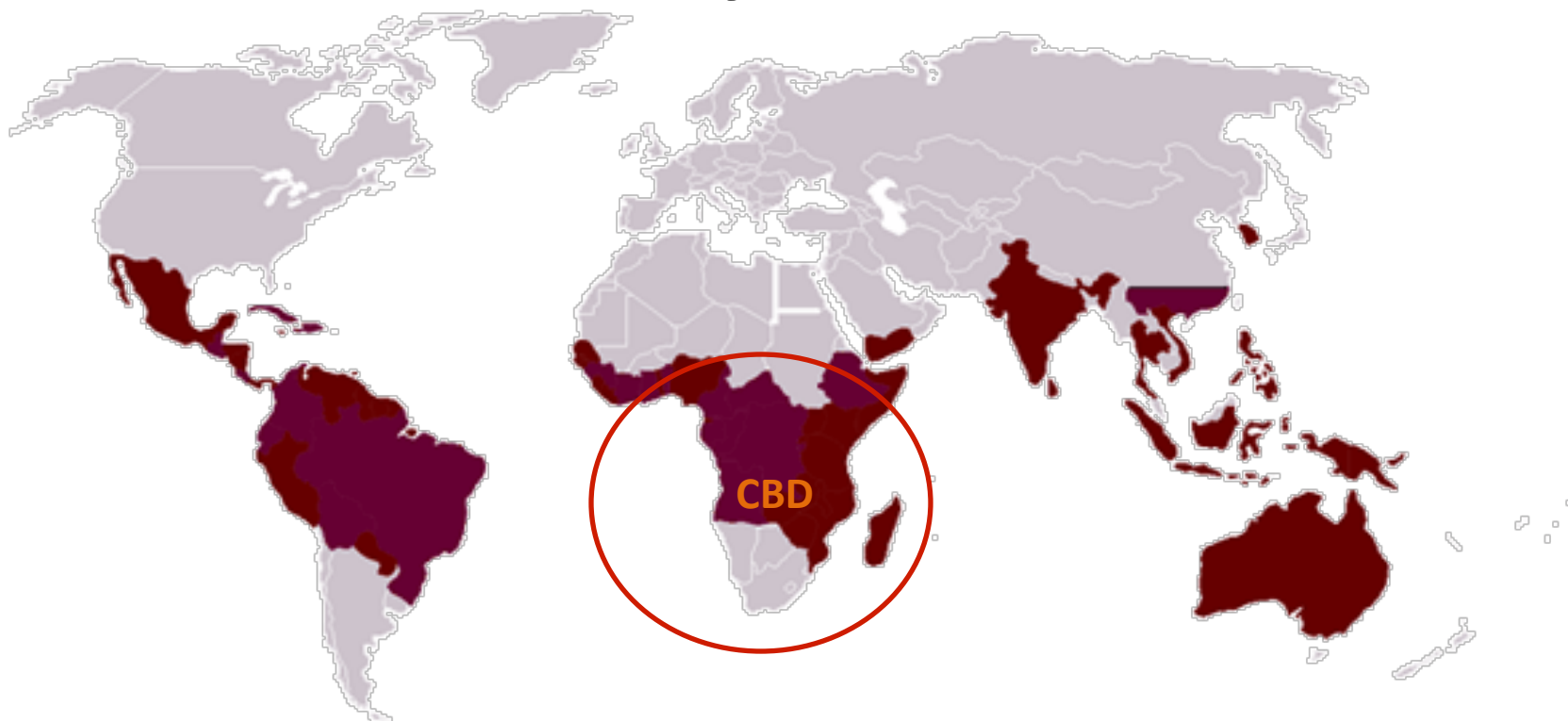
Both HDT and its derivatives as well as all the available coffee materials of CIFC have been **provided free of charge** to all the coffee growing countries of the world



More than 90% of Arabica coffee cultivars resistant to rust grown in different coffee growing countries were created with the help of studies carried out at CIFC



Coffee Berry Disease - CBD



Colletotrichum kahawae
(biological weapon)

http://www.ausfuhrkontrolle.info/bafa/en/export_control/legislation/export_control_cwc_p_war_weapons_list.pdf

CBD is still restricted to **Africa** but is a threat to certain high-altitude coffee areas of **Latin America and Asia**.

CIFC started research on CBD in 1989 in support of breeding programmes of Arabica coffee in Africa and Latin America

CBD was recorded for the first time in Kenya in 1922



> 80% crop loss due to CBD possible during wet years

A close-up photograph of a coffee branch with several leaves and clusters of coffee cherries. The leaves show significant damage: some have large, irregular holes (characteristic of CBD), and others have numerous small, yellowish-brown spots (characteristic of rust). The cherries are in various stages of ripeness, from green to dark red. Three white text boxes with black borders are overlaid on the image: 'Tanzania' in the top left, 'CBD' in the middle left, and 'Rust' in the middle right.

