28th Conference Asic 2021
From 28 June to 1 July 2021

First steps on the resistance profiling of Kawisari coffee hybrid through cytological and gene expression analyses

S2-PO-08

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1. Introduction

Coffee leaf rust (CLR), caused by *Hemileia vastatrix* (Hv), is a threat to Arabica coffee production. Breeding for CLR resistance, using Timor hybrid – HDT (*C. arabica* x *C. canephora*) as a source of resistance, has been the most sustainable strategy. The recent breakdown of resistance in some HDT-derived varieties due to the occurrence of more virulent Hv races, as well as the current CLR epidemics in Central America, highlights the importance of the discovery and characterization of new sources of resistance.

Objectives - Unveil the cellular and molecular resistance profile of the Kawisari hybrid (*C. arabica* x *C. liberica*) derivative, recently used as a donor for resistance in Arabica breeding programs in India.

2. Material and methods

Kawisari hybrid

Hv 1427
Incompatible interaction (Resistance)

Hv 138a
Compatible interaction (Susceptibility)

Sample collection:
1, 4 and 7 days after inoculation

Light microscopy - fungal growth and plant responses

qPCR - Gene expression analysis

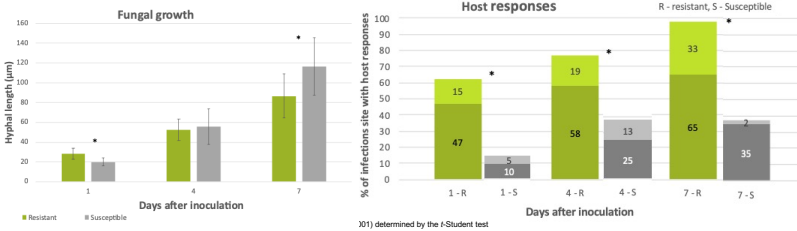
Selection of target genes

Genes involved in defense/resistance identified in other *Coffea* spp. – Hv interactions[1]

Whole genome sequencing data for Kawisari hybrid aligned against the *C. arabica* reference genome. Selection of polymorphic target genes putatively involved in defense/resistance responses

3. Results

Cytological analysis

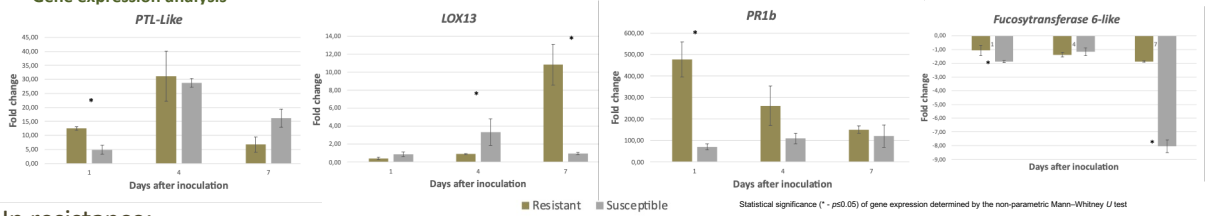


)01) determined by the *t*-Student test

In resistance:

- ✓ Fungal growth is more restricted at 7 dai (post-haustorial resistance)
- ✓ Significant deployment of host responses from 1 dai: hypersensitive-like response (HR) and accumulation of phenolic compounds in the cell walls and cytoplasmic contents

Gene expression analysis



Statistical significance (* - $p \leq 0.05$) of gene expression determined by the non-parametric Mann–Whitney *U* test

In resistance:

- ✓ *PTL-like*, coding for a patatin with lipolytic activity and *LOX13*, coding for a lipoxygenase, are significantly activated at 1 and 7 dai, respectively,
- ✓ *PR1b*, coding a pathogenesis-related protein, is significantly activated at 1 dai, decreasing afterwards,
- ✓ *Fucoyltransferase-6-like*, coding for a glicosyltransferase, is significantly repressed at 1 and 7 dai.

4. Conclusions/Perspectives

The post-haustorial resistance of Kawisari is associated with the early deployment of HR, accumulation of phenolic compounds in the host cells, and activation of genes related to lipid metabolism, cell wall modifications and defense responses.

This study provides the first insights of the resistance responses of a coffee hybrid with potential to be explored as a new source of resistance.

REFERENCES: 1- Diniz, I. et al. 2012 DOI:10.1007/s10658-011-9925-9

FUNDING: This work is being co-funded by Foundation for Science and Technology (FCT) and FEDER funds through PORNorte under the project CoffeeRES ref. PTDC/ASP-PLA/29779/2017 and HDT-Coffee ref. PTDC/ASP-PLA/32429/2017, and FCT UNIT LEAF (UID/AGR/04129/2020).