

Colombian Coffee Collection as a source of genetic resistance to CBD (*Colletotrichum kahawae*)



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Introduction

Coffee Berry Disease (CBD), caused by *Colletotrichum kahawae* [1], severely affects *Coffea arabica* and is currently limited to Africa (2). Without control, it can cause over 80% yield loss. In non-resistant varieties, intensive fungicide use is required [3,4]. Developing resistant varieties is the most sustainable strategy. In Colombia, Cenicafe has used the Timor hybrid TH CIFC 1343 to breed resistant lines using molecular markers, field trials, and hypocotyl inoculation. Since 1997, Cenicafe and CIFC have assessed nine *C. arabica* populations using diverse isolates. This study aimed to establish a resistance classification scale and identify new resistance sources within the Colombian Coffee Collection (CCC).

Materials/Methods

The study evaluated 512 genotypes. Resistance tests against *C. kahawae* were conducted over 25 years (1997-2022) at CIFC laboratories in Portugal. The susceptible Caturra variety served as the control genotype. The evaluated populations were inoculated with 13 isolates of CBD, which are diverse in aggressiveness and geographic origin and belong to the biological collection of the CIFC. *C. kahawae* resistance was evaluated using the hypocotyl inoculation method. Infection severity was assessed after 4 weeks, with resistant reactions defined as grades 1–3 and susceptible as grade 4 [5].

Results/Discussion

From advanced genotypes a scale was obtained for the classification of *C. arabica* genotypes on the basis of their CBD resistance (Table 1). The scale is made up of four resistance classes, namely, high resistance (HR), moderate resistance (MR), low resistance (LR), and very low resistance (VLR), and a susceptible class (S).

Conclusion/Perspectives

TH CIFC 1343 is a potential source of resistance to CBD, new sources should be explored to strengthen the development of varieties with resistance to CBD, especially in regions that depend on susceptible sources such as TH CIFC 832/1. The results obtained in Caturra X TH CIFC 1343 genotypes suggest that it is probable that there are breeds in the *C. arabica* - *C. kahawae* complex.

Each resistance class was established according to the percentage of hypocotyls with phenotypic reactions of severity between 1 and 3, that is, classified as resistant.

Table 1. Average percentage of hypocotyls resistant to *C. kahawae* by class and their respective confidence intervals.

Resistance class	Repetitions	Mean	Li	Ls
High (HR)	300	85.3 a	84.0	86.6
Moderate (MR)	1565	55.9 b	54.4	57.5
Low (LR)	16,828	37.8 c	37.3	38.4
Very Low (VLR)	12,740	6.1 d	5.8	6.4
Susceptible (S)	709	0.0 e	0.0	0.0

*Averages with different letters differ statistically according to Duncan's test at 5%. Li: Lower limit. Ls: Upper limit.

In the populations derived from TH CIFC 832/1, the S class was predominated, similar to the results obtained for the Caturra variety. In the results obtained from the classification of resistance to CBD in TH CIFC 1343, presented an HR phenotype for the Cam1 isolates, which have been reported as being highly aggressive, and for the Que2 and Zim1 isolates, which are of medium-low aggressiveness. TH CIFC 2252 presented an MR phenotype for the Que2 isolate and susceptibility to the other isolates (Figure 1).