Tanzania

CBD

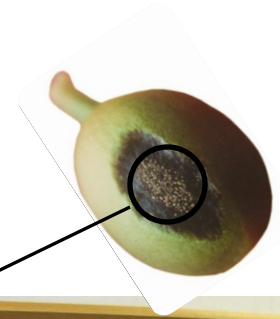
Rust

Chemical control to Rust and CBD, > 40% of field production costs

CIFC has unique collections of germplasm



Coffea spp.



C. kahawae

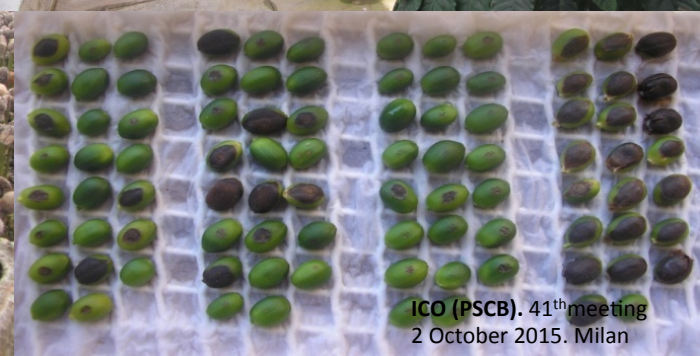
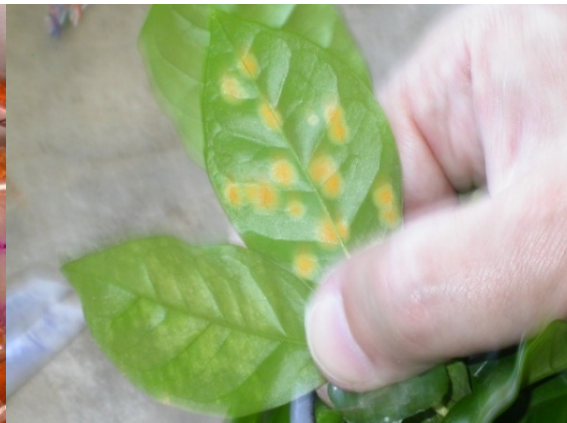


H. vastatrix

CIFC main activities

International co-operation to develop coffee cultivars with resistance to the main diseases

- World survey of physiologic races (characterized more than 50 rust races)
- Screening for coffee resistance to CLR and CBD
- Training of coffee pathologists and breeders (short term, MSc and PhD)





Fundamental Research:

- Identification of **moleular markers** associated with specific *H. vastatrix* and *C. kahawae* pathotypes
- Identification of key **mechanisms of coffee resistance** to *H. vastatrix* and *C. kahawae*, through a cytological, proteomic, metabolomic and transcriptomic approach
- Cellular and molecular basis of *H. vastatrix* and *C. kahawae* **pathogenicity**

Collaborations: IRD, CIRAD and INRA (France), Universities of Bedfordshire (UK), Hohenheim (Germany), UC Davis (USA)

Control of CLR by resistant varieties

SCENARIO

- The majority of resistant varieties currently grown are derivatives of HDT (Catimor, Sarchimor, etc)
- The resistance of many varieties, in different countries already overcome by new rust races
- During the last years CIFC identified highly virulent rust races capable of attacking all the sources of resistance used so far to develop resistant varieties (Catimor, Sarchimor, etc.)

Future ?

We predict that in the next decade almost all the resistant varieties currently grown (eg. Catimors and Sarchimors) will become susceptible.

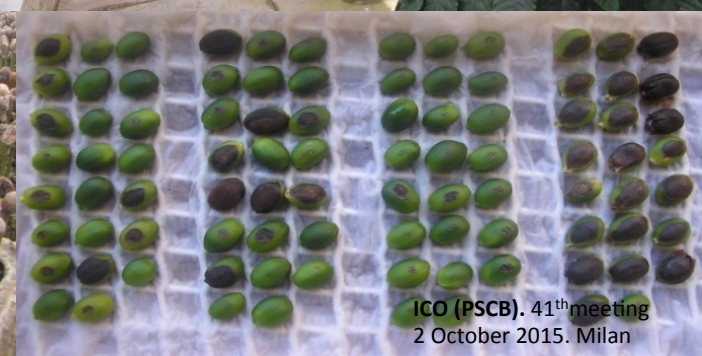
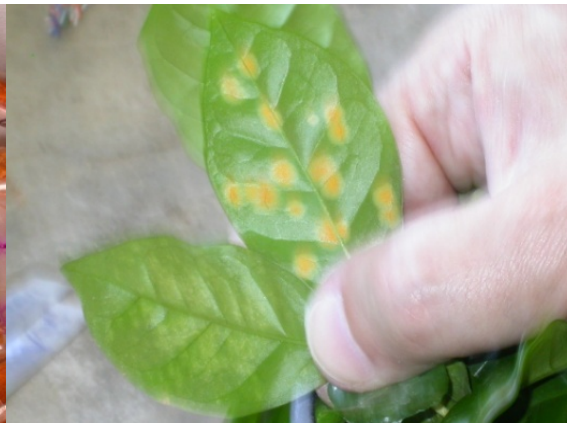
In some regions this phenomenon will be faster and it depends also on the extent of cultivated area.

