

New races of *Hemileia vastatrix* identified in Timor-Leste revealed high spectra of virulence

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RATIONALE

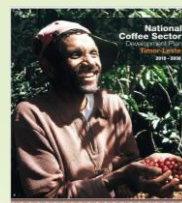
Coffee leaf rust (CLR), caused by the biotrophic fungus *Hemileia vastatrix* Berk & Br., was introduced into Timor-Leste in the late 1880s, resulting in a significant decrease in coffee exports at that time [1]. In 1927 a rust-resistant coffee tree, believed to be a natural cross between *Coffea arabica* and *C. canephora*, was discovered on a plantation of the Typica variety (Arabica) [2]. Seeds from this tree led to the establishment of small plantations in the 1940s. From 1956 onwards, the best plants from this population (called Timor Hybrid – HDT) were widely used to establish new coffee plantations across the east side of Timor Island. While most Timor-Leste coffee plantations currently consist of HDT derivatives backcrossed with the traditional Arabica variety, CLR has increasingly been observed in some of these genotypes.

In the scope of the recent cooperation between the Ministry of Agriculture of Timor-Leste, and Coffee Rusts Research Center (CIFC) It was characterized the virulence of rust samples collected in HDT derivatives from different coffee-growing regions of Timor-Leste.



METHODS

Twenty-five rust samples from East Timor (Bazartete/Liquiçá, Quinta Portugal/Ailéu, Latefoho/Ermera, Maubisse/Ainara, Apidó/Ermera, Liquiçá/Pahata and Liquiçá/Darulete) were sent to CIFC for the assessment of their virulence spectra on a set of 27 coffee differentials. The virulence genes of each rust sample have been inferred based on Flor's gene-by-gene theory.



2.3.1 Production and Productivity
In 2016, MAF estimated that the area under coffee production totaled 59,278 hectares, with production estimates of 10,361 metric tons of green coffee or green bean equivalent (GCE). Coffee production is concentrated in the districts of Ermera, Manufahi, Liquiçá, Ainaro, Aileu, and Bobonaro, representing about 97 percent of the total production. Coffee production in the other districts is not as significant and is mainly for home consumption and sale in local markets. According to MAF, the average yield is about 80-100 kg/ha of GCE.
Sustainable production and good agricultural practices (GAPs) such as composting are, with some exceptions, not followed. Timor-Leste coffee is simply organic by default, meaning that no inorganic fertilizers or chemical inputs (such as pesticides) were used to produce the coffee. Timor-Leste may be the only country in the world that produces exclusively "organic coffee."



RESULTS

Rust samples from Timor-Leste received at CIFC, **between 1961 and 1975**, allowed the identification of ten physiological races: II (v₅); III (v_{1,5}); IV (v₇); XV (v_{4,5}); XXII (v_{5,6}); XXIII (v_{1,2,4,5}); XXV (v_{2,5,6}); XXVI (v_{4,5,6}); XXIX (v_{5,6,7,8,9}) and XXX (v_{5,8}).



In the current work, nine of the rust races presented spectra of virulence different from the known rust races already characterized at CIFC: group 1 (v_{2,5,6,7,8,9} + v₇) and group 2 (v_{5,6,7,8,9} + v₇).



All these 9 rust races showed the ability to infect the following coffee genotypes: CIFC 832/1, a resistant parent of the population designated by Catimor, and CIFC 832/2, a resistant parent of the population designated by Sarchimor and other HDT derivatives. Nevertheless, three of these samples also infected the coffee plant CIFC 4106, the clone of the supposedly original HDT hybrid.



CONCLUSIONS & PRESPECTIVES

The rust races discovered in this study are the most virulent of all those previously characterized at the CIFC in coffee tree populations derived from the Timor Hybrid. These populations include all resistant coffee varieties grown worldwide, as well as various HDT introductions in the CIFC collection. This discovery corroborates/confirmes what was already known about the remarkable ability of the fungus *H. vastatrix* to acquire new virulence genes, capable of infecting pure Arabicas with different resistance spectra, as well as interspecific tetraploid hybrids derived from HDT, Icatú, and Devamachy.

Despite the concerning nature of these findings, not all HDT derivatives tested at the CIFC showed the same level of disease severity when exposed to the new rust races identified in this study.

References

1. Lains e Silva, 1956 In Timor e a cultura do café. Impr. Portuguesa (ed), Pp 1-201.
2. Gonçalves et al. 1976. Comum. Miss. Est. Agron. Ultramar 86: 1–29.

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