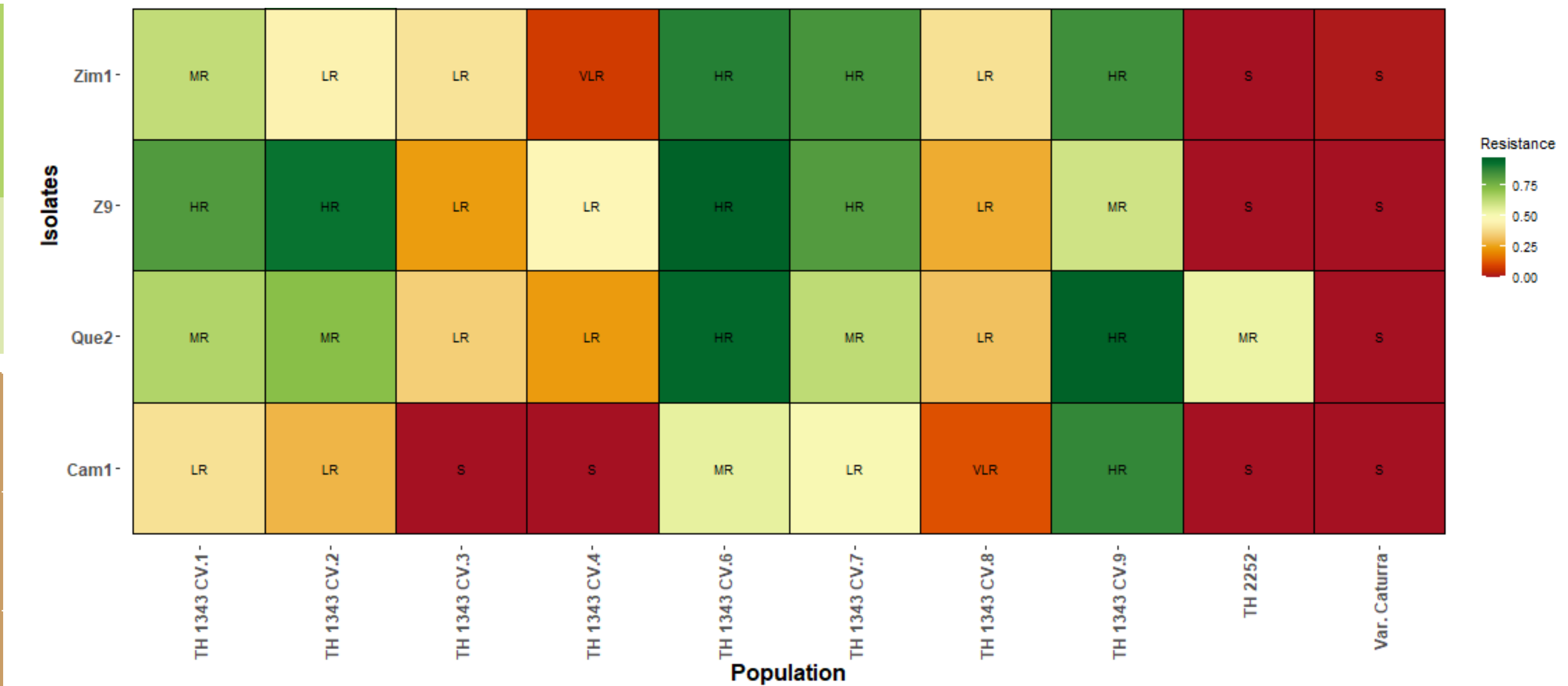


Figure 1. Classification of resistance to the Cam1, Que2, Z9, Zim1, and Zim12 isolates of *C. kahawae* in TH CIFC 1343 and TH CIFC 2252.

Although there is no conclusive evidence for the existence of races in *C. kahawae*, our results suggest that they likely occur in the *C. arabica* - *C. kahawae* complex. This behavior in pathogen specificity on the host (*C. arabica*) was observed in genotypes derived from Caturra × TH CIFC 1343, wild genotypes, and interspecific hybrids (*C. arabica* × *C. canephora*) evaluated with isolates of high and medium/low aggressiveness. While some genotypes were classified in class S, some isolates were also grouped in the HR class or others (Table 2).

Table 2. Percentage of hypocotyls affected by CBD with high resistance (Grade 1) and complete susceptibility (Grade 4) in the *C. arabica* - *C. kahawae* complex in genotypes from Caturra x TH CIFC 1343.

Population	Cam1	Que2	Z9	Zim1
Cat. x TH 1343	100 (S)	-	99 (HR)	-
Cat. x TH 1343	-	100 (S)	-	97 (HR)
Cat. x TH 1343	100 (S)	-	98 (HR)	99 (HR)
Cat. x TH 1343	100 (S)	99 (HR)	-	-

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