This is an issue of great concern !

What can be done by CIFC ?

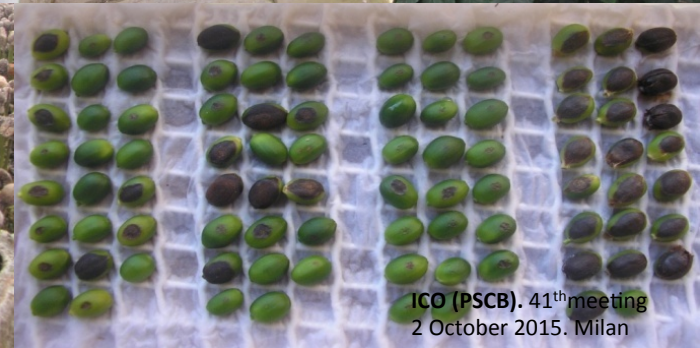
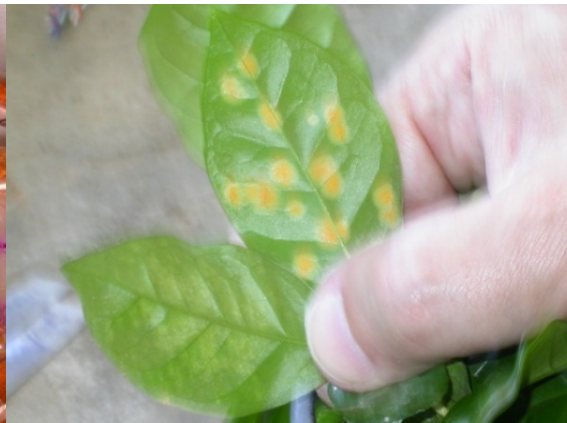
CIFC should continue to develop pragmatic activities !

- World survey of physiologic races (unique rust races collection in the world)
- Screening for coffee resistance
- Training of coffee pathologists and breeders (short term, MSc and PhD)



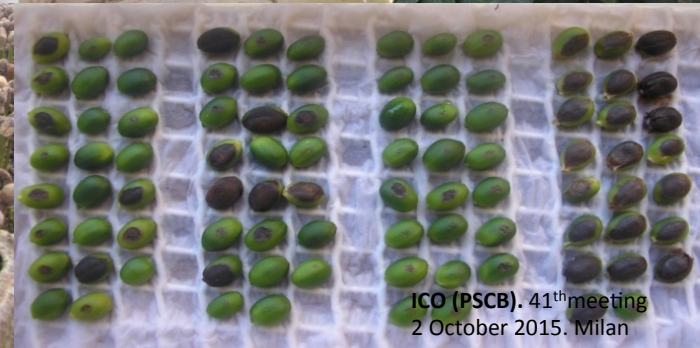
The pragmatic activities of CIFC

- are fundamental to develop new strategies to achieve sustainable Arabica coffee production based on durable resistance to CLR
- to go ahead with a combination of advanced genomic and conventional breeding research
- to develop collaboration with renown centres of plant genomics research (eg. WUR, IRD/CIRAD) in projects to achieve durable resistance to CLR



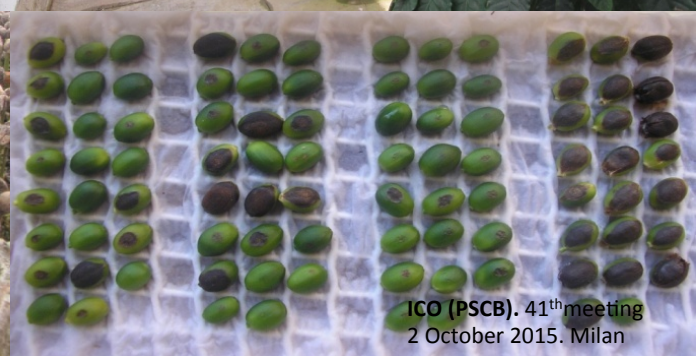
Present situation of CIFIC

- Previously financed almost exclusively by Portugal which does not produce coffee
- No more financial support by the Portuguese Government for CIFIC activities, except for staff salaries, since 2015
- Contract research with coffee growing countries is now also negligible



Finances required to restore CIFC's functioning

- Total **annual budget** should be around € 770,000
- Expected contribution from Portuguese Govt. is about € 270,000 for salaries of permanent staff
- Urgent request to the coffee industry and other stakeholders to finance the remaining costs of running the CIFC (€ 500,000)





Thank You

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