

Breakdown of leaf rust resistance in Arabica coffee cultivars derived from Híbrido de Timor and Icatu in Paraná State, Brazil

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Introduction

- There are many physiological races of coffee leaf rust (CLR) that have overcome the high resistance of Arabica coffee cultivars derived from the Híbrido de Timor (HdT) and Icatu.
- With the breakdown of high resistance, many of these cultivars currently exhibit intermediate resistance at the slightly resistant level or are susceptible (Sera et al., 2022).
- The objective of this study was to analyze resistance level to CLR in Arabica coffee cultivars.

Table 1. Means from field evaluations on Arabica coffee cultivars for the average of the three years (2022, 2023, 2024) of coffee leaf rust severity assessments (CLRS) and percentage of highly resistant plants (%HR), considering the local race population of *Hemileia vastatrix* in the experimental area of Londrina - Paraná, Brazil.

Cultivars	Origin	CLRS ⁽¹⁾	%HR ⁽²⁾
Catuaí Vermelho IAC 99	Mundo Novo x Caturra	4.53 a	0
Catucaiam 24137	Icatu x Catuaí	4.31 a	0
Guará	Icatu x Catuaí	4.05 b	0
IAC Obatã 4739	(Sarchimor x Catuaí) x Catuaí	3.93 b	0
IPR 103	Dwarf Icatu x Catuaí	3.92 b	0
Japy	Icatu x Catuaí	3.87 b	0
Sarchimor MG 8840	Sarchimor	3.86 b	0
Azulão	Icatu x Catuaí	3.59 c	0
MGS Paraíso 2	Catuaí x HdT CFC 2570	3.47 c	0
Rouxinol	Icatu x Catuaí	3.45 c	0
Arara	(Sarchimor x Catuaí) x Catuaí	3.26 c	0
Obatã IAC 1669-20	Sarchimor x Catuaí	3.10 d	0
IPR 108	Sarchimor x (Dwarf Icatu x Catuaí)	2.99 d	0
MGS Aranãs	Icatu x Catimor	2.95 d	2.50
Tupi IAC 1669-33	Sarchimor	2.61 e	4.55
Acauã novo	Sarchimor x Mundo Novo	2.43 e	2.78
IPR 102	Dwarf Icatu x Catuaí	1.85 f	46.43
Asabranca	Sarchimor x Mundo Novo	1.70 f	64.94
IPR 104	Sarchimor	1.49 g	100
IAC 125	Sarchimor	1.38 g	100
Sabiá-una	(Icatu x Catuaí) x (Catimor x Acaiá)	1.33 g	100
IPR 107	Sarchimor x Mundo Novo	1.32 g	100
IPR 105	Catuaí x (Catuaí x BA-10)	1.22 g	100

⁽¹⁾ Means followed by the same letter do not exhibit significant differences according to the Scott-Knott test at 1% level.

⁽²⁾ Only plants with CLRS scores of 1 or 1.5 in all three years of evaluation were classified as HR.

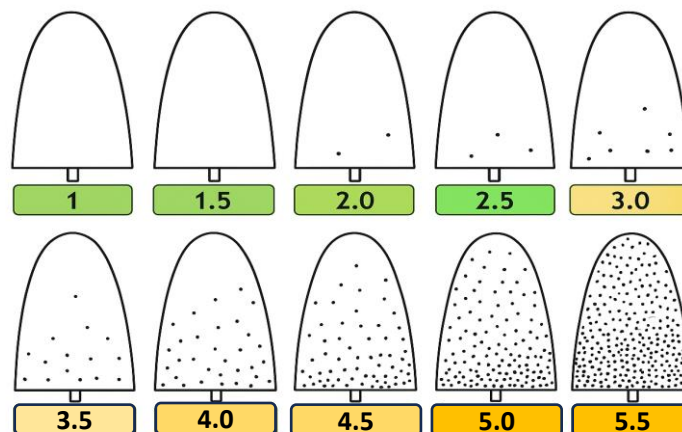


Figure 1. Diagrammatic scale for assessing the severity of CLR based on the percentage of leaves with CLR sporulation.

Materials/Methods

- **Plant material:** 23 *C. arabica* cultivars.
- **Field experiment / IDR-Paraná (Londrina, Paraná, Brazil):**
 - randomized complete block design with four replications and ten plants per plot.
 - planted in 2017 at a spacing of 3.00 x 0.60 m
- **Assessment of CLR severity (CLRS):**
 - years 2022, 2023, and 2024.
 - scores ranging from 1.0 to 5.5 (Sera et al., 2024) (Figure 1).
- **Statistical analysis:**
 - The average of the three years of CLRS was calculated, and the means were compared using the Scott Knott test at a significance level of 1%.
 - The percentage of highly resistant plants (%HR) was calculated.

Results/Discussion

- **Susceptible:** Catuaí Vermelho IAC 99 and Catucaiam 24137 (Table 1)
- **Slight resistance levels and no HR plants:** cultivars originated from Icatu x Catuaí, such as Guará, IPR 103, Japy, Azulão, and Rouxinol.
- **Slight resistance levels and no HR plants:** cultivars derived from HdT, which are generally considered highly resistant (HR) in Brazil, such as IAC Obatã 4739, Sarchimor MG8840, Arara, and MGS Paraíso 2.
- **Moderate-slight resistance:** Obatã IAC 1669-20, Tupi IAC 1669-33, MGS Aranãs, and IPR 108.
- **Moderate resistance:** Tupi IAC 1669-33 and Acauã novo.
- **High resistance in heterozygous condition:** IPR 102 and Asabranca.
- **High resistance in homozygous condition:** IPR 104, IAC 125 RN, IPR 107, Sabiá-una, and IPR 105.

Conclusion/Perspectives

- Most cultivars derived from HdT and Icatu exhibited a breakdown in resistance to local CLR races.
- The cultivars that still maintain high resistance to CLR likely possess a greater number of unbroken *SH* genes, with the exception of IPR 105, which maintains resistance solely due to the presence of the *SH3* gene (Silva et al., 2023).

References:

- Sera, G. H. et al. 2022. Coffee Leaf Rust in Brazil: historical Events, current situation and control measures. **Agronomy**, 12: 496.
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- Silva, A. G. et al. 2023. Assisted selection using molecular markers linked to rust resistance *SH3* gene in *Coffea arabica*. **Crop Breeding and Applied Biotechnology**, 23: e445323413 - 6.